वार्षिक प्रतिवेदन
Annual Report 2022

भाकृअनुप–केन्द्रीय तटीय कृषि अनुसंधान संस्थान
ICAR - Central Coastal Agricultural Research Institute

Old Goa (Goa) - 403 402

Visit of the Hon. Union Agriculture Minister Shri N.S.Tomar Ji to *Krishi Mahotsav* held at Quepum, South Goa on 02.02.2022

Celebration of World Soil Day held at ICAR-CCARI, Goa on 5.12.22

Launching of the pilot project on Rejuvenation of Khazan Lands in Goa on 14.12.22

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ICAR - CENTRAL COASTAL AGRICULTURAL RESEARCH INSTITUTE, GOA

Ela, Old Goa, Goa - 403 402

ICAR-CCARI, Goa
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Cover Page photos: Clockwise from the bottom – view of rice germplasm collection, view of bambusetum established on undulating terrain, young *Shweta Kapila* cows, Cardozo Mankurad mango, Asian sea bass fish, women participants of a training program on nutritious recipes of millets.

PREFACE

According to the 2011 Census, India's coastal districts have a population of 171 million, representing 14.1% of the country's overall population. Overall, nearly 30% of India's population relies on coastal and marine resources. This zone is also a vulnerable ecosystem in the country in view of natural calamities, increase in sea levels, cyclones and climate change events whose frequency of occurrence has increased over the last decade.

Coastal ecosystems deliver a wide range of services, viz. material benefits, regulating services like freshwater storage in the hinterlands, hydrological balance, flood and storm protection, erosion control and shoreline stabilization, regulation of water quality and carbon sequestration. Besides these 'hidden' services, coastal ecosystems provide numerous cultural services, recreational and aesthetic benefits and support a thriving tourist industry that provides employment to thousands of people that are in many cases linked to spiritual, social and cultural dimensions of the coastal region.

The ICAR-CCARI situated in Goa, caters to the development of technologies which are primarily aimed toward the conservation of natural resources of the coastal region, increasing productivity of field crops, breeding crops for stressed environment, identifying high yielding fruit trees of local occurrence, developing package of practices for maintaining animal health, keeping crops and vegetables disease free, increasing fish productivity and developing the concept of agro-eco tourism as a new initiative for entrepreneurship development and retaining youth in agriculture besides involving citizens in protecting and valuing ecosystems.

For the first time in the history of the Institute, an innovative farmer of coastal district of Karnataka, Shri Amai Mahalinga Naik (from Adyanadka village of coastal Dakshina Kannada) who was nominated by ICAR-CCARI, Goa was conferred with the Padma Shri 2022. The Government of Goa on its 35th Statehood Day presented a memento and citation to ICAR-CCARI, Goa on 30th May 2022 for its significant contribution towards progress and development of agriculture, animal husbandry, fishery and food processing which has led to revolutionary changes in the state. ICAR-CCARI Scientist Dr. K.K. Manohara, won the prestigious "Goa State Biodiversity Conservation Award" for his significant contribution to the conservation and utilization of native rice varieties of Goa.

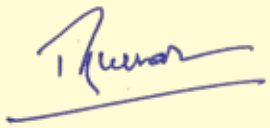
A pilot project on the rejuvenation of *khazan* lands was launched by the Hon'ble Governor of Goa, Shri P.S. Sreedharan Pillai, during a function organized by the agriculture and food processing committee of Goa Chamber of Commerce and Industry (GCCI) on 19th Nov.' 2022. The project has been funded by NABARD, Goa and is being implemented by ICAR-CCARI, Goa.A Memorandum of Agreement (MoA) was signed on 21st March, 2022 (ICAR-CCARI, Goa and Kerala Veterinary and Animal Sciences University (KVASU), Pookode, Kerala for collaboration and for the establishment of Farmer Producer Organization (FPO)/Self Help Groups (SHGs)/Community Organizations (COs) of Tribal farmers of Coastal Districts of Kerala. Another Memorandum of Understanding (MoU) was signed between ICAR-CCARI, Goa with Professor Jayashankar Telangana State Agricultural University (PJTSAU), Hyderabad on 30th March, 2022 for promotion of students' training and quality post-graduate research. ICAR-CCARI, Goa signed a Memorandum of Agreement (MoA) with the Milestone Resorts, Candolim, Goa on 22nd September 2022 for promoting agro-ecotourism.

The Institute for the first time organized an international training program during 7-11th Nov.' 22 in collaboration with CIFOR and ICRAF, which was attended by fourteen participants. The institute also organized a national level training program on cashew production, processing and post-harvest management during 6th to 8th Jan.' 22, which was attended by delegates from thirteen states.

The Institute has received financial support from agencies like the DST, NABARD, ICAR Seed project, IMD, DASD and several AICRP for research studies in various themes, for which we are grateful. Several scientists underwent training in national and international centres of excellence and attended conferences and communicated forty-one research papers.The institute scientists published a total of 78 research papers in different peer-reviewed journals, with 42 of them being published in international journals out of which 30 were published in journals with NAAS rating of >8. The KVK of the Institute organized 48 training programs on various topics and trained 1280 participants, along with 28 on-farm trials and 68 field level demonstrations.

This report is a brief summary of work done at ICAR-CCARI, Goa during 2022, which provides an overview of the large diversity of activities being undertaken. Suggestions for further improvement of our research and extension activities are welcome from our readers.

The support of our sister line departments in the states, farmers and the funding agencies is gratefully acknowledged. I thank Dr. H. Pathak, Director General, ICAR and Secretary, DARE for his patronage, support and his keen interest in our Institute's activities. I also gratefully acknowledge the support and guidance of Dr. Suresh Kumar Chaudhari, Deputy Director General (NRM), ICAR for his consistent encouragement and guidance.



Place: Old Goa
Date: 29.10.23

(Parveen Kumar)
Director

CONTENTS

EXECUTIVE SUMMARY

ICAR- Central Coastal Agricultural Research Institute conducts strategic and applied research under various research themes: conservation, management and utilization of natural and genetic resources, production technologies for crops, animals and fisheries, post harvest technologies, and agro eco-tourism. The research projects have been streamlined into five mega themes. The highlights of research achievements for the year 2022 are presented below.

Natural Resourse Management

- The preliminary results of the studies on land shaping methods for salinity and waterlogging management in salt-affected soils of the coastal region suggest that this method has a potential to improve land productivity and profitability. The cropping intensity of the experimental field increased from 100% to 300% which allowed a year-round utilization of the land. Land shaping with farm pond (10% of total area), bunds (25%) and original lowland (65%) area ensured the incorporation of crop components like vegetables (salt-sensitive) and fishery to augment farm income.
- Integrating the proximal sensing (apparent electrical conductivity directed soil sampling) and the remote sensing along with ground truthing resulted in significant prediction and EC_e and its mapping. A novel approach to expeditely determine the salt-tolerance function for a crop (i.e. onion) using high-resolution satellite time series and EC_a-directed soil sampling was developed.
- A rice-based lowland integrated farming system (IFS) model on a 0.5 hectare has been standardized, combining crop cultivation, dairy farming, and fishery. The system has shown a net return of Rs. 1.68 lakh per year, with the highest contribution coming from crops at 61%, followed by dairy at 22%. In terms of nutrient recycling, the IFS model recycled approximately 57.9 kg of nitrogen (N), 34.5 kg of phosphorus (P), and 69 kg of potassium (K) within the system, indicating efficient utilization and recycling of nutrients which contributes to sustainable agriculture practices. Furthermore, the IFS model generated employment opportunities, providing 352 man-days of employment.
- An upland plantation crop-based model, which includes arecanut, cashew, coconut, and livestock, has been implemented on 0.8 hectare area. This model has generated a net income of Rs. 2.13 lakh per year, with the highest contribution to net profit obtained from the arecanut-based cropping system, accounting for 46% of the total profit, followed by cashew and pineapple system at 23%. The employment generated by the model amounts to 257 man-days, indicating its potential to create livelihood opportunities for the local population. In terms of nutrient recycling, the system effectively utilizes residues and recycles nutrients. Specifically, it recycles approximately 72.8 kg of nitrogen (N), 46.9 kg of phosphorus (P), and 84.3 kg of potassium (K) nutrients.
- The effects on grain production, above ground biomass, energy efficiency, economics, and soil carbon stock in red lateritic soils were investigated for six rice-based cropping systems (along with

one control) using two tillage techniques (conservation and conventional tillage). The adoption of a triple cropping system consisting of direct-seeded rice, zero tillage baby corn, and zero tillage moong showed significant improvements in various aspects. Compared to the farmers practice, this system resulted in a 29% increase in production and a 48% improvement in profitability. The estimated gross carbon input increased by 121%, indicating reduced greenhouse gas emissions and increased carbon storage. Above-ground biomass production increased by 32.7%, reflecting improved resource utilization and nutrient cycling. Soil carbon stock also increased by 48.5%, indicating enhanced soil health and fertility. Overall, the direct-seeded rice-zero tillage baby corn-zero tillage moong system demonstrates the potential of integrated cropping and conservation tillage practices for sustainable agriculture and soil health.

- Extreme weather indices have been calculated for coastal districts of Maharashtra and Goa using the daily maximum, minimum temperature and rainfall dataset. Threshold values for each indicator were identified by regressing the indices with Yield Anomaly Index (YAI). It was observed that extreme weather events had negative impacts on rice productivity
- Endophytic bacteria improves the survival rate (56-75%) of groundnut under salt-affected soils but dual stress due to waterlogging by off-season rainfall leads to crop loss. Thus, managing soil salinity using endophytic bacteria, and avoiding excess soil moisture by proper drainage during unexpected events of off-season rains to avoid crop losses might be effective.
- Trends of annual and seasonal rainfall in east flowing rivers of India (Vaippar, Pamba, Ponnaiyar, Palar, Cauvery, Pennar, Krishna, Godavari, Nagvati, Vamsadhara, Mahanadi, Brahmani, Baitrani and Subernarekha) were studied to estimate the spatio-temporal variability. Data from 48 rain gauge stations spread over 4 states and 16 river basins were used for the estimation.
- In winter season only two stations out of 48 showed significant decrease ($p<0.05$) in rainfall trends. In the pre-monsoon season, three stations ($p<0.05$) showed significant increasing trend and one station showed decreasing trend ($p<0.05$). During monsoon and post-monsoon seasons, three stations showed significant ($p<0.05$) decreasing rainfall trend. Annually, only 6 stations ($p<0.05$) showed significant decreasing rainfall trend. The average annual rainfall in the east flowing rivers varied from < 700 mm to > 1600 mm.

Crop Sciences

- Two hundred germplasm accessions of rice comprising landraces, wild rice, and advanced breeding lines were multiplied during *Kharif* 2022 at the Institute farm or conservation and further utilization. Thirty-one traditional and improved aromatic rice varieties were characterized with the help of uniformly distributed 20 SSR markers. The diversity analysis grouped the genotypes into four different clusters. Diversity analysis using a neighbor-joining tree using Jaccard Coefficient revealed four major groups among the scented rice varieties studied.
- Phenotyping of two hundred thirty-four rice genotypes comprising landraces, wild relatives, advanced breeding lines, and released varieties for salinity stress at the seedling stage was carried out under micro plots with induced salt stress of 10 $dS/M_{(iw)}$. Among the genotypes screened, none exhibited a highly tolerant reaction (SES ~ 1). However, 13 genotypes showed a tolerant reaction with an SES score of 3, while 58 genotypes exhibited a moderately-tolerant reaction (SES score of 5). Additionally, 99 accessions were found to be sensitive (SES

score 7), and 62 were highly sensitive (SES score 9). The genotypes *Mara batta, Sanna IET, Chitga, Dodgi, Karna, Shirali local, Bilashi local, Byalearya, Aravat hilla, Korgut, Walayo, Barkur Batta, and Jeddu batta* displayed tolerant reactions with an SES score of 3.

- In the development of mapping populations and generation advancement, twenty-nine different populations were advanced to subsequent generations following the Single Seed Descent (SSD) method.
- Forty-three new breeding lines developed for multiple stress tolerance were evaluated under rainfed shallow lowland conditions to identify the best entries. The highest grain yield of 8707.1 kg/ha was recorded in RIL (GD1 × CSR 27) followed by 7831 kg/ha in RIL (KARJAT 3 × KS 19-2), 7825 in RIL (KARJAT 3 × KS 19-2), 7723.8 in RIL (GD1 × CSR 27) and 7692.9 in RIL (GD1 × JAYA). Jaya recorded the highest grain yield (6896.4 kg/ha) among the five checks tested. The average grain yield among the lines tested is 6100.6 kg/ha. The same set was evaluated under coastal salinity conditions to identify the best entries. The highest grain yield of 5036.11 kg/ha was recorded in RIL (GD1 × CSR 27) followed by 4855.56 kg/ha in RIL (KARJAT 3 × KS 19-2), 4847.22 in RIL (Karjat 3 × KS 19-2), 4811.11 in RIL (GD1 × CSR 27) and 4675.0 in RIL (GD1 × JAYA). Goa Dhan 3 recorded the highest grain yield (4005.56 kg/ha) among the five checks tested. The average grain yield among the lines tested is 3426.5 kg/ha.
- Four new rice lines with higher yield potential and non-lodging types were nominated for testing under the IVT trial of the CSTVT trial under the AICRP program. The lines were medium duration, non-lodging with potential yield ranging from 4.5 t/ha to 5.0 t/ha.
- With the objective of mapping Quantitative Trait Loci governing seedling stage salinity tolerance, a Recombinant Inbred Line population was developed using Goa Dhan 2, a low-yielding salt-tolerant variety, and Jaya, a high-yielding salt-sensitive variety. During *Kharif* 2022, 272 RILs derived from the above cross were phenotyped under rainfed shallow lowland conditions. The highest grain yield was recorded in RIL-JG-115 (9771 kg/ha) followed by RIL JG RIL 135 (8615.7 kg/ha), RIL JG RIL 193 (8297.1 kg/ha), RIL JG RIL 193 (8250.0 kg/ha) and RIL JG RIL 193 (7590.0 kg/ha).
- Quality seed production in major field crops of Goa state was undertaken at the Institute farm during the *kharif* and *rabi* seasons. Breeder seed production in paddy varieties *viz*., Goa Dhan 1, Goa Dhan 2, Goa Dhan 3, and Goa Dhan 4 and cowpea variety Goa Cowpea 3 was taken up as per the indent received from the Department of Agriculture, Govt of Goa and other stakeholders in the state. Apart from breeder seeds, TL seeds were produced in paddy varieties *viz*., Jaya, Jyothi, Karjat 3, and Sahbhagi Dhan. A small quantity of TL seed production was taken up in green gram varieties TM 96-2 and IPM 2-14.
- Maintenance breeding for the production of nucleus seeds of paddy varieties *viz*., Goa Dhan 1, Goa Dhan 3 and Goa Dhan 4 was taken up during 2022-23 in the Institute farm.
- Twelve Front Line Demonstrations on drought tolerant paddy variety Sahbhagi Dhan was taken up in farmers' fields in Goandongrim and Cotigao villages of Canacona block. The grain yield of the Sahbhagi Dhan ranged from 45 q/ha to 50 q/ha compared to 30 q/ha to 35 q/ha in the check varieties. The Sahbhagi Dhan variety proved itself to be superior to locally grown varieties both in terms of grain yield and straw yield.
- During the *Kharif* season of 2022, two trials viz., IVT-CSTVT and AVT-CSTVT were

conducted under natural coastal salinity conditions in Chorao Island. The IVT-CSTVT trial consisted of 30 test entries, including five checks, while the AVT-CSTVT trial included 10 test entries, also with five checks. In the AVT trial, only one entry, IET 27847, recorded a higher grain yield compared to the best check variety, Goa Dhan 3. IET 27847 achieved a grain yield of 4532 kg/ha, whereas Goa Dhan 3 yielded 4280 kg/ha. As for the IVT trial, only one entry surpassed the best check in terms of grain yield. The highest grain yield was achieved by entry IET 31067, which recorded 6125 kg/ha. The best check variety, Bhutnath, yielded 5650 kg/ha.

- The impact of climate change on potential distribution of Rugose spiralling whitefly (RSW) *Aleurodicus rugioperculatus* through Maximum Entropy (MaxEnt) niche modelling was predicted. The bioclimatic suitability map of RSW distribution under current and future climate scenarios indicates that the occurrence of the whitefly is highly concentrated in the entire coastal and southern states of India. Potential natural enemies comprising of parasitoids, predators and entomo-pathogens were observed to be attacking various life stages of fall armyworm (FAW), *Spodoptera frugiperda* in fodder maize. The field egg parasitism of *Trichogramma chilonis* Ishii and *Telenomus remus* Nixon was 13.90% and 29.37%, respectively. Among the larval parasitoids, *Campoletis chlorideae* Uchida was the most dominant and was recorded throughout the cropping period. Eleven species of predators were observed to be predating on various life stages of FAW. Occurrence of stem and root borers in cashew plantations was recorded. Among the stem and root borers, the species *Neoplocaederus ferrugineus* and *N. obesus* was found to be major one. The mango stem borer *Batocera rufomaculata* and ambrosia beetle *Euplatypus parallelus* were also observed to be attacking stem borer infested cashew trees.

Horticulture Sciences

- Date palm seedlings were characterized for morphological traits. Arecanut germplasm and improved selections were characterized for nut and kernel traits. The project on ornamental horticulture for livelihood diversification in coastal India characterized 119 plants of jasmine germplasm of Goa using 37 traits.
- A waterlogging tolerant cassava germplasm, collected from flood-affected Ernakulam District Kerala was evaluated for tuber yield under arecanut as an intercrop under natural water logged conditions.
- *Momordica* germplasm collection was evaluated and it was recorded as *Momordica sahyadrica.* This species is an important, neoendemic, under-utilized, dioecious species confined by natural distribution only to India, particularly, to the Sahyadri mountain range.'Sahyadri gourd' appellation was used for *M. sahyadrica* for the first-time and using chemical stimuli ($AgNO_3$ 500ppm) crossing between two genetically female genotypes was attempted, which resulted in normal fruit set and seed development.
- Under AICRP on Vegetable Crops, 10 trials that included Mustard Green:1 trial (varietal), Okra: 3 trials (YVMV varietal/ resistant), Tomato: 6 trials (hybrid and ToLCV varietal/hybrid) were evaluated for reporting to the Project Coordinating Unit AICRP-VC, ICAR-IIVR, Varanasi. An average yield of 683 q/ha and 658 q/ha were reported with multiple harvests from mustard green entries, 2021-MGVAR-6 and 2021-MGVAR-3 respectively. Eight, six and seven entries from trials OKRA (YVMV) Varietal AVT-II, OKRA (YVMV) Varietal AVT-I and OKRA (YVMV) Varietal resistant IET, respectively recorded 0% YVMV incidence at 90 days after sowing.

Animal Science and Fishery Sciences

- Species identification of yeast pathogens associated with clinical mastitis by 16s rRNA sequencing was carried out and their antibiotic resistance profile assessed. The antimicrobial properties of methanolic extracts of Coleus (Plectranthus) amboinicus, *Pogostemoncablin* (Indian patchouli), *Costusigneus* (Insulin plant) *Adhatoda vasica, Artemisia annua*, *Andrographis paniculata* and *Senna alexandrina* against *Staphylococcus aureus* and yeast pathogens was assessed by disc diffusion method. The MIC of *Plectranthus ambonicus* extract against *Staphylococcus haemolyticus, S. epidermidis* and *S.aureus* were observed to be 50µg/ml, 25µg/ml and 25µg/ml, respectively.
- Analysis of sero-prevalence of PPR in goat serum samples from Goa showed 25.3% prevalence of PPR disease.
- Reproductive characterization of native *Shweta Kapila* cattle was undertaken and major reproductive attributes included age at puberty (25.6±0.32 months), age at first service (34.1±1.24 months), age at first calving (41.3±1.65 months), mean service period (92.3±1.83 days) and inter-calving interval (392.4±8.62 days). Mean birth weight was 13.35±0.23 kg and calves showed daily weight gain of 0.21±0.01 kg/day. Females had relatively shorter age at puberty and calving interval suggestive of apparently favourable reproductive potential of this indigenous breed. Evaluation of breeding bull reproductive function was performed through breeding soundness examination in indigenous *Shweta Kapila* and *Gir* breeds of cattle.
- The rectal temperature and respiration rate during hot period were comparatively low in *Shweta Kapila* (an indigenous cow breed of Goa) than other breeds (*Sahiwal* and *Gir*) of cattle. There was high level of enzymatic activity indicating more tissue damage during hot period in *Sahiwal* and *Gir* as compared to *Shweta Kapila* cattle. The high Na^+ and Cl^-, and low K^+ serum ion concentration than other breeds of cattle, indicated better thermo-tolerance ability of *Shweta Kapila* cattle. The sequencing results revealed 3 novel SNPs (loci g.G4733C, g.C4765A and g.A4848G) in 3'UTR of HSP90AA1 gene in *Shweta Kapila* cattle.
- Semen profiling of indigenous pig semen was also carried out using ATR-FTIR spectroscopy and important spectral regions measured were fingerprint region (500–1,500 cm^{-1}) for nucleic acids and sugars and the amide I/II region (1,500–1,700 cm^{-1}) for proteins. In indigenous pig semen samples, distinctive pattern could be identified in the amide I/II region corresponding to sperm proteins. Procedures for AI and Computer Assisted Semen Analysis were standardized in backyard poultry varieties like *Gramapriya*. Poultry AI has been successfully adopted in selected flocks of the Institute units with average fertility of 93% and hatchability of 81%.
- As part of the National Animal Disease Epidemiology Network, livestock disease outbreak investigations and monthly disease outbreak reporting were carried out. The important disease outbreaks diagnosed in Goa during the reporting period were Infectious coryza and CRD in poultry; Porcine Circo virus-2 infection, *E. coli septicemia,* systemic infection with *Pasteurella multocida and Streptococcus zooepidemicus* in pigs and Theileriosis, Babesiosis, Brucellosis and septicaemia due to *Fusobacterium necrophorum* in cattle.
- In a study on investigation of infectious reproductive disorders in dairy cattle vaginal, uterine swab and blood samples were collected from 34 cows from four dairy farms situated in Goa and investigated for bacterial culture, antibiotic sensitivity test (AST), RBPT, DNA isolation and PCR.

During the study one cow was diagnosed with endometritis by endometrial cytology using cytobrush and white side test and 5 cows were diagnosed with brucellosis using RBPT. The bacterial culture of vaginal swab samples revealed isolation of *E. coli* from 8 cases and *Staphylococcus* spp. from 4 cases.

- Natural feed additives were evaluated through GC-MS for screening of active phytoconstituents and to study their action in synergistic way upon feeding to backyard poultry. Feeding experiments were conducted in CARI-Devendra, Gramapriya, and indigenous ducks with combination of Shyama tulsi *(Ocimum tenuiflorum),* Moringa *(Moringa oleifera),* Chekurmanis *(Sauropus androgynus),*Kalmegh (*Andrographis paniculate*), Alpinia *(Alpinia galanga),* Turmeric *(Curcuma longa)* and Ginger *(Zingiber officinale)*. The feeding of these phytogenic feed additives at 2% showed improvement in the growth, immune-response, feed conversion ratio, haematology, gut health in backyard poultry. Three different varieties of Japanese quails CARI-Shweta (layer), CARI-Uttam (Broiler) and CARI-Brown were evaluated under hot and humid climate of Goa over generations.
- In the poultry seed project, different varieties like - Gramapriya, CARI-Debendra and Kadaknath were reared in the reporting year and their growth and production was evaluated. A total of 13,980 number of chicken germplasm, 860 number of duck and 7186 number of quails including fertile eggs, chicks, adults were supplied to farmers.
- Growth, survival, and economic efficiency of Asian seabass (*Lates calcarifer)* were evaluated in a polyculture experiment for Small Indigenous Fish (SIFs) and Tilapia as a forage fish in freshwater pond systems. Survival rate was highest (72%) in the treatment where seabass was cultured along with SIF and Tilapia in a 2000 sq.m pond. This led to a biomass production of 1773 kg in a period of nine months. Feed acceptance of SIFs by seabass was higher than that of Tilapia and IMC juveniles in terms of number, weight, and frequency percentage.
- Trials to determine suitable forage fishes for Sea bass culture indicated that glass fish, (*Ambassis ambassis)* can be used as a forage fish in saline to low-saline culture systems for Asian seabass grow-out culture. Brood stock development, freshwater tolerance, and maturity studies was conducted for *Ambassis ambassis in freshwater ecosystem, which indicated that the species* showed 10-20% adaptation. The length-weight profiles of Small Indigenous Fishes (SIFs) of the Cyprinidae family from different freshwater bodies in Goa was studied. Length weight data of a total of 2485 fish specimens (*Systomussarana*: 782; *Rasboradandia*: 606; *Puntius vittatus*: 577*; Puntius mahecola*: 520) were documented from different locations in freshwater systems in Goa.
- For diversification of fish species and to demonstrate various aquaculture and allied activities to fish farmers, culture demonstrations of Tilapia, Pangasius and Etroplus species were initiated. Aquaculture farm was developed including nursery ponds and grow-out ponds for fish breeding, culture, and aquaculture experiments. In a NABARD funded project on ornamental fisheries, three training programme were organized on Ornamental fish culture for entrepreneurship development for 61 trainees. Two demonstration units of ornamental fish culture were also set up.
- In order to breed indigenous ornamental fishes in captivity, sampling and brood-stock collection of indigenous freshwater ornamental fishes was carried out from different sites in Goa. Five species of ornamental fish were identified and breeding trials were set up for these fish species for captive breeding and seed production.

Melon barb (*Haludaria pradhani*) was bred under captivity, and 500 seeds were produced.

Agro-Eco-Tourism

- Different existing agro-ecotourism models in coastal regions of India were studied and accordingly, a conceptual framework was developed to classify the agro–ecotourism paradigm as either primary or secondary depending on its location (on–farm vs off–farm) or the degree to which it is related to agriculture. A package of practices and scientific guidelines for sustainable agro-ecotourism models in coastal regions were formulated and disseminated to various stakeholders. More than 50 farmers, entrepreneurs and youth were trained and exposure visits have been conducted to students (>1000) through our Agro-ecotourism Center and Agro-Business Incubation Center. A model 'Dhanavantari Vatika' (1670 m^2) with 150 species of medicinal and aromatic plants and a model 'Nakshatra Vatika' has been established as integral component of Agro-ecotourism.

Hybrid Napier var. CO-5

Konkan Kalyan Goats

Good bearing of cashew apples

INTRODUCTION

Introduction

ICAR- Central Coastal Agricultural Research Institute is a premium multi-disciplinary institute working to address issues of developing sustainable agriculture and allied activities in the fragile coastal ecosystem of the country. The coastal eco-system is spread over nine states, two union territories covering 32.88 m ha. The Institute is mandated to carry out research and extension work in field and horticultural crops, livestock, and fisheries relevant to the natural resource base for ensuring sustainable productivity, to develop climate-resilient land use and farming systems and agro-ecotourism in the coastal region.

The Institute was established as the ICAR Research Complex for Goa in April 1976 and after a short period as a part of ICAR Research Complex for North East Hill Region, the Complex was brought under the administrative and technical control of the Central Plantation Crops Research Institute, Kasaragod, Kerala. After functioning at different Government agricultural farm sites in Goa, the location was finally shifted to Ela, Old Goa in 1982. The Institute was upgraded to a full-fledged Institute in April 1989 to cater to the growing needs of agricultural research, education and extension in the state of Goa. While the research activities of the Institute were earlier confined to meeting the agriculture needs of Goa, now the Institute has been further upgraded since 2014 to serve the agricultural research needs of 75 coastal districts in mainland states, 7 districts in mainland union territories.

ICAR-CCARI is under Natural Resources Management (NRM) Subject Matter Division and is situated at Ela, Old Goa. The vision of the institute is "Global Excellence in Sustainable and Sustaining Coastal Agricultural Research". The institute has the following mandates:

- Research on field and horticultural crops, livestock, and fisheries relevant to the natural resource base of coastal India for sustainable productivity.
- Develop climate-resilient land use and farming systems for improved and sustainable livelihood through coastal agriculture.
- Act as a centre of agro-eco-tourism.

The institute has four major divisions namely- Natural Resource Management, Crop Science, Horticultural Science and Animal & Fishery Science. The Institute is headed by the Director, who is supported by 23 Scientists, 13 Technical, 15 Administrative and 19 Skilled Support staff, making the total staff strength of the Institute to 70. The research programmes of the institute are streamlined by the Research Advisory Committee of the institute.

The major areas of research are-

i) Conservation and management of natural resources of coastal region
ii) Conservation and utilization of genetic resources in the coastal region
iii) Development and validation of production technologies of major crops of coastal region
iv) Development and validation of production technologies of livestock and Fisheries
v) Improving livelihood security through post-harvest technologies and other Agri-enterprises.

The Institute has made significant research contributions in identification of promising crop varieties/accessions of field and horticultural crops; development of suitable soil

and water conservation measures in cashew, coconut and mango; development of integrated farming system models for low land and upland situations; development of eco-friendly management practices of major insect pests and diseases in plantation field crops and vegetable crops; development and standardization of production technologies for field and horticultural crops of Goa; standardization of low cost protected structures for vegetable and flower production; standardization of packages for rearing cattle, goat, buffalo, pig and poultry; disease diagnosis and animal health management; standardization of ornamental fish culture, carp culture and brackish water fish farming; standardization of mussel farming practices; dissemination of PFZ advisories and validation of advisories; and exploration of fish diversity of Goa.

The Institute is also engaged in the transfer of technology through FLD's, trainings, workshops, etc. The research accomplishments made by scientists, technologies transferred to farmer's fields, awards and recognitions conferred upon the staff and other events organized by the Institute, are presented in the report.

WEATHER REPORT

Information about weather is of paramount importance for agricultural production. Observation of weather parameters is being continuously recorded by the Institute. Observations made during January 2022 to December 2022 are discussed here.

Meteorological Observatory: Agro-meteorological Observatory, KVK farm, ICAR-Central Coastal Agricultural Research Institute, Ela, Old Goa, Goa – 403402.

Location of the observatory: 15°29′22″ N, 73° 55′ 10″ E, 67 m above mean sea level.

Data presented: January 2022 to December 2022.

Time of observation: Morning session I – 0734 (7.34 AM) and afternoon session II – 1434 (2.34 PM)

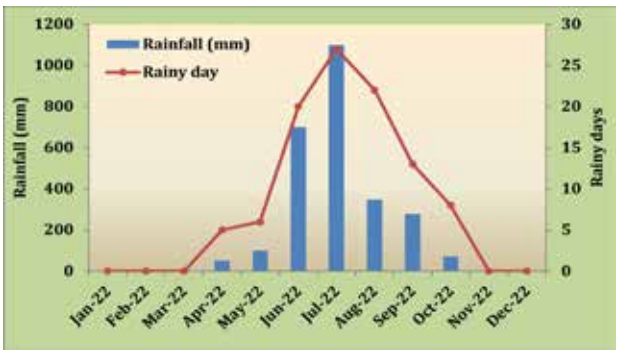
Air temperature

Mean monthly maximum temperature during January 2022 to December 2022 varied from 26.0 °C (July 2022) to 38.5 °C (March 2022), whereas mean minimum temperature varied from 16.0 °C (January 2022) to 28.0 °C (April 2022)

Mean maximum and minimum air temperature during January 2022 to December 2022

Rainfall and rainy days

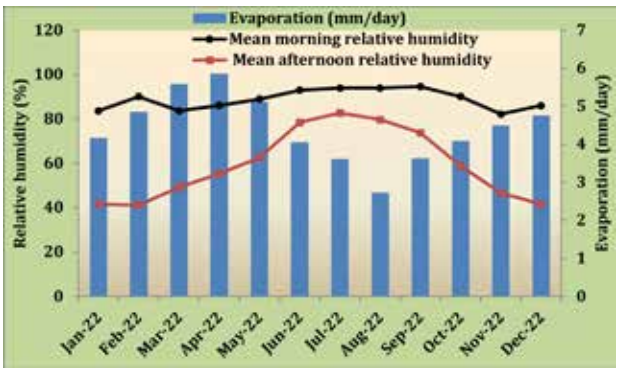
The total rainfall received during January 2022 to December 2022 was 2647.9 mm. A total of 2423.3 mm was received during *kharif* (June 2022 to September 2022). The annual rainfall for this year was 1399.7 mm lower than that of 2021 (4047.6 mm). Total number of rainy days observed were 101 and were lower compared to last year (130 days).



Trend of mean monthly rainfall and number of rainy days

Evaporation and relative humidity

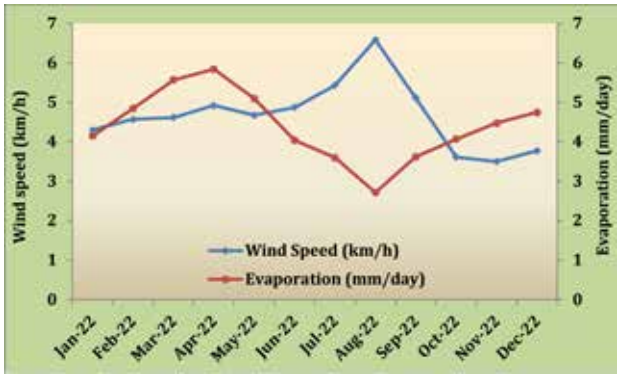
Daily evaporation was measured using USWB-Class A open pan evaporimeter. The total water evaporated from January 2022 to December 2022 was 1576.8 mm. The highest morning and afternoon relative humidity observed was during September and July 2022, respectively, whereas the corresponding lowest was recorded during November and February 2022.



Mean monthly evaporation and morning and afternoon relative humidity

Wind speed

Mean monthly wind speed ranged from 3.50 km/h (November 2022) to 6.59 km/h (August 2022). Mean monthly wind speed started decreasing from August 2022 to November 2022 and it increased thereafter.



Mean monthly wind speed and evaporation

Sunshine hours

The mean monthly sunshine hour recorded ranged from 1.3 hours (July 2022) to 9.6 (February 2022). As expected, mean monthly sunshine hours were lower during rainy season compared to rest of the months of the year.

Soil temperature

The ranges of mean monthly soil temperature recorded in morning hours at 5, 10 and 20 cm depths were 23.7-30.6°C, 25.9-34.3°C and 27.0-34.5°C, respectively, whereas the corresponding ranges for afternoon observation were 31.1-44.1°C, 29.5-39.1°C and 27.6-35.4 °C.

Important dates of observations during January 2022 to December 2022 with the highest and lowest values of weather parameter

Particular of weather parameter	Value	Date
Highest maximum temperature	38.5 °C	14-03-2022
Lowest minimum temperature	16.0 °C	12-01-2022
Highest rainfall	168.6 mm	08-07-2022
Highest evaporation	8.0 mm	26-04-2022
Highest wind speed	13.1 km/h	11-08-2022
Maximum sunshine hours	10.7 h	28-05-2022

Mean monthly weather parameters recorded at ICAR-CCARI from January 2022 to December 2022.

Month	Temperature (°C)		Relative Humidity (%)		Wind Speed (km/h)	Sunshine (h/day)	Evaporation (mm/day)	Rainfall (mm)	Rainy day	Cloudiness (h)	
	Max.	Min.	07.34 AM (0734)	2.34 PM (1434)						07.34 AM (0734)	2.34 PM (1434)
Jan	32.2	19.4	83.6	41.6	4.30	9.2	4.2	0.0	0	3.2	3.1
Feb	33.9	19.5	90.1	41.1	4.57	9.6	4.8	0.0	0	3.7	0.3
Mar	35.6	23.6	83.6	49.1	4.62	6.2	5.6	0.3	0	3.7	1.0
Apr	35.2	25.0	86.1	55.4	4.92	6.2	5.8	51.2	5	3.8	1.3
May	33.7	25.9	89.0	62.6	4.67	5.7	5.1	99.6	6	4.0	3.7
Jun	31.1	23.9	93.0	78.4	4.88	3.3	4.0	700.6	20	4.6	4.7
Jul	29.5	23.4	94.0	82.7	5.44	1.3	3.6	1098.3	27	5.1	5.0
Aug	29.7	22.9	94.0	79.6	6.59	1.6	2.7	347.6	22	4.9	4.4
Sep	30.2	22.5	94.6	73.7	5.11	4.9	3.6	276.8	13	4.2	3.9
Oct	32.5	21.7	90.0	58.7	3.62	6.9	4.1	71.3	8	3.3	2.4
Nov	34.3	21.2	82.2	46.6	3.50	7.3	4.5	0.0	0	3.0	1.2
Dec	34.6	21.0	86.0	41.6	3.77	7.8	4.7	2.2	0	3.0	1.6

RESEARCH ACHIEVEMENTS

Mega Project 1: Conservation and management of natural resources of the coastal region

Project: Assessment of the properties of the coastal saline soils and development of integrated nutrient management practices and crop establishment methods for improving its productivity

(GR Mahajan and R Ramesh)

Considering the challenges of salinity and waterlogging in salt-affected coastal soils, a holistic approach of land-shaping to manage soil salinity and to incorporate different components as integrated farming systems was initiated and studied on a preliminary basis. Land shaping of an experimental field of approximately 0.4 ha was evaluated. Some of the salient research findings that were noted are ;

- **A group-based approach during initial years of reclamation:** During the initial stages of reclamation and cultivation of the salt-affected coastal soils, a farmer group based apprtoach (total approximate area of 0.8 ha comprising of 3 farmers) was observed to be effective. Utilizing good quality irrigation water to irrigate crops during the post-monsoon seasons and skimming the saline water from the well regularly reduced salinity of the field by 72% (i.e. from (EC_e) 29.2 dS m^{-1} (year 2014) to 8.2 dS m^{-1}(year 2022) and brought back the land under cultivation.The approach helped to expedite the reclamation process. Though it is a preliminary observation, however, it could be significant if implemented for a community or a large-scale reclamation of such soils.
- **Land shaping for salinity management and to accommodate different crop components:** Land shaping of an experimental field of 0.4 ha as 10% area for a farm pond for water harvesting and fisheries, 65% area as original field as low-lying land, and 25% of area as raised bunds. The modifications helped to accommodate multiple enterprises as crops and fisheries besides salinity management, water harvesting and conservation. Cropping intensity of the experimental field increased from 100% to 300% which allowed a year-round utilization of the land. The approach allowed the successful cultivation of paddy crop in *Rabi* season by salinity and water management, which was otherwise fallow for the last five years. About 50% of the land portion was brought under cultivation with the intervention.
- An additional water resource of 720 m^3 for the irrigation to the r*abi* crops from the farm pond was created. Using the soil from the excavation of the farm pond, an area of 25% of the total was made suitable for salt-sensitive crops through raised bunds along the periphery of the field and close to the pond. The bunds also arrest the intrusion of saltwater in the field and further help to reduce the increase in soil salinization.

The preliminary results obtained showed a scope to investigate the use of land shaping further in depth for improving productivity and profitability form these lands.

Project: Study of conservation agricultural practices for sustainability of rice-based cropping systems in the west coast of India

(Parameshа V, Parveen Kumar and GR Mahajan)

The study examined the effects of conservation and conventional tillage practices on six different rice-based cropping systems, focusing on grain yield, above ground biomass, energy efficiency, economics, and soil carbon stock. The cropping systems included puddled transplanted rice (PTR)-PTR, direct-seeded rice (DSR)-DSR, rice-moong, rice-cowpea, and rice-baby corn.The results highlighted significant variations in rice equivalent yield (REY) due to tillage management practices. Notably, the triple cropping system of direct-seeded rice-zero tillage baby corn-zero tillage moong exhibited a significant increase in production (REY-12.4 t/ha) and profitability (Net return-1.66 lakh/ hectare). Conversely, the farmer's practice (PTR-PTR) showed considerably lower yield and net returns.The treatment T_7 - MBR + DSR-RR + ZT baby corn - BBR+ZT Moong demonstrated the highest estimated gross carbon input (3.45 Mg/ha) due to increased above-ground biomass production (16.1 t/ha). Similarly, this treatment exhibited the highest soil carbon stock (31.9 Mg C/ha), while the farmer's practice recorded the lowest values. Regarding energy output, the T_7 recorded the highest total energy output (248315MJ/ha). In contrast, conservation tillage practices across different cropping systems resulted in lower energy input due to reduced usage of machinery and diesel. In summary, the study revealed the superiority of the triple cropping system of direct-seeded rice-zero tillage baby corn-zero tillage moong in terms of production, profitability, carbon input, and soil carbon stock. Conservation tillage practices also demonstrated lower energy input compared to conventional tillage. These findings emphasize the potential of specific cropping systems and conservation tillage for improving sustainability and productivity in rice-based agriculture.

General view of experimental plot during *kharif,* 2022

Effect of different tillage practices on rice equivalent yield, C input, soil C stock, energy input, and net returns of different rice-based cropping systems

Treatments	Rice equivalent yield (t/ha)	Above-ground biomass (t/ha)	Estimated gross C input (Mg/ ha)	Soil Carbon Stock (Mg C/ ha)	Total Energy output (MJ/ ha)	Net returns (Rs.- Lakh / ha)
T_1- PTR - PTR (Farmers' practice)	9.4c	12.1c	1.50d	20.9d	148005	1.18d
T_2- DSR+BM - ZT Cowpea	10.5b	13.9c	1.77b	27.8b	171360	1.59b
T_3- DSR-ZT Moong-ZT Baby corn	12.3a	15.5a	1.93b	28.6b	245616	1.68a
T_4- DSR-ZT Moong-ZT moong	11.8a	14.9b	1.82b	28.9b	193973	1.59b
T_5- DSR+BM-ZT Moong	9.75c	11.1d	1.40d	25.2c	181160	1.34c
T_6- DSR-Sweet corn	10.32b	13.4d	1.69c	21.8d	219050	1.37c
T_7 –MBR + DSR-RR + ZT baby corn – BBR+ZT Moong	12.7a	16.1a	3.45a	31.9a	248315	1.82a

Note: DSR-Direct seeded rice; MBR-Moong bean residue; PTR-puddled transplanted rice; ZT-Zero tillage; BM-Brown Manuring. Similar letters between the treatments indicate non-significance at a 0.05 level

Project: Evaluation of potential rice-based cropping systems under salt-affected coastal saline soils for enhancing cropping intensity, sustainability, and livelihood security

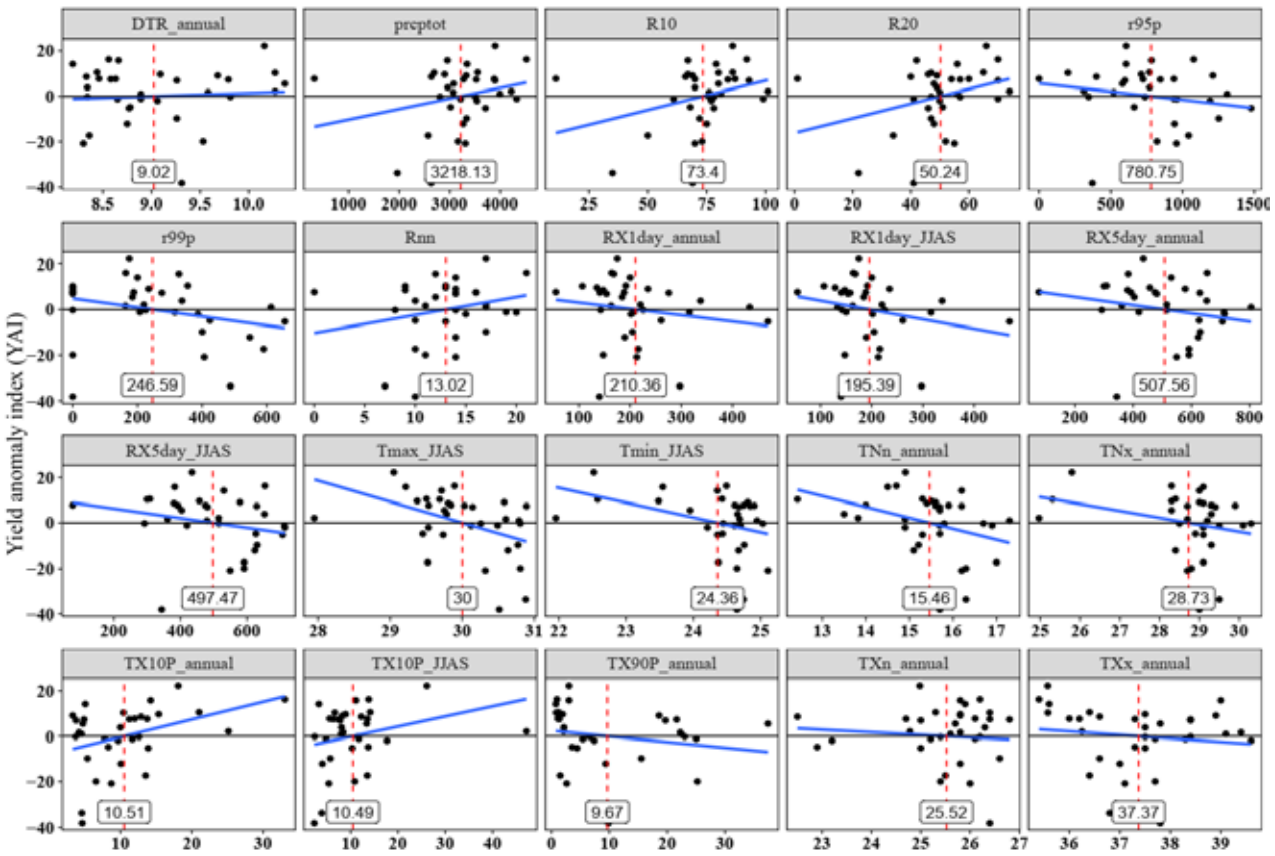
(Parameshа, V, Parveen Kumar, Manohara, KK, Shripad Bhat and Sukanta K Sarangi)

Farm trials were conducted at Diwar island to improve the cropping intensity under salt-affected coastal saline soil to enhance sustainability and livelihood security. The objectives of the study are to increase the cropping intensity under coastal saline soils for doubling farmers' income, assessment of production, profitability, and sustainability of different cropping systems under coastal saline soils, and to quantify different ecosystem services and environmental impacts associated with different cropping system under coastal saline soils. The different rice-based cropping systems selected are rice-cowpea, rice-moong, rice-sweet corn, rice-baby corn, rice-chili, rice-okra, and rice-leafy vegetables. Rice-Bhendi has the highest rice equivalent yield and gross return of 4.2 quintals and Rs. 84,000/- per hectare, respectively. Rice-Sweetcorn and Rice-Chili have comparable rice equivalent yields, with 2.3 and 1.45 quintals per hectare, respectively. Rice-cluster bean and Rice-Baby corn have similar rice equivalent yields of 1.6 and 1.5 quintals per hectare, respectively. However, Rice-Baby corn has a higher gross return of Rs. 75,000, while Rice-cluster bean has a lower gross return of Rs. 32,000. Rice-Cowpea has the lowest rice equivalent yield of 0.6 quintals per hectare among all the cropping systems. However, it still manages to generate a relatively high gross return of Rs. 72,000. In summary, Rice-Bhendi stands out for its high rice equivalent yield and gross return, while Rice-Baby corn also performs well in terms of gross return. Rice-Sweetcorn, Rice-Chili, Rice-cluster bean, and Rice-Cowpea show varying levels of yield and profitability. Germination of moong and establishment of Rhodes grass under coastal saline conditions get affected severely.

Project: Impact assessment of extreme weather events on productivity of major crops in coastal region of India

(Bappa Das, A Raizada, V Arunachalam and K K Manohara)

Climate change and extreme weather events are adversely impacting agricultural production and food security. Suitable climate change mitigation and adaptation strategies are required to assure national food security. In this regard, developing mitigation and adaptation measures requires identification of thresholds in various extreme weather indices in relation to crop yield. Using the daily maximum, minimum temperature and rainfall dataset obtained from India Meteorological Department, Pune for the period of 1983-2015, different extreme weather indices have been calculated for 5 weather stations of coastal Maharashtra and Goa. Rice yield data collected for these districts were converted into yield anomaly index (YAI) by subtracting the actual yield from technological trend yield as the percentage of technological trend yield. Individually indices were regressed with YAI to identify the thresholds. Results show that increasing the temperature related indices have reduced the rice yield beyond threshold except for percentage of days when maximum temperature (TX) < 10th percentile (TX10p) for monsoon (TX10P_JJAS) and annual (TX10P_annual). Among the precipitation based extreme weather indices, annual count of days when precipitation >= 10 and 20 mm (R10 and R20), and annual total precipitation in days with rainfall >=1mm (prcptot) showed positive influence on rice yield, while all other precipitation based extreme weather indices had a a negative impact on rice yield. The threshold values will help to develop climate resilient varieties suitable for the coastal regions.



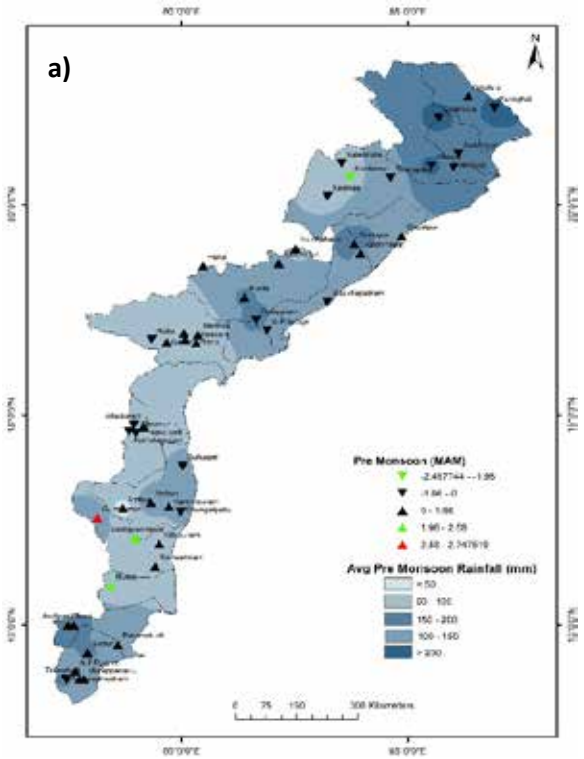
Relationship of temperature and precipitation based extreme weather indices with rice yield for Uttara Kannada district

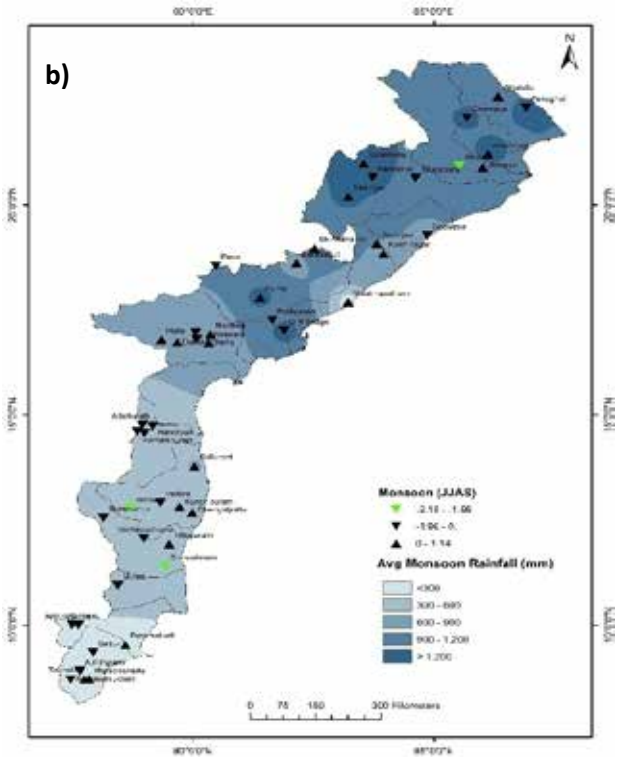
Project: Assessment and mapping of trends in the hydro-climatic variables over the west and east coast regions of India.

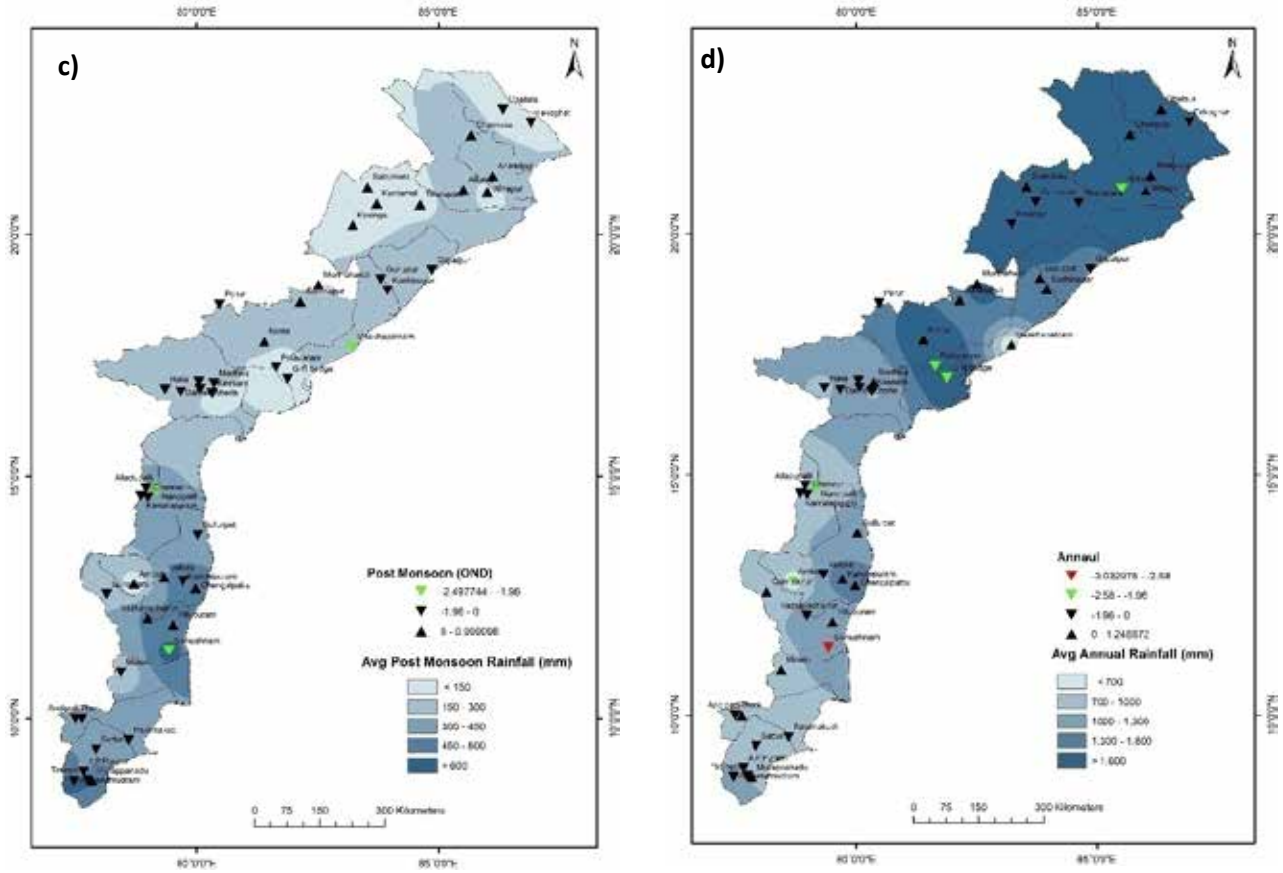
(Sujeet Desai, Bappa Das and Sreekanth G B)

Rainfall trend analysis in east flowing rivers of India

Seasonal and annual rainfall trends in the east flowing rivers of India was studied to assess their spatio-temporal variability. The east flowing rivers consists of 16 river basins and sub-basins covering the states of Tamil Nadu, Andhra Pradesh, Odisha and West Bengal. Time series data of 48 IMD rain gauge stations from 1989-2018 (30 years) was used to analyse the spatio-temporal trends of rainfall. Non-parameteric tests such as Mann-Kendall test, Spearman's rho test and linear regression were used to analyse the trend in time series and Sen's slope was used to estimate the rate of change. All the tests were considered statistically significant at 1% and 5% significance level. The average rainfall for all the seasons was estimated using the 30 years rainfall data and spatial variability maps were prepared. The analysis revealed that, in the winter season only 2 stations out of 48, showed significant decreasing rainfall trend ($p<0.05$) whereas trends in all other rainfall stations were not significant. In the pre-monsoon season, 2 stations ($p<0.05$) and 1 ($p<0.01$) showed significant increasing trend and 1 station showed significant decreasing trend ($p<0.05$) whereas trends in other stations were non-significant. During monsoon and post-monsoon seasons 3 stations showed significant ($p<0.05$) decreasing rainfall trend whereas the remaining stations exhibited non-significant trends. Annually, out of 48 stations, only 5 stations ($p<0.05$) and 1 station ($p<0.01$) showed significant decreasing rainfall trend. Overall, annually including all the seasons most of the rain gauge stations exhibited non-significant rainfall trend. The upward and downward arrows indicate increasing and decreasing trend respectively. The red and green arrow indicates significant increasing/decreasing trend at 1% and 5% significance level, respectively whereas black arrow indicates non-significant increasing/ decreasing trend in rainfall. The average annual rainfall in the east flowing rivers varied from < 700 mm to > 1600 mm.







Spatio-temporal rainfall trends in east flowing rivers (a) Pre-monsoon b) Monsoon (c) Post-monsoon (d) Annual

Project: Assessment and development of agroforestry systems for improved livelihood and climate change mitigation in coastal regions of India

(Uthappa A R, A Raizada, AR Desai, R Solomon Rajkumar, Shripad Bhat, Gopal R Mahajan, Paramesha V, Bappa Das, Sujeet Desai, Nagaratna B Biradar and Vinod Kumar)

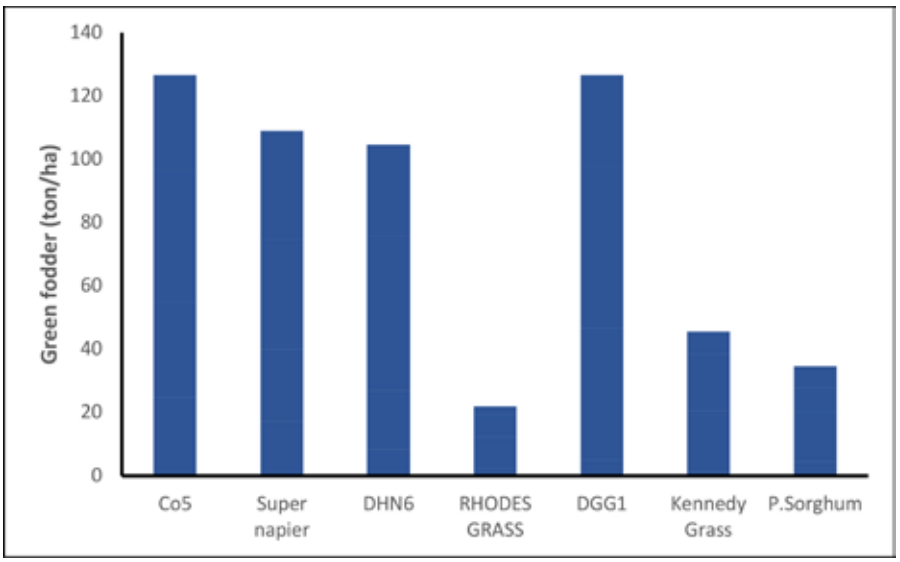
Agroforestry is considered as a climate resilient land use practice. According to FSI, 2013 around 18% of different agroforestry systems are distributed along (18% of agroforestry area in India) the coastline. There exists wide scale diversity in perennial and annual components integrated in coastal agroforestry systems, but there is no scientific documentation of these agroforestry systems. Through literature review and consultation with other researchers, major agroforestry systems of coastal region have been identified. The major systems are -plantation based multi-storied cropping systems, home gardens, silvo-pastoral systems, hedge row intercropping, woodlots, live fences and hedges and multi-enterprise farming systems. In the west, coconut or arecanut based agroforestry systems were dominant in coasts of Kerala, Karnataka and Goa. In hedge row intercropping different agrisilvicultural systems were practiced along the coast in which perennial components were *Tectona grandis, Mangifera indica, Acacia auriculiformis* and bamboos (*Dendrocalamus stocksii, D. strictus and Bambusa* spp). In the west coast, especially in the Konkan region, *Kulagar*- a traditional agroforestry system is a dominant systems and has been practiced by farmers from times immemorial. The major crops of this system are arecanut and coconut. Trees like jackfruit, kokum, nutmeg, teak and *Averrhoa bilimbi* are also part of this kulagar.

In the bamboo germplasm collection

consisting of 14 different bamboo species (*Bambusa balcooa, Bambusa bambos var. gigantea, Bambusa nutans, Bambusa polymorpha, Bambusa tulda, Bambusa vulgaris, Dendrocalamus asper, Dendrocalamus brandisii, Dendrocalamu shamiltonii, Dendrocalamus latiflorus, Dendrocalamus membranaceus, Dendrocalamus stocksii, Dendrocalamus strictus, Thyrsostachys oliveri*) which was established in the year 2021 different biometric observations were recorded. The highest clump size was recorded in *Bambusa nutans* (105 cm) followed by *Dendrocalamus membranaceus* (85 cm). The highest culm diameter was recorded in *B.vulgaris* (10.41 mm) followed by *Thyrsostachys oliveri* (10.18 mm). The highest length was recorded in *Thyrsostachys oliveri* (170.70 cm) followed by *D. Latiflorus* (151.42 cm). In the year 2022, 35 new species of bamboo have been collected from Kerala and planted in the bambusetum located at C Block of our Institute farm.

In the a silvi-pastoral experimental trial with soil and water conservation measures (continuous contour trench and staggered trenches) was initiated in the year 2021. The performance of seven different fodder grasses viz., bajra napier hybrid (Var. Co5, super napier, DHN6), Dharwad Guinea Grass 1(DGG1), Perennial Sorghum (CoFS 29), Kennedy grass (*Brachiaria ruziziensis*) and Rhodes grass (*Chloris gayana*) were studied under coconut plantation. Based on four harvests, the highest green fodder biomass was recorded in Dharwad Guinea Grass-1 (126.68 tons/ha) followed by bajra napier hybrid var CO5 (126.62 tons/ha), while the lowest was in Rhodes grass (21.99 tons/ha). The data also revealed that, green fodder yield was highest in plots with continuous contour trench plot followed by staggered trench and control plot.

A well-established coconut based silvi-pastoral system at ICAR- CCARI, Goa



Green fodder yield of different fodder grasses under a coconut based silvi-pastoral

Mega Project 2: Conservation and utilization of genetic resources in the coastal region

Project: Genetic improvement of rice for coastal agro-ecosystem.

(Manohara KK and Paramesha V)

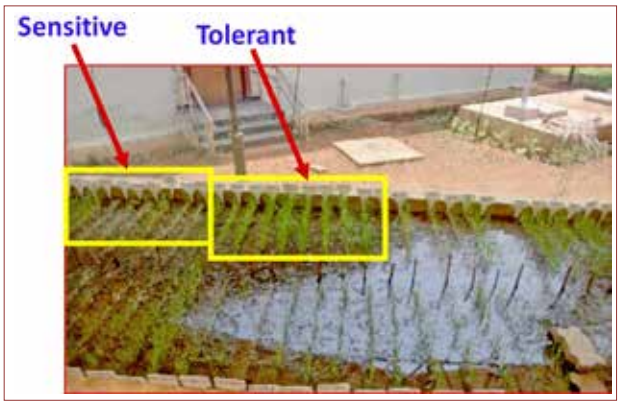
Germplasm collection and conservation

A set of 200 accessions of rice germplasm collections comprising of landraces, wild rice and advanced breeding lines were sown for seed multiplication and conservation purpose during *Kharif* season at the Institute farm. Periodical rouging of off types was carried out to maintain purity of the collected accessions. The estimation of quality parameters along with micro-nutrient analysis is in progress. Further,twenty traditional rice varieties from Goa state were multiplied separately to produce sufficient quantity of seeds for grain quality analysis including micro-nutrient analysis.

Field view of rice germplasm block at Institute farm during *kharif* 2022

Screening of rice germplasm accessions for salinity tolerance at seedling stage

Two hundred thirty-four rice genotypes comprising landraces, wild relatives, advanced breeding lines and released varieties were screened for salinity stress at seedling stage in micro-plots during *rabi*season with induced salt stress of 10 $dS/_{M(iw)}$. Among the genotypes screened, none of them showed highly-tolerant (SES ~ 1) reaction. However, 13 genotypes showed tolerant reaction with SES scoring of 3, 58 of them showed moderately-tolerant reaction (SES score 5), 99 accessions were sensitive (SES score 7) and 62 were highly-sensitive (SES score 9). The genotypes *viz*., *Mara batta, Sanna IET, Chitga, Dodgi, Karna, Shirali local, Bilashi local, Byalearya, Aravathilla, Korgut, Walayo, Barkurbhatta, Jeddu* showed tolerant reaction with SES scoring of 3. These landraces could become novel source for salinity tolerance at seedling stage. FL 478 was used as tolerant check while IR29 was used as sensitive check.



Screening for seedling stage salinity tolerance during *rabi* season

Population development and advancement

Twenty-nine different populations developed for variety development and for mapping of salinity tolerant genes were advanced to subsequent generations following Single Seed Descent (SSD) method. Single panicles were harvested from each plants in the population for further advancement. The details of the populations are given below:

Generation	No of populations	List of populations maintained
F_4	11	Goa Dhan4 × CSR 27; (Jaya × CSR 27) × Jaddubatta; Pusa 44 × KS 19-2; Jyothi×Giddabatta; Karjat 3 × Goa Dhan 4; Jyothi×Karjat 3; Goa Dhan 4 ×Jyothi; CSR 27 × Jaya; Jaya ×Jaddubatta; CSR 27 ×Pusa 44; Jaya × Goa Dhan 4
F_5	16	Mysore sanna× **Jaya; Jaya × CSR 27; Goa Dhan 1 × CSR** 27; Pusa 44 × CSR 27; Mysore sanna× **Goa Dhan 4; Goa Dhan 1** ×Guddadanibatta; Jaya ×Guddadanibatta; (Jaya × CSR 27) × Goa Dhan 1; (Goa Dhan 3 × (Jaya × CSR 27); Jyothi×Giddabatta; (Goa Dhan 1 × Jaya) × (Pusa 44 × CSR 27); (Goa Dhan 1 × Jaya) ×Jaddubatta; Guddadanibatta× **Goa Dhan 4;** Jaya×Kalame; Jaya ×Choman; (Jaya × CSR 27) × Goa Dhan 1
F_6	1	Jaya × Goa Dhan 2
F_{12}	1	Pusa 44 × Goa Dhan 2

Field view of a. Mapping populations

b. Collection of single panicles for advancement

Evaluation of short-listed promising advanced breeding lines under normal and coastal salinity conditions

Short listed advanced breeding lines from five *elite* × *elite* cross combinations from the 2021 *kharif* screening experiments were evaluated under rainfed shallow lowland and under coastal saline soils for assessing their performance.

Evaluation of advanced breeding lines under rainfed shallow lowland condition at the Institute farm - Station trial year I.

Forty-three short listed promising lines were evaluated under rainfed shallow lowland condition to identify the best entries. The trial was conducted in Randomized Complete Block Design with two replications at the Institute farm. All the yield and its related parameters were estimated to identify the best performing lines. The results indicated that there was sufficient variability among the tested lines. Days to 50% flowering ranged from 90 days to 124 days, plant height ranged from 99.3 cm to 236 cm, productive tillers per hill ranged from 5.0 to 13.7, panicle length ranged from 20.2 cm to 32.3 cm, gains per panicle ranged from 58.3 to 209.3, per cent fertility ranged from 44.3% to 95.7% and grain yield ranged from 2628.6 kg/ha to 8707.1 kg/ha. Highest grain yield 8707.1 kg/ha was recorded in RIL(GD1 × CSR 27) followed by7831 kg/ha inRIL (KARJAT 3 × KS 19-2), 7825 in RIL (KARJAT 3 × KS 19-2), 7723.8 inRIL (GD1 × CSR 27) and 7692.9 in RIL (GD1 × JAYA). Jaya recorded highest grain yield (6896.4 kg/ha) among the five checks tested. Average grain yield among the lines tested is 6100.6 kg/ha.

Evaluation of advanced breeding lines under rainfed shallow lowland condition at Institute farm during *kharif* season

Estimation of Genetic variability parameters for yield and its attributing traits in selected Advanced Breeding Lines under normal condition – Station Trial Year I

Trait	Minimum	Maximum	Mean	PCV	GCV	H^2 (BS)	GAM
Days to 50% flowering	90.0	124.0	102.3	7.4	6.0	64.1	9.8
Plant height (cm)	99.3	236.0	132.0	17.4	15.1	75.0	27.0
Productive tillers per hill	5.0	13.7	8.5	20.8	11.1	28.4	12.2
Panicle length (cm)	20.2	32.3	25.2	8.8	7.0	61.9	11.3
Grains per panicle	58.3	209.3	138.5	25.5	11.6	20.8	10.9
Per cent fertility	44.3	95.7	84.8	9.6	6.1	40.9	8.1
Grain yield (kg/ha)	2628.6	8707.1	6100.6	20.0	14.2	50.3	20.8

Top five entries among the lines tested under rainfed shallow lowland condition during *Kharif* season

Sl. no	Test Entries	Days to 50% flowering	Plant height (cm)	Productive tillers per hill	Grain yield (kg/ha)
1	RIL (GD1 × CSR 27)	114.5	134.5	8.5	8707.1
2	RIL (Karjat 3 × KS 19-2)	97.5	126.2	11.2	7831.0
3	RIL (Karjat 3 × KS 19-2)	97.5	126.2	11.2	7825.0
4	RIL (GD1 × CSR 27)	93.0	109.2	10.8	7723.8
5	RIL (GD1 × JAYA)	104.0	112.2	8.7	7692.9
6	Jaya (Check)	99.5	135.7	11.3	6896.4
7	Goa Dhan1 (Check)	101.5	155.7	10.2	6533.5
8	Goa Dhan4 (Check)	98.0	147.7	8.5	6166.2
9	Goa Dhan3 (Check)	94.0	141.2	8.2	6064.5
10	Goa Dhan2 (Check)	116.0	226.8	7.3	5250.0
11	Mean	102.29	131.98	8.54	6100.6
12	CD @ 5%	9.19	23.21	3.03	1739.7
13	CV (%)	4.45	8.71	17.59	14.13

Evaluation of advanced breeding lines under coastal saline condition at Chorao Island - Station trial year I

Forty-three short listed promising lines were evaluated under coastal salinity condition to identify the best entries. The trial was conducted in a Randomized Complete Block Design with two replications at Chorao Island under natural coastal salinity condition. All the yield and its related parameters were estimated to identify the best performing lines. Results indicated that there existed a sufficient variability among the tested lines. Days to 50% flowering ranged from 97 days to 128 days, plant height ranged from 91.7 cm to 199.3 cm, productive tillers per hill ranged from 5.3 to 11.3, panicle length ranged from 18.2 cm to 30.8 cm, gains per panicle ranged from 46.0 to 215.3, per cent fertility ranged from 45.4% to 95.7% and grain yield ranged from 788.9 kg/ha to 5036.1 kg/ha. Highest grain yield of 5036.11 kg/ha was recorded in RIL (GD1 × CSR 27) followed by 4855.56 kg/ha in RIL (Karjat 3 × KS 19-2), 4847.22in RIL (Karjat 3 × KS 19-2), 4811.11 in RIL (GD1 × CSR 27) and 4675.0 in RIL (GD1 × Jaya). Goa Dhan 3 recorded highest grain yield (4005.56 kg/ha) among the five checks tested. Average grain yield among the lines tested is 3426.5 kg/ha.

Estimation of Genetic variability parameters for yield and its attributing traits in selected Advanced Breeding Lines under normal condition – Station Trial Year I

Trait	Min	Max	Mean	PCV	GCV	H^2 (BS)	GAM
Days to 50% flowering	97.0	128.0	109.8	7.5	7.1	88.5	13.7
Plant height (cm)	91.7	199.3	119.0	16.8	15.0	79.1	27.4
Productive tillers per hill	5.3	11.3	8.3	17.9	9.3	26.9	9.9
Panicle length (cm)	18.2	30.8	22.1	11.3	9.5	70.6	16.4
Grains per panicle	46.0	215.3	99.2	28.1	13.5	23.1	13.4
Per cent fertility	45.4	95.7	78.9	14.5	10.2	49.6	14.9
Grain yield (kg/ha)	788.9	5036.1	3426.5	32.0	15.7	23.9	15.8

Top five entries among the lines tested under coastal salinity condition during k*harif* season

Sl. No	Test Entries	Days to 50% flowering	Plant height (cm)	Number of productive tillers per hill	Grain yield (kg/ha)
1	RIL (GD1 × Jaya)	108.50	109.17	9.33	5036.11
2	RIL (K3 × KS 19-2)	114.00	123.17	9.67	4855.56
3	RIL (GD1 × CSR 27)	120.50	142.17	7.33	4847.22
4	(RIL GD1 × Jaya)	111.00	122.67	9.33	4811.11
5	(RIL GD1 × Jaya)	109.00	109.83	8.17	4675.00
6	Goa Dhan 3 Check)	109.50	135.00	9.83	4005.56
7	Goa Dhan 1 Check)	119.00	118.50	8.33	3594.45
8	GoaDhan 4 (Check)	99.00	122.00	10.50	3562.50
9	Jaya (Check)	117.00	102.33	7.83	2863.89
10	Goa Dhan 2 Check)	118.00	198.83	6.83	2572.23
11	Mean	109.8	119.0	8.3	3426.5
12	CD @ 5%	5.7	18.6	2.6	1943.8
13	CV	2.55	7.69	15.28	27.94


Evaluation of advanced breeding lines under coastal salinity condition at Chorao Island during *kharif* season

New rice lines nominated in the All India Coordinated Rice Improvement Project

Four new rice lines with higher yield potential and non lodging types were nominated for testing under IVT trial of CSTVT trial under AICRP programme. The lines were medium duration, non lodging and yield potential ranging from 4.5 t/ha to 5.0 t/ha. The details along with designation, parents combinations and grain yield is given below

Sl. No.	Designation	DFF	NPT	GY(kg/ha)	
				Normal	Stress
1	GR9-5-163-12 (Jaya × CSR27)	92	8	7000.57	4675.89
2	GR10-7-146-2 (Goa Dhan 1 × Jaya)	104	9	7031.86	4755.56
3	GR11-2-174-11 (Goa Dhan 1 × CSR27)	93	10	7723.81	5036.00
4	GR11-4-283-34 (Goa Dhan 1 × CSR 27)	92	7	8707.24	4857.21
5	Goa Dhan3 (Best check in Stress)	101	9	6896.71	4005.78
6.	Jaya (Best check in Normal)	100	8.7	7692.0	2863.89

GR9-5-163-12


GR11-4-283-34

GR10-7-146-2

GR11-2-174-11

New breeding lines nominated for testing under AICRP trials

Coconut

The values of output at current year and base year price were calculated for major coconut growing coastal districts. The 99th percentile of value of output of coconuts was estimated to be Rs. 1028.20 crores and Rs 746 crores at current and base year prices respectively. Kozhikode and Malappuram districts of Kerala showed this trend especially during 2014-16. The 1st percentile value of output of coconuts were observed to be Rs. 2.03 lakhs and Rs 1.95 lakhs at current and base year prices, respectively. Ahmedabad district of Gujarat showed this trend especially during 2011-17. Kozhikode district of Kerala also recorded high share (52.86) of area proportion to total geographical area (TGA %).

99th percentile for Value of output for coconut at current year prices and base year prices (2011-2012) from year 2011-2012 to 2016-2017

99th percentile (102819.5) Lakh rupees			99th percentile (74597.57) Lakh rupees		
Value of output at current year prices			Value of output at base year prices (2011-2012)		
Kerala	Kozhikode	2014-2016	Kerala	Kozhikode	2014-2016
Kerala	Malappuram	2014-2016	Kerala	Malappuram	2012-2013, 2015-2016

1st percentile for Value of output for coconut at current year prices and base year prices (2011-2012) from year 2011-2012 to 2016-2017

1st percentile (2.030) Lakh rupees			1st percentile (1.953) Lakh rupees		
Value of output at current year prices			Value of output at base year prices (2011-2012)		
Gujarat	Ahmedabad	2011-2013, 2014-2015, 2016-2017	Gujarat	Ahmedabad	2011-2013, 2014-2015, 2016-2017

Date palm

A study was conducted on five cultivars of date palm namely- Bumaan, Fard, Barhi, Qyno and Zahidi, where seedling traits were recorded on two year old plants whose seed and one year old seedling traits were recorded last year. About 27 (12 quantitative and 15 qualitative traits) morphological traits were recorded on 90 leaves of 46 seedlings of date palm of two-years old during September, 2022. Leaf base was uniform and narrow medium in all cases. Pinnate shape, type, and pinnae apex displayed uniformity and were lanceolate, unipinnate, and acute respectively and were uniform in all cases. Longest pinnae showed extensive variation. Leaf length varied from 11.3 cm to 97.4 cm, leaf base width and shoot tip width varied from 0.3 to 1.5 cm and 0.7 to 2.1 cm, respectively. Pinnae number, length, and width varied from 2 to 27, 9.1 to 44.1 cm, and 0.3 to 2.0 cm respectively.

Arecanut

One arecanut germplasm from Mr Subramanya Bhat of Kumta Uttara Kannara District Karnataka was characterised for nut and kernel traits. It has won Limca book of World Records for large fruit size (fruit weight 36.5 to 56.43 g). The dry kernel weight was observed to vary between 10.5 to 11.6 g per fruit. Three local varieties of arecanut were characterised for kernel traits and the details are given below. The Joida collection showed least release of powder while cutting the kernel.

Kernel traits of arecanut germplasm of Karnataka coast

Local Variety	Kernel Length (mm)	Kernel Breadth (mm)	Dry Kernel Weight(g)	Bulk density (g/100 ml)	Powder on cutting kernel (g)
South Canara	23.36	30.45	13.69	58.16	0.0560
Sirsi	17.88	30.80	9.94	57.28	0.0862
Joida	16.34	25.06	6.88	59.34	0.0276

One arecanut tree of Mohitnagar variety planted by Mr Sanjay Patil Usgao village Goa had displayed large fruits each weighing 67-76 g with dry kernel recovery (7.6 to 8.3 g/fruit).

Arecanut fruits of germplasm from Mr Subramanya Bhat of Kumta, Karnataka

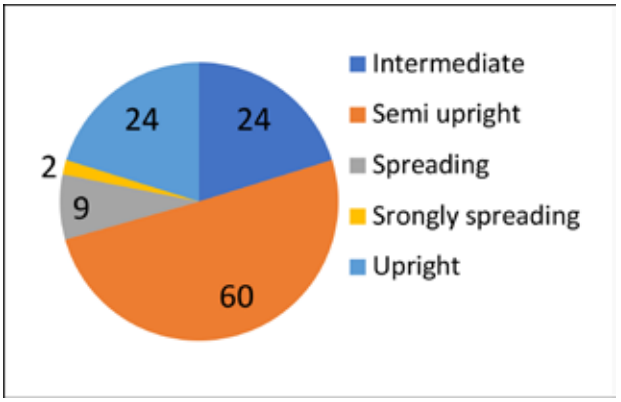
Arecanut fruits of large fruited germplasm from Mr Sanjay Patil, Goa

Arecanut fruits of germplasm from Sirsi, Karnataka

Project: Agro biodiversity, nursery techniques, and post-harvest technology of ornamental crops for livelihood diversification in coastal India

(V Arunachalam and Maneesha S R)

The project has been initiated with the objective of evolving ornamental crop-based livelihood opportunities for coastal farmers. Five orchid species native to Goa were maintained. *Anthurium* varieties were maintained under shade net house. Jasmine germplasm block has been rejuvenated where accessions native to Goa state have been collected and established. About 119 plants of jasmine germplasms were characterized for 37 traits which included nine qualitative traits of plant, three qualitative traits of bud, six qualitative traits of flower, six quantitative traits of bud, ten quantitative traits of flower and three color values (CIELAB) of flower. Of the five plant growth habit types, strongly spreading was rare trait and seen only in two out of 119 plants. Semi upright was the common growth habit found in 60 out of 119 plants. Blunt leaf tip, rounded leaf base were rare traits and seen in only two out of 119 plants, and three out of 119 plants, respectively.



Variability of plant growth habit type in Jasmine germplasm of Goa

Bud and floral variability of jasmine germplasm of Goa

Project: Production and post-harvest management of fruit crops kokum, jack fruit and breadfruit of West coast region of India

(Maneesha S R, R Ramesh and Mathala Juliet Gupta)

Evaluation of *kokum* germplasm

Out of the 179 *kokum* plants available in *kokum* germplasm block, 129 (68.62%) are seedlings and 43 (22.87%) are grafts of 13 promising accessions. There are seven tissue culture plants collected from CSIR-NCL, Pune and Goa University, Talegaon. The age of the plants ranges from 1-8 years and 53.72% of the population is 3-year-old. In the germplasm, 30% of the trees flowered in 3rd year and 24% flowered in 4th year. The gestation period of grafts was 3 to 4 years and gestation period of seedlings was 7 to 8 years. In this germplasm, seedlings with 4 years gestation (12.73%) and seedlings with 5 years gestation (1.82%) were observed which has great vigour for flowering. A few early bearing seedlings with short (3 to 4 years) gestation period (SDL-39/18, SDL-35/18)) were identified in this germplasm. Male, female and hermaphrodite plants with cluster bearing nature and solitary flowers are also available in the germplasm. Early bearing accessions of the germplasm are SDL 1/14 and SDL 99/14. Regular bearing seedlings, SDL-54/14 (78.80 kg) and SDL-43/14 (74.98 kg) had the highest mean yield from the last two bearing seasons. The highest mean fruit weight and rind weight were in KAS 11 (104/16) (51.11 g & 25.10g)) and SDL-1/14 (49.27 g & 28.90 g). PED-1(13/18) had comparatively sweet fruits with high rind T.S.S. (13.7° Brix) and pulp T.S.S. (13.4° Brix). The highest rind acidity of 7.68% and pulp acidity of 3.84% was recorded in SDL-1/14. The number of seeds was highest in KAS-11(104/16) (7.60), but the highest individual seed weight was in SDL-1/14 (0.60g).

SDL-1/14 fruits

SDL-1/14 fruits cross section

KAS 11 (104/16) fruits

KAS 11 (104/16) fruits cross section

PED-1 (13/18) fruits

PED-1(13/18) fruit cross section

Post-harvest losses in *kokum* and jackfruit

During 2022, 35 *kokum* trees were harvested with a total yield of 566.58 kg out of which, 326.71 kg were utilized for the preparation of various value-added products and sold as fresh fruits. Around 239.87 kg were unutilized due to, poor quality causing a post-harvest loss of 42.34%. In case of jackfruit, out of 25 trees, only 15 trees were harvested with a total yield of 869.67 kg. Out of that, 653.69 kg were utilized, and 215.98 kg were unutilized causing a loss of 24.83%. Around 40 kg fruits were not harvested due to rain.

Project: Assessment and strengthening of vegetable production in coastal region through acquisition, utilization of local germplasm and strategic introduction of commercial vegetables

(Chaudhari G V, A R Desai, R Ramesh, Maruthadurai R and Shripad Bhat)

In Goa, farmers grow Brinjal ('*Agsechi Vayingim*', '*Taleigao Vayingim*'), Okra (local seven ridged okra '*Sat-Shiro Bheno*'), Sweet potato (red and white coloured local types), Red amaranth (*Tambdi Bhaji*) *etc*. traditionally in the "*porso*" where most of the vegetable growers cultivate different vegetables on a small piece of land during *rabi* season with assured water supply for irrigation. One can also spot Chillies, Vegetable cowpea/Yard long bean (*wal*), Onion (local onion/ *Gawatikando*), Cluster bean, Gourds, other Root and Tubers crops, *etc*. With an objective to enrich the vegetable basket of coast particularly of Goa, non-traditional important vegetables like Potato (*Solanum tuberosum*) and Cauliflower (*Brassica oleracea* var. *botrytis*) were evaluated for their suitability under coastal conditions. The available varietal technology of the non-traditional vegetables mentioned below) were evaluated under Goan conditions, while two evaluation trials were vitiated namely in Muskmelon (trial vitiated due to severe incidence of viral complex) and Chilli (trial vitiated due to bacterial wilt heavy incidence).

List of varieties being evaluated in different vegetable crops

Sl. no.	Potato (*Solanum tuberosum*)	Cauliflower (*Brassica oleracea* var. *botrytis*)
1	Kufri Kiran	Amazing*
2	Kufri Lima	Pusa Ashwini
3	Kufri Pukhraj	Pusa Kartiki
4	Kufri Surya	Pusa Meghna
5	Kufri Thar -1	Pusa Sharad
Seed Source	ICAR-CPRI	F_1 purchased from vegetable seed shop* & ICAR-IARI

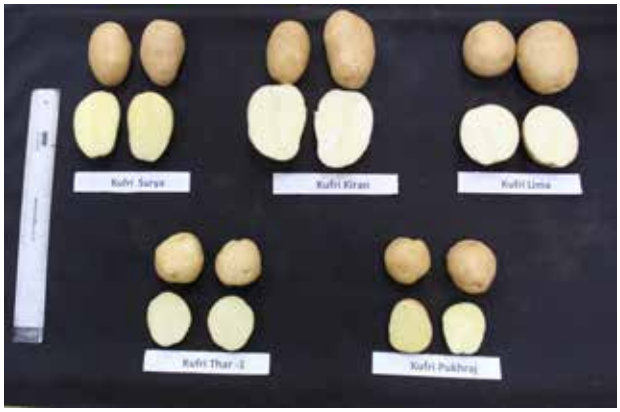
Potato (*Solanum tuberosum*) varietal evaluation trial

Potato is a non-traditional crop for Goa therefore, a varietal evaluation trial was conducted on 120 sqm area in 'Saljini village' in the South Goa district to check the possibility of Potato cultivation. ZAO Sanguem, Dept. of Agri., Govt. of Goa, facilitated farmer's field selection. Five varieties supplied by ICAR-CPRI were planted in four replications with 6 sq.m plot area for each variety per replication. A spacing of 60 cm×20 cm(row to row × plant to plant) were adopted, ridges and furrow planting method as well as all other cultural practices were followed. The crop was observed to be affected mainly by Bacterial wilt incidence resulting in compromised tuber yield. The trial took 103 days (trial planted on November 13, 2021 and harvested on February 24, 2022) at the farmer's (Shri. Gokuldas Goankar's) field. Demonstration on harvesting potato tuber was also carried out. The data recorded were subjected to RBD analysis. When total tuber yield was considered, although numerically variable, '*Kufri Lima*', '*Kufri Kiran*', 'Kufri Surya' recorded statistically-at-par yield respectively 131.8q/ha, 123.3 q/ha and 117.1 q/ha, over rest of the evaluated varieties, *Kufri Pukhraj* (72.6 q/ha) and *Kufri Thar-1* (79.7 q/ha). When the tuber yield produced per variety was considered of more than 50g individual tuber size, it was comparatively less.

Potato Varietal Evaluation Trial

Monitoring visit by Director, ICAR-CCARI

Potato tubers harvesting demonstration



Variety wise Potato Tubers

Potato total tuber yields (extrapolated) q/ha

Varieties	Mean, total potato tuber yield	Mean, >50g size individual potato tuber yield
Kufri Lima	131.8	112.2
Kufri Kiran	123.3	84.3
Kufri Surya	117.1	51.4
KufriI Pukhraj	72.6	10.4
Kufri Thar 1	79.7	1.0
CD (5%)	22.7	20.2
CV	13.9	25.0

Cauliflower (*Brassica oleracea* var. *botrytis*) varietal evaluation trial

Cauliflower is another non-traditional crop for Goa, the quality varietal/F_1seeds were procured from the Division of Vegetable Science, ICAR-IARI, New Delhi, as well as a ruling commercial cauliflower F_1 'Amazing' was also included for its performance testing. Seeds were sown in pro-trays on October 20, 2021 at the Institute. ZAO Sanguem, Dept. of Agri., Govt. of Goa, facilitated farmers' group (*Bhumika* Self-help group) selection in Verlem (South Goa), for the trial. Healthy seedlings (37 days old) of cauliflower varietal/F_1 were transplanted at a spacing of 60 × 50 cm on November 26, 2021, at the *Bhumika* Self-help group's popular strawberry farm, Verlem. Cauliflower cultivation practices were followed meticulously. Protective spraying of neem oil (5ml/ litre of water) on the cauliflower trial was demonstrated to farmers. After 47 days from transplanting (84 days after seed sowing) cauliflower varieties *viz*., *Pusa Ashwini, Pusa Kartiki, Pusa Sharad*, reached marketable curd size respectively of 490g, 470g and 425g, respectively (including stems of some jacket leaves). The curd diameter was recorded as 13 to 14 cm in Pusa Ashwini and Pusa Kartiki. However, Pusa sharad recorded a curd diameter of 11 to12 cm. After 57 days from transplanting 'Pusa Meghna' reached marketable curd size and yielded solid, compact curds of around 610g (including stems of some jacket leaves). Its curd diameter then ranged 13 to 14 cm.

Cauliflower varietal evaluation trial at Verlem

Visit to trial plot by Director, ICAR-CCARI

Cauliflower (*Brassica oleracea* var. *botrytis*) varietal evaluation trial

Sahyadri gourd (*Momordica sahyadrica*) germplasm maintenance and utilization

Sahyadri gourd (*Momordica sahyadrica*) is an important, neo-endemic, underutilized, dioecious vegetable species. Thirty-two germplasm collections (SET A: sixteen male vine and SET B: sixteen female vine) maintained *in situ* were evaluated during June-October 2022 *(Kharif* season).

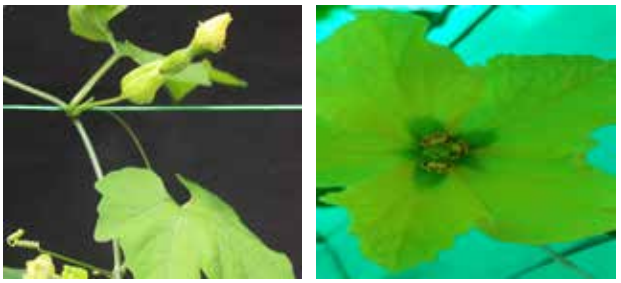
***In situ* maintenance of Sahyadri gourd (*Momordica sahyadrica*) germplasm**

Further, the effect of chemical stimuli ($AgNO_3$ 500 ppm) at flowering stage was studied on both Dioecious-Male and Dioecious-Female *M. sahyadrica* collections. Exogenous application of 500ppm $AgNO_3$ solution successfully induced phenotypically hermaphrodite flowers in Dioecious-Female *M. sahyadrica* genotypes.

The functionality of the pollens from induced hermaphrodite genotypes were ensured by utilizing them for pollinating Dioecious-Female genotypes that resulted in normal fruit

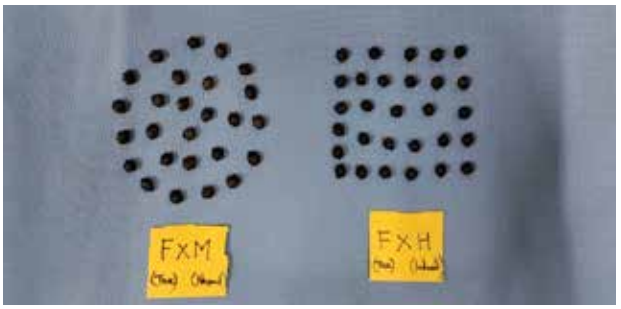
Dioecious-Male sex form (only staminate flowers/buds with visible bract)

Dioecious-Female sex form (only pistillate flowers/ buds with visible ovary)



Phenotypically hermaphrodite flowers induction on dioecious-female genotypes (anthers & stigma both visible along with bract and ovary)

set and seed development. This technique may help initiate generation advancement breeding in *M. sahyadrica* by crossing two genetically female genotypes which is otherwise not possible naturally.



Seed development in *M. sahyadrica* genotypes: F×M (Dioecious-Female pollinated by Dioecious-Male) and F×H (Dioecious-Female pollinated by induced hermaphrodite genotype)

Project: Conservation of major farm animal resources in the coastal region through evaluation of seminal traits, semen processing and preservation protocols

(Gokuldas P P and Amiya R Sahu)

Major objectives of this project are development and refinement of semen collection and processing protocols, evaluation of qualitative and quantitative semen attributes and feasibility assessment of semen preservation and insemination techniques in indigenous breeds of cattle, pig and goat reared in the coastal region. During the period, evaluation of breeding bull reproductive function was performed through breeding soundness examination in indigenous *Shweta Kapila* and *Gir* breeds of cattle. Trials on assessment of testicular perfusion in breeding bulls and training for semen collection are underway.

Bull exposure and training

Accessories for bull semen collection

A study on reproductive characterization of native *Shweta Kapila* cattle was undertaken during the period. Farm records of cattle over a period of five years were screened to determine different parameters of overall productive and reproductive efficiency.

Reproductive attributes of indigenous *Shweta Kapila* cattle

Reproductive attributes	Mean ± SEM
Age at puberty (months)	25.6±0.32
Age at sexual maturity (months)	30.6±0.38
Oestrus cycle length (days)	20.5±0.18
Oestrus duration (hours)	18.4±0.26
Age at first calving (months)	41.3±1.65
Mean Service period (days)	92.3±1.83
Inter-Calving interval (days)	392.4±8.62

Production parameters of *Shweta Kapila* cattle

Parameter	Mean ± SEM
Daily milk yield (kg)	2.95±0.17
Peak milk yield (kg)	3.18±0.21
Lactation length (days)	218.88±9.7
Lactation milk yield (kg)	304.78±32
Days to reach peak MY (d)	39.36±1.8

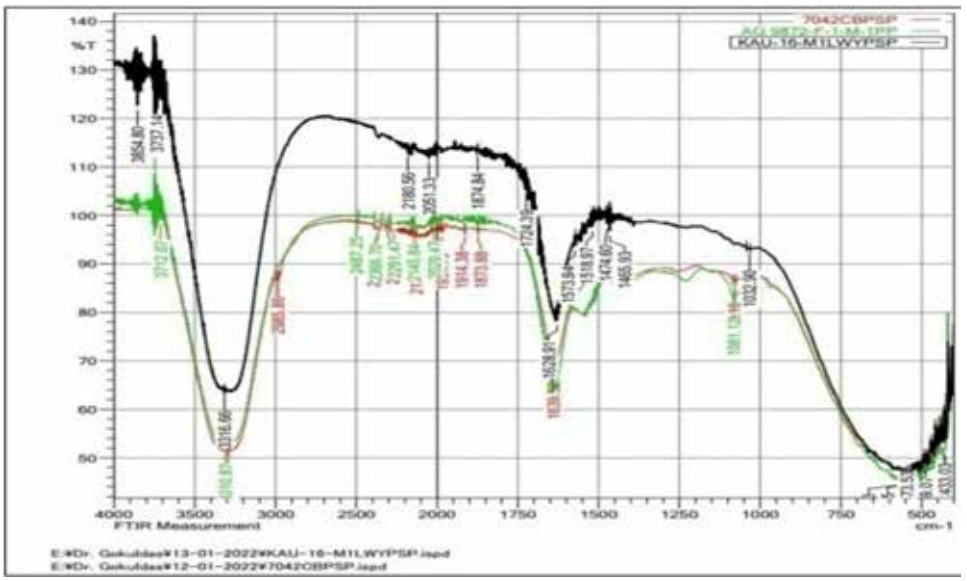
Overall production attributes were improved over the period possibly due to selective breeding and good management practices. Most of the reproductive and productive parameters were comparable to that of other indigenous dwarf breeds of the coastal region. Females had relatively shorter age at puberty and calving interval suggestive of apparently favourable reproductive potential of this indigenous breed. *Shweta Kapila* breed is also characterized by climate resilient and disease resistance traits with relatively low feed intake and ideal for rearing under low-input and eco-friendly production systems.

Major seminal traits including qualitative and quantitative semen attributes were evaluated for reproductive characterization of Agonda Goan breed of indigenous pig and *Konkan*

Kanyal goat. Efforts are also underway to explore detailed sperm morphometry employing sperm head dimensions and derived morphometric indices and multi-scan and semi-automated image analysis software. Also, trials on evaluation of *in-vitro* sperm characteristics like sperm plasma membrane, acrosome and DNA integrity using fluorescent probes including PI, FITC- PNA, CFDA and Hoechst 33258 have been initiated.

To explore the potential of FTIR Spectroscopy in semen characterization and evaluation, procedures for sample processing and semen profiling of indigenous pig semen were standardized using Shimadzu® IRTracer-100 and Attenuated Total Reflectance (ATR) as a sampling technology. The technique requiring minimal sample preparation, enables non-perturbative, label-free extraction of information for assessment of sperm cell functionality and biochemical variations. Optimal FTIR spectra for indigenous pig semen could be obtained in mid-infrared region (wavelengths between 2.5 to 25 µm) with 2cm^{-1} spectral resolution and 40 as scan number (n). Important spectral regions measured were the fingerprint region (500–1,500 cm^{-1}) for nucleic acids and sugars and the amide I/II region (1,500–1,700 cm^{-1}) for proteins. In indigenous pig semen samples, distinctive pattern could be identified in the amide I/II region corresponding to sperm proteins. There exists a good scope for the technique to detect characteristic alterations in semen, to distinguish good quality sample, age-wise comparison of samples and to study biochemical and metabolic alterations especially in frozen semen samples for assessing the freezability.

Standardized Artificial Insemination (AI) using liquid boar semen combined with controlled breeding involving estrus induction and synchronization in Institute as well as farmers' field. Total of 323 piglets were born through 60 numbers of AI and 42 numbers of farrowings with success rate of 71% in the farmers' field during the period. Adoption of this technology has boosted pig production in farmers' field as a result of higher number of viable piglets and improved piglet growth rate. Around 130 numbers of farmers were benefitted generating overall employment of 35,156 man-days with income generation of 198.44 lakhs rupees.



FTIR Spectrograph of native pig semen sample obtained in mid-infrared region

Project: Genetic variability studies for thermo-tolerance in selected breeds of livestock under coastal environment.

(Amiya Ranjan Sahu and Gokuldas P P)

Sample collection and recording of physiological parameters

In this study, data on temperature and humidity parameters was accessed from institute meteorological observatory station to calculate Temperature-Humidity Index (THI). The resultant (THI) indicated May month as an extreme hot period and January month as coolest period of the year. Based on the THI result, the collection of blood samples and recording of physiological parameters (rectal temperature and respiration rate/minute) was done during the hot and cold period. Blood samples were collected from *Shweta Kapila* (n=21), Gir (n=9), *Sahiwal* (n=6) and *Malnad Gidda* (31) cattle; *Murrah* (n=6) buffalo; *Agonda Goan* (n=55) Pig; and *Konkan Kanyal* (n=32) and *Malabari* (n=6) goats maintained in the institute farm of ICAR-CCARI, Goa and farmers field of Goa and Karnataka.

Estimation of physiological and biochemical parameters

The rectal temperature and respiration rate recorded during hot and cold period were analyzed. The enzymatic activity of serum samples of different animals were estimated by Biophotometer (Eppendorf™). The serum ion concentration of the samples were estimated by Spectrophotometer.

DNA isolation and PCR

Genomic DNA was isolated from blood samples by phenol chloroform isoamyl alcohol method and DNA quality was checked by agarose gel electrophoresis using 0.7 per cent agarose powder in 1X TBE buffer. The concentration of DNA was estimated taking absorbance at 260 and 280 nm in the Biophotometer. The oligonucleotide primers were designed by Primer3 input version 0.4.0 software to amplify the 3 UTR region

Data on rectal temperature and respiration rate of native animal breeds

Species	Breeds	Rectal temperature (°F)		Respiration rate/ minute	
		January	May	January	May
Cattle	*Shweta Kapila*	102.1±0.6	103.1±0.2	21±2	28±3
	Gir	101.6±0.2	103.7±0.7	19±3	33±2
	Sahiwal	101.8±0.8	103.1±0.5	20±2	31±3
	Malnad Gidda	101.4±0.7	103.2±0.3	22±3	30±4
Buffalo	*Murrah*	102.5±0.6	103.4±0.9	18±4	25±5
Pig	*Agonda Goan*	101.7±0.4	103.9±0.6	36±2	39±3
Goat	*Konkan Kanyal*	101.4±0.3	103.6±0.8	22±3	26±4
	Malabari	101.3±0.7	103.1±0.6	24±4	27±6

Biochemical analysis of serum enzymatic activity of native animal breeds

Species	Breeds	Creatinine Kinase (IU/L)		Lactate Dehydrogenase (IU/L)	
		January	May	January	May
Cattle	*Shweta Kapila*	0.21±0.06	0.25±0.08	4634.16±186.39	4899.16±196.94
	Gir	0.19±0.08	0.28±0.07	4692.98±163.26	5075.98±169.62
	Sahiwal	0.20±0.07	0.26±0.11	4769.25±167.84	5092.25±177.44
	Malnad Gidda	0.22±0.09	0.25±0.15	4723.93±194.47	4963.93±144.88
Buffalo	*Murrah buffalo*	-	0.31±0.09	-	5193.96±142.84
Pig	*Agonda Goan*	0.57±0.23	0.86±0.29	4360.62±107.29	5760.13±113.45
Goat	*Konkan Kanyal*	0.33±0.11	0.48±0.17	4346.93±137.73	4946.38±145.21
	Malabari	-	0.54±0.22	-	4798.82±143.57

Biochemical analysis of serum ion concentration of native animal breeds

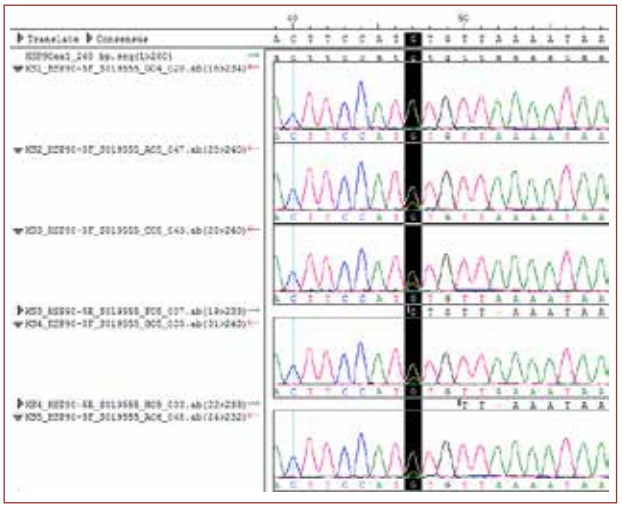
Species	Breeds	Na (mmol/L)		K (mmol/L)		Cl (mmol/L)	
		January	May	January	May	January	May
Cattle	*Shweta Kapila*	202.12±24.18	265.19±32.16	19.21±3.98	29.19±5.18	167.11±23.45	228.13±34.42
	Gir	190.55±20.20	220.55±23.52	25.25±4.13	41.24±6.16	152.66±21.90	192.12±31.88
	Sahiwal	194.09±22.14	214.11±28.17	28.33±3.21	43.37±7.72	156.27±19.47	181.32±49.44
	Malnad Gidda	192.66±27.87	242.61±24.69	21.63±2.96	33.13±5.16	148.93±18.77	173.25±14.16
Buffalo	*Murrah*	-	223.56±18.79	-	28.60±1.92	-	162.43±10.02
Pig	*Agonda Goan*	154.33±27.69	194.42±31.69	24.03±5.48	42.27±6.86	220.83±33.06	254.21±41.92
Goat	*Konkan Kanyal*	110.50±31.65	150.71±37.77	18.46±2.14	49.13±5.75	330.80±27.19	420.17±42.11
	Malabari	-	153.15±29.45	-	43.02±2.19	-	403.25±19.54

(260 bp) of HSP90AA1 gene. The amplification reaction was carried out in 0.2 ml microfuge tubes using thermal cyclers (Eppendorf Mastercycler) and annealing temperature was standardized as 55.1°C for 30 sec.

PCR amplicons of HSP90AA1 gene in Shweta Kapila cattle

Sequencing and polymorphism report

The PCR amplicons of six random samples of *Shweta Kapila* cattle were sequenced in both forward and reverse directions. Sequence data were analyzed using the EditSeq and SeqMan of LASERGENE software version 7.1.0 (DNASTAR Inc., USA). The change of codons were checked for the change in amino acid by online available ExPASy translate tool. The gene sequences were analysed for both forward and reverse reads using reference sequence of cattle HSP90AA1 gene obtained from NCBI GenBank (Accession number: XM_019983599). On analysing sequences three single nucleotide polymorphism (SNPs) were detected in the 3'UTR region of HSP90AA1 gene at the loci g.G4733C, g.C4765A and g.A4848G. The mutations were observed as shown in chromatogram characterized by the transversion of G>C and C>A with change in amino acid from cysteine (TGT) to serine (TCT) and glutamine (CAA) to cysteine (AAA), respectively, whereas the transition mutation A>G did not change any amino acid. The genotyping of the identified SNPs will be carried out in the due course of project period.



Representative chromatogram of SNP 4733G>C in 3'UTR of HSP90AA1 gene

Preliminary results indicate that the indigenous breed is adaptive to its local environment with unique genetic makeup that increases the thermo-tolerance ability. The genetic polymorphism is also being studied in the different regions of the HSP genes to explore the associated effects of the SNPs with thermo-tolerant traits in *Shweta Kapila* cattle.

Mega project 3: Development and validation of production technologies of crops of the coastal region

Project : Study and the management of major diseases of vegetable crops in Coastal Regions.

(R Ramesh, R Maruthdurai and Ganesh Chaudhari)

Field evaluation of bacterial wilt resistant brinjal varieties

Released bacterial wilt resistant brinjal varieties (Goa Brinjal-1, Goa Brinjal-2, Goa Brinjal-3, Goa Brinjal-4, Goa Brinjal-5 and Goa Brinjal-6) and three promising green fruit type lines (5-8-1, 92-3-7 and 93-8-1) were evaluated along with susceptible local cultivars (*Agassaim* and *Taligao*) under field conditions. Bacterial wilt incidence in the test varieties/ lines was less than 10% except in Goa Brinjal-1 and Goa Brinjal-4. Yield of the test varieties/ lines ranged from 15.0 to 29.5t/ha.

Mean of 5 years data of all the 6 bacterial wilt resistant varieties/lines indicated that bacterial wilt incidence was less than 7% in Goa Brinjal-1, Goa Brinjal-2, Goa Brinjal-3, Goa Brinjal-4, Goa Brinjal-5 and Goa Brinjal-6. The above varieties/ lines recorded fruit yield ranged from 18.3 to 24.4 t/ha. In the susceptible checks, bacterial wilt incidence was 73 to 80%.

Evaluation of brinjal grafts and rootstocks to bacterial wilt disease

Brinjal grafts from the combination of five rootstocks (S00003, S00004, S00022, TS02257 and *S. torvum*) and two brinjal scions (*Agassaim* and *Taleigao*) were screened in greenhouse with *R. solanacearum* inoculation. Bacterial wilt incidence was recorded till 28 days post inoculation. Grafts made on S00004, S00022, TS02257 and *S. torvum* rootstocks showed less than 10 per cent wilt incidence. In case of grafts made on S00003, wilt incidence was 10 to18 per cent, while the wilt incidence was 93 to 100 per cent in case of seedlings and grafts of *Agassaim* and *Taleigao*.

Project: Integrated management of major diseases of tomato and chilli in Coastal regions *(R Ramesh)*

Field evaluation of ChiLCV disease resistant chilli hybrids

Five ChiLCV disease resistant chilli hybrids (Arka Gagan, Arka Tanvi, Arka Saanvim, Arka Yashasvi (H 8) and Arka Tejasvi) were obtained from ICAR IIHR along with other hybrids (Arka Meghana and Arka Harita) and varieties (Kashi Abha (VR-339), Kashi Anmol and Kashi Gaurav) from ICAR IIHR and ICAR IIVR. All these hybrids/ varieties are being evaluated in two locations for the incidence of ChiLCV disease and other yield parameters.

Evaluation of tomato grafts to bacterial wilt disease

Tomato grafts from the combination of five rootstocks (S00003, S00004, S00022, TS02257 and *S. torvum*) and two tomato scions (Kashi Adarsh and Kashi Chayan) were screened in greenhouse with *R. solanacearum* inoculation. Bacterial wilt incidence was recorded till 28 days post inoculation. Grafts made on S00022 and *S. torvum* rootstocks showed less than 15 per cent wilt incidence. In case of grafts made on S00003, S00004 and TS02257, wilt incidence was 10 to 50 per cent, while the wilt incidence was 100

per cent in case of seedlings and grafts of *Kashi Adarsh* and *Kashi Chayan*.

Production of talc formulation of bio-control agents for various experiments and field trials

Talc based formulation of *Trichoderma* (280 kg) was produced and sold to farmers and agriculture department, Govt of Goa and were also used in various experiments and field trials at the Institute. Bacterial antagonists (550 kg of Goa Bio-1 and Goa Bio-2) was produced and given to farmers of Goa under STC, Institute and NABARD projects. Further, the bio-agents were used in demonstration plots to treat black pepper plants for management of foot rot and plant health management experiments of chilli and paddy.

Project: Bio-ecology and integrated management of cashew stem and root borers in coastal region of India.

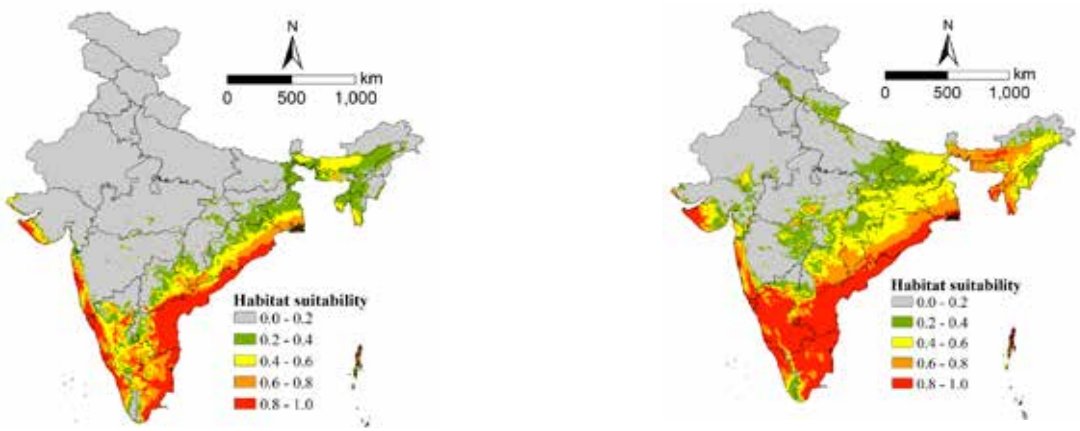
(R Maruthadurai and R Ramesh)

Potential geographical distribution of rugose spiralling whitefly, *Aleurodicus rugioperculatus* under future climate change scenario

Rugose spiraling whitefly (RSW), *Aleurodicus rugioperculatus* is a recent invasive pest in India causing widespread damage to coconut and other horticultural crops. The latest Coupled Model Intercomparison Project phase 6 (CMIP6) dataset was analyzed to predict the potential distribution of RSW under present and future climate change scenarios in 2050 and 2070 under Shared Socioeconomic Pathway (SSP) 126 and SSP585 emission scenario with 19 bioclimatic variables through maximum entropy (MaxEnt) niche modelling. The habitat suitability on the map was divided into high, optimum, moderate, low and unsuitable with respective values of 0.8-1.0, 0.6-0.8, 0.4-0.6, 0.2-0.4 and 0.0-0.2, respectively. The MaxEnt model performed well and predicted the potential distribution of *A. rugioperculatus* with high accuracy AUC values of 0.991 and 0.989, TSS of 0.890 and 0.841, CBI of 0.972 and 0.934 for training and testing, respectively. Jackknife test for estimating the predictive power of the variables showed annual mean temperature followed by mean diurnal range were the most important bioclimatic variables for RSW distribution. The bioclimatic suitability map of RSW distribution under current and future climate indicates that the distribution of RSW is highly concentrated in the entire coastal and southern states of India. Multi-model ensemble is predicted to increase the suitable areas of RSW in 2050 and 2070 under future climate change scenarios compared to current climatic conditions.

Potential natural enemies of invasive fall armyworm *Spodoptera frugiperda* on fodder maize

Fall armyworm (FAW), *Spodoptera frugiperda* has emerged as a major pest of maize



Current distribution **Future potential distribution**

(Score of habitat suitability index: 0.0-0.2 – Unsuitable, 0.2-0.4- low, 0.4-0.6- moderate, 0.6-0.8- optimum, 0.8-1.0- high)

Map indicating the current and future distribution patterns of rugose spiralling whitefly under changing climatic scenarios.

in India. Potential natural enemies comprising of parasitoids, predators and entomo-pathogens were observed to be attacking various life stages of FAW. The field egg parasitism of *Trichogramma chilonis* Ishii and *Telenomus remus* Nixon was observed to be 13.90% and 29.37%, respectively. Among the larval parasitoids, *Campoletis chlorideae* Uchida was the most dominant one and was recorded throughout the cropping period. Eleven species of predators were observed to be predating on various stages of FAW. Among the predators, rove beetle *Paederus fuscipes* Curtis was the most abundant with 1-2 adults per plant. Four entomo-pathogens *viz*., *Metarhizium rileyi* (Farlow), entomopathogenic bacteria, *Spodoptera frugiperda* nuclear polyhedrosis virus and *Hexamermis* spp. were observed to be parasitizing FAW larvae.

Stem and root borer complex in cashew

The infestation of stem and root borer is one of the major constraints in cashew production. Field studies were carried to record the associated stem and root borers in cashew plantations. Dead or dying trees (> 50 per cent of bark circumstances damaged) due to stem and root borer attack were examined and selected for intensive sampling. Among the stem and root borers, the species *Neoplocaederus ferrugineus* and *N.obesus* were the major ones. The mango stem borer *Batocerarufo maculata* and ambrosia beetle *Euplatypus parallelus* was also observed to be attacking stem borer infested cashew trees.

Evaluation of bio pesticides for the management of cashew stem and root borer

Entomopathogenic fungus *viz*., *Beauveria bassiana* and *Metarhizium anisopliae* and bio-pesticides like Spinosad and Azadirachtin were evaluated for the management of cashew stem and root borer under laboratory conditions. Field collected grubs of *N. ferrugineus* were reared individually on fresh cashew bark pieces in an insect breeding dish. Different larval instars *viz*., first, second and third instars were selected for the immersion exposure bioassay.

Campoletis chlorideae

***Hexamermis* spp.**

Project: Identification of edaphic and climate factors affecting mango production in coastal region and its management

(Maneesha S R, A R Desai, S K Singh and Bappa Das)

Observations in mango flowering and fruit drop

In an experiment conducted on mango plants, 100% Kesar mango trees and 50% Alphonso mango trees, 31.63% Mankurad trees and 31.25% Amrapali mango trees flowered with foliar application of 3% KNO_3. In another study 3% KNO_3 induced 77.78% flowering. Fruit fall was in the range of 1-112 fruits per tree with an average of 21.04 fruits per tree. A total of 484 fruits have fallen from Amrapali mango trees and their weight ranges from 0.15 kg to 4.81 kg per tree with an average of 1.41 kg per tree. The total weight of fruits fallen was 25.43 kg from Amrapali trees. The mean fruit weight of the fallen fruits ranged from 100 g to 850. g in Amrapali with a mean value of 420 g. In Mankurad mango, the mean number of fruits dropped were 19.40 with a range of 1 to 128 fruits per tree and the weight of the fruits ranged from 0.01 to 6.55 kg per tree. The mean weight of the fruit dropped ranged from 90 g to 420 g.

Project: Impact analysis of ICAR-CCARI technologies.

(Shripad Bhat, A R Desai, Manohara K K, G R Mahajan, Paramesha V, Amiya Ranjan Sahoo and Monica Singh)

Interventions were carried out under the Scheduled Tribe Component (STC) programme by the Institute in a community-owned farm of Gaondongrim village of Canacona Taluka in South Goa and its impact was assessed. This farm of 10 hectares area is collectively owned and farmed by 33 tribal farm families and half of the farm area was barren land. Several interventions were designed and implemented: (i) rejuvenation of barren land through planting of improved cashew varieties under agri-horti system, (ii) improved nutrient and production technologies, (iii) effective utilization of interspace and available natural resources and (iv) value addition through preparation of feni from cashew apples. The estimated impact of these interventions revealed that the employment generated at the farm increased from 730 man days per year (2017-18 – before interventions) to 1,683 man days per year (2021-22 – after the interventions). Net returns obtained from the farm improved by Rs. 3,44,467 due to interventions. Results of paired t-tests indicated that both these improvements were statistically significant. Due to these agri-horti interventions, besides improved employment opportunities at the farm, labour productivity in terms of gross returns per man day and net returns per man day also improved. The gross returns per man day increased with an improvement of 156% and the net returns per man day increased to Rs. 119 registering a growth of 160%.

View of improved cashew variety and collection of cashew apples for the production of *feni* (a traditional drink) at Zintawadi, Cancona

Yield levels and returns obtained from the Institute's salt-tolerant paddy varieties (Goa Dhan 1, Goa Dhan 2 and Goa Dhan 3) was compared with the local traditional salt-tolerant variety *(Korgut),* by collecting data from 80 farmers (20 each for each variety) in Goa. The average landholding sizes of sample farmers ranged from 1.83 acres to 2.03 acres and the area under paddy ranged from 0.75 to 0.85 acres. Results of two-sample t-tests indicated that both yield levels and returns from cultivating improved salt-tolerant varieties were significantly higher compared to *korgut*. The average yield levels in the farmers' fields were 3.16 t/ha (net return of Rs.31,821/ha) in Goa Dhan 3, 2.82 t/ha (Rs. 24,590/ha) in Goa Dhan 1 and 2.59 t/ha (Rs. 20,810/ha) in Goa Dhan 2, while it was 1.7 t/ha (Rs. 3,240) in case of *korgut*. This differences in net returns can be attributed to higher yields (average increase of 68%) since cost of cultivation and procurement prices are almost the same. It was observed that besides adopting improved varieties, farmers can mill the paddy grown under *khazan* lands and sell at premium prices as there exists a niche consumer segment for this produce.

Data collection from paddy farmers at Chorao island

Project : Assessing research needs of stakeholders of ICAR-CCARI, Goa and their perceptions about Institute's services

(Shripad Bhat and Monica Singh)

Stakeholder opinion on the services offered by the Institute were collected from 30 farmers visiting the Institute for purchasing seed, planting materials, bio-fertilizers, breeds of animals and fish for availing extension services and training programmes etc. Analysis of stakeholder feedback indicated that the majority of the respondents strongly agreed that quality of products/services offered by the Institute was good (70%), price was reasonable (67%) and delivery of products/services was on time (57%). Around 47 per cent each of the stakeholders strongly agreed and agreed that they were satisfied with the products/services offered by the Institute. Major suggestions for improvement of products/services of Institute were inclusion of payment options through UPI/QR code and scope for improving the availability of planting materials/animal breeds. For assessing research needs of coastal farmers, a questionnaire was prepared through Google Form and link was shared with stakeholders of all the coastal districts and UTs. The link for the same is also hosted on the Institute website. Responses from 69 stakeholders including farmers/groups, SAUs/ Researchers, KVKs, state government officials were collected from all coastal states and UTs and analysed. In the field of agriculture/horticulture, problems related to weather (15%), marketing and prices (15%), labour scarcity and higher wages (14%) and poor soil fertility and salinity (11%) were ranked higher by both respondents and experts. In field of animal husbandry/ poultry, lower productivity/profitability (18%) and other problems such as unavailability of resilient breeds and repeat breeding (32%) were ranked higher. In fisheries sector, shortage of good quality fish seeds (21%), weather-related problems (7%) and habitat degradation (5%) were ranked higher by stakeholders and experts.

Data collection from stake holders

Major problems reported by stakeholders from all coastal states and UTs (n=69)

Sectors	Major reported problems	Frequency	Expert Rank*
Agriculture/Horticulture (total reported problems=141)	Weather-related problems	21 (15)	08.5
	Pests and diseases	21 (15)	07.0
	Marketing and prices	18 (13)	08.5
	Labour scarcity and higher wages	14 (10)	08.5
	Poor soil fertility and salinity	11 (08)	08.5
	Barriers to mechanization	08 (06)	05.0
Animal Husbandry/Poultry (total reported problems=94)	Lower productivity/profitability	17 (18)	10.0
	Fodder Shortage	16 (17)	06.0
	Higher feed cost	11 (12)	07.0
	Diseases	11 (12)	08.0
	Lack of timely veterinary services and facilities	09 (10)	05.0
	Others (unavailability of resilient breeds, repeat breeding etc.)	30 (32)	09.0
Fisheries (total reported problems=73)	Shortage of good quality fish seeds	15 (21)	10.0
	Lower profitability	13 (18)	06.0
	Lower catch	06 (08)	08.0
	Lack of storage and infrastructure facilities	06 (08)	06.0
	Weather related problems	05 (07)	10.0
	Habitat degradation	04 (05)	10.0
	Diseases	05 (07)	08.0

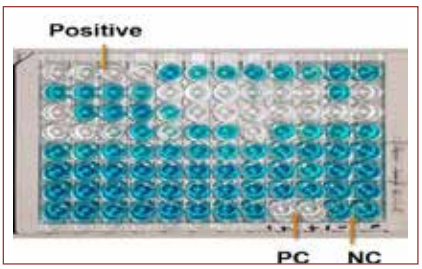
* Rank of 1 denotes lowest while 10 denotes highest importance; ranked by four experts. Figures in parentheses indicate percentages to the total number of problems reported by stakeholders.

Mega Project 4: Development and validation of production technologies of livestock and fisheries

Project: Serological and molecular diagnosis of PPR (Peste Des petits Ruminants) in small ruminants and developing preventive strategies in coastal region

(Susitha Rajkumar and Shirirsh Narnaware)

To study the seroprevalence of PPR, a total of 174 goat serum samples were collected from goat herds in North and South Goa and were screened using INgezim PPR Compac 192 tests kit. The average seroprevalence was observed to be 25.3%



ELISA test for detection of PPR antibody in sera

Seroprevalence of PPR antibody in goat serum samples from Goa

Taluka	Total serum samples	Positive for PPR	% Positive
Quepem	39	20	51.28
Sattari	12	0	0
Sanguem	3	0	0
Bardez	8	1	12.50
Ponda	42	5	11.90
Salcette	30	2	6.67
Cancona	40	16	40.00
Total	174	44	

Project: Prevalence, impact and management of the economically important diseases of dairy animals in coastal India

(Susitha Rajkumar and Shirish D Narnaware)

Isolation of yeast pathogen from clinical mastitis and study of the antibiotic resistance profile

Twenty milk samples were collected from cows which were affected with clinical mastitis and were unresponsive to antibiotic treatment. Isolation of bacteria and fungus were attempted. Yeast could be isolated from only 12 milk samples. Species identification of yeast pathogens were carried out by 16s rRNA gene using NL1-NL4 primers and identified species were *Trichosporon faecale* and *Rhodotorula muciloginosa*. The isolates were subjected to antibiotic susceptibility test by Kirby Bauer disc diffusion test on Meuller hinton agar which showed high resistance against antifungal antibiotics and the antibiotics Fluconazole showed least resistance followed by Voriconazole. All the yeast isolates were resistant to antibiotics Iitraconazole and Amphotericin.

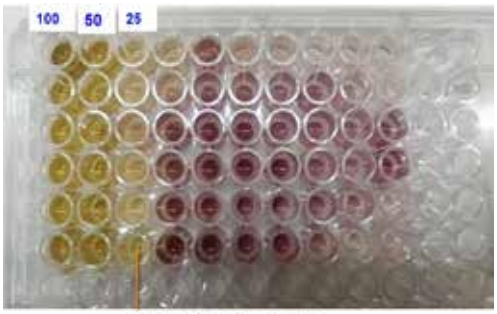
Screening of herbal extracts for antimicrobial property

Herbs collected from Institute herbal garden and dried herbs obtained from ICAR – DMAPR, Anand were used for this study The collected dried herbs were *Coleus (Plectranthus) amboinicus, Pogostemon cablin (Indian patchouli), Costus igneus (Insulin plant) Adhatoda vasica, Artemisia annua, Andrographis paniculata* and *Senna alexandrina.* Dried plants material was extracted in methanol (25g/250ml methanol). Antimicrobial potency of herbal extracts against *Staphylococcus aureus* and yeast isolates from mastitis was assessed by disc diffusion method.

The extracts of *Costusigneus* (Insulin plant), *Andrographis paniculata* and *Senna alexandrina* showed higher zones of inhibition for *S. aureus* and yeast isolates. The Minimum Inhibitory Concentration (MIC) of *Plectranthus ambonicus* extract against *Staphylococcus haemolyticus, S. epidermidis* and *S. aureus* were 50µg/ml, 25µg/ml and 25µg/ml respectively.

Average zone of inhibition in disc diffusion tests using herbal extracts

Extract	Average diameter of zone for S. aureus (mm)	Average diameter of zone for yeast (mm)
Pogostemon cablin (Indian patchouli)	13	11
Coleus amboinicus	11	10
Costus igneus (Insulin plant)	14	12
Adhatoda vasica	10	11
Artemisia annua	13	13
Andrographis paniculata	14	14
Senna alexandrina	15	12
Methanol	0	0
Enrofloxacin	36	40



MIC against *S. aureus*

Micro-plate showing MIC of Coleus *amboinicus* extracts against S. *epidermidis*

Project: Augmenting backyard poultry production through technological interventions in breeding, feeding and management aspects pertaining to Indian West coast

(Nibedita Nayak, Gokuldas P P, Susitha Rajkumar, Amiya Ranjan Sahu and Monica Singh)

Evaluation of active constituents and mechanism of combination of phytogenic feed additives in backyard poultry

Phytogenic feed additives are considered as alternative to antibiotics which stimulates the growth performance, gut health, immunity without any adverse residual effect on poultry birds. The aim of this study was to assess the phytogenic constituents, nutritive value of herbal feed additives and to elucidate their effect on various production performances in combinations in slow growing chicken variety and ducks. The UV-Vis and Fourier transform infrared (FTIR) analysis was done for different herbal feed additives like Shyama tulsi *(Ocimum tenuiflorum),* Moringa *(Moringa oleifera),* Chekurmanis *(Sauropus androgynus),* Kalmegh (*Andrographis paniculate*), Alpinia *(Alpinia galanga),* Turmeric *(Curcuma longa)* and Ginger *(Zingiber officinale)* (The UV-VIS absorbance spectra of the powdered turmeric fall between wavelengths (l) from 300 nm to 500 nm confirming the presence of Curcumin while ginger ranged from 230-

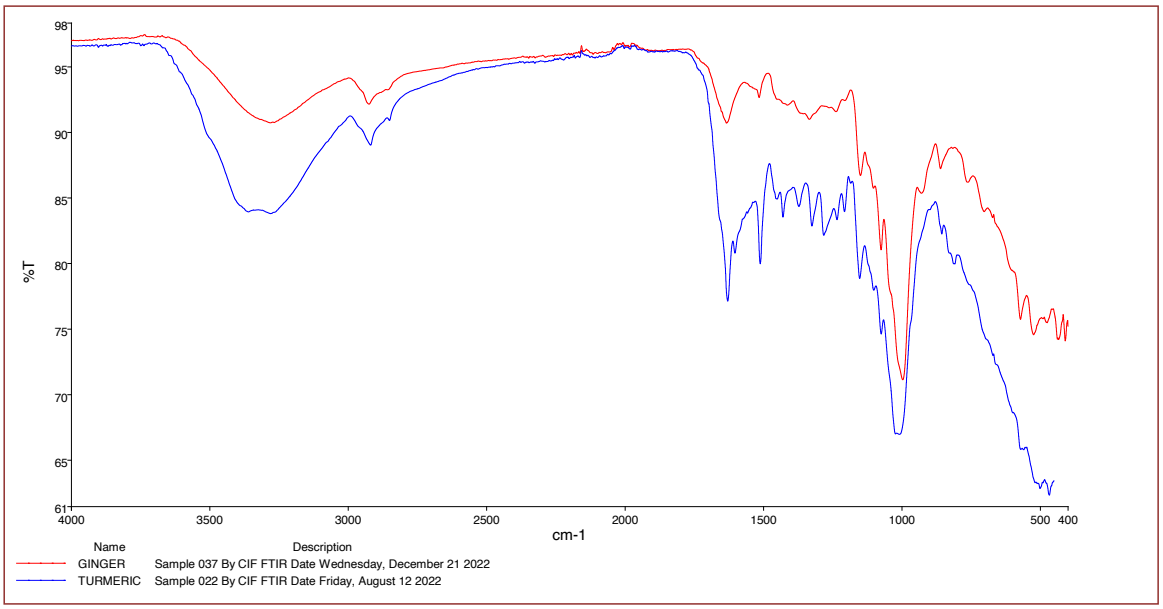
280 nm confirmed the presence of gingerols and shogaols. The turmeric powder showed FTIR spectra at 3360.33 cm^{-1}, 3281.3 cm^{-1}, 2919.34 cm^{-1}, 1629.35 cm^{-1}, 1603.27 cm^{-1}, 1074.99 cm^{-1} which are signature peaks of curcumin where as ginger powder exhibited FTIR spectrograph at 3281.27 cm^{-1} signifying hydroxyl and phenolic groups in gingerols, shogoals, zingerone and paradols, 2924.99 cm^{-1} as methylene C–H asymmetric stretch which is backbone of several secondary metabolites, 2198.98, 2163.68, 2152.6, 2115.76 cm^{-1} as aromatic combination, 1638.85 cm^{-1} as C=C stretching of terpenes like zingiberene, camphene, β-elemene, limonene. For combinations of moringa, chekurmanis and shyamatulsi, peaks fall in the range of 270-340nm in UV-Vis corresponding to flavonoids, polyphenol and organic choromophores. FTIR methanolic extract showed presence of functional groups like hydroxyl. Carbonyl, aromatic and organosulfur in the range of 589.39 cm^{-1} -2917.82 cm^{-1}. Percentage of protein in *alpinea, shyama tulsi, chekurmanis* and *moringa* were 7.72, 10.72,19.39 and 28.29, on dry matter basis respectively. The resulting spectra corresponding to different active ingredients and their concentration in rhizomes and leaves of selected herbs by FTIR is presented below:

Effect of herbal feed additives in combinations on growth, immunity, gut health of dual-purpose backyard chicken (var CARI-Debendra)

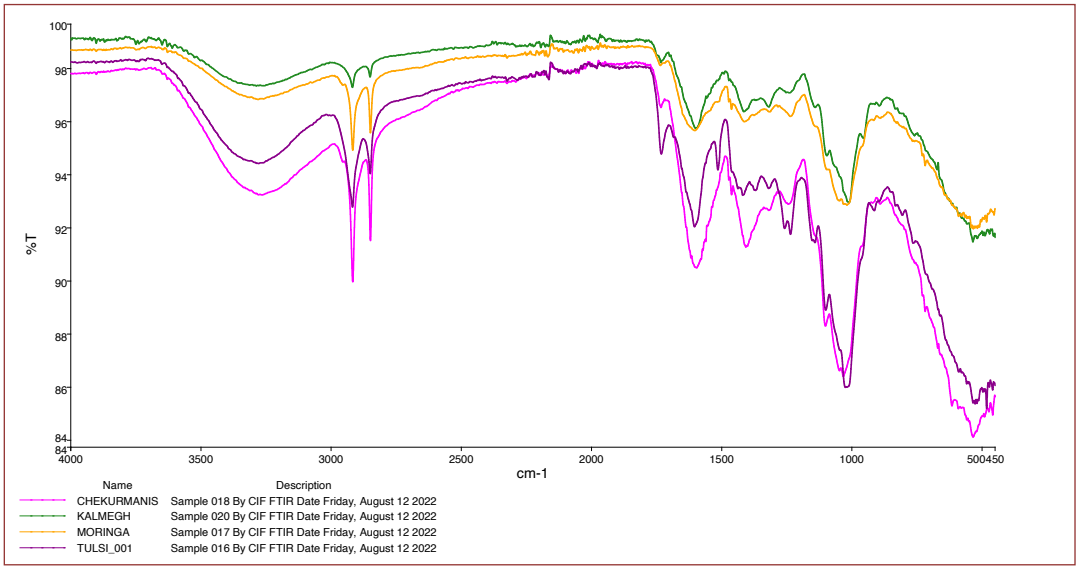
A total of 90 (30×3) CARI-Debendra, a dual-purpose chicken variety was used in this experiment as control and treatment groups for 12 weeks, respectively. The leaves of tulsi (*Ocimum sanctum*), chekurmanis (*Sauropus androgynus*), drumstick tree (*Moringa oleifera*) were harvested, cleaned, oven dried and pulverised to fine powder. Significant difference ($P<0.05$) was observed in body weights at 8th (507.26/550.67) and 12th weeks (1176.04/1240.3) between control and treatment groups. Actual water: feed intake was 0.26 for treatment and 0.29 for control at 12 weeks. The cell mediated immune response was higher in treatment group with FI of 0.25±0.15 and 0.14±0.03 for control. Gut morphometrics of duodenum, jejunum, caecum like villi height. villi width, crypt depth were studied. In conclusion, feeding of phytogenic feed additives at 2% improved the growth, immune-response, feed conversion ratio and gut health in backyard poultry.

Effect of herbal feed additives in different concentrations and combinations on backyard layer chicken (var. Gramapriya)

A biological feeding experiment on



FTIR characterisation of rhizomes of turmeric and ginger



FTIR characterisation of leaves of *tulsi, moringa, kalmegh and chekurmanis*

phytogenic feed additives of Chekurmanis (*Sauropus androgynus*), Moringa (*Moringa oleifera*), Shyama tulsi (*Ocimum sanctum*), each at 1% (Treatment 1) and 2% (Treatment 2) was conducted on 150 Grampriya chicks for 6 weeks. The aim of the study was to assess the effect of early nutrition with herbal feed additives on growth, immunity, and production performances. No significant difference in water:feed intake and mortality was observed during experimental period, but significant differences in growth rate of Gramapriya layer chicks were observed among control, treatment 1 and treatment 2 till 6 weeks. No significant differences were observed in body core temperature and respiration rate.

Effect of herbal feed additives in different concentrations and combinations on indigenous Kuttanad ducks

A biological experiment on feeding of herbal feed additives each at 1% and 2% of Chekurmanis (*Sauropus androgynus*), Moringa (*Moringa oleifera*), Shyama tulsi (*Ocimum sanctum*), Kalmegh (*Andrographis paniculata*) was conducted in 36 number of Kuttanad ducks for 6 weeks interval. The aim of the study was to assess the effect of early nutrition with herbal feed additives on growth, immunity, palatability of feed in indigenous ducks. No significant difference in water:feed intake and mortality observed during experimental period. The growth rate of ducks in treatment group (536 g) varies significantly from control group (498 g) at 6 weeks.

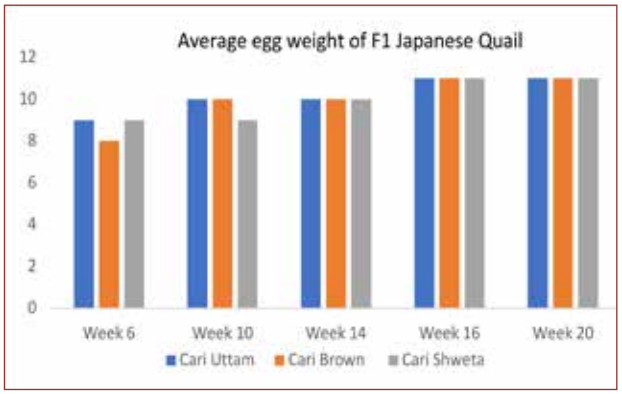
Adaptation and growth kinetics of broiler and layer of Japanese quails reared in hot and humid climate

Three different varieties of Japanese quails CARI-Shweta (layer), CARI-Uttam (Broiler) and CARI-Brown were evaluated under hot and humid climate of Goa over generations.

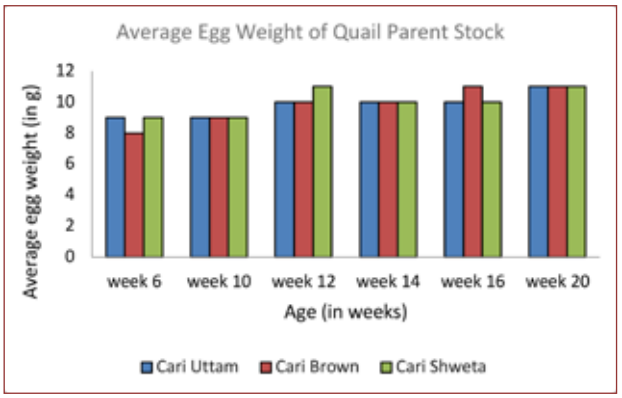
Semen evaluation and AI in backyard poultry

Artificial insemination (AI) in poultry birds is a useful technology especially for broiler breeds and improved backyard poultry varieties, where fertility is low due to reduced libido and heavy body weight. The process of AI has been standardized and evaluated in backyard poultry varieties like Gramapriya birds reared under coastal climatic conditions. The developed technology comprises of the process for semen collection through dorso-abdominal massage method, semen processing, evaluation and insemination using pooled extended semen. Procedures for Computer Assisted Semen Analysis (CASA) of poultry semen samples were also standardized. Major sperm motion parameters measured were the percentage of motile sperm, progressively motile sperm, path

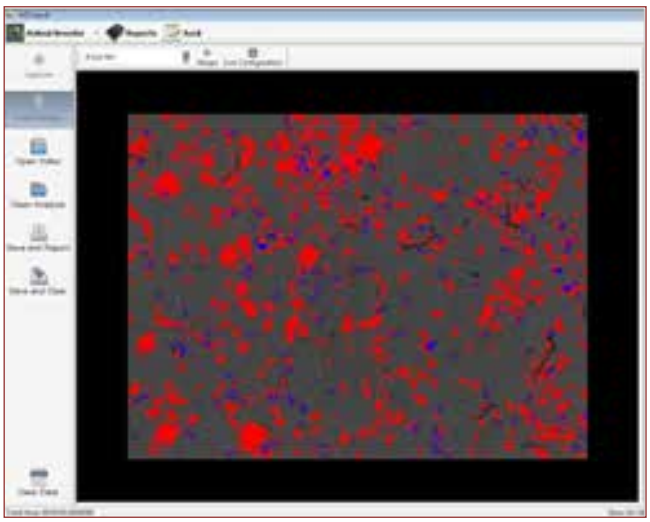
velocity (VAP), progressive velocity (VSL), curvilinear line velocity (VCL), straightness and linearity. Poultry AI has been successfully adopted in selected flocks of the Institute units, with average fertility of 93% and hatchability of 81%. Institute has also popularized this technology through training and demonstration to farmers in the region.



Egg weight of different varieties of Japanese quail parent stock



Egg weight of different varieties of Japanese quail F1 stock



Computer Assisted Semen Analysis of poultry semen

Project: Studies on prevalence, etiopathology, risk factors and management of infectious reproductive disorders in dairy cattle of west coast region.

(Shirish D Narnaware, Gokuldas P P and Susitha Rajkumar)

Sample collection and surveillance

To determine the prevalence of major infectious reproductive disorders in dairy cattle of West coast region, a survey of health status of dairy cattle was conducted and biological samples such as blood, vaginal swabs and uterine swabs were collected from four cattle farms of Goa.

Vaginal and uterine swabs collected from cattle were used for bacterial isolation using Brain Heart Infusion (BHI) broth and BHI agar plates and antibiotic sensitivity test (AST) was performed on Mueller Hinton Agar (MHA) plates using the agar disc diffusion method. The diameter of the zones of inhibition was measured by antibiotic zone scale™ (HiMedia, India) and the zones were graded as sensitive and resistant to the drugs tested by referring to Zone Size Interpretative Chart (HiMedia, India). The AST of all bacterial isolates against the tested antibiotics were summarized.

Details of sample collection from cows of different farms

S.N.	Location of farm	Total cattle	Samples collected	Disease problem	Bacteria isolated/ identified
1.	Dairy farm, Morlem Sattari, Goa	27	10	Repeat breeding (2)	*E. coli* (2)
2.	Govt. Cattle Breeding Farm, Kopardem, Valpoi, Sattari, Goa	554	10	Abortion (1), Repeat breeding (4), Anestrus (1)	Brucellosis (5), *E. coli* (3)
3.	Dairy Farm, ICAR-CCARI, Old Goa	48	12	Repeat breeding (1)	*Staphylococcus* spp. (3), E. coli (3)
4.	Dairy farm, Kudnem, Bicholim	12	2	Repeat breeding (2)	*Staphylococcus* spp.(1)

Reproductive health camp at State Govt. Cattle Breeding Farm, Kopardem, Valpoi, Sattari, Goa.

AST of isolated bacteria (Figures in parenthesis indicate % sensitive)

Sl.No.	Antibiotic discs used	Sensitive isolates	
		E. coli (n=8)	*Staphylococcus* spp.(n=4)
1.	Ceftizoxime (CZX)	8 (100)	3 (75)
2.	Enrofloxacin (EX)	6 (75)	4 (50)
3.	Ampicillin/Cloxacillin (AX)	6 (75)	2 (50)
4.	Cefaperazone (CPZ)	8 (100)	4 (100)
5.	Gentamicin (GEN)	8 (100)	2 (50)
6.	Ceftriaxone (CTR)	6 (75)	4 (100)
7.	Ciprofloxacin (CIP)	8 (100)	4 (100)
8.	Levofloxacin (LE)	8 (100)	4 (100)
9.	Streptomycin (S)	4 (50)	2 (50)
10.	Penicillin (P)	3 (37.5)	1 (25)
11.	Cefalexin (CN)	7 (87.5)	3 (75)
12.	Amoxyclav (Amoxicillin/Clavulanic acid) (AMC)	4 (50)	2 (50)

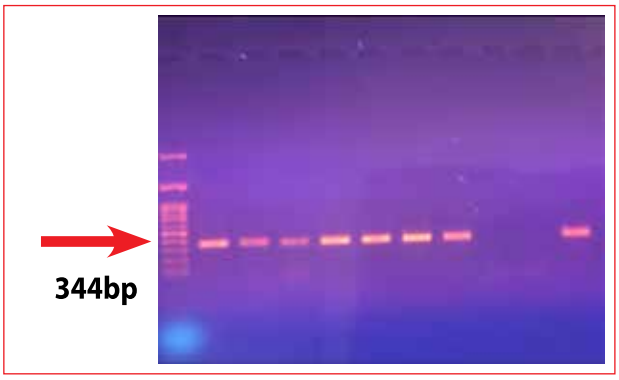
For diagnosis of brucellosis, Rose Bengal Plate Test (RBPT) was carried out on all the serum samples of which 5 samples from Govt. Cattle Breeding Farm, Kopardem were detected to be positive. The cytological examination of the endometrium was carried out using Cytobrush technique for endometrial cell collection, cytology smear preparation, bacterial culture and DNA extraction. The endometrial samples were collected from 2 cows and smears prepared were stained using Giemsa stain. Cytology of one sample showed moderate number of neutrohils along with endometrial epithelial cells indicating possible case of endometritis.

White side test was performed on uterine discharge from three cows. In this test 1 ml uterine discharge sample was mixed with 1 ml of 5% sodium hydroxide solution, boiled and cooled. The intensity of yellow color indicates grade of infection. Of the 3 tested samples one sample was positive showing yellow color indicating possible case of endometritis.

Cytobrush used for uterine cytology

DNA isolation and PCR

Genomic DNA was isolated from the bacterial colonies by boiling and snap chilling method. All the bacterial isolates were confirmed by PCR using the oligonucleotide primers for amplification of EcAlr gene of E. coli and gap gene of *Staphylococcus* spp.



PCR amplification of EcAlr gene of *E. coli*.

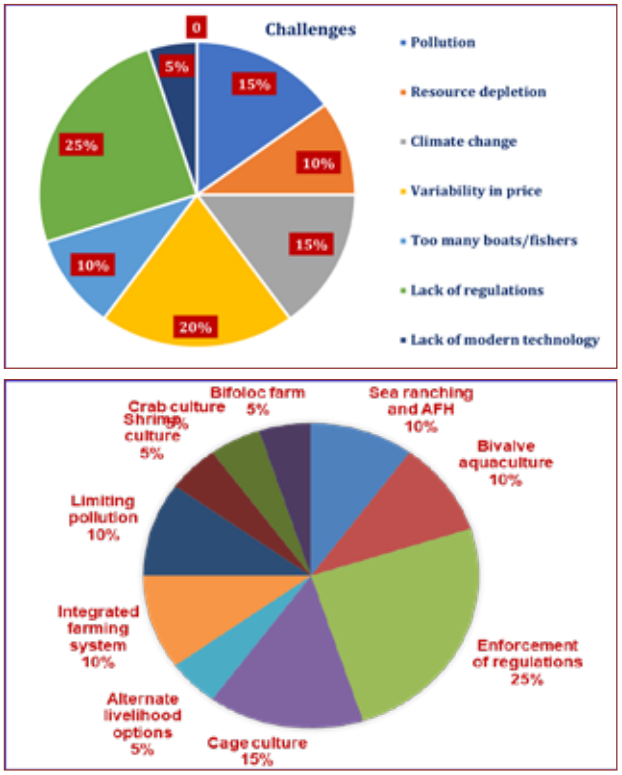
Project: Assessment, management and designing improvement options for fisheries in selected low impacted estuaries along west coast of India

(Sreekanth G B and Trivesh Mayekar)

Fish community structure from 30 estuaries from west coast of India were characterised. In total, 257, 247, 190, 158, 107, 174, 270, 75, 84, and 51 species were collected from Zuari, Mandovi, Terekhol, Chapora, Sal, Kali, Aganashini, Sharavathi, Gangavali, and Poonthura estuaries respectively aggregating to 340 species. Data from primary and secondary information was used for other estuaries, the total count for the western coast of India was 450 fish types. Fish productivity (tonnes km^{-2}) was highest in Aganashini (38.2) followed by Vembanad (23.9) while the lowest values recorded from Ulhas (1.2), Chettuva and Galgibag (3.1).

Based on the frequency of fishing operations, 85% were full time and 15% were part-time fishers. The peak months of fishing were September, October, November, February and March. The average cost of fishing gear, motorised boat, traditional boat and motor were Rs. 22583.6±1340.2, Rs. 104647.4±10609.9, Rs. 25674.8±3922.3, and Rs. 158643.7±18522.6, respectively. The net profit/month and benefit-cost ratio were Rs. -589 to 29860 and 0.58-1.73 respectively. The catch per unit of effort (kg per day's fishing) and net returns (income in rupees per month) were the highest in Zuari (34.4, 23,190) estuary followed by Mandovi (26.5, 17013), while the lowest values were recorded for Ulhas (12.3, 9278), Narmada (12.5, 9279) and Tapti (13.9, 7731).

The major challenges for the fishing were 1. Lack of fishing regulations, 2. Variability in price, 3. Too many fishers, 4. Pollution and 5 Climate change. The improvement options identified



The challenges and adaptation options identified by the estuarine fishermen

by fishermen were - 1. fishing regulations, 2. cage culture, 3. limiting pollution, 4. integrated farming systems 5. sea ranching 6. bivalve aquaculture 7. crab culture and 8. shrimp culture.

The fish community index was modified into an Estuarine Multi-metric fish index (EMFI) and was used to define both EMFI and Composite Pressure Index (CPI) for the estuaries along west coast of India. Based on these indices, only three estuaries were identified with good ecological status (Gangavali, Mandovi and Zuari: EMFI>0.60) and all others were moderate (24, EMFI≧0.45 to <0.60) and poor (Narmada, Tapti and Ulhas: ≧0.30 to <0.45). No estuaries were in the excellent (≥0.80), very low (≧0.20 to <0.30) and poor (≦0.20) categories.

The seasonal abundance of finfish seeds was analysed across six estuaries (Zuari, Mandovi, Terekhol, Chettuva, and Kali) and the results showed the dominance of bream, rabbitfish, trevally, grouper, glassfish, seabass, grey mullet, pearlspot, sillago, red snapper, mud crab and silver moony. For all these species, the highest counts were observed during the post-monsoon season followed by premonsoon season.

Ecosystem models were constructed using Ecopath approach to analyse the trophic network and ecosystem structure of Zuari, Mandovi, Terekhol, Poonthura and Ulhas estuaries. Based on ecological indices, Terekhol, Poonthura and Ulhas estuaries were classified as moderate to high impacted estuaries and Zuari and Mandovi as moderately impacted estuaries.

Project: Assessing status of coastal aquaculture practices and improvement through technology intervention for promoting livelihood of fish farmers in west coast of India

(Trivesh Mayekar, Sreekanth G B, G R Mahajan, Manohara K K, R. Solomon Rajkumar and Parmesha V)

Growth profile, survival, and economic efficiency of Asian seabass (*Lates calcarifer*) in a freshwater polyculture system

The Asian seabass (*Lates calcarifer*), commonly known as "Chonok" in Goa, is a highly preferred food fish with high-quality meat and commercial importance. This trial aimed to assess the impact of Small Indigenous Fish (SIFs) as forage fish on the growth, survival, and economic efficiency of Asian sea bass cultured in freshwater pond systems. The study was designed with three treatments (T1 - 600 Seabass + 2000 Tilapia + 500 IMC + 40000 SIFs, with no aeration, T2 - 2000 Seabass + 2000 Tilapia + 20000 SIFs, with aeration, and T3 - 2000 Seabass + 2000 Tilapia + 20000 SIFs, with No aeration) and validated for its techno-economic viability. The survival rate for T1, T2 and T3 was 72%, 66.66%, and 54%, respectively, with a total production of 656.64 kg, 1772.89 kg, and 1382.4 kg, with the average seabass weight of 1.52 ± 0.11 kg, 1.33 ± 0.15 kg, and 1.28 ± 0.13 kg, respectively. As for the novelty of SIFs, in T1, the percentage of SIFs in the food-content seabass

was higher and gave good growth results.

The SIF feed acceptance by seabass was more than tilapia and IMC juveniles in terms of number, weight, and frequency percentage. There was no significant difference ($p < 0.05$) between the means of final length and survival rate. However, the growth in final weight and daily weight gain of the fish with the stocking of 600 fish in 2000 m^2 (3.33 fish m^{-2}) was significantly higher ($p > 0.05$) compared to the stocking of 2000 fish in 2000 m^2 (1.00 fish m^{-2}). The benefit from the treatment of T2 and T3 with a stocking density of 2000 fish in 2000 m^2 (1.00 fish m^{-2}) was higher compared to the treatment of T1 with 600 fish in 2000 m^2 (3.33 fish m^{-2}), but the highest capital efficiency was recorded for the treatment of T1 (3.33 fish m^{-2}). This methodology has emerged as a sustainable farming model that can enhance the livelihood security of fish farmers and also efficiently utilize low-saline water bodies for fish production and community development. In comparison with the sea bass polyculture, Asian seabass polyculture with artificial pelleted feeding in freshwater system is also carried out, and the results are being compared for better growth with the polyculture experiment.

Length-Weight profiles of Small Indigenous Fishes (SIFs) from different freshwater bodies of Goa

This study recorded the length-weight relationships of four finfish species of the Cyprinidae family from the freshwater systems of Goa. A total of 2485 fish specimens (*Systomus sarana*: 782, *Rasbora dandia*: 606, *Puntius vittatus*: 577, *Puntius mahecola*: 520) were collected from different locations in freshwater systems of Goa from 2020 to 2022. The values of exponent *b* in the length-weight relationship varied between 0.8139 (*Puntius mahecola*) to 1.5989 (*Systomus sarana*), with a mean value of 1.1524 for all the species. The importance of *a* varied from 0.0532 (*Puntius mahecola*) to 0.4465 (*Rasbora dandia*), and significant r^2 values ranging from 0.71 to 0.91were obtained. All the species showed negative allometric growth.

Study on feeding approach for Asian seabass with *Ambassis ambassis*

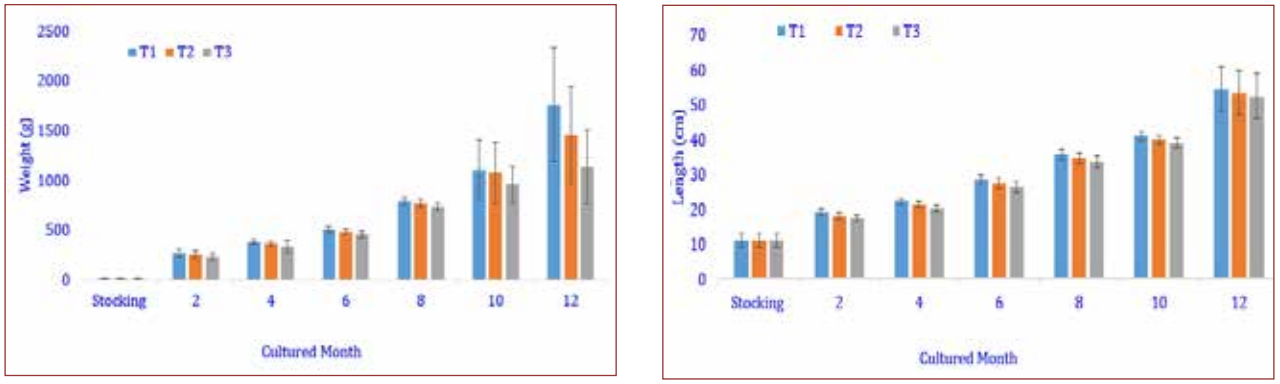
In this study, a trial on an alternative feeding method for Asian seabass foraging on *Ambassis ambassis* has been carried out. The Asiatic glassfish is one of the most common fish of Goa and is found widely in fresh, brackish, and coastal marine waters. Three treatments of salinities were studied [T1 (10 ppt), T2 (5 ppt), and T3 (0 ppt)] and a control of 15 ppt with a tank volume of 400 litres with two replications each. Each tank was stocked with two nos. of Asian seabass (mean weight: control: 705 ± 5.00 g, T1: 710 ± 0.00 g, T2: 710 ± 0.00 g, and T3: 705 ± 5.00 g). A total experiment period

Asian Seabass

Seabass culture pond, ICAR-CCARI

Differential growth in harvested sea bass fish after 9 months

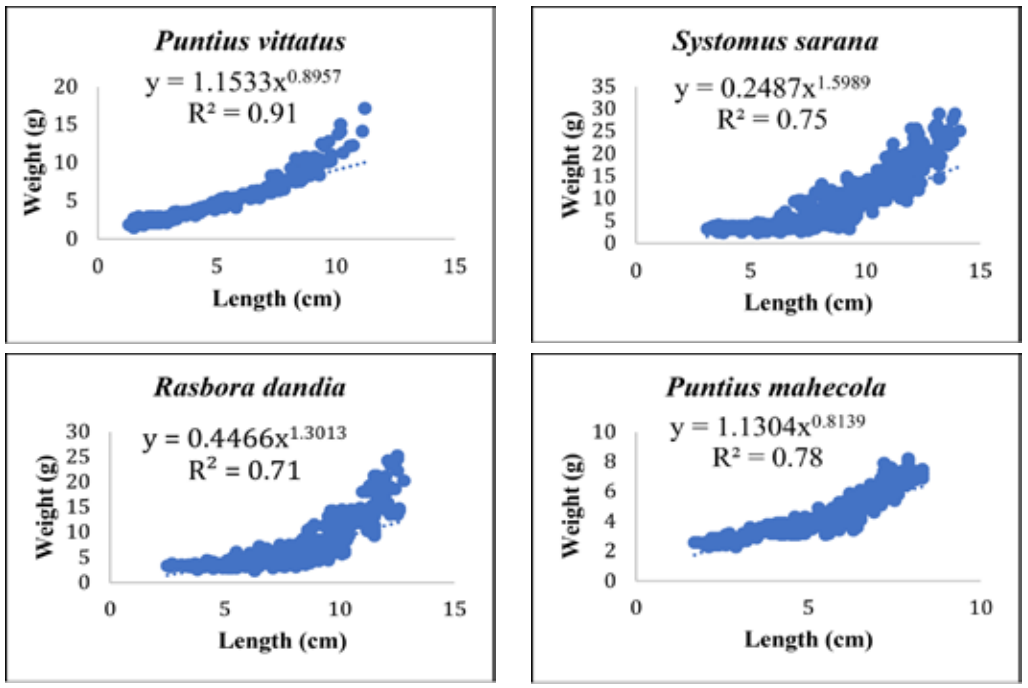
Asian seabass harvest from the pond of ICAR-CCARI



Growth in Length and Weight of the Fish during the experimental period

Length-weight data of SIF species

Fish species	Number	Length (cm)	Weight (g)
Systomussarana	782	3.1 – 14.1	2.3 –28.9
Rasbora dandia	606	2.5 – 12.8	2.4 –25.3
Puntius vittatus	577	1.3 – 11.2	1.5 –17.2
Puntius mahecola	520	1.7 – 8.3	2.3 – 8.2



Length- Weight analysis of SIFs

of 30 DOC with the feeding of glassfish (mean weight: 5.5 g, mean body depth: 3.66 cm) @ 4% per day was carried out. During the total DOC, feed utilization by seabass for glassfish observed for control, T1, T2, and T3 were 8-9%, 7-8%, 4-5%,and 1-2%, respectively, and the survival percentage was 1-2%, 2-3%, 5-6%, and 8-9%, respectively. The species can be used as a foraging fish in saline to low-saline culture systems for Asian seabass grow-out culture. This will be a better alternative to the pelleted feeding method to save upon the cost of production, achieving faster growth, better yield, and quality fish production, and leading to a sustainable and eco-friendly culture system.

Broodstock development, freshwater tolerance, and maturation study of *Ambassis ambassis*

Ambassis ambassis, commonly known as Asiatic glass fish, is one of Goa's abundantly available brackish water fish. Development of captive broodstock, understanding of reproductive biology, and freshwater tolerance of the species was considered for starting the breeding program of the species. To develop the captive broodstock of *Ambassis ambassis*, sub-adult fish and seeds were collected from the Divar Island, Mandovi estuary (salinity 10-15ppt). We stocked 4000 *Ambassis ambassis* in a freshwater pond. The stocked size of glass fish was in the range of length 3.2 - 10.3 mm and range of weight 1.293 - 10.1gm. After stocking, monthly sampling was conducted for analysis of growth and survival. Freshwater tolerance studies showed 10 -20% fish mortality.

Diversification of aquaculture species

For achieving sustainable aquaculture production, species diversification is vital. High-value fishes are in good demand in the domestic market and often are in short supply. Sea bass, Pearl spot, Tilapia, and Pangasius are in good demand in the local market. Therefore, its farming could be lucrative and emerge as a significant aquaculture enterprise benefiting many coastal fishers and fish farmers. To train fish farmers in aquaculture and allied activities, different species of Tilapia were introduced along with Pangasius and Pearl spot fish species.

Glassfish sampling at Mandovi estuary

Glassfish *(Ambassis ambassis)*

Development of aquaculture farm

To conduct fish culture experiments, breed fish, and train fish farmers in various aquaculture activities, a scientific fish farm has been established with a total area of 15,400 m^2. Four new unlined nursery ponds (each of 400 m^2) have been constructed for the rearing of nursery fishes. Three existing grow-out ponds were renovated, and one new grow-out pond was constructed. Ten aquaculture ponds are used for aquaculture experiments, fish breeding, and culture at CCARI, Goa.

Broodstock development and captive breeding of *Haludaria pradhani*

Haludaria pradhani (Melon barb) is one of the indigenous tropical freshwater barb varieties endemics to the Western Ghats and Tamil Nadu. It inhabits rivers, ponds, lakes, etc., and prefers shallow areas. The success obtained in

Ambassis ambassis

Stocking of *Ambassis ambassis* in the pond

the captive breeding of *Haludaria pradhani* is the first report of this species in India. Sampling was carried out in the natural shallow freshwater habitats of Goa. A total of 50 brooders were collected (05±0.03 cm) and were kept in a 500 L FRP tank for broodstock development for 3 to 4 months and fed on a protein-rich diet of dried bloodworms and ornamental flake feed (33% protein) at 5% of body weight, 3-4 times a day. The male and female were identified and conditioned separately for three weeks before releasing into the spawning tank (1:1). A total of 7 breeding pairs were set in different spawning tanks of 200 L capacity. Stones, marbles, and dried plant leaves were placed at the bottom of the tank, and a square-shaped nylon net was placed on the rocks and marbles to avoid egg consumption by parents. Spawning was observed after one week in the early mornings with a fecundity of 200-300. The larval period observed was of 100-120 days. During the initial

Different strains of Tilapia

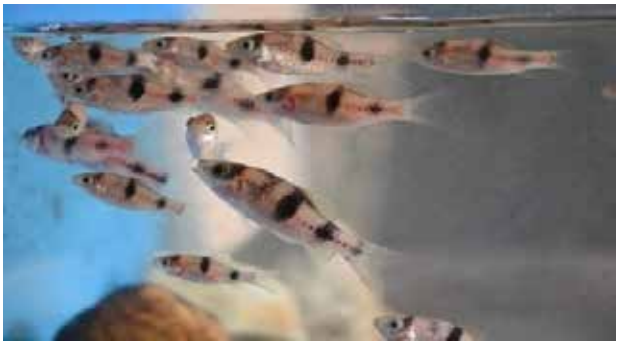
Pangasius

Pearl Spot

Aquaculture farm facility at CCARI

stage, they were fed with Artemia, later followed by dried bloodworm, Daphnia, and good quality dried flake feed. The juvenile survival rate was 15-20%. Further breeding trials are going on to enhance their survival rate. The technology could lead to conserving the wild stock and provide an alternative livelihood option for youth and women.

Broodstock of *Haludaria pradhani*



Juveniles produced

Adult fish of *Haludaria pradhani*

Mega project 5 : Improving livelihood security through post-harvest technologies and other agri-enterprises

Project: Development of Ready-To-Eat (RTE) Animal and Fish-based Traditional Foods of Coastal India by Retort Processing

(R Solomon Rajkumar, C O Mohan, Mathala Juliet Gupta and Sunetra Talaulikar)

Quality evaluation of retort pouches

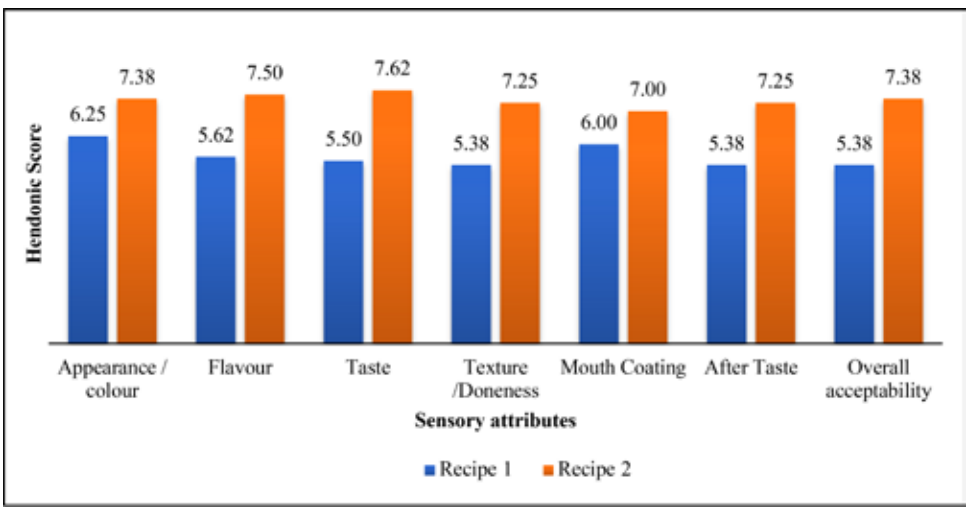
Retortable pouches having three-layer configuration of 12µ PET ALOX/15µ Nylon/70µ cast polypropylene of size 16 x 18cm were used for filling the curry. The tests for the quality of the retort pouch carried out included tensile strength and elongation at break (IS 2508, 1984) and heat seal strength (ASTM, 1973) using Universal Testing Machine (Lloyd instruments LRX plus, Hampshire, UK)

Standardization and process optimization of traditional chicken curry

The formulation of the traditional Chicken *Xacuti* was standardized based on the information collected from housewives, cooks, and preliminary trials and hedonic scale sensory evaluation was conducted. The preparation of gravy/curry medium and boneless chicken pieces were done separately. The best recipe was selected based on the Hedonic scale sensory evaluation by a selected consumer panel (Chart no 1). The optimization of the F_0 value was done at three different levels, 6, 7, and 8 minutes, and based on sensory evaluation, the F_0 value was standardized. After processing, all the pouches were wiped dry and kept in a dustproof cabinet at ambient temperature (25–30°C).

Retort processing of traditional chicken xacuti

A pilot-scale Mill Walls Model 24 rotary retorting system that could withstand a working pressure of 3.5 bars was used for the experiment. The retort was operated in the steam/air mixture mode during the sterilization cycle. The temperature was set at 121.1° C with a steam pressure of 1.05 bar and an over pressure of 2.1 bars for 55.76 min was maintained during each process cycle. Copper nickel thermocouples capable of measuring temperature in the range of 85°C to 145°C with an accuracy of ±0.1°C and a response time of 0.2 s, were used. The



Selection of best recipe based on the Hedonic scale sensory evaluation

Standardized recipe *(Chicken Xacuti)*

Thermal processing in retort pouches

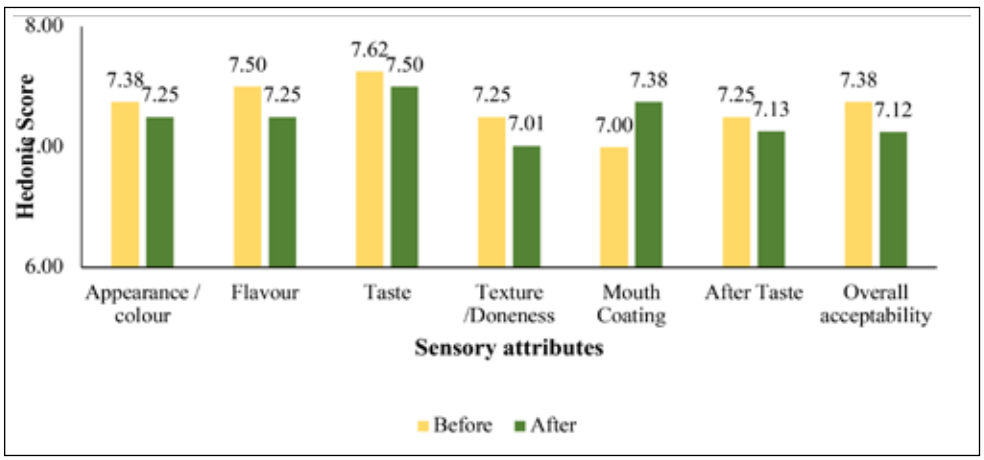
Final standardized product in retort pouches *(Chicken Xacuti)*

Final standardized product *(Chicken Xacuti)* ready for the consumption

retort temperature (RT) was maintained at 121.1°C and air pressure was maintained at 28 psi throughout the heating and cooling periods. The lag factor for heating (J_h), the slope of the heating curve (f_h), time in minutes for sterilization at retort temperature (U), and lag factor for cooling (J_c) were calculated. The parameters, final temperature deficit (g), process time (B), and total process time (T_B) were calculated by the mathematical method of Stumbo (1973). The parameters were determined by plotting temperature deficit (RT - Tc) on semi-log paper. Total process time (T_B) was determined by adding process time (B) to the effectiveness of the come-up time. The product core temperature and the lethal rates (F_0 value) were noted and the F_0 value was calculated. The commercial sterility was performed as per the standards of IS: 2168 (1971) at the 45th day. The processed samples in thioglycolate broth were incubated in anaerobic conditions at 37°C for 48 h and at 55°C for 5 days to assess the commercial sterility of the products. The product is commercially sterile and the product is ready for the commercialization.

Sensory evaluation of the Chicken *Xacuti* before and after thermal processing

The standardized recipe before and after the retort processing were compared for sensory attributes by a selected consumer panel and the final product indicates that it is sensorily acceptable (> 7.0 on hedonic scale) for consumption.

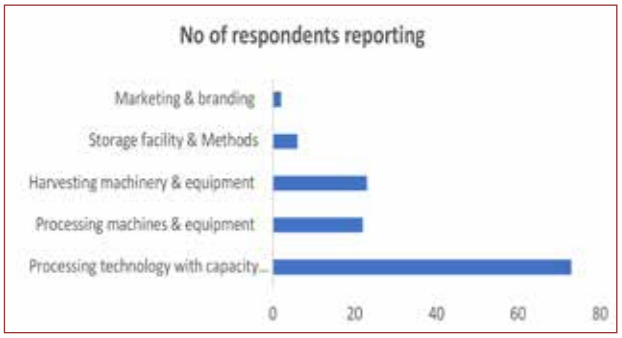


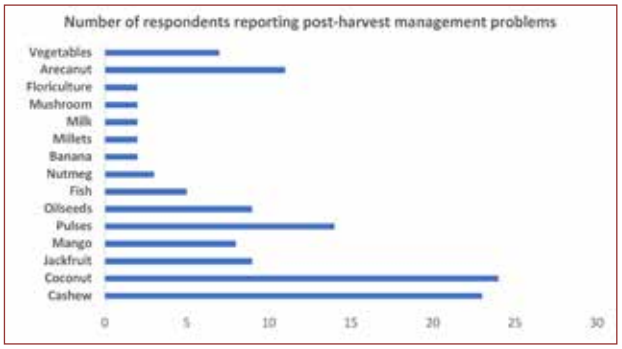
Project: Assessment and development of cropping systems based harvest and post-harvest management technologies for coastal India

(Mathala Juliet Gupta, R. Solomon Rajkumar, A R Desai , R Ramesh, Maneesha S R, Shripad Bhat and Monica Singh)

Based on the farming systems identified from secondary data, a questionnaire was developed and shared as a google form to various stakeholders in the coastal states, to corroborate the cropping systems and prioritize on-farm processing problems. Three virtual meetings were also held with the stakeholders to assess the processing related problems of the coastal states. The percent distribution of respondents from various coastal states ranged from 0% in West Bengal & Union Territories, 1-3% in states of Odisha, Andhra Pradesh, Kerala and Karnataka, and 34% in Goa and highest 40% in Maharashtra. The problems faced by the respondents with regard to processing of produce were as follows:

The major crops as reported by the respondents and the number of respondents who listed processing problems of these crops were aggregated and the same has been summarized in the figure given below.



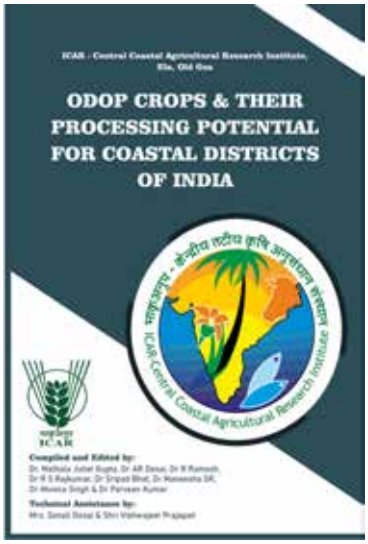


Summary of stakeholder survey assessment carried out for the coastal districts

Most of the districts just need technology know how and sensitization since the technologies already exists. A technical bulletin with possible products, their protocols, process layout, cost of processing unit set-up, machine manufacturers list etc. is under preparation and e-copies will be provided to stakeholders.

Top researchable issues identified for development of machinery and process lines are:

- Jackfruit processing (center for excellence to be set up)
- Jackfruit harvesting machine, Jackfruit peeling machine
- Jackfruit seed peeler
- Tender Cashew Processing machinery line to be designed and developed
- Harvesting equipment for *kokum* and other future fruit
- MOA with a m/c fabricator

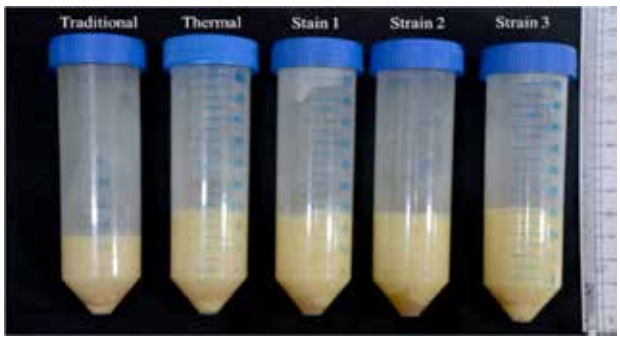


Technical Bulletin to give an easy access to technologies for processing and Value addition of One District One Crops for the coastal Districts

Preparation of *Kokum* butter

The *kokum* (*Garcinia indica*) is a fast-growing tree found in tropical India, especially in the Western Ghats region. The tree is economically

valuable for its food, powder, pulp, and seed oil, which is also known as *kokum* butter. The butter, extracted from the seeds, is nutritive, demulcent, astringent, and emollient. It has been used by folklore healers in the Western Ghats region to treat various skin ailments like dry skin conditions and cracked heels. Traditionally, the process for preparing solid *kokum* butter begins by drying the collected seeds under sunlight and removing the seed-coat manually to obtain the kernels. These kernels are then triturated with water to make a paste. The paste is mixed with water and heated for a long time until a layer of oil starts floating on the water, which is skimmed off and transferred into another vessel. The oil is then allowed to cool down at room temperature, and solid *kokum* butter is obtained. However, the extraction of *kokum* oil is a laborious process, and the preparation of *kokum* butter locally has reduced due to the difficult extraction process. In this scenario, an improved method using thermal (drying in cabinet dryer at different temperatures) and bio-thermal processing (Drying at elevated temperatures and then fermenting with various strains) technique was developed to increase the extraction yield of *kokum* butter



***Kokum* Butter Extracted after different pre-treatments**

Yield and efficiency of traditional and improved-thermal and bio-thermal method for extraction of kokum butter

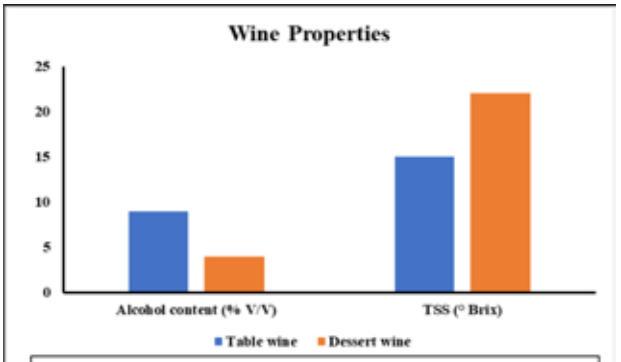
Sl. No	Sample		Oil yield	Extraction efficiency
1	Traditional method		10.79 ± 3.86	26.21
2	Thermal treatment		13.65 ± 2.96	33.16
3	Bio-Thermal method	Strain 1	15.51 ± 1.09	37.68
4		Strain 2	16.60 ± 0.84	40.31
5		Strain 3	17.36 ± 0.43	42.16

Preparation of Kokum Wine

Kokum (*Garcinia indica*) is a tropical fruit-bearing tree that is native to the Western Ghats region of India. It is highly valued for its medicinal and culinary properties, as well as its oil and butter production. The fruit of the *kokum* tree is commonly used in traditional Indian cuisine to add a sour flavor, and the rind is also used to make a popular cooling drink called *kokum sherbet*. Value addition in *kokum* production involves creating more diverse and high-value products from *kokum*, such as *kokum* candy, pickles, chutneys etc. These products can fetch a higher price in the market and provide additional income for farmers and processors.

A majority of *kokum* yield in India is used for syrup and juice production during the summer months, while some parts are dried and stored. The remaining parts of the fruit are not harvested and go waste. However, these parts can be used to produce fermented beverages like wine, which are un-distilled alcoholic beverages that are nutritive, and tastier. The *kokum* fruit can be used to make wine and can be a good substitute for grapes in the wine industry. The juice of ripe fruit is red, and dark in color. Moreover, the juice is highly acidic and has a strong bitter and astringent taste, which is attributed to the abundance of hydroxyl citric acid (HCA) and tannin. To produce a high-quality wine with low alcohol content, the juice was first diluted to a TSS content of 25 °Brix and the pH was adjusted to reduce the acidity. The juice was then pasteurised and fermented by adding desired microbial strain until constant TSS was obtained followed by clarification and bottling. Yeast strain, co-fermentation, and sequential inoculation are all significant factors in the development of flavor in fruit wine. The selection of a specific yeast strain can greatly impact the sensory profile of the finished wine. Two types of wine, namely table wine and a dessert wine were produced in this method by the careful selection of yeast strains and the final product had an alcohol content of 10% and 4% respectively.

Co-fermentation, where two or more yeast strains are used, can result in more complex flavours and aromas. Sequential inoculation, where multiple yeast strains are used in a specific order during fermentation, can also contribute to the development of unique and desirable flavours. Further works on co-fermentation and sequential inoculation under investigation for tailoring the flavour profile of the final wine and create a product that is distinct and enjoyable to consumers.



Alcohol and TSS Content of the two major types of *Kokum* wine

Sl. No.	Product	Economic Value of the product obtained from 1 kg of whole fruit (Rs.)	Remarks
1.	Whole fruit	Rs. 50/-	Short Shelf life, small sale window
2.	Chips	(200-300 g) –Rs. 100/-	One year window for sale, but ethnically preferred in a few states only
3.	Tender Jackfruit	(500 g) – Rs. 200/-	One year window for sale, wide demand across the globe
4.	Tender Jackfruit Xacutti gravy	(570g) – Rs. 450/-	Can be retort pouched, one year sale window, only a small niche market ethnic Goans living abroad
5.	Jackfruit Leather	(100 g) - Rs. 500/-	One year shelf life, niche but narrow market
6.	Jackfruit flour	(80g, deseeded only bulbs) - Rs. 100/- (120g, only skin removed) - Rs. 160/-	One year shelf life, but has a wide scope, can be sold as flour and/or as a value-added product
7.	Jackfruit Wine	(150 ml) –Rs. 75/-	More than a year shelf life- market still unexplored as organoleptic pending

Jackfruit Processing and value addition

Jackfruit value addition could be a remunerative secondary agriculture operation for many coastal states of India. A study on the economics of value addition is summarized below. Value addition of Jackfruit for vegetable purpose and into flour gives us a window of one year to further process it into commercial products.


Tender Jackfruit pieces Vegetable Purpose


Tender Jackfruit *bhaji* prepared immediately after harvest

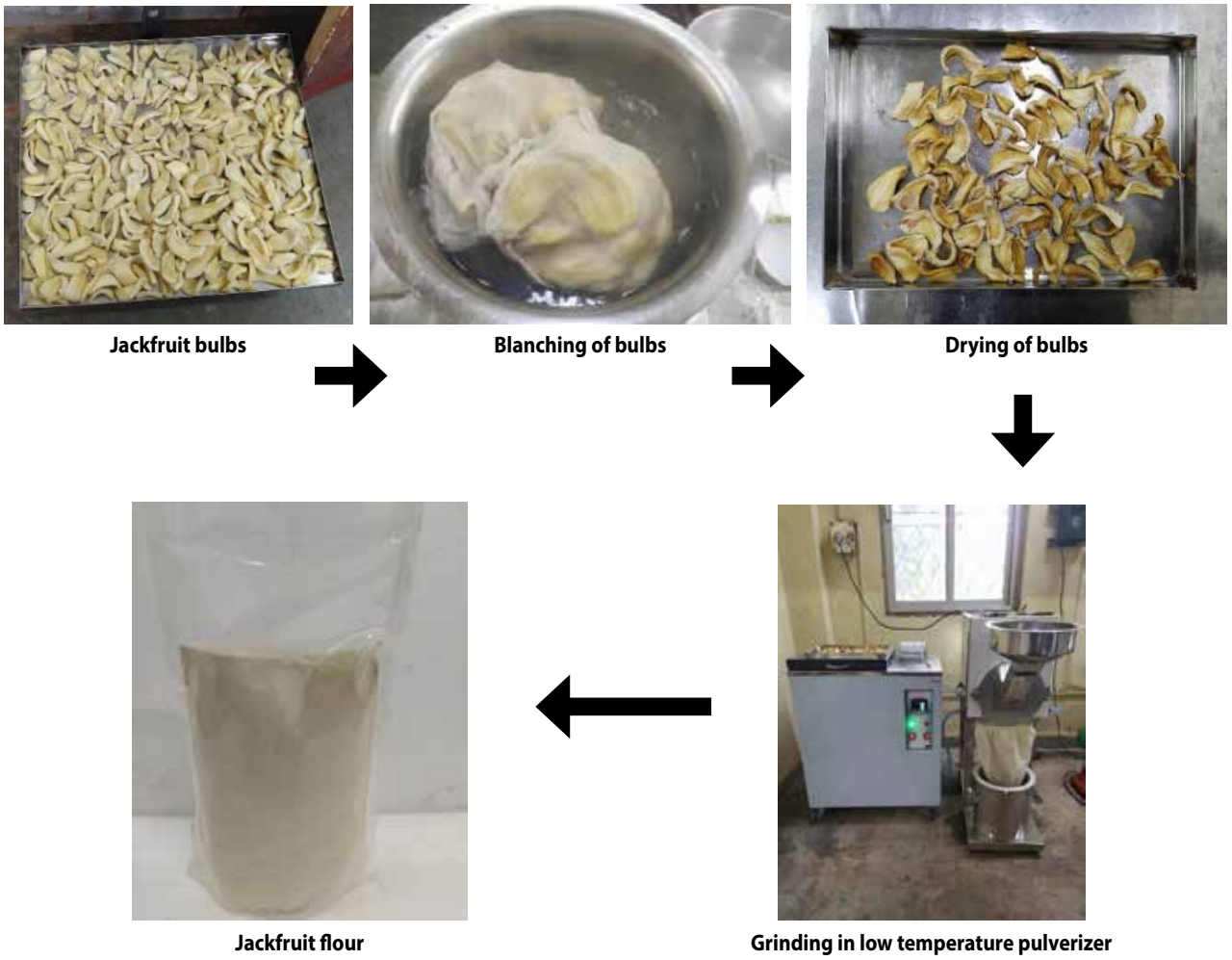

Tender Jackfruit *bhaji* prepared after one year of storage


Tender Jackfruit for Vegetable Purpose


Jackfruit *Xacutti* prepared immediately after harvest


Jackfruit *Xacutti* prepared after one year of storage

Studies on storage and value addition of tender Jackfruit



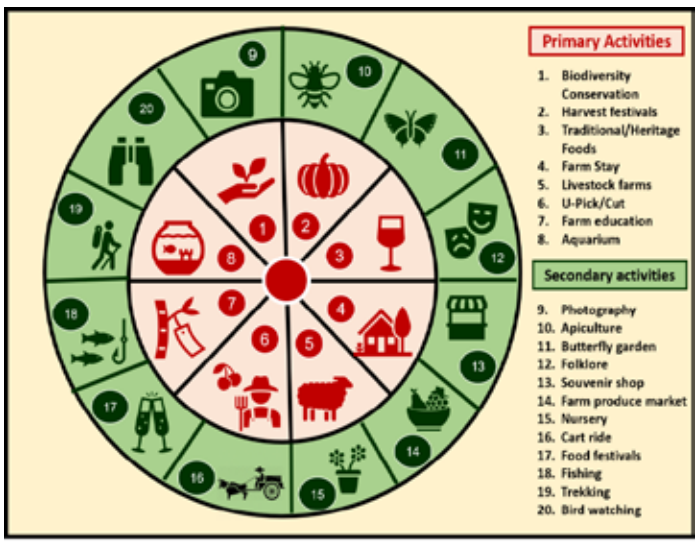
Process of jackfruit flour preparation

Project: Prospects and promotion of agro ecotourism in coastal region of India

(Parveen Kumar, RS Rajkumar, AR Desai, V Arunachalam, MJ Gupta, GR Mahajan, Maneesha SR, Sujeet Desai, R. Ramesh, R. Maruthadurai, Shripad Bhat, Uthappa, AR, Trivesh Mayekar. Chaudhari GV and Nibedita Nayak)

Agro–ecotourism is a modern concept to boost tourism activity on farms. It offers scope for the integration of farming activities, tourism industry and farm business and is being considered to be a viable livelihood strategies to link tourism with agricultural services, products, and experiences to satisfy the needs of both farmers and tourists. Agro–ecotourism is a strategy for sustainable farming practices assuring year-round income to farmers and other stake holders involved in farming. Considering the potential of this niche, a conceptual framework for the promotion of agro-ecotourism as a multi-dimensional farming enterprise in coastal regions of India has been developed under an Institute funded project "Prospects and promotion of Agro Eco tourism in coastal regions of India". As part of this project, different existing agro-ecotourism models in coastal regions of India were studied and a conceptual framework was developed to classify the agro–ecotourism paradigm as either primary or secondary depending on its location (on–farm vs off–farm) or the degree to which it is related to agriculture. A package of practices and scientific guidelines for sustainable agro-ecotourism models in coastal regions were formulated and disseminated to

various stakeholders. More than 50 farmers, entrepreneurs and youth were trained and exposure visits have been conducted to students (>1000) through our Agro-ecotourism Center and Agro-Business Incubation Center. A model '*Dhanavanatari Vatika*' (1670 m^2) with 150 species of medicinal and aromatic plants and a model '*Nakshatra Vatika*' has been established as integral component of agro-ecotourism. The technology is now a template for replicating the concept of agro-ecotourism in various spice gardens, and coconut and arecanut (*Kulaghar*) farms across the coastal states. Agro-ecotourism complemented with integrated farming systems across the states of Goa and Karnataka resulted in the increase of net returns by 20-25% ensuring round-the-year income to farmers. Five agro-ecotourism start-ups from two states (Goa ad Karnataka) have been registered through consultancy and technical support of the Agro-ecotourism (AET) Center and Agro-Business Incubation (ABI) Center of ICAR-CCARI.



Views of the AET unit with tourists and planting of seedling in the *Nakshatra* garden.

Project: All India Co-ordinated Rice Improvement Project

(Manohar KK)

During k*harif* season of 2022, trials IVT-CSTVT and AVT-CSTVT were conducted under natural coastal salinity condition in Chorao Island. The trials were laid out in a Randomized Complete Block Design (RCBD) with two replications. Periodical salinity and pH values were recorded during the critical stages of crop growth. IVT– CSTVT trial was constituted with 30 test entries including five checks namely Bhuthnath (Coastal Saline Check), FL478, CSR10(Early duration check), Pusa 44 (Sensitive check) and Local check.AVT-CSTVT trial was constituted with 10 test entries including five checks namely Bhuthnath (Coastal Saline Check), FL478, CSR10(Early duration check), Pusa 44 (Sensitive check) and Local check. In AVT, only one entry IET 27847 recorded higher grain yield compared to the best check variety Goa Dhan 3. IET 27847 recorded grain yield of 4532 kg/ha while Goa Dhan 3 recorded grain yield of 4280 kg/ha . In IVT, only one entry recorded higher grain yield compared to the best check. Highest grain yield was recorded by entry IET 31067 (6125 kg/ha). The best check variety is Bhutnath with grain yield of 5650 kg/ha.

Field view of CSTVT trial in Chorao Island during kharif season

Project: All India Co-ordinated Research Project on Integrated Farming Systems

(Paramesha V, Parveen Kumar, Manohara KK, Shripad Bhat, R. Solomon Rajkumar and Sukanta K Sarangi)

Development of rice-based lowland integrated farming system

A standardized rice-based farming system model was implemented on 0.5 hectares of land in typical lowland situations in Goa. The model incorporates various components such as crops (rice, cowpea, moong, finger millet, and vegetables), fodder production, dairy farming, a fish pond, FYM unit, and a kitchen garden. In 2022, the system yielded 20.7 quintals of rice, 578 kg of baby corn, 589 cobs of sweet corn, 185 kg of finger millet, 59.6 kilograms of moong, 62 kilograms of cowpea, and 3.2 tons of fodder maize. The dairy component produced 890 liters of milk. The net return from the system amounted to Rs. 1.68 lakh, with crops contributing the highest percentage (82%), followed by dairy (18%). The cropping system module generated 9520 kg of crop straw/stover, 7800 kg of green fodder, and 968kg of crop residue, which were recycled within the system as animal feed and organic manure. Cow dung, totaling 6500 kg, was also recycled. The model generated 352 man-days of employment during the year. Through residue recycling, approximately 57.9 kg of nitrogen (N), 34.5 kg of phosphorus (P), and 69 kg of potassium (K) were recycled within the system. Overall, the rice-based farming system model demonstrated successful crop production, dairy farming, and utilization of residues, resulting in a significant net return. The system also provided employment opportunities and effectively recycled nutrients, contributing to its sustainability and productivity.

Integrated farming system model for lowland situations of Goa

Rice+Dairy based Integrated farming system model

Development of plantation crop-based upland integrated farming system

A farming model designed for upland situations in Goa, covering 0.8 hectares, encompasses multiple enterprises including plantation crops, goatery, duckery, compost unit, and water harvesting ponds. The cropping system consists of cashew and pineapple, coconut and pineapple with turmeric, and arecanut with banana and turmeric. The model achieved a net income of Rs. 2.13 lakh per year, with the highest contribution to net profit from the arecanut-based cropping system, followed by the cashew and pineapple system. This signifies the economic viability of these crops in the model. Furthermore, the model generated 257 man-days of employment, promoting local livelihoods and rural development. Through residue recycling, approximately 72.8 kg of nitrogen (N), 46.9 kg of phosphorus (P), and 84.3 kg of potassium (K) were recycled, reducing the need for external fertilizer purchases and emphasizing sustainable practices.In summary, the upland farming model in Goa demonstrated its profitability, employment generation, and nutrient recycling capabilities. By focusing on profitable crops such as arecanut and cashew, distributing turmeric, and implementing sustainable practices, the model showcased a sustainable and economically viable approach to farming in upland areas of Goa.

Coconut+turmeric, arecanut+turmeric cropping system of upland Integrated farming system

Plantation crop based integrated farming sytem model

Kuttunad Ducks and Konkan Kanyal goats in the upland IFS model

Project: All India Co-ordinated Research Project on Palms.

(V Arunachalam)

Coconut based cropping systems for different agro-climatic regions

Evaluation of coconut-based cropping system models

An experiment was laid out with seven treatments replicated thrice in a RBD design to develop location-specific coconut-based cropping systems for different agro-climatic regions, to assess the effect of the cropping system on the productivity of coconut, and to determine the economics of the cropping systems. Post-experimental nutrient data was recorded in the plot and the potassium levels in the soils were low. Pre-experimental coconut yield in the experimental plot was average nut yield/year per palm= 47 during July 2014-June 2015. Coconut nut yield per palm during the year after intercropping is 78 nuts per palm per year.

Evaluation of varieties and establishment of mother blocks and production of quality planting material in Arecanut

Nucleus seed gardens for varieties

Nucleus seed garden of Hirehalli Dwarf was established in different phases and is being maintained with currently 284 surviving palms of which 82 are available at the reproductive stage. Fresh fruit weight (g) varied from 10.65 in progeny no. 92126(23) to 60.08 in palm no. 6404. The dry *chali* weight (g/fruit) varied from 2.68 in palm no. 5216, 3.03 progeny no. 92126(23), to 49.69 in palm no. 640.

Performance of intercrops with coconut

Sl. No.	Treatment	Crop & part harvested	Yield of intercrop (kg/ha)
T1.	Coconut + Black pepper + Papaya + Drumstick	Papaya fruit	229.17
T2.	Coconut + Black pepper + Heliconia	Heliconia flower	191500*
T3.	Coconut + Black pepper + Banana + Lemon	Lemon fruit	Pre-bearing stage
T4.	Coconut + Black pepper + Passion fruit + Pineapple	Pineapple fruit	1194.03
T5.	Coconut + Black pepper + Annona	Soursoup fruit	46.51
T6.	Coconut + Black pepper + Crossandra	Crossandra flower	29.49

*stems/ha

Project: All India Co-ordinated Research Project on Vegetable Crops.

(Ganesh Choudhari and R Ramesh)

Under AICRP on Vegetable Crops as per allotment, 10 trials as mentioned in the table were evaluated for reporting to the Project Coordinating Unit AICRP-VC, ICAR-IIVR, Varanasi. The trials were also visited by Director, ICAR-IIVR, Varanasi on 12th May, 2022.

Mustard green Initial Evaluation Trial (IET): sowing date 01.12.2021, spacing 20 × 10 cm; Okra Initial Evaluation Trial (IET)/ Advance Varietal Trial I and II (AVT I and II): sowing date 10.03.2022, spacing 60x30 cm; Tomato trials (IET, AVT I, AVT II): sowing date 18.01.2022, spacing 60 × 50 cm; Tomato Hybrid Det.-AVT II: sowing date 15.01.2022, spacing 60 × 50 cm.

Performance of various entries of vegetable crops during *rabi*and *kharif*, 2022.

Sr. No.	Name of trial/s	Number of entries received	Number of entries germinated and tested	Best performing entries
1	Mustard green - IET	06	03	For leaf yield with multiple harvests 2021-MGVAR-6 (683 q/ha) and 2021-MGVAR-3 (658 q/ha)
2	Okra (YVMV) Varietal AVT-II	12	12	YVMV incidence 0% in entries namely 2019/OKYVRES-1, 2019/OKYVRES-2, 2019/OKYVRES-5, 2019/OKYVRES-6, 2019/OKYVRES-7, 2019/OKYVRES-9, 2019/OKYVRES-11 and 2019/OKYVRES-13, after 90 days from sowing
3	Okra (YVMV) Varietal - AVT-I	08	08	YVMV incidence 0 % in entries namely 2020/OKYVVARRES-1, 2020/OKYVVARRES-2, 2020/OKYVVARRES-3, 2020/OKYVVARRES-4, 2020/OKYVVARRES-6 and 2020/OKYVVARRES-7, after 90 days from sowing
4	Okra (YVMV) Varietal Resistant IET	10	10	YVMV incidence 0 % in entries namely 2021/OKYVVRES-1, 2021/OKYVVRES-3, 2021/OKYVVRES-4, 2021/OKYVVRES-5, 2021/OKYVVRES-6, 2021/OKYVVRES-7 and 2021/OKYVVRES-8, after 90 days from sowing
5	Tomato Hybrid Det.-AVT II	08	08	-
6	Tomato (TOLCV) Hybrid AVT-II	08	08	-
7	Tomato (TOLCV) Varietal AVT-II	07	07	-
8	Tomato Hybrid Det.-AVT-I	07	07	-
9	Tomato (TOLCV) Hybrid AVT-I	08	08	-
10	Tomato Hybrid Det.-IET	06	06	-

Views of trials on okra and tomato being carried out at the Institute farm.

Quality seed production (Breeder seed and Truthfully labelled seeds) at the Institute farm

Quality seed production in major field crops of Goa state was undertaken under this project at the Institute farm during *kharif* and *rabi* season. Breeder seed production in paddy varieties *viz*., Goa Dhan 1, Goa Dhan 2, Goa Dhan 3 and Goa Dhan 4 and cowpea variety Goa Cowpea 3 was taken up as per the indent details of seed production for the year 2022 is given below.

Front Line Demonstration on paddy variety Sahbhagi Dhan & Participatory seed production in farmer's field

In addition to the production being taken up at the farm, twelve front line demonstration on drought tolerant paddy variety Sahbhagi Dhan

Quantity of seed produced at the Institute farm

Crop	Varieties	Class of seed	Qty (Quintal)
Paddy	Goa dhan 1	Breeder seed	5.0
	Goa dhan 2	Breeder seed	2.0
	Goa dhan 3	Breeder seed	5.0
	Goa dhan 4	Breeder seed	5.0
	Jaya	Truthfully labelled seed	1.0
	Jyothi	Truthfully labelled seed	0.5
	Sahbhagidhan	Truthfully labelled seed	1.5
	Karjat 3	Truthfully labelled seed	0.5
Cowpea	Goa Cowpea 3	Breeder seed	2.0
Green gram	TM 96-2	Truthfully labelled seed	0.5
Total quality seed produced at the Institute farm during *Kharif* and *Rabi* season (2022		23.5	

(a) (b)

Participatory seed production in farmers field a. Ragi variety KMR 301 in Kanakumbi b. paddy variety SahbhagiDhan in Kavlem, Gaondongrim, Canacona

received from the Department of Agriculture, Govt of Goa and other stake holders in the state. Apart from breeder seeds, TL seeds were produced in paddy varieties *viz*., Jaya, Jyothi, Karjat 3 and Sahbhagi Dhan. Small quantity of TL seed production was taken up in green gram varieties TM 96-2 and IPM 2-14. The was taken up in farmers field in Goandongrim and Cotigao villages of Canacona block. Grain yield ranged from 45 q/ha to 50 q/ha compared to 30 q/ha to 35 q/ha in the check varieties. The Sahbhagidhan variety is superior to locally grown varieties both in terms of grain yield and straw yield.

Maintenance breeding in released salt-tolerant rice varieties

Maintenance breeding for production of nucleus seeds of paddy varieties viz., Goa Dhan 1, Goa Dhan 3 and Goa Dhan 4 were taken up during *kharif* season in the Institue farm. Raised in panicle to paired rows of 2 m length with 3 m between the varieties as isolation distance. Panicles were collected from the plot to form the base seeds and nucleus seeds were harvested from the entire plot.

Capacity building / technology dissemination

Trainings were imparted to farmers in Gaodongrim and Cotigao villages about the quality seed production. Farmers were apprised about the importance of using quality seed production in increasing producition. Farmers were given training on seed treatment, and identification of important insect pests and disease symptoms in the field to take the appropriate control measure. Two trainings and one field day were organized during the *kharif* 2022.

Field view of nucleus seed production plot at the Institute farm

Project: AICRP on Pigs

(Amiya Ranjan Sahu)

The growth performance of proposed crossbred pig variety (Goya) in the fifth generation was 1.051±0.05 kg (n=531) at birth weight,7.75± 0.47 kg (n=405) as weaning weight and 74.24±5.09 kg (n=74) as marketing weight at the age of eight months. The mortality rate was 6.71% in pre-weaning and 4.54% in post-weaning period. Artificial insemination service was provided to needy farmers at their door step and improved germplasm supplied for breeding. The centre provided fundamental knowledge to farmers and entrepreneurs in scientific practices of pig rearing through different trainings, demonstrations and farmers' field days. The beneficiaries under TSP and SCSP components were provided with different inputs for self-sustainable farming and improvement of their livelihood.

Generation-wise growth performance

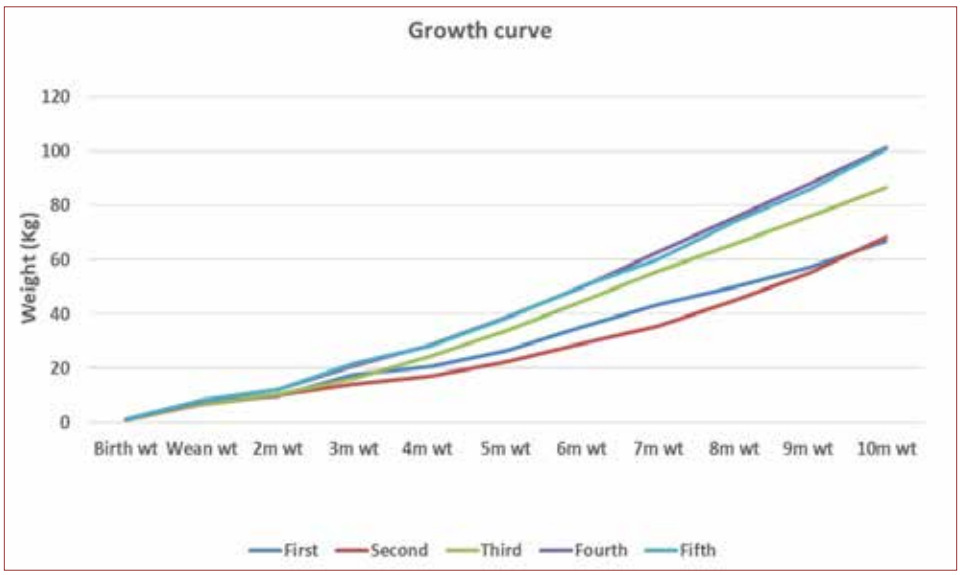
During the reporting year, crossbreed pigs (75% Large White Yorkshire and 25% Agonda Goan inheritance) of different generations were produced and data on growth and litter traits recorded. Breeding sows (35 nos.) and breeding boars (12 nos.) were selected for *interse* mating. The least square means were calculated for body weights till 10 months of age and compared among all the generations. Pure LWY female pigs (5 nos.) were procured from Pig Breeding Centre, KVASU, Kerala to replace breeding stock and avoid inbreeding in the herd.

Selective breeding by artificial insemination

Four genetic groups viz., Agonda Goan (indigenous breed), Large White Yorkshire (exotic breed), 50% crossbred (50% inheritance of both indigenous and exotic) and 75% crossbred (75% exotic inheritance) were maintained in the farm. Selection of animals and breeding was followed as per the technical program of AICRP on pig. One breeding boar was allotted for every three breeding sows in a ratio of 1:3. Artificial insemination (AI) was strictly followed for breeding sows. Total number of AI carried out during 2022 was 40 in the institute herd and 60 in animals owned by farmers.

Germplasm supply

A total of 323 piglets were produced in 42 numbers of farrowing from the 75% crossbred sows. In this reporting year, total germplasms supplied were 347 numbers benefiting 130 farmers including beneficiaries under STC and SCSP programme generating a revenue of Rs. 13,20,093/-.



Generation-wise growth performance of crossbred pigs

Project: AICRP Groundnut - Voluntary center

(GR Mahajan and R Ramesh)

A study was carried out to evaluate different endophytes for yield enhancement in groundnut grown in salt-affected coastal soils. Five endophytic inoculants were applied as a seed treatment to groundnut (TAG-24 a locally popular variety) seed while the control received no application. Like the first year (2020-21), the experiment was vitiated consecutively for the second year(2021-22)due to the off-season rainfall during the flowering stage and maturity stage of the crop, which was during April and May months. Water stagnation in the fields for a few days caused mortality of the crop in all treatments. Electrical conductivity (EC_e) at the time of sowing was 2.06 dS m^{-1} which eventually increased with the advancement of the growing season to 5.02dS m^{-1} till 98 days after sowing (14 weeks after sowing) and just before the off-season rain. The salinity stress throughout the crop growing season negatively affected germination and survival rate. Survival rate of the endophytic bacterial treatments was higher by 56-75% compared to control. A total of 150.8 mm of rainfall was received during April-May, 2022 (51.2 mm in April and 99.6 mm in May), which resulted inwater stagnation and thereby rotting of the plants which could not reach maturity. Poor crop stand in the saline environment was improved by the application of the different endophytic bacteria but the crop growth diminished to mortality due to the anoxic condition created by water ponding irrespective of any endophytic bacterial treatments.

Externally Funded Projects

Project: Land shaping methods and integrated farming system approach for improving livelihood security of farmers under Khazan lands of Goa (NABARD funded)

(GR Mahajan, Parveen Kumar, Sujeet Desai, Paramesha V, Uthappa AR and Shripad Bhat)

A pilot-scale research project funded by NABARD on the management of salt-affected lands in Goa, locally called *Khazan* lands, was launched by ICAR-CCARI in December 2022. The project is to be implemented in a multi-institutional, multidisciplinary, and farmers-participatory mode. The project, covering approximately 2 ha, aims to demonstrate the approach on the fields of eight beneficiary farmers to demonstrate land shaping methods and integrated farming systems on salt-affected coastal soils of Goa; to assess the productivity, economics, energy budget, and life cycle assessment of the farming system; and to undertake capacity building of stakeholders in the rehabilitation of *Khazan* land.

Views of marked pond area and newly created farm pond

Project: Empowerment of farmers through adoption of sustainable and Eco-friendly Integrated Pest and Disease Management technologies in major vegetable crops in Goa (NABARD)

(R Maruthadurai and R Ramesh)

Impact of wide spread adoption of integrated pest and disease management technologies in chilli

Integrated pest and disease management technology was demonstrated in 22 ha under chilli production in Canacona, Sanguem, Quepeum, Tiswadi, Bicholim and Mapusa. More than 250 farmers were provided with inputs like Goa Bio-2, spinosad, chitosan and sticky traps for demonstration. Based on the field evaluation and considering the ease of application, soil application of Goa Bio-2 @ 1.25 g/plant and four sprays of spinosad (15, 30, 45 and 60 DAP) @ 0.03% was taken up. Disease incidence and dry chilli yield were recorded from about 50 demonstrations. Results of the wide area demonstrations indicated that 33% reduction in ChiLCV disease incidence and 40% increase in dry chilli yield in the fields where soil application of Goa Bio-2 and spinosad spray treatment compared to control. Other benefits of this technology include lesser incidence of thrips, white flies, aphids and other diseases in the demonstration plots.

Demonstration plot

Yield of chillies

Project: Entrepreneurship development and livelihood improvement through training and demonstration of ornamental fish culture. (NABARD funded)

(Trivesh Mayekar)

Sampling and brood-stock collection of indigenous freshwater ornamental fishes and their captive breeding

During routine sampling and exploration surveys for collecting Indigenous freshwater ornamental fish varieties from Keri and Valpoi in different freshwater ecosystems, a total of eleven other fish species were collected, out of which five species were identified as ornamental due to their colour pattern and attractive body structure.

Breeding trails have been set up for selected fish species for captive breeding and seed production.

Sampling site Valpoi

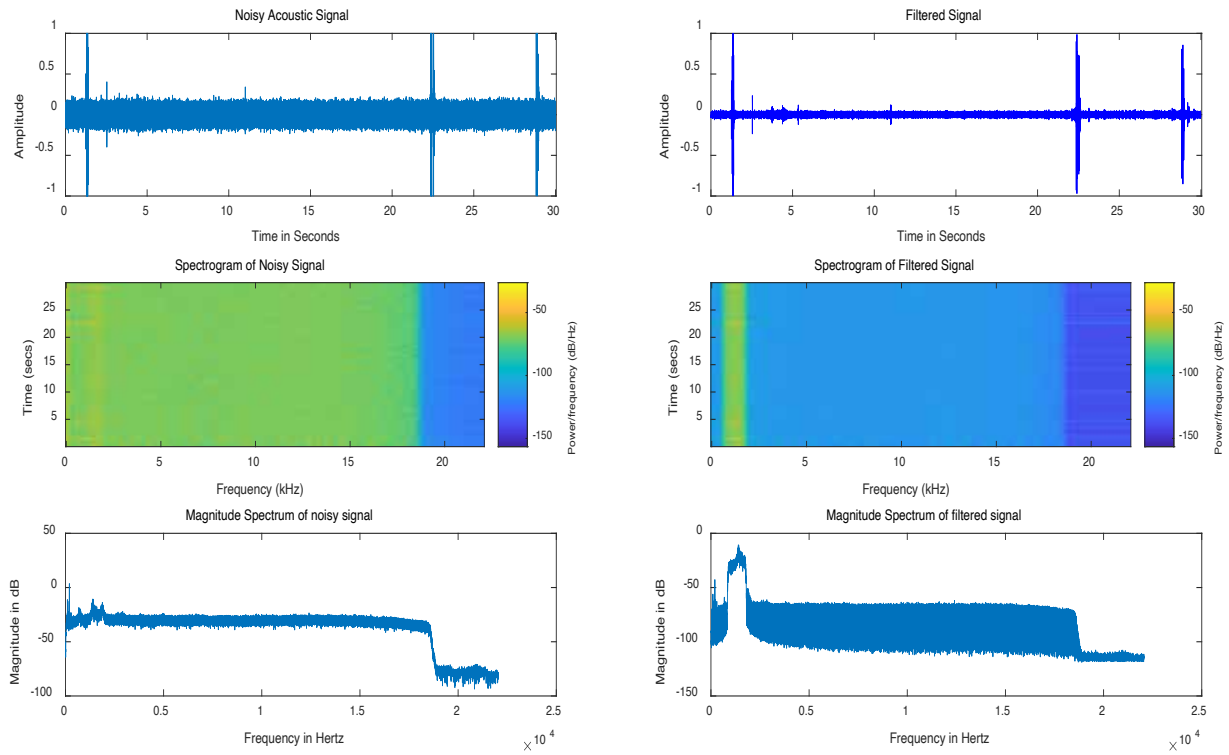
Sampling site Keri

Indigenous Fishes of Goa

Project: Design and development of acoustic methods for early detection of stem and root borer Plocaederus spp infestation in cashew (DST, SERB)

(R Maruthadurai and T Veerakumar)

An acoustic based early detection technique for stem and root borer *Plocaederus* spp infestation in cashew was standardized. The acoustic sounds of various larval instars *viz.*, 1st instar, 2nd instar, 3rd instar, 4th instar, and 5th instar were characterized in tissues and field evaluated the acoustic device. The acoustic signal contains root borer sound along with surrounding noise. The acoustic signal was passed through FIR bandpass filters and fixed the lower cut-off frequency is 800 Hz and the upper cut-off frequency is 1800 Hz by using a trial-and-error approach. Burst analysis of different larval instars in cashew logs shows no significant differences between the number of bursts and various larval instars. Fewer bursts are observed when the larvae were in the sapwood region than in the cambium region. The empty cashew log and healthy trees do not produce any significant noise. The number of burst counts and impulses are used to predict the likelihood of infestation. Relatively more number of burst counts were recorded in third and fourth instar larvae compared to first instar larvae. The success rate of prediction is 90.3%, 96.67%, 96.15%, 96.67% and 100% in the first, second, third, fourth, and fifth instar, respectively, under laboratory conditions. Developed a novel method and systems for the detection of stem and root borer infestation in cashew, the first one from India and filed for Indian patent (Provisional patent No: 202221006557).



Acoustic sounds of first instar

Project: Assessment of carbon footprint in integrated farming system through life cycle assessment for sustainability and climate resilience (NICRA)

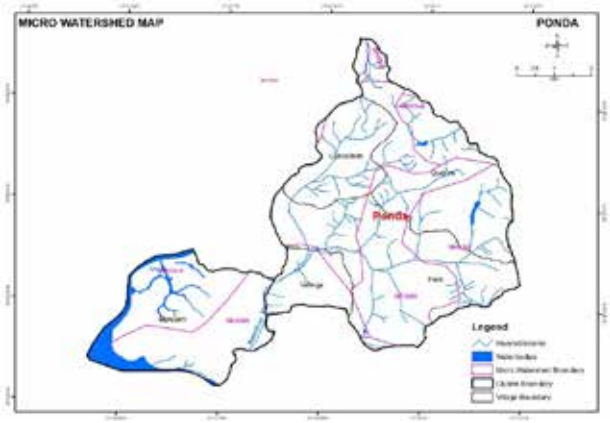
(Paramesha, V, V Arunachalam, Trivesh Mayekar, Gokuldas PP and AR **Uthappa)**

A life cycle assessment (LCA) was conducted to assess the environmental impact of the rice–rice and rice–cowpea systems. The LCA was evaluated from the cradle-to-gate perspective. A higher energy consumption was found in the rice–rice system (32673 vs. 18197 MJ/ha), while the energy output was higher in the rice–cowpea system (211071 vs. 157409 MJ/ha). The data revealed that the energy consumption was 44% lower in the rice–cowpea system, coupled with a higher energy efficiency (11.6 vs. 4.8) due to the lower energy consumption and the higher energy output. Further, the results indicated an energy saving in the rice–cowpea system due to the higher use of renewable energy sources such as farmyard manure. Field emissions, fertilizer production, and fuel consumption were the major contribu-tors to the greenhouse gas (GHG) emissions in both cropping systems. The total GHG emissions were 81% higher in the rice–rice system (13894 ± 1329 kg CO_2 eq/ha) than in the rice–cowpea system (7679 ± 719 kg CO_2 eq/ha). The higher GHG emissions in the rice–rice system were largely due to the use of fertilizers, diesel fuel, and machinery. Hence, diversifying the winter rice with a cowpea crop and its large-scale adoption on the west coast of India would provide multiple benefits in decreasing the environmental impact and improving the energy efficiency to achieve sustainability and climate resilience in rice-based cropping systems.

Project: Sustainable natural resource conservation and livelihood improvement through integrated watershed management in Goa

(Sujeet Desai, A Raizada, Gopal Mahajan, AR Uthappa, Bappa Das, Paramesh V, Shripad Bhat, Gokuldas PP and Monica Singh)

Climate change issues and their consequences have a negative impact on the agricultural production systems, posing significant challenges to sustainable livelihoods, particularly for the vast majority of people in India who are directly or indirectly dependent on agriculture. A new watershed programme, PMKSY-WDC 2.0, is planned in this context. At a macro level, the vision of WDC-PMKSY2.0 projects is to accelerate agricultural economic growth in the country's less endowed rainfed areas. District Irrigation Plans (DIPs) developed under PMKSY serve as a master plan for the district's water sector development. The convergence to be promoted here is incorporating the PMKSY component "Per Drop More Crop" in order to improve the water use efficiency of the water sources created in the project area. The watershed development project under PMKSY-WDC 2.0 is being implemented by ICAR-CCARI, Goa at Ponda block with an area of about 5455 ha covering six micro watersheds namely Priol, Veling, Apewal, Cuncoliem, Keri and Madkai. Major problems faced in these watersheds are shortage of irrigation water for agriculture, drinking water shortage for human and livestock, excessive erosion due to steep and undulating topography and low agricultural productivity. The agricultural crops mainly include Paddy, plantation crops like coconut, arecanut and cashew and vegetables. The preliminary activities under the watershed project like Participatory Rural Appraisal (PRA), Baseline survey and net planning of the watershed was carried out. The information on the springs and groundwater table depth in the watershed area was collected and compiled. The basic thematic maps of the watershed area like drainage line, LULC, soil texture, soil depth, soil drainage, slope, soil erosion and potential treatment maps were prepared.



Micro watershed boundary with drainage network of study area

Project: Network Project on Functional Genomics & Genetically Modification (NPFGGM) in Corps (ICAR)

(Manohara K K)

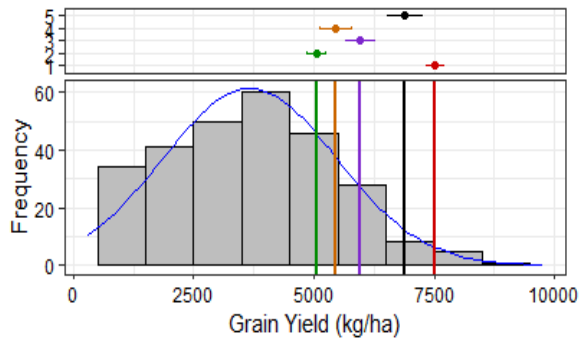
Phenotyping of Recombinant Inbred Line (RIL) population derived from salt tolerant (Goa Dhan 2) and susceptible (Jaya) parents for grain yield and its components traits under normal condition

With an objective of mapping Quantitative Trait Loci governing seedling stage salinity tolerance, a RIL population was developed using Goa Dhan 2, a low yielding salt tolerant variety and Jaya, a high yielding salt sensitive variety. During, *Kharif* season, 272 RILs derived from the above cross were phenotyped under rainfed shallow lowland condition. Wide variability was exhibited by all the studied traits. Days to 50% flowering ranged from 76 days to 130 days, days to maturity ranged from 109 to 160 days, plant height ranged from 92 cm to 259 cm, productive tillers ranged from 2.43 to 14.27, panicle length from 22.05 to 36.75, grains per panicle ranged from 36.63 to 247.67, percent fertility ranged from 20.95 to 99.05 and grain yield ranged from 295 kg/ha to 9771 kg/ha. Highest grain yield was recorded in RIL-JG-115 (9771 kg/ha) followed by RIL JG RIL 135 (8615.7 kg/ha), RIL JG RIL 193 (8297.1 kg/ha), RIL JG RIL 193 (8250.0 kg/ha) and RIL JG RIL 193 (7590.0 kg/ha). Heritability in broad sense and genetic advance was highest in grain yield (86.77, 87.92) followed by grains per panicle (84.17, 49.97) and plant height (91.12, 37.86).

Estimates of genetic parameters in F_6 RILs of Jaya × Goa Dhan 2

Trait	Minimum	Maximum	Mean	CV (%)	GCV	PCV	H^2	GAM
DFF	76.0	130.0	99.35	1.5	15.68	15.75	99.09	32.20
DM	109.0	160.0	134.08	2.37	11.32	11.57	95.82	22.87
PHT (cm)	92.0	259.0	169.53	6.04	19.23	20.14	91.12	37.86
NPT	2.43	14.27	5.72	15.55	17.77	23.93	55.16	27.23
PL (cm)	22.05	36.75	29.86	2.6	8.98	9.35	92.36	17.81
GPP	36.63	247.67	126.96	11.5	26.4	28.78	84.17	49.97
PF	20.95	99.05	82.69	8.24	7.61	11.22	46.05	10.66
GY (kg/ha)	295.0	9771.0	3668.74	16.06	44.85	47.83	87.92	86.77

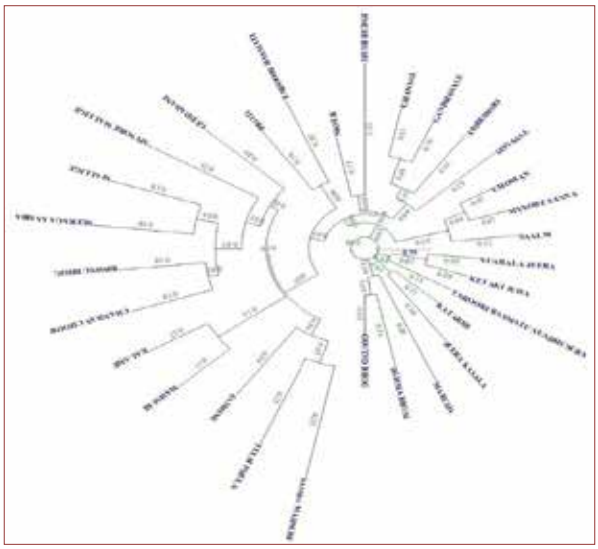
Note: DFF: Days to 50% flowering; DM: Days to maturity; PHT: Plant height; NPT: Number of productive tillers per hill; PL: Panicle length; GPP: Grains per panicle; PF: Perce nt fertility; GY: Grain yield per ha; H2: Heritability in Broad sense; GAM: Genetic advance as percent of mean.



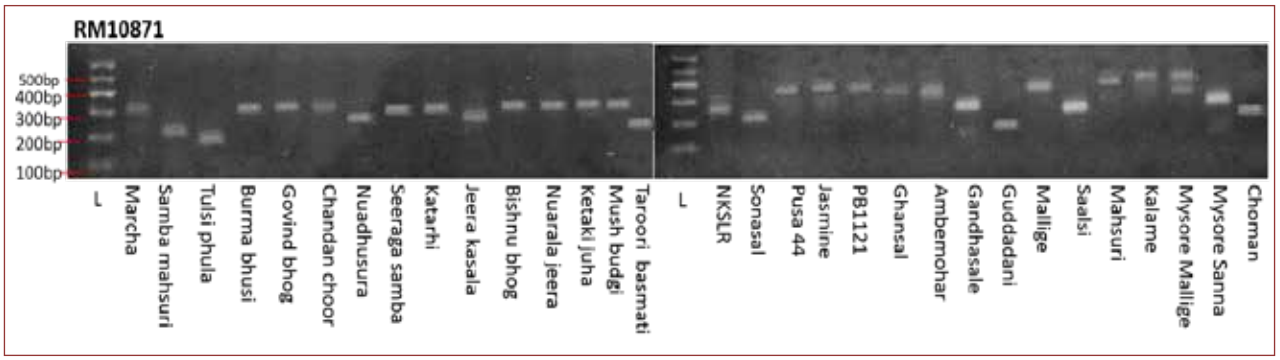
Frequency distribution of grain yield in RIL population derived from Jaya x Goa Dhan 2 under rainfed shallow lowland condition.

SSR marker based genetic diversity analysis in scented rice varieties

Thirty-one traditional and improved aromatic rice varieties were characterized with the help of uniformly distributed 20 SSR markers of the rice genome. The diversity analysis grouped the genotypes into four different clusters. Diversity analysis using neighbour joining tree using Jaccard Coefficient revealed four major groups among the scented rice varieties studied. The genotypes grouping is based on 20 SSR markers distributed on 12 linkage group of rice.



Neighbour joining tree using Jaccard Coefficient indicating the diversity among the 20 scented rice varieties



Profile of SSR marker RM10871

Project: Production and formulation technology refinement of bacterial bio-agents for soil borne plant disease management under coastal ecosystems-Phase II, (ICAR)

(R Ramesh and Maruthadurai R)

Evaluation of capsule formulation of bio-agents for the management of foot rot in black pepper

Field experiment was initiated in October 2021 at farmer's field in Narve village. The treatments include talc and capsule formulations

of RCh6-2b and STC-4. The black pepper cuttings were treated either in nursery or while planting. Initial observations indicated that there is no mortality of cuttings in the bio-agent treatments. However increased disease incidence was observed till 12 months. Plant height was significantly higher in the treatments compared to untreated control after 12 months of treatments. Field demonstration on the effect of capsule formulation of RCh6-2b on black pepper foot rot incidence in Sanguem village indicated less disease incidence and increased plant vigour.

Disease management and growth promotion in vegetables using bacterial bio-agents agents

Talc based bio-formulations (Goa Bio-1 and Goa Bio-2) were mass produced and distributed to the farmers of Goa in more than 50 chilli disease management field demonstrations. There was no incidence of wilt or other soil borne diseases in the bio-agent treated fields. Results from field demonstrations indicated that application of Goa Bio-1 and Goa Bio-2 along with spraying of chitosan/ spinosad reduced the leaf curl virus disease compared to control.

Project : District Agro-Met Unit (DAMU), North Goa

(Bappa Das,V. Arunachalam, R Ramesh, HRC Prabhu, Maruthadurai R, Gokuldas P P, Paramesha V and Nibedita Nayak)

Weather varies spatio-temporally, which has a significant impact on agricultural productivity. Timely information on weather forecast and advisories might be a feasible method to avoid crop losses and improve crop yield and eventually, farmers' income. District Agro-Met Unit (DAMU) was set up at ICAR-CCARI, Old Goa to provide real-time weather forecasts and agro-advisories at a block/*taluka* level to the farming community of North Goa district. The advisories were compiled in the form of weather-based agro-advisory bulletins twice a week (every Tuesday and Friday). Wider and effective dissemination was achieved through bilingual bulletins published in English and Konkani (local language of the region) languages. About 130 WhatsApp groups were created to disseminate the AAS bulletins to farmers that covered farmers of 195 villages in North Goa district. The agro-advisories were disseminated to 7000 farmers twice every week. A framework for reaching out to farmers at the village and block levels were also established by putting it on several Goa state government websites. Awareness and capacity-building programmes were also conducted regularly. Weekly feedback was collected from the farmers about the usefulness of the agro-advisories. The feedback analysis revealed that weather-based agro-advisory service is a useful tool for enhancing the production and income of coastal farmers.

Project: NAIF Component II (Agri-Business Incubator)

(Mathala Juliet Gupta, R S olomon Rajkumar, Shripad Bhat)

At the ICAR-CCARI Agri Business Incubation Centre, AGNI 14 incubates were registered during 2022. On registration, based on the their business ideas they were allotted mentors from the institute. The distribution of the incubates in the major disciplines of the institute is given below. The major business ideas were in areas of fisheries production technology, animal reproduction, organic farming, bio-control formulations for diseases and pests, waste management, horticulture, food processing, api-tourism, agro- ecotourism. Out of the 14 incubates 7 have formally registered their businesses and have started operations.

Along with incubation facility, AGNI provides services like incubation fees, technology customization and prototype evaluation and the total revenue generated during 2022 through these activities was Rs. 8.30 lakhs. ABI Centre

AGNI is providing incubation certificate to approved incubates and monitoring progress through monthly report from incubates and mentors by google forms. Continuous mentoring and use of analytical labs and food lab facilities as per decision of mentors is provided for the incubates. The food lab of AGNI has been modernised and various start of art equipment to assist the incubates have been purchased like - water shower retort, bomb calorimeter, vegetable peeler, deep freezer, hotplate with magnetic stirrer etc. A total 32.5 lakhs was allotted for the capital equipment and works this year under NAIF Component -II (ABI).

Agri Business Centre of AGNI and webpage was formally inaugurated by Dr. S. K. Chaudhari, Deputy Director General (NRM), ICAR, New Delhi on 13th May 2022.

Inauguration of Agri Business Centre of AGNI at CCARI by the DDG (NRM)

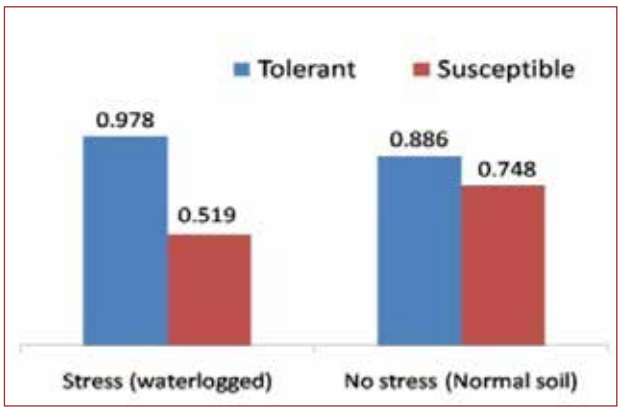
Project: ICAR –Mega Seed Project Seed Production in Horticultural Crops

(V Arunchalam)

A waterlogging tolerant cassava germplasm was obtained from Kerala a visit during 03-05 September 2018 to flood-affected Ernakulam District which received heavy rainfall from 9th – 15th August 2018. Stem cuttings from surviving plants of *Tapioca* (Cassava) were collected and multiplied. The tolerant genotype was tested in waterlogged soils. A trial comparing cassava varieties was planted during October 2021 as intercrop in adult Arecanut cv. Mangala garden in a submergence area adjacent to normal soil. About a total of 48 plants were planted with four treatments (submergence tolerant accession in normal soil, submergence tolerant accession submerged soil, submergence susceptible accession in normal soil, and submergence susceptible accession in submerged soil After 8-12 months of planting, the data on weight of plant, total number of leaves, number of tubers, weight of tubers harvested were recorded. The waterlogging tolerant cassava recorded twice the tuber yield than susceptible check variety in waterlogged condition. Tolerant genotype produced lesser leaves and heavier tubers than susceptible check especially in waterlogged soil.

The contents like glucose, sodium, potassium, total polyphenol, and nitrate, antioxidant (DPPH) assay in tender and mature coconut water were quantified using Fourier Transform Infrared Spectroscopy (FTIR), colorimetric, ion-specific electrode, and smartphone app-based techniques. Two mutants of black pepper (bold fruit (AT-01), double-leaf tip) were characterized for the second season for their morphometric traits, yield, and piperine content.

The generation and sale of 7702 numbers of elite quality planting materials of horticultural crops during Jan to Dec 2022 are detailed in table. A revenue of Rs 4.03 Lakhs was generated from the sale of elite quality planting material and farm produce.



Yield of tubers (kg/plant) of water logging tolerant and susceptible cassava germplasm

Revenue earned from the sale of different plants

Sl. No.	Fruit type	Sale (Rs.)
1	Arecanut	4105
2	Coconut	1155
3	Mango	622
4	Black pepper	657
5	Cashew	161
6	Lemon	263
7	Wax jamb	110
8	Soursop	151
9	Papaya	96
10	Clove	73
11	Others	309
	Total	7702

Project: Poultry Seed Project (ICAR)

(Nibedita Nayak)

Different bird varieties like - Gramapriya, CARI-Debendra, Kadaknath were reared in the reporting year. The body weight of male and female Gramapriya birds were 46 g and 72 g at 1st week, 1.5 kg and 2.1 kg at 21st week (age at sexual maturity) and 1.8, 2.9 kg at 62 weeks, respectively. Hen Housed egg production for a longer period (20 – 50 weeks) with 250 layers was 84.23. Fertility rate varies from a minimum of 70% to 90% in October (min) and June (max). Hatchability varies in close correlation with fertility from 27% (May) to 75% (August). The average body weight for CARI-Debendra was 25 g at hatching and 600 g at 8 weeks. The reasons for low hatchability was detected by break open analysis of hatching eggs and where the embryo was observed to be sticky due to lack of cooling facility for storage at physiological zero. Total 13,980 number of chicken germplasm, 860 number of duck and 7186 number of quails including fertile eggs, chicks, adults were supplied which earned a revenue of Rs. 5,26,893.

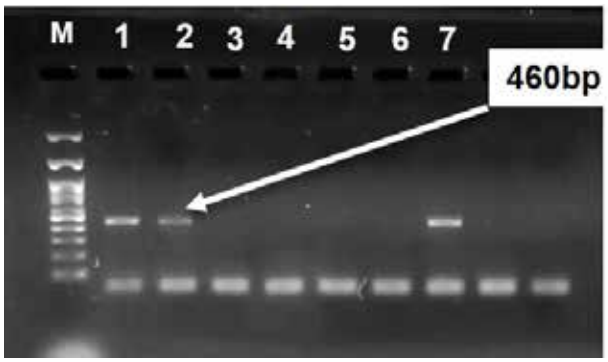
Project: ICAR-National Animal Disease Epidemiology Network.

(Susitha Rajkumar)

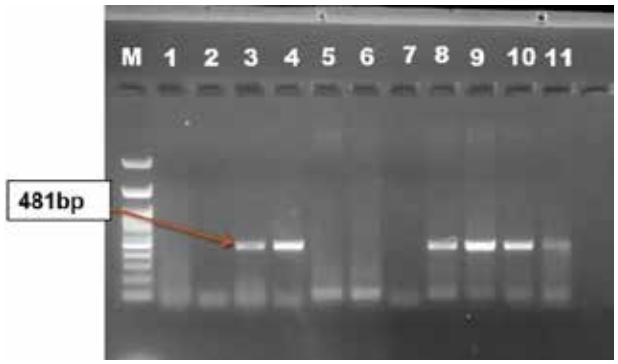
Investigation on livestock disease outbreak, monthly outbreak reporting and sample collection from Goa as part of a nationwide prevalence study are the main objectives of this project. Disease outbreak investigations were carried out by farm visits and laboratory diagnosis. An outbreak of calf mortality in Dharbhandora, South Goa, was diagnosed as due to *E coli* septicemia. Huge mortality in two poultry farms one each at Assagaon and Old Goa, North Goa district due to mixed infection with *Avibacterium paragallinarum* the causative agent of infectious coryza, *Mycoplasma gallisepticum* and *M. synoviae* were diagnosed by isolation of bacteria and PCR confirmation. Nine pig disease outbreaks from North and South Goa districts were diagnosed. The diseases diagnosed were Porcine Circo virus-2 infection, *E coli* septicemia, systemic infection with *Pasteurella multocida* and *Streptococcus zooepidemicus*. Disease outbreaks diagnosed in cattle were 3 cases of Thileriosis and one case

each of Babesiosis, Brucellosis and septicemia due to *Fusobacterium necrophorum*.

An outbreak of respiratory disease in pig herd in Navelim village, South Goa was investigated. A pig herd of 200 Large white yorkshire and crossbred pigs including adults and piglets showed high mortality (40%) in January 2022. The clinical signs observed were high fever, reduced feed intake, staggering gate, huddling, difficulty in breathing, cough, and brown to greenish diarrhea followed by death within a span of 3 weeks. The outbreak was diagnosed by post mortem examination, histopathology, bacterial isolation and PCR confirmation. In bacterial culture *Pasteruella multocida* could be isolated from heart blood and tissues from 3 cases. PCR of the tissue DNA confirmed the presence of *P. multocida* and Porcine Circo Virus-2 (PCV-2) infection as the cause of mortality. The study confirmed the presence of PCV-2 infection in pig herds in Goa for the first time. Sequencing and Phylogenetic analysis of the PCV-2 *ORF-2* gene showed clustering with isolates from North India (GU808525), Kerala (MW627194) and Andhra Pradesh (MW790263).

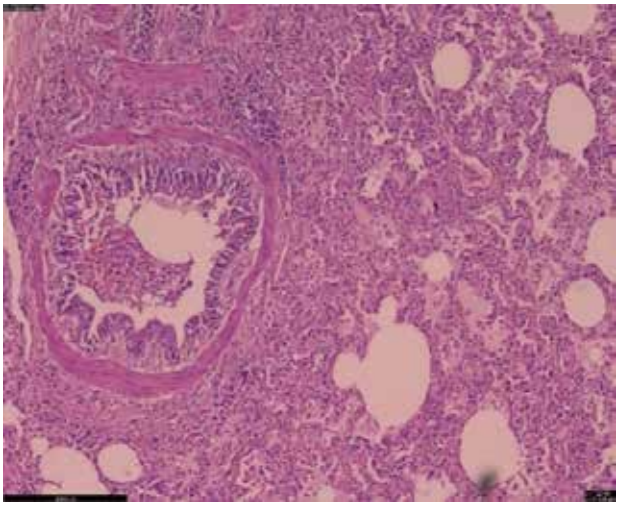


Amplification of 481 bp fragment PCV-2 virus in field samples

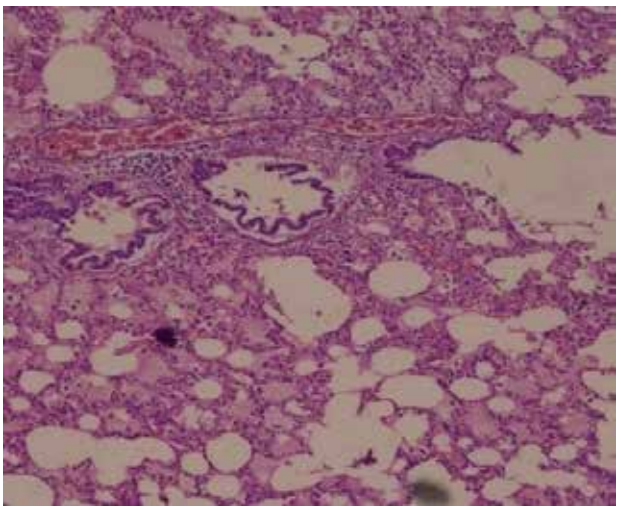


P. multocida specific PCR amplified a product of 460bp

Pig carcass showing purple discoloration of skin and exudation of blood mixed fluid from nasal cavity



Lung section, bronchiolar lumen filled with edematous exudate and denuded epithelium



Severe congestion of capillaries, coalesced alveoli forming bullae and accumulation of edematous fluid in the alveoli. H&E staining

SIGNIFICANT ACCOMPLISHMENTS

IPR Cell /ITMU Activities

Patent Applications Filed/Processed

- A provisional patent was filed in the patent application entitled 'Method and System for Detection of Stem and Root Borer Infestation' (PA# 202221006557) at the Indian Patent Office through Institute IPR Attorney-M/s Krishna & Saurastri Associates LLP, Mumbai, on February 08, 2022
- Form 1 was filed on 'Method and System for Detection of Stem and Root Borer Infestation (202221006557)' at Patent Office through Institute IPR Attorney - M/s Krishna & Saurastri Associates LLP, Mumbai, on April 04, 2022

Contract Research/MoA/MoUs Signed

- A Memorandum of Agreement (MoA) was signed between ICAR-CCARI, Goa andMilestone Resorts, Candolim, Goaon September 22, 2022, for promoting agro-ecotourism. As per the MoA, the Institute will undertake the contract research on the "Assessment of agro-ecotourism conceptual framework models in an island ecosystem of Goa". The licence fee was Rs. 17,70,000 (Rs. 15,00,000 + 18% GST), and this non-exclusive licensing agreement is valid for three years.

- An MoA was signed between ICAR-CCARI, Goa, and Kerala Veterinary and Animal Sciences University, Kerala for the establishment of Farmer Producer Organization /Self Help Groups / Community Organizations of Tribal Farmers on March 16, 2022

- A Memorandum of Understanding (MoU) was signed between ICAR-CCARI, Goa with Professor Jayashankar Telangana State Agricultural University, Hyderabad on March 30, 2022, for the promotion of students' training and quality postgraduate research.
- A Tripartite Agreement was signed among ICAR-CCARI, Goa, Krishi Vigyan Kendra, South Goa and Directorate of Industries, Trade and Commerce, Goa for establishing Common Incubation Centre under Pradhan Mantri Formalisation of Micro food processing Enterprises (PMFME) scheme on April 01, 2022

- ICAR-CCARI, Goa signed an MoU with the University of Agricultural Sciences, Dharwad, Karnataka on June 20, 2022, for long-term collaboration through the promotion of student training and quality postgraduate research in cutting-edge areas
- ICAR-CCARI, Goa signed anMoA with the Association for Innovation Development of Entrepreneurship in Agriculture (a-IDEA), Technology Business Incubator of ICAR National Academy of Agricultural Research Management, Rajendranagar, Hyderabad, Telangana on July 08, 2022, to co-operate for accessing the laboratory infrastructure facilities and mentoring

Lecture/ Facilitation in Online Webinar

- The ITMU facilitated an online interaction of the farmer community representatives of Khola/Canacona Chilli cultivators Group, Khola Village, Goa in the Webinar and interaction with PSGC Awardee by PPV&FRA, New Delhi on 12th January, 2022.

- A lecture was delivered by Nodal Officer, ITMU to farmers on the importance of protecting farmers' rights in the areas of farm innovations, breeding and protection of varieties including PPV&FR Act, BDA/ NBA and conservation of varieties among the farmers and farming on April 11, 2022, at KVK-North Goa. A total of 21 farmers from Goa participated and interacted during this lecture.

Meetings Coordinated

- The ITMU coordinated a meeting of the scientists of ICAR-CCARI, Goa with Dr. Praveen Malik, Chief Executive Officer, Agrinnovate India Ltd. for discussing commercialization of technologies for public benefit on December 09, 2022

- The ITMU coordinated a meeting of the scientists of ICAR-CCARI, Goa with Dr. K. Srinivas, Assistant Director General (Intellectual Property & Technology Management) on November 23, 2022, to discuss IPR and ABI-related issues

Others activities

- Success Stories on Doubling Farmers' Income were compiled and communicated to the NRM division on March 11, 2022
- Technology Inventory was prepared and shared with ATARI, Bengaluru and ATARI, Jodhpur on March 15, 2022
- Information related to ITMU activities for DARE/ICAR Annual report was sent to IP&TM, New Delhi on November 15, 2022

Technology Evaluation

Performance evaluation of process machinery

A total of 53 performance evaluation tests were done during this year and reports given to around 5 machine manufacturing companies. This activity led to a revenue of Rs. 7,31,600/. The list of various types of farm machinery tested is given below.

List of different farm machinery evaluated

S.No.	Date	company	Machine Tested
1	04/04/2022	SVR Agrotech Pvt. Ltd.	Unipole 10 ft ladder
2			Unipole 20 ft ladder
3			Cabon fibre *doti* 80 feet
4			Arecanut debuncher
5			Double wheel barrow
6			Drum type *gorabalu* polisher
7			Motocartfrotune dumper
8			Arecanut dehusker 6 belt
9			Arecanut dehusker 8 belt
10			Arecanut dehusker 4 belt
11			Arecanut dehusker 3 belt
12			Arecanut dehusker 2 belt
13			Manual arecanut climber
14			Arecanut tree climber
15			Pepper decorticator
16			Coconut tree climber
17			Stone type *gorabalu* polisher
18		V Agrotech Pvt. Ltd., Bengaluru	Arecanut dehusker 8 belt
19			Arecanut dehusker 6 belt
20			Arecanut dehusker 4 belt
21			Arecanut dehusker 2 belt
22			Stone type *gorabalu* polisher
23			Drum type *gorabalu* polisher
24			Cabon fibre *doti* 80 feet
25			Motocart frotune dumper
26		Mabens Engineering Pvt. Ltd., Shimoga	Arecanut dehusker 6 belt
27			Stone type *gorabalu* polisher
28			Drum type *gorabalu* polisher
29			Cabon fibre *doti* 80 feet
30			Motocart frotune dumper
31			Arecanut tree bike heavy
32			Manual arecanut climber
33			Manual coconut climber

34	06/04/2022	Easy Life Entrerprises Ltd., Mangaluru. Karnataka	Shredder
35			Chaff cutter
36	14/09/2022	Saya Enterprises, Puttur, Karnataka	Brush cutter
37			Chainsaw
38	13/10/2022	Saya Enterprises, Puttur, Karnataka	Double wheel barrow
39			Unipole aluminium ladder 20 ft
40			Unipole aluminium ladder 10 ft
41			Unipole fibre ladder 10 ft
42			Unipole fibre ladder 20 ft
43			Telescopic pruner pole 60 ft
44			Portable power sprayer 4 stroke
45			Portable power sprayer 2 stroke
46			Manual knapsack sprayer
47	27/10/2022	Easy lifeEntrerprises Ltd., Mangaluru. Karnataka	4 belt arecanut dehusker
48			Motocart 350
49			Motocart 125
50			Chainsaw
51			Brushcutter
52			Power sprayer 2 stroke
53			Power sprayer 4 stroke

Chaff Cutter

Shredder

Motorized Wheelbarrow-350

Pepper Decorticator

On-going Research Projects

Sr. No.	Project Title	PI	Co – PI	Duration
Natural Resource Management				
1.	Genesis of soils and associated evaporates for sustainable land use options and carbon management in the coastal region of India.	GR Mahajan	GR Mahajan, Bappa Das Sujeet Desai Sreekanth GB	2020 – 24
2.	Study of conservation tillage practices for sustainability of rice based cropping systems in west coast of India.	Paramesha V	GR Mahajan Parveen Kumar	2019-24
3.	Evaluation of potential rice based cropping systems under salt affected coastal saline soils for enhancing cropping intensity, sustainability and livelihood security.	ParameshaV	Parveen Kumar Manohara KK Sukanata K Sarangi Shripad Bhat	2021-26
4.	Impact assessment of extreme weather events on productivity of major crops in coastal region of India	Bappa Das	A Raizada V Arunachalam Manohara KK	2022–25
5.	Assessment and mapping of trends in hydro-climatic variables over west and east coast regions of India	Sujeet Desai	Bappa Das Sreekanth GB	2019–23
6.	Assessment and development of agroforestry systems for improved livelihood and climate change mitigation in coastal regions of India	Uthappa AR	Desai AR A. Raizada Shripad Bhat Gopal Mahajan Paramesha V Sujeet Desai Bappa Das R. Solomon Rajkumar Nagaratna B. Biradarand Vinod Kumar	2021-25
Horticulture Sciences				
7.	Harnessing palms for sustainable livelihoods of coastal India	V Arunachalam	Paramesha V Bappa Das	2020–24
8.	Agro-biodiversity, nursery techniques, andpost-harvest technology of ornamental crops for livelihood diversification in coastal India.	V Arunachalam	MJ Gupta Maneesha SR	2021- 24
9.	Identification of edaphic and climate factors affecting mango production in coastal region and its management	V Arunachalam	AR Desai Sujeet Desai Bappa Das	2020-23
10.	Collection, evaluation of genetic resources and management of fruit and spices	AR Desai	Sujeet Desai Paramesha V Nibedita Nayak	2011-23

11.	Integrated strategies for crop improvement and organic production in cashew for coastal climate resilience	AR Desai	Manohara KK Paramesha V	2020–23
12.	Assessment and development of cropping systems based harvest and postharvest management technologies for coastal India	MJ Gupta	AR Desai R Ramesh Shripad Bhat RS Rajkumar Monica Singh	2020–24
13.	Assessment and strengthening of vegetable production in coastal region through acquisition, utilization of local germplasm and strategic introduction of commercial vegetables.	Chaudhari GV	AR Desai R Ramesh Maruthadurai R Shripad Bhat	2021-25
14.	Impact analysis of ICAR-CCARI technologies	Shripad Bhat	AR Desai Manohara KK GR Mahajan Paramesha V. Amiya Ranjan Sahu Monica Singh	2021-24
Crop Science				
15.	Integrated management of major diseases of tomato and chilli in coastal regions	R Ramesh	R Maruthadurai Ganesh Chaudhari Manohara KK	2012–27
16.	Genetic improvement of rice for coastal agro-ecosystem	Manohara KK	Paramesha V	2020–25
17.	Bio-ecology and integrated management of cashew stem and root borers in coastal region of India	R Maruthadurai	R Ramesh Bappa Das	2022–25
Animal Science and Fishery Science				
18.	Serological and molecular diagnosis of PPR (PesteDespetits Ruminants) in small ruminants and developing preventive strategies in coastal region	Susitha Rajkumar	Shirish Narnaware Bappa Das Shivasharanappa N	2020–23
19.	Prevalence, impact and management of the economically important diseases of dairy animals in coastal India	Susitha Rajkumar	Shirish Narnaware	2019–23
20.	Conservation of major farm animal resources in the coastal region through evaluation of seminal traits, semen processing and preservation.	Gokuldas PP	Amiya Ranjan Sahu	2020-25
21.	Genetic variability of thermo tolerance in selected breeds of livestock under coastal environment.	Amiya Ranjan Sahu	Gokuldas PP	2020–25
22.	Augmenting backyard poultry production through technological interventions in breeding, feeding and management aspects pertaining to Indian West coast.	Nibedita Nayak	Gokuldas PP Susitha Rajkumar Amiya Ranjan Sahu Monica Singh	2019–23

23.	Development of ready-to-eat (RTE) animal and fish based traditional of coastal India by retort processing	RS Rajkumar	CO Mohan MJ Gupta SunetraTalaulikar	2021-25
24.	Studies on prevalence, etio pathology and management of infectious reproductive disorders in dairy cattle of west coast region	Shirish D Narnaware	Susitha Rajkumar Gokuldas PP	2022-25
25.	Assessing status of coastal aquaculture practices and improvement through technology intervention for promoting livelihood of fish farmers in west coast of India. .	Trivesh S Mayekar	Sreekanth GB GR Mahajan Manohara KK Rajkumar S Paramesha V	2020-23
Agro-Eco-Tourism				
26.	Prospects and promotion of agro ecotourism in coastal region of India	Parveen Kumar	RS Rajkumar AR Desai V Arunachalam MJ Gupta GR Mahajan Sujeet Desai R Ramesh R Maruthadurai Shripad Bhat Uthappa AR Trivesh Mayekar Chaudhari GV Nibedita Nayak	2017–23

AICRP CENTRES

Sl. No	Project Title	PI	Co-PI (s)	Duration
1.	All India Co-ordinated Research Project on Integrated Farming Systems	Paramesha V	Parveen Kumar AR Desai GR Mahajan GB Sreekanth Gokuldas PP Manohara KK Uthappa A R Rajkumar R S Trivesh Mayekar	2010-26
2.	All India Co-ordinated Research Project on Palms	V Arunachalam	--	2015-23
3.	All India Co-ordinated Research Project on Cashew	AR Desai		2006-26
4.	All India Co-ordinatedResearch Project on Vegetables	Chaudhari G V	R Ramesh	2015-24
5..	All India Co-ordinated Research Project on Pig	Amiya Ranjan Sahu		2001-26
6.	All India Co-ordinated Research Project on Seeds	Manohara KK		2006-26

EXTERNALY FUNDED PROJECTS

Sl. No	Project Title	PI	Co-PI (s)	Duration
DST				
1.	Design and development of acoustic methods for early detection of stem and root borer Plocaederusspp infestation in cashew	R Maruthadurai	T Veerakumar	2019-22
NABARD				
2.	Land shaping methods and integrated farming system approach for improving livelihood security of farmers under khazan lands of Goa	Gopal Mahajan		2022-25
3.	Entrepreneurship development and livelihood improvement through training and demonstration of sustainable ornamental fish culture in Goa	Trivesh Mayekar	Sreekanth GB	2022-25
PMKSY, DoLR, Govt. of India				
4.	Sustainable natural resource conservation and livelihood improvement through integrated watershed management in Goa	Parveen Kumar	Sujeet Desai A. Raizada G R Mahajan AR Uthappa Paramesha V Bappa Das Gokuldas PP Monica Singh	2021-26
Coconut Development Board				
5.	Layout of demonstration plots and organic farming of coconut	V Arunachalam		2022-24
MIDH, DASD				
6.	Centrally sponsored MIDH scheme through DASD, Kozhikode	AR Desai		2018-23
ICAR				
7.	Network Project on Functional Genomics & Genetically Modified crops	Manohara KK		2015-26
8.	Production and formulation technology refinement of bacterial bio-agents for soil borne plant disease management under coastal ecosystems- Phase II	R Ramesh	Maruthadurai R	2017-26
9.	District Agrimet Unit, North Goa	Bappa Das	GR Mahajan	2019-26
10.	Poultry seed project	Nibedita Nayak		2014-26
11	National Animal Disease Epidemiology Network	Susitha Rajkumar	Shirish D Narnaware	2015-26
12.	Agri-Business Incubator	MJ Gupta	RS Rajkumar Shripad Bhat	2019-24
13.	National Agriculture Innovation Fund (NAIF), Component - I (ITMU)	Shripad Bhat		2008-24
14.	Assessment of carbon footprint in integrated farming system through life cycle assessment for sustainability and climate resilience	Paramesha V	V Arunachalam Uthappa AR Gokuldas PP Trivesh Mayekar	2021-24
15.	NSP on Horticulture crops (Revolving Fund)	V Arunachalam		2021-26
16	NSP on Fisheries (Revolving Fund)	Trivesh Mayekar		2021-26

Awards and Recognitions

Innovative farmer of coastal district of Karnataka Shri Amai Mahalinga Naik nominated by ICAR-CCARI, Goa conferred with the Padma Shri 2022

Shri Amai Mahalinga Naik (Age 77 years), an innovative farmer from Adyanadka village of coastal Dakshina Kannada district of Karnataka has been conferred with the coveted Padma Shri 2022 by the Government of India for transforming an arid sloping hill into a fertile farm through innovative zero-energy micro-irrigation system. A team constituted by the Director, ICAR-CCARI, Goa comprising of two Scientists visited the farmer and documented his technologies through good quality photographs and prepared the application for the nomination of Padma awards 2022. For all his efforts though-out his life which he accomplished on his own, he earned the moniker "One-man army" and "Tunnel man". Naik's farm has become a must-see model-farmland and has over 1000 visitors a year including foreign tourists. He profusely expressed his gratitude to ICAR-CCARI, Goa and Govt. of India for recognizing his hard work and innovation.

ICAR-CCARI, Goa was felicitated by the Government of Goa on its 35th Statehood Day

The Government of Goa on its 35th Statehood Day presented a momento and citation to ICAR-Central Coastal Agricultural Research Institute, Goa on 30th May 2022 for its outstanding contribution towards progress and development of agriculture, animal husbandry, fishery and food processing which has made revolutionary change in the state of Goa. Dr. Parveen Kumar, Director of this Institute received the award from Shri Shripad Naik, Hon'ble MoS Tourism, Shipyard and Waterways, GoI, in the presence of Hon'ble Shri P,S Sreedharan Pillai, Governor of Goa, Dr. Pramod Sawant Hon'ble Chief Minister, Govt. of Goa and other dignitaries in Raj Bhavan, Goa.

Goa State Biodiversity Board (GSBB), Government of Goa, honours ICAR-CCARI scientist Dr. Manohara K K

ICAR-CCARI Scientist Dr. Manohara, K. K., honoured with the prestigious 'Goa State Biodiversity Conservation Award" for the year 2022 in the "Applied Biodiversity Researcher' category during the World Environment Day programme held on 5th June 2022. The award carries a citation, Rs. 25000/- and a memento. He was awarded for his significant contribution to the conservation and utilisation of native rice varieties of Goa state.

Other award winners

Dr. A. Raizada

- Received the Dr. Darshana Nand Puri award in Sept. 2022 from the Indian Association of Soil & Water Conservationists, for his excellent contribution to Research, Development and Training in Natural Resource Conservation for the biennium 2019-22.

Dr. R. Ramesh

- Received the Fellowship of the Indian Phyto pathological Society, New Delhi,

Dr. R. Maruthadurai

- Received the Prof T N Ananthakrishnan Young Scientist Award for the biennium 2020-21 by Prof T N Ananthakrishnan foundation.
- Best oral presentation award in 7th International Conference on Opportunities and Challenges in Agriculture, Environmental & Biosciences for Global Development was held on 29-31st October 2022 at Old Goa organised by Agro Environmental Development Society, Rampur
- Best oral presentation award in the National Seminar on "Climate Resilient Technologies for Sustainable Agriculture Interventions and Approaches was held virtually on 26-27th March 2022 organised by Centurion University of Technology and Management, Paralakhemundi, Odisha.

Dr. Gokuldas PP

- Dr. CM Singh Award for the Best PhD Scholar of ICAR-IVRI (2015) conferred during the 10th Convocation held at ICAR-IVRI, Izatnagar, U.P. on 23rd August, 2022.

Dr. GR Mahajan

- Fulbright Outreach Lecturing Fund (OLF) Award 2022 of Institute of International Education (IIE), Washington DC, US to deliver lectures at the California State University, Fresno State, California, US in October 12-13, 2022
- Fulbright Outreach Lecturing Fund (OLF) Award 2022 of Institute of International Education (IIE), Washington DC, US to deliver lectures at the University of Florida and Broward College, Florida, US in September 15-16, 2022
- First prize of the FAO #GSOIL4N scientific poster contest 2022 at the Global Symposium on Soils for Nutrition organized by the Food and Agricultural Organization, Rome Italy from July 26-29, 2022. First prize in Theme I and the highest vote-getter (8300 unique votes) among all four themes of the symposium.
- Awarded and completed Fulbright Nehru Academic and Professional Excellence (FNAPE) Fellowship 2021-22 by the United States India Education Foundation, New Delhi, India in Research Category at University of California, Riverside, CA, USA from March 31 – December 30, 2022.
- Best Scientist Award 2021 by ICAR – Central Coastal Agricultural Research Institute, Old Goa, Goa, India for outstanding contributions in the field of coastal agriculture and Institute building activities.

Dr. Shripad Bhat

- Best Oral Presentation (third place) for the paper on "Growth analysis of raw cashewnut prices in Goa" in the International Conference on Opportunities and Challenges in Agriculture, Environmental & Biosciences for Global Development held at Old Goa, 29-31 October, 2022
- Best Scientist Award in Agricultural Economics on the occasion of 7th International Conference on "Opportunities and Challenges in Agriculture, Environmental & Biosciences for Global Development held on October 29-31, 2022 at Conference Hall, St. Joseph Vaz Spiritual Renewal Centre, Cruz Dos Milagres, Old Goa, Goa

Dr. Sreekanth GB

- Young Scientist Award of National Academy of Agricultural Sciences, New Delhi for the year

2022 in "Animal Sciences including Veterinary Science, Dairy Science, Poultry Science, Fishery and Aquatic Resources".

- Dr. JK Jena Gold Medal by the Inland Fisheries Society of India during the First Indian Fisheries Outlook-2022 organized by ICAR-CIFRI with IFSI from 22-24 March 2022 at ICAR-CIFRI, Barrackpore, West Bengal.
- Young Scientist Award by the College of Fisheries Panangad Alumni Association of the Kerala University of Fisheries and Ocean Studies, Kochi, Kerala for the year 2021.

Dr. R S Rajkumar

- Provided with an International Travel Award by the International Association of Food Protection (IAFP) for the contributions towards Food safety during IAFP 2022 Annual Meeting in Pittsburgh, Pennsylvania, (USA) during July 31 – 3 August 2022.
- Received the ICAR-CCARI Best Scientist Award-2021 for contributions towards coastal agriculture and institutional building.
- Best Oral Presentation for the paper during the International Conference on "Convergence of Technology and Policy for Sustainable Meat Production" held from 25th to 28th October 2021 at Meat Technology Unit, Thrissur, Kerala

Dr. Susitha Rajkumar

- Best Scientist Award by Indian Veterinary Association, at International Summit on Food safety and nutritional security through sustainable livelihood., on 11th December 2022, Goa

Dr. Trivesh Mayekar

- Goa State Biodiversity Recognition Award 2022 for fish biodiversity conservation work from Goa State Biodiversity Board, Goa.
- Young Scientist Award in Fisheries science from Society for Advancement in Agricultural Technology and Development, ChaurasiVenmiadhaw Ward, U.K. India in 2022.
- Young Scientist Awardin Fisheries science for contribution to the field from Agro-EnvironmentalDevelopment SocietyMajhra Ghat, Rampur, U.P., India in 2022.
- Best Poster award for the National Symposium on "Self-Reliant Coastal Agriculture", at ICAR-CCARI from May 11th – 13th,2022.

Dr. Uthappa A R

- Blog Competition Winner Award for the blog title "Non-timber forest products (NTFPs): A tribal ATM" in the XV World Forestry Congress organised by Food and Agriculture Organization of the United Nations and Korea Forest Service during 2-6 May, 2022 at Seoul, Republic of Korea.

Dr. Amiya Ranjan Sahoo

- IPSA Prof. P. K. Pani Award in Poultry Genetics-2019 during IPSACON 2022 (4-6 November 2022) held at DUVASU, Mathura, U.P.
- Ayurvet Research Award-2021 during IPSACON 2022(4-6 November 2022) held at DUVASU, Mathura, U.P.

Dr. Nibedita Nayak

- Ayurvet Research Award-2021 given by the Indian Poultry Science Association during IPSACON 2022 (4-6 November 2022) held at DUVASU, Mathura, U.P. Award.
- Best poster (3rd) award in the World Ayurvedic congress organized by the World Ayurvedic Foundation & DST, held during 8-11 December 2022 at Kala Academy, Panjim, Goa.

Dr. Mathala J Gupta

- Selected as Fellow of Institution of Engineers, India, 23rd December 2022
- Received Approval from Dr. BSKKV Dapoli Academic Council as University Postgraduate teacher for Agricultural Process Engineering since October 4, 2022.

Publications

Research Articles

International

Ajay V S, Amrutha R Krishnan and Sreekanth G B. 2022. Fisheries profile of Puthenvelikara backwaters of Vembanad Lake, Kerala, India. *International Journal of Fisheries and Aquatic Studies* 10 (1): 142-150.

Ajay V S, Sreekanth G B, Adarsh Jayanth AB, Adarsh K, Aloysius Amal A, Bandy Sumanth Kumar R, Abhiram A, and Dheeran P. 2022. Fish composition and efficiency of stake nets in Puthenvelikkara backwaters of Vembanad Lake, Kerala, India. *Acta Scientific Veterinary Sciences* 4 (7): 182-189.

Arunachalam V, Salgaonkar D C, Kevat N V, Walawalkar B V, and Das B. 2022. Quantification of betacyanin content variation of amaranth varieties by an Android App, colorimeter, and infrared spectroscopy. *Chinese Journal of Analytical Chemistry* 50(10), 100145. https://doi.org/10.1016/j.cjac.2022.100145 (NAASRating: 7.193)

Basavalingaiah K, Paramesh V, Ranjan Parajuli, Girisha H C, Shivaprasad M, Vidyashree G V, Greg Thoma, Hanumanthappa M, Yogesh GS, Misra S D , Bhat S, Irfan M M, Rajanna G A. 2022. Energy flow and life cycle impact assessment of coffee-pepper production systems: An evaluation of conventional, integrated and organic farms in India. *Environmental Impact Assessment Review*, Vol. 92, 106687 DOI: https://doi.org/10.1016/j.eiar.2021.106687 (NAAS Rating:12.12)

Chandran S, Singh S B, Sreekanth G B, Deshmukhe G, Nayak B B, and Jaiswar A K. 2022. Spatio-temporal distribution of aquatic biodiversity in Gorai Creek, Sub-Urban Mumbai, India. *Marine Science and Technology Bulletin,* doi: 10.33714/masteb.1071967 (No rating).

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Fahad S, Chavan S B, Chichaghare A R, Uthappa A R, Kumar M, Kakade V, Pradhan A, Jinger D, Rawale G, Yadav D K, et al. 2022. Agroforestry Systems for Soil Health Improvement and Maintenance. *Sustainability*. 14(22):14877. https://doi.org/10.3390/su142214877 (NAAS Rating 9.89).

Faleiro J R, Hamadttu Abdel Farag El-Shafie, Allan Cameron Oehlschlager, Salah Mohammed Ahmed Aleid, and Mahajan G R. 2022. Field evaluation of repellents against red palm weevil *Rhynchophorus ferrugineus* (Olivier) (Coleoptera: Curculionidae) through trap shutdown studies. *Journal of Plant Diseases and Protection* 129: 791–804. (NAAS Rating: 7.85)

Jinger D, Dhar S, Dass A, Sharma V K, Shukla L, Paramesh V, Parihar M, Joshi N, Joshi E, Gupta G, Singh S, 2022. Residual Silicon and Phosphorus Improved the Growth, Yield, Nutrient Uptake and Soil Enzyme Activities of Wheat. *Silicon.*https://doi.org/10.1007/s12633-022-01676-w. (NAAS Rating : 8.57)

Joshi N, Pandey, S T, SinghV P, Jinger D, Joshi S, Paramesh V, Parihar M, Singh R, Javed T, Saud S, Hassan S, Wang D, Wu C, Fahad S. 2022. Direct-Seeded Rice + Brahmi (*Bacopa monnieri*) Intercropping and Weed Management Practices Affects Weed Control Efficiency and Competitive Indices. *Int. J. Plant Prod.* https://doi.org/10.1007/s42106-022-00222-3. (NAAS Rating: 8.9)

Kashyap P, PrustyA K, Panwar A S, Paramesh V, Natesan R, Shamim M, Verma N, Jat P C, Singh M P. 2022. Achieving Food and Livelihood Security and Enhancing Profitability through an Integrated Farming System Approach: A Case Study from Western Plains of Uttar Pradesh, India. Sustainability 14, 6653. https://doi.org/10.3390/su14116653. (NAAS Rating: 9.89)

Keerthana P S, Soorya Gopan, Rubeena Rajabudeen, Rinu Fathima, Kavya Shibu, Nisha R, Pooja Udayan, Teena Elvis, Gifty T, Arun Das NH, Dinesh K, Safeena M P and Sreekanth G B. 2022. Post-harvest losses in the fisheries sector-facts, figures, challenges and strategies. *International Journal of Fisheries and Aquatic Studies* 10(4): 101-108.

Kiranya B, Sahadevan P, Sreekanth GB, Biju Kumar A and Rajeev Raghavan. 2022. Characterization of fish community structure and estuarine fish community index for temporarily closed estuaries (TCEs) from India's western coast. *Environmental Science and Pollution Research*, Doi: https://doi.org/10.1007/s11356-022-18631-2. (NAAS Rating 11.19).

Kiranya B, Sahadevan P, Sreekanth GB and Raghavan R. 2022. A checklist of fishes and shellfishes of the Poonthura estuary, southwestern coast of India. *Journal of Threatened Taxa* 14(7): 21409–21420.(NAAS Rating 5.64)

Kumar, RM, Gadratagi BG, ParameshV, Kumar P, Madivalar Y, Narayanappa N, Ullah F. 2022. Sustainable Management of Invasive Fall Armyworm, Spodoptera frugiperda. *Agronomy* 12, 2150. https://doi.org/10.3390/agronomy12092150. (NAAS Rating 9.89)

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Maruthadurai R, Veerakumar T, Veershetty C and Satish A N C. 2022. Acoustic detection of stem and root borer *Neoplocaederus ferrugineus* (Coleoptera: Cerambycidae) in cashew. *Journal of Asia Pacific Entomology* 25(3):101968. https://doi.org/10.1016/j.aspen.2022.101968 (NAAS Rating: 7.58)

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Narnaware S D, Jyotsana B, Ranjan R, Prakash V, Choudhary SS, Sahoo A. 2022. Case Report: Congenital tuberculosis in an aborted dromedary camel fetus. *Frontiers in Veterinary Sciences*. 28 (9): 956368. (NAAS: 9.47)

Nivesh S, Patil J P, Goyal V C, Bhagwat S, Singh A K, Raizada A, Malik A, Alban Kuriqi. 2022. Assessment of future water demand and supply using WEAP model in Dhasan River Basin, Madhya Pradesh, India. *Environmental Science and Pollution Research* Doi.org/10.1007/s11356-022-24050-0 (NAAS Rating 11.19)

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Book Chapters/ Books/ Compendia

Arunachalam, V. 2022 Potential minor tuber crops genetic resources in Coastal Ecosystem of A&N islands and Lakshadweep In: Murugesan, P, Visalakshi Chandra C, A.V.V. Koundinya and Vikramaditya Pandey (Editors), 2022. *Sustainable Exploitation of genetic resources of underutilized tuber crop.* ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram, Kerala, India, ISBN: 978-81-957479-0-0, Pages 72-75

Arunachalam V, Paramesh V, Uthappa A R, Kumar P. 2022. *Ecosystem service analysis: concepts and applications in diversified coconut and arecanut gardens*. ICAR Central Coastal Agricultural Research Institute, Ela Old Goa - 403402 Goa India. ISBN 978-81-956638-2-8

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Kumar P, Arunachalam V, Das B, Gokuldas P P, Rajkumar S, Mayekar T S, Uthappa A R. 2022. *Souvenir and abstracts of National Symposium on Self Reliant Coastal Agriculture* 11-13 May 2022. ISBN 978-81-956638-3-5.

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Maneesha S R, Pitre V, Ubarhande AV, Devidas R, Desai S, Chakurkar E B. 2022. Dhanvantari Vatika - A Model Herbal Garden for an Agro- Ecotourism Unit. In: Lama, T., Burman, D.,Mandal, U.K., Sarangi, S.K., Sen, H.(Eds) *Transforming Coastal Zone for Sustainable Food and Income Security.* Springer, Cham.https://doi.org/10.1007/978-3-030-95618-9_15.

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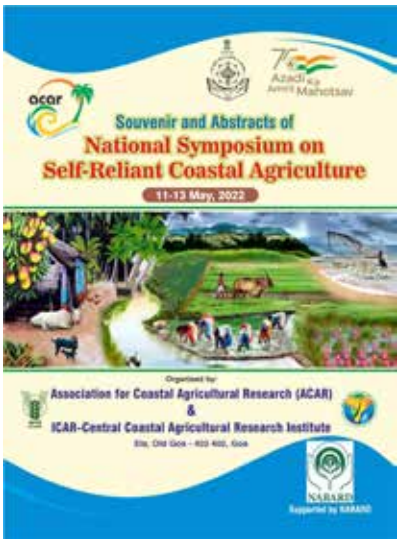
Raizada A and Uthappa A R.2022. Coastal agroforestry and its importance in climate resilience and Sustainable Development Goals. In: P Kumar, A R Uthappa, V. Paramesha, A H Rizvi, S K Dhyani, C Biradar and J Rizvi. *Training Lecture Notes on Diversification of Coastal Agroecosystems for Climate Resilience and Livelihood Security.* Pp-71-95.

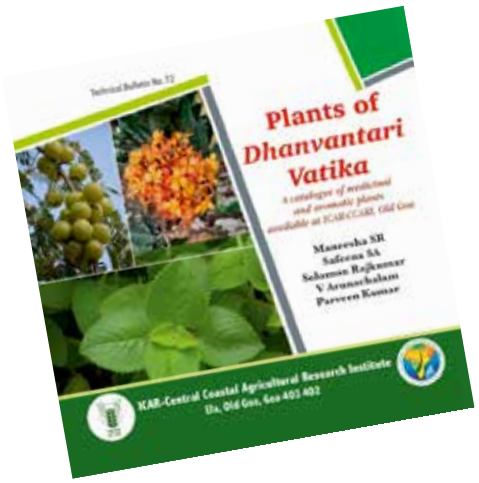
Rajkumar S R, Uthappa, A R and Susitha Rajkumar. 2022. Scope of livestock diversification in coastal agroecosystems systems. In: P Kumar, A R Uthappa, V. Paramesha, A H Rizvi, S K Dhyani, C Biradar and J Rizvi. *Training Lecture Notes on Diversification of Coastal Agroecosystems for Climate Resilience and Livelihood Security*. ICAR-CCARI and CIFOR-ICRAF, India, pp. 102-108.

Sreekanth G.B., Mayekar T., Arunima B., Das A., and Paramesha V., Fish Farming in coconut gardens: prospects and farming methods. In: *Ecosystem service analysis: Concepts and applications in diversified coconut and arecanut gardens*, pp 105-

INSTITUTE AS PUBLISHER

Publications	Authors/ Editors/ Publishers
Reports	
Annual Report (2021) pp.1-137	Parveen Kumar, A. Raizada, Manohara KK, Shirish Narnaware, Bappa Das, GB Sreekanth, Maneesha S R, Sripad Bhat and Monica Singh
Annual Report (2021)Hindi pp.1-60	Parveen Kumar, A. Raizada, Mathal J Gupta and Shashi Vishwakarma
Souvenir and Abstracts of National Symposium on Self-Reliant Coastal Agriculture pp. 1-208	Parveen Kumar, V Arunachalam, BappaDas,Gokuldas, P P, Susitha Rajkumar, TriveshMayekarand Uthappa A R
Leharein (Hindi Magazine) Pp 1- 99	Parveen Kumar, Mathala J Gupta, Shasi Vishwakarma and Shreya Barve
Technical Bulletins	
Plants of *Dhanvantari Vatika* Technical Bulletin No 72 pp 1-90	Mannesha SR, Safeena SA, S Rajkumar, V Arunachalam and Parveen Kumar
News Letters	
Vol. XXIII. No 2, May - December, 2021 Pp 1-56	Manohara KK, Susitha Rajkumar, Bappa Das and Sujeet Desai





EDUCATION

Shripad Bhat

- Evaluated the M.Sc. (Agri.) Thesis entitled '*Economic Impact Assessment of Supplying Treated Sewage Water to Irrigation Tanks under HN Valley Project to Chikkaballapur District of Karnataka Stat*e, from UAS, GKVK, Bengaluru

Sreekanth GB

- Member of the advisory committee of Mr. Sudhan C, FRM PA8-07, FRM Division of ICAR-CIFE, Mumbai for PhD thesis entitled *Assessment of health and valuation of ecosystem services derived from Gorai creek, Mumbai, India*.
- Member of the advisory committee of Ms. Ashwini Gopi Kumar, FRM, KUFOS, Kochi for PhD thesis entitled *Ecosystem assessment of Kavvayi estuarine wetland in terms of fish community, plankton and benth*os.
- Member of the advisory committee of Ms. Keerthana TA, FRM, KUFOS, Kochi for the PhD thesis entitled *Assessment of Molluscan diversity, community structure and fisheries status of Kavvayi backwaters.*
- Member of the advisory committee of Mr. Rinchen Nopu Bhutia, FRM PA7-06, ICAR-CIFE, Mumbai for the PhD thesis entitled *Fish trophic guild and food web structure of Matla estuary, North-eastern coast of India*.
- Member of the advisory committee of Mr. Abhijit Malik, FRM-PA9-02 for his PhD thesis entitled *Study of reproductive potential and feeding adaptations of fishes collected from selected sites off Maharashtra, Eastern Arabian sea.*

Lectures delivered by the Scientists

Date	Lecture Topic/Programme	Participants	Venue
V Arunachalam			
05-02-2022	Potential minor tuber crops genetic resources in Coastal Ecosystem, Andaman & Nicobar Islands, and Lakshadweep	Trainees	Virtual platform by ICAR-CTRI, Thiruvananthapuram
22-02-2022	Diversification options in coconut, arecanut gardens, and their ecosystem services	Trainees	ICAR-CCARI, Goa
25-05-2022	Fruit cultivation & Kitchen gardening	Farmers & women entreprenuers	Amona village, North Goa
26-05-2022	Improved varieties of arecanut and coconut in Kulagar	Participants	ICAR-CCARI, Goa
12-08-2022	Commercial horticulture & livelihood opportunities	Students	Government College of Arts, Science & Commerce, Khandola North Goa
27-08-2022	Exploration, collection, conservation and utilization status of tuber crops in West Coast and Lakshadweep	Delegates	Virtual platform by ICAR-CTRI, Thiruvananthapuram
09-11-2022	Potential of spices, plantation and fruit crops for achieving livelihood security in coastal ecosystems	Trainees	ICAR- CCARI, Goa
06-12-2022	*In silico* analysis of genes governing climate resilience and nutrient contents of tuber crops	Delegate Trainees	ICAR-CTRI, Thiruvananthapuram
16-12-2022	Technologies in Horticulture	Officers	KVK, North Goa
20-12-2022	Technologies in Horticulture	Officers	KVK, North Goa
R Ramesh			
26-05-2022	Management of diseases of coconut, arecanut and black pepper in *Kulagar*	Farmers	ICAR-CCARI, Goa
09-11-2022	Sustainable management of plant diseases of coastal ecosystem with reference to bacterial wilt in vegetable crops	International and national trainees	ICAR-CCARI, Goa
20-12-2022	Technologies in Crop Production	Officers	KVK, North Goa
Shirish Narnaware			
15-06-2022	Economically important Diseases of ruminants	Officers	ICAR – CCARI, Goa
11-08-2022	Bacterial diseases of poultry, their diagnosis and management	Trainees	ICAR – CCARI, Goa
20-12-2022	Technologies in animal sciences and fisheries	Officers	KVK, North Goa
GR Mahajan			
26-01-2022	Competitive Soil Sciences Examination- Introduction & Preparation	Students	Virtual platform by College of Agriculture, Dhule
17-02-2022	Soil fertility and fertilizer use: Essential plant nutrients and their deficiency symptoms, concept of essentiality of plant nutrients, Indicators of soil fertility and productivity	Students	Mahatma Phule Krishi Vidyapeeth, Rahuri

17-02-2022	Agricultural Education and Career Opportunities	Students	ICAR – Central Soil Salinity Research Institute, Karnal
14-03-2022	Competitive Soil Sciences Examination-Introduction & Preparation	Students	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli
15-09-2022	Assessment and mapping of salinity using the geospatial and remote sensing techniques	Students, faculty and staff	Broward College, Ft. Lauderdale, Florida, CA, USA
16-09-2022	Coastal Information system: An Approach for research prioritization and sustainable management of the coastal region.	Students, faculty and staff	Broward College, Ft. Lauderdale, Florida, CA, USA
11-08-2022	Using GIS for salinity mapping and development of GIS-Geoserverbased information system	Students, faculty and staff	University of California, Riverside, CA, USA
12-10-2022	The use of soil apparent electrical conductivity-directed soil sampling and high-resolution satellite imagery to map soil salinity and characterize the crop-yield response to salinity	Students, faculty and staff	California State University, Fresno State, CA, USA
03-10-2022	Assessment and management of the salt-affected soils of the coastal region	Students, faculty and staff	USDA Salinity Laboratory, Riverside, CA, USA
13-10-2022	Fulbright Fellowships: An opportunity for an international level socio-cultural exchange and research exposure	Students, faculty and staff	California State University, Fresno State, CA, USA
Susitha Rajkumar			
20-01-2022	Advantages of Goat Farming and status of goat farming in Goa	Farmers	KVK, North Goa
20-01-2022	Housing, Goat shed designs and various materials used in low cost and commercial goat shed	Farmers	KVK, North Goa
22-01-2022	Goat diseases and health care management	Farmers	KVK, North Goa
21-03-2022	Common pig diseases and health care management of pigs	Farmers	ICAR-CCARI, Goa
15-06-2022	Diagnosis of important diseases of pigs and poultry	Veterinary Officers	ICAR-CCARI, Goa
11-08-2022	Major viral diseases of poultry their diagnosis and management	Farmers	KVK, North Goa, Goa
Sreekanth GB			
02-02-2022	Fishes of the wetlands and rivers of Goa, status, and conservation strategies.	Delegates	Virtual platform by Goa State Wetland Authority
22-02-2022	Fish farming in coconut gardens: prospects and farming methods.	Trainees	ICAR-CCARI, Goa.
Gokuldas PP			
15-06-2022	Management of infertility in farm animals-An overview of important causes & treatment strategies	Veterinary Officers of Goa	ICAR-CCARI, Goa
11-08-2022	Importance of Artificial Insemination in backyard poultry	Farmers	ICAR-CCARI, Goa
Shripad Bhat			
17-03-2022	Economics of fodder cultivation & dairy farm budgeting	Trainees	ICAR- CCARI, Goa

25-03-2022	Correlation & regression analysis	Trainees	Virtual platform by, Central Muga Eri Research and Training Institute, Jorhat
11-04-2022	IPR for Entrepreneurs, Legal aspects of business and creation of enterprise; Legal compliances for business	Trainees	ICAR- CCARI, Goa
05-05-2022	Scope of Machine Learning and Artificial Intelligence in Agricultural Marketing	Delegates	ICAR- CCARI, Goa
Sujeet Desai			
3-03-2022	Rain water Harvesting and Water Conservation	Students	Virtual platform by JNV South Goa
17-03-2022	Land degradation, watershed database and soil and water conservation of the Goa Bhoomi Geoportal	Trainees/ Officers	ICAR-CCARI, Goa
30-03-2022	Traditional wisdom of water conservation in Goa and its enhancement for sustainable agriculture	Farmers / Officers	Metropole Hall, Margao Goa
Amiya Ranjan Sahu			
20-01-2022	Goat breeds suitable for coastal region and selection of good quality breeding goats	Trainees	ICAR – CCARI, Goa
09-03-2022	Poultry breeds and varieties suitable for coastal climate and their breeding strategy for propagation	Trainees	ICAR – CCARI, Goa
21-03-2022	Breeds of pigs and their important characteristic features and utility in coastal climate	Trainees	ICAR – CCARI, Goa
Uthappa AR			
21-02-2022	Soil faunal diversity and its role in ecosystem health	Trainees	ICAR-CCARI, Goa
16-11-2022	Role and suitability of Agroforestry systems for sustainable form productivity in Coastal regions of India	Trainees	Virtual platform by ICAR-Indian Institute of Soil & WaterConservation (IISWC)-Research Centre-Kota-Rajasthan
Nibedita Nayak			
9-03-2022	Housing for backyard birds in high rainfall hot humid climate like Goa	Trainees	KVK, North Goa, Goa
10-03-2022	Feed and feeding practices for backyard poultry and Brooder, grower and layer management	Trainees	KVK, North Goa, Goa
11-03-2022	Egg to chick: Production practices for quality chick production and backyard hatchery management	Trainees	KVK, North Goa, Goa
21-03-2022	Care of Newborn piglets and housing for pigs	Trainees	ICAR- CCARI, Goa
Trivesh Mayekar			
21-02-2022	Entrepreneurship opportunities in Aquaculture for livelihood improvement: A present status and future prospectus".	Trainees & Farmers	ICAR-CCARI, Goa
02-07-2022	The Global and national status in Ornamental Fish Industry	Trainees &Farmers	ICAR-CCARI, Goa
11-07-2022	Status of Seaweed Aquaculture	Trainees &Farmers	ICAR-CCARI, Goa
20-12-2022	Introduction to Ornamental Fish Farming: Status and Scope	Trainees & Farmers	ICAR-CCARI, Goa

Training and Capacity Development

Date	Name	Programme	Venue
16-02-2022 to 18-02-2022-	**Shirish Narnaware**	Quality management system (QMS) as per ISO9001:2015	Virtual platform by ICAR-NINFET, Kolkata
21-02-2022 to 23-02-2022.	**Amiya Ranjan Sahoo**	Competency enhancement programme for effective implementation of training functions by HRD Nodal Officers of ICAR	Virtual platform by ICAR-NAARM, Hyderabad
21-03-2022 to 26-03-2022	**Ganesh Chaudhary**	Plant Taxonomy for Plant Genetic Resources Management	ICAR-National Bureau of Plant Genetic Resources, New Delh
28-03-2022 to 03-04-2022	**GR Mahajan**	Short course on 'Soil salinity assessment'	USDA – Soil Salinity Laboratory, Riverside, CA, USA
1-08-2022 to 5-08-2022	**Uthappa AR**	Collaborative Training Program on Fodder Technology Innovations for Sustainable Livestock Production	Virtual platform by MANAGE and ICAR-IGFRI, Jhans
16-08-2022 to 20-08-2022	**Shripad Bhat Uthappa AR**	Various Aspects of Watershed Development Components under WDC PMKSY 2.0"	KVK, South Goa, Margao Goa
18-08-2022 to -20-08-2022	**Mathala J Gupta**	Response Surface Methodology	ICAR-NAARM, Hyderabad
20-09-2022 to -24-09-2022	**Nibedita Nayak**	Advanced biotechnological approaches to augment productivity in poultry for ensuring food and nutritional security	ICAR-Directorate of Poultry Research, Hyderabad
18-10-2022 to 21-10-2022.	**Amiya Ranjan Sahoo**	Metagenomic Data Analysis	Virtual platform by ICAR-Indian Agricultural Statistics Research Institute, New Delhi
13-12-2022 to 15-12-2022	**Nibedita Nayak**	Emotional and Social Intelligence at Workplace	Virtual platform by ICAR-Indian Institute of Wheat & Barley, Karnal
23-12-2022	**GR Mahajan**	A one-day refresher short course ' Soil salinity assessment'	USDA – Soil Salinity Laboratory, Riverside, CA, USA
26-12-2022 to 27-12-2022	**Shripad Bhat**	Watershed Development Component of PM Krishi Sinchayee Yojana (PMKSY) - MIS in the state of Goaon at at KVK, South Goa	KVK, South Goa, Margao Goa

Participation in Conference / Seminar/ Symposia/ Workshops/Meetings

Date	Name	Programme	Venue
10-01-2022 to 11-01-2022 2	**Shirish Narnaware**	Workshop for Liaison Officers for reservation in services (SC/ST/OBC/ EWS/PwBD/ Ex-servicemen)	Virtual platform by Institute of Secretariat Training & Management, New Delhi
28-01-2022	**Shirish Narnaware**	Symposium Rewind Friday: Equine Infectious Gastrointestinal diseases	Virtual platform by Davis Thompson Foundation, USA
18-02-2022	**Shirish Narnaware**	Symposium Rewind Friday: Pathology of Abortion with Emphasis on Ruminants, Horses, and Pigs	Virtual platform by Davis Thompson Foundation, USA
25-02-2022	**Shripad Bhat**	45th State Level Technical Committee (SLTC) meeting	Goa State Coop Bank Ltd, Panaji
14-03-2022 to 16-03-2022	**Shirish Narnaware**	International Workshop on Antimicrobial Resistance in Foodborne Pathogens: Safety	Virtual platform by ICAR-Indian Veterinary Research Institute, Izatnagar
23-03-2022 to 26-03-2022	**R Ramesh**	8th International Conference on Plant Pathology: Retrospect and Prospects	SKN Agricultural University, Jobner-Jaipur, Rajasthan.
26-03-2022 to 27-03-2022	**Bappa Das**	National Seminar on "Climate Resilient Technologies for Sustainable Agriculture-Interventions and Approaches"	Virtual Platform by Centurion University of Technology and Management, Paralakhemundi, Odisha
30-03-2022	**Sujeet Desai**	Workshopon Demand Driven Mission-Water Technology Initiative	Metropole Hall, Margao Goa
04-05-2022	**Shripad Bhat**	46th Meeting of SLCCI on Pradhan Mantri Fasal Bima Yojana (PMFBY)	Panaji, Goa
5-05-2022 to 07-05-2022	**Trivesh Mayekar**	12th Indian Fisheries and Aquaculture Forum.	Chennai
3-06-2022 to 4-06-2022 -	**Shripad Bhat**	National Conference on 'Underutilized Horticultural Genetic Resources: Conservation and Utilization'	Virtual platform by ICAR-CIARI, Port Blair
15-06-2022 to 17-06-2022	**Ganesh Chudhari**	40th Group Meeting of All India Coordinated Research Project (Vegetable Crops)	Virtual platform by ICAR-IIVR, Varanasi
15-06-2022	**Shripad Bhat**	NABARD - Meet of Programme Implementing Agencies (PIAs)	Margao, Goa
22-06-2022	**GR Mahajan**	Workshop on Advances in citrus water management	Coachella Valley Water District, Palm Desert, CA, USA
23-06-2022	**GR Mahajan**	Workshop on Advances in citrus water management	San Diego County Farm Bureau, Escondido, CA USA
28-06-2022 to 30-06-2022	**Uthappa AR**	Workshop of "All India Fodder Production Officers: Kharif"	Virtual platform by ICAR-IGFRI, Jhansi.

18-07-2022 to 21-07-2022	**Parmesha V**	Review of Research Activities and Strengthening Future Research Program under NICRA Program	NASC, New Delhi
16-09-2022 to 17-09-2022 -	**Shirish Narnaware**	Symposium on COVID 19 pandemic and the way forward	BITS Pilani, Birla Goa
16-09-2022 to 19-09-2022 -	**Shripad Bhat**	International Conference on Environmental Sustainability & Biotechnology: Opportunities & Challenges	Ravindra Bhavan, Madgaon, Goa
26-10-2022 to 27-10-2022	**GR Mahajan**	Workshop on 'Introduction to Planet, Satellite Imagery, and Platforms'	University of California, Riverside, CA, USA
29-10-2022 to 31-10-2022	**Shirish Narnaware** **Shripad Bhat** **Trivesh Mayekar**	7th International Conference on Opportunities and Challenges in Agriculture, Environmental & Biosciences for Global Development	St. Joseph Vaz Spiritual Renewal Centre, Old Goa.
3-11-2022 to 4-11-2022	**R Ramesh**	National Conference on Recent Trends in Plant Sciences and Biotechnology	Goa University, Bambolim, Goa
06-11-2022 to 09-11-2022	**GR Mahajan**	ASA, CSSA, SSSA International Annual Meeting	Baltimore Convention Center, Baltimore, Maryland, USA
09-11-2022 to 11-11-2022	**Mathala J Gupta**	56th Annual Convention of ISAE and International Symposium on "India@2047: Agricultural Engineering Perspective"	Tamil Nadu Agricultural University, Coimbatore.
17-11-2022 to 20-11-2022	**Susitha Rajkumar**	International Veterinary Pathology Congress-2022	PVNR Telangana Veterinary University, Hyderabad
29-11-2022	**Shripad Bhat**	State Credit Seminar 2023-24	NABARD, Panaji Goa
07-12-2022 to 10-12-2022	**GR Mahajan**	Enrichment Seminar: "Preparing for and Mitigating the Effects of Climate Change'	Cleveland Council on World Affairs (CCWA), Cleveland, Ohio, USA
10-12-2022	**Shirish Narnaware** **Gokuldas PP** **Susitha Rajkumar** **Amiya Ranjan Sahu** **Uthappa AR** **Nibediat Nayak**	International Conclave on Pashu Ayurveda held during the 9th World Ayurveda Congress & Arogya Expo-2022	ESG Auditorium, Panaji
11-12-2022	**Shirish Narnaware** **Gokuldas PP** **Susitha Rajkumar** **Amiya Ranjan Sahu**	International summit on Food safety and nutritional security through sustainable livelihood: A farmer's perspective	ICAR-CCARI, Goa
18-12-2022 to 20-12-2022	**Parmesha V**	Biennial workshop of AICRP-IFS	Mahatma Phule Krishi Vidyapeeth, Rahuri

Technology Dissemination

ICAR-KRISHI VIGYAN KENDRA, NORTH GOA

ICAR-Krishi Vigyan Kendra was established at the Institute in 1983 for carrying out technology assessment, refinement, demonstration at local agroclimatic condition and capacity building programme in agriculture and allied sector. The major activities carried out are given below:

Trainings

Every year KVK conducts capacity building programme to impart knowledge and skill to the farmers, farm women and extension functionaries on advanced agricultural technologies and latest technical know-how. During 2022, 48 training programmes were conducted involving 1280 participants. The major training programmes were on the production and management technology, resource conservation technology, natural farming, vermi-composting, organic input production, integrated pest management, integrated disease management, beekeeping, value addition of major fruit crops, entrepreneurship development, scientific management of dairy, poultry and goatery, design and development of low/minimum cost diet, women empowerment etc.

Training on Bee keeping at KVK, North Goa

Training on organic input preparation at Chodan, Tiswadi

Training programme on ornamental fisheries at KVK, North Goa

Training on silage making at KVK, North Goa

Participation of KVK in different forums

KVK is actively involved in conducting 2357 different types of extension activities involving 13288 farmers such as field day, exposure visit, exhibitions, *sammelans,* agro-advisories, webinars, soil health camp, etc. In addition, KVK also uses different social media platform such as WhatsApp groups, Facebook, Youtube and Twitter for mass dissemination of information. It is also actively involved in celebrating important days such as World Food Day, Mahila Kisan Diwas, International Women's Day, World Soil Day, World Environment Day, Kisan Diwas, National Pulse Day, *Swachhata Pakhwada* etc. and organizing various other activities.

Celebration of *Kisaan Diwas* at ZAO, Pernem

Celebration of International Women's Day at KVK

Celebration of World Food Day at Arle-Keri

Celebration of World Soil Day at KVK

On Farm Trials

On Farm Trials (OFT) were conducted in Farmer's field to test new technologies or an idea under farmer's condition and management and by using farmer's own practices as control. Following OFTs were conducted in the year 2022

S.No.	Programme	Particulars
A	**ON FARM TRIAL**	**No. of trials**
1	Assessment of salt tolerant paddy varieties Goa Dhan 3 & Goa Dhan 4. It was observed that the yield of Goa Dhan-4 was highest with 2.19 t/ha	5
2	Assessment of brinjal variety. Goa brinjal-1 and Goa brinjal-2 is being evaluated. The trial is under progress	5
3	Assessment of Tomato varieties *Arka Rakshak* and *Konkan* Vijay. *Arka Rakshak* was the highest yielding variety with 47.5t/ha yield	5
4	Assessment of Red Amaranthus varieties *Goa Tambadi Bhaji-1* and *Konkan Durangi*. Yield of both varieties were at par i. e 11.58 t/ha of Goa Tambadi Bhaji and 11.23 t/ha of Konkan Durangi.	5
5	Assessment of improved poultry breeds. Grampriya breed was preferred due to its high egg production -169egg/year	5
6	Assessment of High yielding Fodder varieties Co-5 and Super Napier is evaluated. The trial is under progress	3

Assessment of Salt Tolerant varieties of Paddy Goa Dhan 3 & Goa Dhan 4

Assessment of brinjal variety- Goa brinjal1 and Goa brinjal 2

Frontline demonstrations

FLD are conducted on latest technologies on farmers field under the supervision of the KVK staff. Following FLD were conducted in 2022.

Sl. No.	Frontline demonstration	No of Demonstrations	Area covered (ha)
1	Popularization of High yielding salt tolerant rice variety Goa Dhan1	8	1
2	Management of Stem & Root Borer	10	2
3	Popularization of cowpea var. *Goa Cowpea3*	10	1
4	Popularization of High yielding yard long bean var. *Arka Mangala*	10	0.5
5	Popularization of Sweet corn var. Golden COB F1	10	0.5
6	Popularization of high yielding variety Arka Manik	10	0.5
7	Popularization of Onion var. NHRDF Red-3	10	0.5
	Total	68	6

Popularization of high yielding salt tolerant rice variety Goa Dhan 1at Diwar, Tiswadi

FLD on CSRB Management at Guleli, Sattari

Popularization of high yielding watermelon varietyat Parra, Bardez

Popularization of cowpea var. Goa Cowpea 3, at Parra, Bardez

Technology demonstration under NICRA

KVK received Rs. 8.5 lakh under TDC-NICRA to demonstrate climate resilient technologies in Mayem village. Under this projectfollowing resilient technologies were demonstrated

Crop	Technology demonstrated	Variety	No. of Farmers	Area (ha)/No
Rice	Goa Dhan 1+ Goa Bio 1	Goa Dhan1	33	20
Arecanut	Bordeaux spray		10	
Cowpea	Goa Cowpea 3+ IPM	Goa Cowpea 3	5	0.5
Tomato	ArkaVikas + IPM + INM	Arka Vikas	5	0.5
Yard Long bean	Arka Mangala + poly mulch + INM	Arka mangala	4	0.1
Goatery	Scientific goat farming	Konkan kanyal	2	5 nos.
Poultry	Scientific backyard poultry	Grampriya	5	110 nos.
Dairy	Mastitis control management	-	10	28 nos.

Demonstration of Goa Dhan 1 and Goa Bio 1 under NICRA at Mayem, Bicholim

Distribution of Konkan Kanyal goats under NICRA at CCARI Goat unit to Mayem farmers

Cluster Demonstration on Oilseeds

KVK received Rs.2.4 lakh under CLFD on Oilseed to demonstrate improved groundnut cultivation technology in 20 ha. These demonstrations were conducted in Dhargal Village. Groundnut variety DH-256 was demonstrated on farmers' field. The average yield of DH-256 obtained was 24.85 q/ha with a B:C ratio of 2.87.

Field day on Groundnut under CFLD on Oil seeds at Dhargal, Pernem

Dr. Parveen Kumar, Director, CCARI visiting CFLD plots

Revenue generation

Sl.No.	Particulars	Quantity	Revenue generated (Rs.)
1	Planting material	2196 nos.	8,948
2	Virgin Coconut Oil	86.6litre	95,370
3	Vermicompost	4690 kg	95,025
5	Vegetable seeds	516.55 kg	6,62,000
6	Poultry	11592 nos.	1,16,444
Total			**10,58,321/-**

Front line demonstrations on integrated pest and disease management technologies in Chilli

Demonstration of Integrated pest and disease management in Chilli

Ten front line demonstrations on chilli integrated pest and disease management technologies was undertaken at six *taluks viz*., Canacona, Sanguem, Quepeum, Tiswadi, Bicholim and Mapusa. Plant protection inputs like Goa Bio 1 and Goa Bio II, spinosad, chitosan and yellow and blue sticky traps were distributed to 100 farmers. On-field demonstrations and hands-on training was provided to farmers on nursery drenching of biocontrol agents, main field application, instalment of sticky traps and its preparation, and spraying of bio-pesticides. Results of the demonstrations indicated a 33% reduction in ChiLCV disease incidence and 40% increase in dry chilli yield as compared to control. Other benefits of this technology include lesser incidence of thrips, whiteflies, aphids and other diseases in the demonstration plots.

Introduction and evaluation of tropical apple varieties in Goa

Low chilling requiring tropical apple varieties viz., Anna, HRMN-99 and Golden Dorsett were introduced in three villages of Netravali region of Sanguem Taluka. The annual mean minimum temperature of this region was 21. 51 °C with a range of 17.62 °C (January) - 24.53 °C (May). Annual mean maximum temperature of this region was 31.20 °C with a range of 28.07 °C (August) to 34.34 °C (April), annual rainfall range was 0.74 mm (January) o 1348.71 mm (July) with an annual rainfall of 3588.51 mm. Grafted plants were procured from Himachal Pradesh and distributed to tribal farmers under STC scheme. In the Salgini village, 30 plants were planted in 4 × 3 m spacing in the fields of Mr. Gokuldas Gaonkar on 11th February 2022. In Verlem village, 21 plants of three varieties under 4 × 4 m spacing by a Self-Help Group lead by Mrs. Dinitha. In Tudov village, on 27.05.2022, a small plot was established in the field of Mr. Satish Gaonkar on 13.06.2022 under 3 × 3 spacing with 18 plants. The growth and yield performance of the apple plants will be evaluated continuously.

Artificial Insemination technology adoption and dissemination in farmers' field

Artificial insemination (AI) is one of the most importantand valuable reproductive biotechnological toolsfor genetic improvement in farm animals. With the aim of improving productivity in pig farming, Institute hascarried out standardized AI technology in farmer's field. AI using liquid semen is being performed and during the period, total of 323 piglets were born through 60 numbers of AI and 42 numbers of farrowings with success rate of 71% in the farmers' field. Adoption of this technology has boosted pig production due to higher number of viable piglets and improved piglet growth rate. Around

AI on being carried out in farmers' pig pen

130 numbers of farmers were benefitted generating overall employment of 35,156 man-days with income generation of 198.44 lakhs rupees. In addition, farmers were trained to perform AI and also received technical advice on estrus detection, scientific feeding and health management practices. The Institutehas distributed superior quality pig germplasm including improved crossbred pig variety to the farming community in the region.

The Institute has also standardized AI technology using liquid buck semen combined with estrus induction and synchronization employing double prostaglandin $F_2\alpha$ regimen in indigenous goats and efforts are underway to develop more efficient and cost-effective indigenous semen diluents for optimal success rate in AI. Adoption of this controlled breeding technology has boosted goat production with overall conception rate of 60% and twinning rate of 30% in farmers' field.

Establishment of small scale dairy processing unit

A Community-based "Small Scale Dairy Processing Unit" for the tribal farmers of Vaniyampara Village of Coastal District of Thrissur has been established with a budgetary allocation of Rs. 9.91 lakhs, under financial support from STC in collaboration with Kerala Veterinary and Animal Sciences University, Wayanad, Kerala.

Development of a small-scale pen culture system for rearing the Mud crab (*Scylla serrata*)

A standard methodology was developed for cultivation of mud crab in pen system based on design and area of pen, size of crablets, seeding rate and culture period. The package of practice developed consisted of a 0.1 ha pen system (50 m × 20 m × 2 m, made of green nylon garden fencing net (800 GSM and 25 mm mesh size) and silpaulin sheet (500 GSM)) stocked with crabs of 5-8 cm (carapace width) @ density of 1 crab per m^2 for a period of 6 months. PVC pipes of 25 mm, 40 mm, 50 mm, 75 mm, 125 mm, 150 mm were placed in the bottom of the pen as hide-outs for the crabs.

Feeding was carried out on alternate days with trash fish twice in a day (40% early morning and 60% in the evening) @3-6% of the body weight. The total cost including the fixed and operating components for one crop is Rs. 35,000/- with the total harvest being 250 kg. The demonstration of the technology of in an area for 0.1 ha generated an income of Rs 0.75 lakhs with a production cost of 0.35 lakhs yielding a net profit of 0.40 lakhs. The benefit cost ratio was 2.15 from a single pen structure.

Crab culture pond (left) and harvested crabs (right)

Demonstration of Estuarine cage culture of pearlspot(*Etroplus suratensis)* in Vembanad Backwaters, Kerala


Cage culture system (left) and harvested fish-Pearlspot (right)

A cage culture trial of pearlspot (Kerala's state fish), *Etroplus suratensis* was conducted in a participatory mode during 2020-2021 in association with fishermen of Vembanad estuary and Department of Aquaculture, KUFOS, Kochi. A total of 2000 fingerlings of pearlspot was stocked in cages (6 × 6 × 2.5 m) The mean harvest size of the fish improved to 225 g from 195 g. The total harvest and returns from the cage were 450 kg and Rs.2.05 lakhs respectively. The net profit and BC ratio from the cage was Rs.1.05 lakhs and Rs.2.05 respectively. Thus, the technical support in terms of training, feed, cage net and modifications in the feeding protocol increased net profit from a cage by Rs. 0.65 lakh.

Demonstration of cage culture of Asian seabass (*Lates calcarifer)* at Mulki estuary, Mangalore, Karnataka


Cage culture system(left) and harvested fish-seabass (right)

A cage culture (6×6×1.5 m) trial has been conducted in association with fishermen in a participatory model for a period of one year during 2021-2022. The stocking density of seabass (fingerlings of 60-80 mm) was 1000 numbers per cage. Trash fish was given feed @ 15 kg day^{-1}. The fish attained a mean growth of 1.25 kg with a total harvest of 700 kg fish in eight months. The total cost incurred for the culture was Rs. 1.50 lakhs and the net profit was Rs.1.65 lakhs. Therefore, cage culture of seabass can be an excellent livelihood option for farmers/fishermen along the estuarine gradient.

Demonstration of a low cost estuarine fish trap for sustainable fishing in estuaries

The schematic diagram of the trap (left) and distribution of trap for trials (right)

A low-cost estuarine fish trap was demonstrated in a participatory mode with fishermenof Goa for its efficiency and catch rates. The design was made and standardised using the designing software (AutoCAD). The GI made half-cylindrical model of the trap was with the following dimension- 90 cm × 54 cm × 30 cm. There were 45% success rate for the trap in a total of 30 trials. The average weight of fish caught per trial was 1.2±0.6 kg. The species trapped were red snapper, grouper, seabass, bream, pearlspot and crabs.

Management measures for estuaries along the western coast of India

1) Monitoring, control, and regulation of activities in the estuarine stretch.
   - Enforcement of prohibition illegal fishing activities: mini purse seines/trawl/dynamiting/ poisoning
   - Regulation of mesh size for fishing nets: gillnets and stake nets should be more than 20 mm and length of net (<200 m)
   - Regulation of collection of fish and shrimp/crab larvae/seeds using fine-meshed nets
   - Volume-based regulation of the disposal of sewage and industrial effluent to the estuarine environment
   - Regulation of licences mining for sand and silt (to protect clam beds and benthic substratum)
   - Management of alien invasive fish species through an integrated approach
   - A new Inland Fisheries Act including estuaries could be formulated
   - Promotion of sustainable aquaculture in estuaries- Mussel, oyster and cage fish farming
2) Maintain freshwater flows into the estuarine stretch to increase the habitats for the freshwater and estuarine species
3) Develop an integrated modelling system capable of evaluating the impacts of changes in land use and management interventions on the ecosystem- hydrodynamic and ecosystem modelling.
4) Focus research on the following - nutrient cycling, water quality indicators, biotic indicators, biodiversity profiles, ecosystem function and modelling, food web studies, management of nutrient input, health indices, climatic factors and variability, evaluation of socio-economic profile, and ecosystem services in estuaries of the coast lines in India
5) Development and standardisation of sustainable aquaculture systems such as mussel/oyster culture, cage culture, brackishwater pond culture, crab culture, Integrated Multitrophic Aquaculture (IMTA) and brackishwater based Integrated Farming Systems (B-IFS).

International Training Program

ICAR-CCARI, Goa in collaboration with Center for International Forestry Research (CIFOR) and World Agroforestry (ICRAF) organized International Training Program on "Diversification of Coastal Agroecosystems for Climate Resilience and Livelihood Security" from 7th to 11th November 2022. Dr Suresh Kumar Chaudhari, Deputy Director General (Natural Resource Management), ICAR, New Delhi was the Chief Guest of the inaugural function. Dr Parveen Kumar, Director, ICAR-CCARI, Dr Javed Rizvi, Director, CIFOR-ICRAF, Asia, Dr Chandrashekhar Biradar, Country Director, CIFOR-ICRAF, India Dr Shiv Kumar Dhyani, Country Coordinator, CIFOR-ICRAF and Dr A. Arunachalam, Director, ICAR-Central Agroforestry Research Institute, Jhansi, Uttar Pradesh were the Guest of Honours. The training was attended by 8 foreign and 6 national participants physically from India, Bangladesh, Sri Lanka, Indonesia, Maldives and Vietnam

National Level Training Program on Cashew

A National level training program on Recent Advances in Cashew Production Processing & Post Harvest Management was organized, at KVK-North Goa ICAR–Central Coastal Agriculture Research Institute during 6-8 January, 2022. Dr. S. K. Malhotra, Ex-Agriculture & Horticulture Commissioner, Government of India, was the Chief Guest and Dr. Venkatesh N. Hubballi, Director DCCD, Cochin was guest of honour. The training program was attended by delegates from 13 different states.

Skill development training on Scientific goat farming

Skill development training on Scientific goat farming was held at ICAR-CCARI Goa during 20-22 January, 2022. Training was inaugurated by Dr. Parveen Kumar, Director, ICAR-CCARI, Goa. Around 55 participants including farmers from North and South Goa districts and few students from College of Agriculture, Sulcorna, Goa attended the training. The participants were shown management practices followed in the institute goat farm and were also shown different types of fodder grasses maintained at Institute fodder museum.

Short course on ecosystem services analysis

ICAR-CCARI, Goa organized a short course on Ecosystem services analysis in diversified coconut and arecanut gardens on 21 February, 2022 in hybrid mode. Dr. Parveen Kumar, Director, inaugurated the course. A total of 13 physical mode participants and 13 online participants from five different states representing ICAR Institutes, State Agricultural/Horticultural Universities, deemed to be University and Krishi Vigyan Kendrasparticipated in the training program.

Three scientific beekeeping programs

Three capacity building programs on Scientific Beekeeping were organized by ICAR-CCARI, Goa during 21 to 28 February, 2022 for three batches with concurrent sessions. Dr. Parveen Kumar, Director, ICAR–CCARI, Goa inaugurated the program. The program was attended by 75 participants and all were supplied with honey bee box and other related equipment's.

Skill Development Training on Scientific Backyard Poultry

ICAR–CCARI, Goa organized a three days Skill Development Training on Scientific Backyard Poultry from 9th to 11th March, 2022. Dr. Parveen Kumar, Director, ICAR–CCARI inaugurated the training programme. A total 116 poultry farmers from the state of Goa participated in this training programme.

One day training programme on 'Digital tools and techniques for a self-reliant Goan Agriculture'

ICAR-CCARI, Goa organized a one-day training programming on Digital tools and techniques for self-reliant Goan Agriculture' under the *Azadi Ka Amrit Mahotsav* (AKAM) (@India75) for the officers and staff of the Directorate of Agriculture, Government of Goa on 17th March, 2022. Dr. Parveen Kumar, Director, ICAR-CCARI, Goa welcomed the participants of the training and highlighted the importance of training on digital tools and its use for the state of Goa. A total of 23 participants of ADA, AO, AAO, ZAO, Agri. Assistant, Chemist, Sample collectors from Directorate of Agriculture, Government of Goa attended the training..

Skill Development Training on Improved fodder cultivation and silage making

ICAR–CCARI, Goa organized a three days Skill Development Training on Improved fodder cultivation and silage making from 15 to 17 March, 2022 under *Azadi ka Amrit Mahotsav.* Dr. Parveen Kumar, Director, ICAR–CCARI inaugurated the training programme. Experts from ICAR– IGFRI, RRS, Dharwad and Goa State Animal Husbandry Department delivered lectures regarding fodder cultivation. A total of 20 dairy farmers from Goa participated and were benefitted by this training programme.

Farmers' Training Programme on Production and Propagation Techniques of Important Spice Crops

A Farmers' Training Programme, "Production and Propagation Techniques of Important Spice Crops was organized by ICAR-CCARI, Goa during 25-26thMarch 2022.Dr. Parveen Kumar, Director, ICAR–CCARI, Goainagurated the training programme. Thirty-five farmers participated in the training programme which had both technical and practical sessions on various aspects of organic and inorganic cultivation of turmeric, ginger, nutmeg, black pepper and cinnamon.

Three days training on jackfruit processing

ICAR–CCARI, Goa organized a three days training programme on jackfruit processing from 21-23 April, 2022 under *Azadi Ka Amrit Mahotsav.* Hands on training and demonstration was given on different value-added products of jackfruit like pickle, halwa, bulb powder, seed powder, seed kheer, jack chilly, jack squash, jack biryani and jack chips. Total 14 participants attended programme from Goa and Maharashtra.

Farmers' Training Programme on Advances in Processing and Value Addition Technologies for Spices

A Farmers' Training Programme, "Advances in Processing and Value Addition Technologies for Spices", was organized at ICAR-CCARI, Goa during 21- 22nd April 2022. Dr. Parveen Kumar, Director, ICAR–CCARI, Goa inaugurated the training programme. Two days' training programme which had both technical and practical sessions on various aspects of processing in spices was coordinated by Dr. A R Desai, for fifty participants comprising of young graduates, spice farmers and the enthusiastic entrepreneurs alike.

Training on ODOP crop Jackfruit

A training programme, on ODOP Jackfruit processing, was organized between 6th to 11th April, 2022 at ICAR-CCARI, Goa. The training was attended by 22 beneficiaries of the PMFME Scheme. The beneficiaries were trained on various aspects of processing of Jackfruit Value addition into minimally processed tender jackfruit, pickle, papad. Leather, flour, wine processes, SOPs, Packaging, Storage, FSSAI guidelines, EDP, Supply chain, plant layout, machinery selection, cleaning of processing machinery, advances in packaging, different packaging materials, methods and machinery involved (Primary, Secondary and tertiary) in the packaging of fruits and vegetable products, advances in the storage of fruits and vegetables, cleanliness etc.

Two days training program on jackfruit processing

ICAR–CCARI, Goa organized a two days training program on jackfruit processing during 8-9th June, 2022, under *Azadi ka Amrut Mahotsav*. Hands on training was imparted in which preparation of different value-added products like jackfruit pickle, chips, halwa, papad, kababs were demonstrated. The training was attended by 25 entrepreneurs.

Training on Disease diagnosis and management of infertility in livestock

ICAR-CCARI, Goa organized a training on 'Disease diagnosis and management of infertility in livestock' for the Veterinary Officers of Goa under *Azadi Ka Amrut Mahotsav* on 15th June, 2022. The inaugural session which was presided by Dr. Parveen Kumar, Director of the Institute. Around 25 field veterinary officers of the Directorate of AHVS, Goa and Goa Dairy participated in the training. The program included lectures on economically important diseases of ruminants, diagnosis of important diseases of pigs and poultry and management of infertility in farm animals.

Capacity building programme on ornamental fish culture

ICAR-CCARI, Goa organised a capacity building programme on entrepreneurship development and livelihood improvement through training and demonstration of ornamental fish culture with the funding support from NABARD under Azadi Ka Amrit Mahotsav on 2nd July, 2022. A group of 20 fishermen/enthusiasts from Diwar Island, Goa were benefitted with the knowledge on various ornamental fish culture systems and their management.

Training on kokum processing and value addition

A training programmes was organized by ICAR-CCARI, Goa on kokum processing and value addition on 6 July, 2022 under *Azadi ka Amrit Mahotsav*. The training programme was attended by state agriculture department officials and farmers from all the zones. A total of 45 participants attended the programme.

Training on turmeric cultivation and processing

A training programmes was organized by ICAR-CCARI, Goa on turmeric cultivation and value addition at ICAR-KVK, North Goa on 11 July, 2022 under Azadi ka Amrit Mahotsav. The training programme was attended by state agriculture department officials and farmers from all the zones. Dr. AR Desai, Principal Scientist, Horticulture gave lecture on cultivation and processing of turmeric and also explained on different machineries required for processing of turmeric. Total 45 participants attended the programme.

Training Programme on Improved Production and Processing technology of Cinnamon

A training programme, on "Improved Production and Processing technology of Cinnamon" was organized at ICAR-CCARI, Old Goa on 29th November, 2022 for creating awareness about the potential for commercial cultivation of true cinnamon. Dr. Parveen Kumar, Director, ICAR–CCARI, Goa, in his inaugural remarks not only highlighted the scope for commercial cultivation but also the health benefits of true cinnamon, besides throwing light on major countries contributing to the current global market. About 45 participants comprising of young graduates, spice farmers and the enthusiastic entrepreneurs alike were imparted the training for promoting cultivation of cinnamon for reaping the benefits in the years ahead.

To make Goa Agriculture self-reliant ICAR-CCARI organized training program for *Swayampurna Mitras*

ICAR-CCARI, Goa organized one-day 'Orientation Programme on 16th Dec.' 22 for 72 *Swayampurna Mitras* in Agriculture' from North Goa with the objective of imparting knowledge on technologies developed by the institute to make Goa Self-reliant in agriculture. This programme aimed to develop *Swayampurna Mitras* as master trainers in agriculture for bridging the gap between demand and supply of agricultural commodities.

ICAR-CCARI, Goa also organized another one-day 'Orientation Programme on 20th Dec.' 22 for 75 *Swayampurna Mitras* in Agriculture from South Goa, with the objective of imparting knowledge on technologies developed by the institute to make Goa self-reliant in agriculture. This programme aimed to develop *Swayampurna Mitras* as master trainers in agriculture for bridging the gap between demand and supply of agricultural commodities.

ICAR-CCARI organizes a one-day training program on 'Ornamental Fish Farming'

ICAR-CCARI, Goa organized a one-day training on 'Ornamental Fish Farming' on 20/12/22. A group of total 27 trainees benefited from this training. Dr. Parveen Kumar, Director highlighted about the potential of ornamental fish culture as a livelihood option and contribution of the sector to the growth of the country during his inaugural address.

Scheduled Tribe Component (STC) and Schedule Caste Sub Plan (SCSP)

Field Day & Farmers-Scientists Interaction under Scheduled Tribe Component

A team of scientists from ICAR-CCARI, Goa visited FLD plots at Ziltawadi and Satorlim in Gaondongrim Panchayat, Canacona and organized a Field Day on 11thFebruary 2022 and a Farmers-Scientists Interaction under the Scheduled Tribe Component (STC). In this field day, scientists and the ST farmers of SHG's visited FLD plots on cashew production technology and productivity enhancement in coconut based cropping system. While reviewing the progress of the activities, Dr. Parveen Kumar, Director appreciated the technological backstopping and observed that, due to the interventions, yield levels have increased more than three times, besides effective utilization of byproducts of one component as inputs in other components complementarily. Farmers expressed their satisfaction and informed the team about the increased incomes and employment generated due to various technological interventions. The team held interactive discussions with farmers and discussed further action plans.

Distribution of bio-agents to ST farmers

An awareness meeting was conducted at Satorlim, Gaodogrim village, Canacona *Taluka* to the ST farmers on 25-05-2022 in the presence of Zonal Agricultural Officer, Canacona. Thirty ST farmers participated in the programme. Bio-agents viz. talc formulation of Trichoderma, Goa Bio-1, Goa Bio-2 and capsule formulations worth Rs. 0.96 lakh were distributed to the ST farmers.

Distribution of improved variety of Poultry germplasm to tribal farmers of Goa

ICAR-CCARI, Goa conducted a distribution programme under scheduled tribe component (STC) for tribal farmers of Goa on 19th July 2022. Dr. Parveen Kumar, Director, ICAR-CCARI, Goa addressed the farmers about importance of backyard poultry farming in Goa. He also interacted with the participants about increasing their flock size and to increase their farm income. A total 14 farmers from Divar, Shiroda, Pedne, Tiswadi areas received various inputs like CARI-Debendra grower birds, quails, fertile eggs, linear feeder and waterers.

Training-cum-Demonstration on Scientific Breeding Practices in Poultry Husbandry organized under the STC Program

A one-day training and demonstration program on Scientific Breeding Practices in Poultry Husbandry" was conducted at ICAR-CCARI, Goa under the STC Program on 11th August 2022.The training was attended by a total of 12 farmers from Tiswadi and Salcete *talukas*.

Establishment of a Small-Scale Dairy Processing Unit and organized skill development programme under STC fund in collaboration with KVASU for the tribal farmers of Kerala

ICAR-CCARI, Goa established a Small-Scale dairy processing unit in collaboration with Kerala Veterinary and Animal Sciences University (KVASU), Kerala for the skill development of Scheduled Tribe farmers of Coastal Districts of Kerala. The Small-Scale Dairy Processing Unit was inaugurated on 19th September 2022 at the Vaniyampara Village of Thrissur District of Kerala in the august presence of Prof. M. R. Saseendranath, Hon'ble Vice Chancellor, KVASU, Dr. Parveen Kumar, Director, ICAR-CCARI, Goa and other dignitaries form KVASU and the local *grama panchayats*. The Director, ICAR-CCARI along with the team of scientists visited the tribal hamlets and interacted with the farmers to get the first-hand information on the socio-economic status and research intervention needs of the scheduled tribes of Kerala. In continuation to the inauguration, skill development programs were conducted in different batches for the tribal farmers of seven tribal hamlets of Thrissur district on "Value added Milk Products" at the Department of Dairy Technology, Varghese Kurien Institute of Dairy and Food Technology (VKIDFT), Mannuthy, Kerala.

Gilimpses of Institute Activities

The Institute successfully organized a special campaign 2.0 for disposal of pending matters from 02-10-2022 to 31-10-2022

Sl. No.	Activities undertaken during the Special Campaign
1	*Swachhta* Pledge was administered to all the Employee
2	Cleaning and weeding of Institute sports ground
3	Vermi-compost awareness programme was conducted in the School
4	Cleaning of Offices, Laboratories & Corridors in the main building by the respective Officials
5	Vermi-compost awareness programme was conducted in the village Panchayat
6	Pruning of plants and trimming shrubs inside the boundary walls of the Institute Campus of Block A.
7	Weeding out of physical files
8	Cleaning and painting the sign boards in the Institute campus
9	Cleaning the outside of the boundary walls of the Institute in collaboration with the local Panchayat
10	Rally for generating awareness about *Swachhta* in Old Goa Village
11	Pruning of plants and trimming shrubs inside the boundary walls of the Institute Campus (B Block)
12	Tree plantation drive
13	Checking and repairing the water leakage, flush system in all the washrooms in Block A, B and C
14	Cleaning, weeding and removal of plastic from the Residential Quarters area
14	Cleaning the area near the old banyan tree near nursery unit and to make the area functional.
16	Cleaning the area in front of the Labour Shed and use it as a Vermi-compost Unit
17	Pruning of plants and trimming shrubs inside the boundary walls of theInstitute Campus (C Block)
18	Cleaning and painting the field boards in the Institutec ampus
19	Cleaning, removal of plastic and other waste from the National Highway adjacent to the Institute
20	Updating the signboard on the ground floor of the main building and disposal of old unserviceable scrap machinery, scientific equipment and metal scrap
21	In order to keep the campus clean and tidy, dust-bins were kept at the security gates and outside the main building
22	Plastic waste collection drive was conducted at public places, community market places and/or nearby tourist spots
23	Unserviceable items were disposed and broken furniture were identified and repaired

The Institute also successfully organized *Swachhta Pakhwada* at ICAR-CCARI, Goa during 16th -31st December, 2022.

Date	Activities were undertaken during *Swachhta Pakhwada*
16-12-2022	1. Displayed banners at prominent places of this Institute. 2. Administered *Swachhta* Pledge to all the Staff members/Officials. 3. Stock taking & briefing of the activities were organized during the *Swachhta Pakhwada* to all the Staff members. 4. Tree plantation drive was organized at this Institute
17-12-2022	1. Basic maintenance 2. Cleaning of Office and corridors/premises of the Institute was conducted. 3. Organized a *Swachhta* campaign to bring about an improvement in the general quality of life in school children of Priol village, Goa and also to promote cleanliness, hygiene, and eliminating open defecation. 4. Weeding out of old records was conducted. 5. Some metal scraps was identified for systematic disposal during the campaign.
18-12-2022	1. Cleanliness/ waste collection drive was conducted in the village Veling, Goa which is adopted under *Mera Gaon Mera Gaurav* programme and also briefed the villagers about segregation of plastic and biodegradable waste. 2. *Swachhta* campaign was organized in the Higher Secondary School of Usgao village, Goa. The co-ordinator of the *Swachhta Pakhwada* briefed the students on vermin-composting and also encouraged students for cost effective and appropriate technologies for ecologically safe and sustainable sanitation.
19-12-2022	1. Cleanliness and sanitation drive was conducted within campus and surroundings including residential colonies and the Old Goa market place drainage channel. 2. Segregation of biodegradable and non-biodegradable waste and disposal of same was done at this Institute.
20-12-2022	1. Under the *Swachhta* campaign waste management activity/generation of wealth from waste was conducted utilizing organic waste and converting it into useful compost.
21-12-2022	1. As a part of *Swacchta Pakhwada*, an awareness program was organized at ICAR-CCARI, Goa for the contractual staff about recycling of waste water and importance of rain water harvesting. Dr. Sujeet Desai, Scientist (LWME) briefed the contractual labourers about the process and importance of eco-friendly waste water treatment facility of the institute for recycling waste water of animal units and its utilization. The labourers were also briefed about the importance of rain water harvesting and its judicious use for agriculture and other allied activities. 2. Cleaning, desiltation and banking was carried out of the percolation pond of this Institute.
22-12-2022	Under *Swachhta Pakhwada* a silent procession was organized where all the staff members/officials actively participated to spread the awareness regarding swachhta in surrounding area of this institute.

23-12-2022	1. On account of *Swachhta Pakhwada* Special Day - *Kisan Diwas* was organized at Dhargal village on 23.12.2022 to spread awareness on *Swachhta* among farmers & farm women. Also felicitated Young Progressive Farmers. 2. Honorable Shri. Narendra Singh Tomar, Ministry of Agriculture & Farmers Welfare Addressing on occasion of *Kisaan Diwas* held at this institute.
24-12-2022	On account of *Swachhta Pakhwada* to spread awareness about sanitation, a campaign was organised at village Dhargal where masks and sanitizer was distributed to farmers and farm women.
25-12-2022	On account of *Swachhta Pakhwada* removal of plastic waste and cleaning of the road on highway was carried out as Swachhta Campaign.
26-12-2022	Under *Swachhta Pakhwada* a Drawing and an Essay Writing Competition was held for children of staff members of this institute.
27-12-2022	1. A webinar was organized at this Institute on 'Waste Management and Vermicomposting', the speaker for webinar was Shri. Sanjay Patil, a Progressive farmer from Savoi Verem, Goa briefed about waste management and vermicomposting. 2. Visited Marcel village, Goa, and briefed the villagers about vermicomposting, conversion of wealth from waste and natural farming. 3. Visited Goa College of Engineering Farmagudi, Goa, in this program *Swachhta Pakhwada* co-ordinator delivered a lecture on segregation of waste, vermicomposting, conversion of wealth from waste and natural farming to the students. 4. Students from Kendriya Vidyalaya, Kurti, Goa visited our Institute KVK, North Goa, the students were briefed about waste management, vermicomposting, and natural farming.
28-12-2022	*Swachhta Pakhwada* awareness campaign was organized on "recycling of waste" at Bhironda, Valpoi, Goa. The speaker Shri. Uday Singh Rane, *Sarpanch* of BhirodaValpoi briefed about the vermin-compost procedure and also demonstrated the same to all the villagers. This really encouraged the villagers to convert organic waste into very rich manure. Vermi-compost bags were also distributed during the campaign.
29-12-2022	Approx 24 farmers visited our Krishi Vigyan Kendra (KVK), North Goa. The Head I/c of KVK briefed them about the entire process of vermi-composting to convert organic waste into useful compost to grow healthy plants and also briefed them on the method to segregate dry and wet waste.
30-12-2022	On account of *Swachhta Pakhwada* Smt. Sandra Gonsalves, *Sarpanch*, and Shri Harshad Dhulapkar, Panch of Old Goa village Panchayat visited our Institute. The *Sarpanch* addressed the gathering and agreed that Swachhta is the need of an hour and appreciated the efforts taken by the Institute to keep the campus clean. Both the VIPs were briefed about the entire activity of vermin-composting, converting the organic waste into useful farm manure.
31-12-2022	Write up for 16 - 31 Dec, 2022 was sent to press Media by Shri Rahul Kulkarni, Co-ordinator for *Swachhta Pakhwada*.




Views of activities undertaken under the *Swachhta Pakhwada* at CCARI, Goa.

संस्थान के राजभाषा प्रकोष्ठ की गतिविधियां

संस्थान की राजभाषा प्रकोष्ठ संस्थान के कार्यान्वयन में राजभाषा के उपयोग के प्रोत्साहन तथा भारत सरकार की राजभाषानीतियों का अनुकरण व प्रसार में अहं भूमिका निभाती है। हिन्दी के प्रयोग तथा प्रधानता के आधार पर राजभाषा विभाग भारत सरकार द्वारा विभक्त किए गए तीन भौगोलिक क्षेत्रों में, हमारी संस्थान ङ्गगफ क्षेत्र में स्थित है। राजभाषा अधिनियम व राजभाषा नियम के अनुसार संस्थान में राजभाषा संबंधी कार्यों की समीक्षा तथा राजभाषा के प्रयोग को गति प्रदान करने हेतु संस्थान के निदेशक की अध्यक्षता में राजभाषा कार्यान्वयन समिति गठित की गयी है जिसमे विभिन्न अनुभागों के वैज्ञानिकों, तकनीकी कर्मचारियों तथा प्रशासनिक कर्मचारियों को शामिल किया गया है। संस्थान के राजभाषा कार्यान्वयन समिति निम्न प्रकार से है :

1. डॉ प्रवीण कुमार, निदेशक - अध्यक्ष
2. डॉ मतला जूलियट गुप्ता, वरिष्ठ वैज्ञानिक - सचिव
3. श्रीमति मोंटीया रीता डीसिल्वा, प्रशासनिक अधिकारी -सदस्य
4. श्रीमति स्नेहा आर्लेकर, सहायक प्रशासनिक अधिकारी - सदस्य
5. श्रीमति प्रतिभा सावंत, सहायक प्रशासनिक अधिकारी - सदस्य
6. श्रीमति सुनंदा सावंत, सहायक प्रशासनिक अधिकारी - सदस्य
7. श्री सिद्धार्थ मराठे, वरिष्ठ तकनीकी अधिकारी - सदस्य
8. श्री शशि विश्वकर्मा, वरिष्ठ तकनीकी अधिकारी -सदस्य
9. श्रीमति प्रांजलि वाडेकर, वरिष्ठ तकनीकी अधिकारी, पुस्तकालय समन्वयक -सदस्य
10. श्री विश्वजीत प्रजापति, तकनीकी अधिकारी - सदस्य
11. श्री विश्वास शर्मा, सहायक - सदस्य
12. श्रीमति श्रेया बर्वे, आशुलिपिक -सदस्य

वर्ष 2022 में राजभाषा कार्यान्वयन समिति की त्रैमासिक बैठक 17.03.2022,17.06.2022, 30.07.2022, 31.10.2022 तिथियों को सम्पन्न हुई है। इनमें राजभाषा संबंधी कार्यकलापों की समीक्षा की गई तथा राजभाषा कार्यान्वयन में आनेवाली बाधाएँ एवं उनके निदान के उपायों पर चर्चा एवं सुझाव लिये गए। राजभाषा कार्यान्वयन समिति भारत सरकार के राजभाषा विभाग द्वारा निर्धारित वार्षिक कार्यक्रम के लक्ष्यों की प्राप्ति हेतु समुचित योजना को सुनिश्चित करती है तथा समय-समय पर किए गए प्रयासों की समीक्षा एवं मार्गदर्शन भी करती है।

हिन्दी पखवाड़ा 2022

भाकृअनुप - केन्द्रीय तटीय कृषि अनुसंधान संस्थान, इला, ओल्ड गोवा में 06 सितम्बर से 23, सितम्बर 2022 के दौरान हिन्दी पखवाड़े का आयोजन उत्साहपूर्वक किया गया। संस्थान में 06 सितंबर 2022 को हिंदी पखवाड़े का उद्घाटन समारोह संपन्न हुआ। संस्थान के माननीय निदेशक महोदय डॉ. प्रवीण कुमार ने इस कार्यक्रम का उद्घाटन दीप प्रज्वलन से किया। सभा को संभोदित करते हुए निदेशक महोदय ने हिंदी पखवाड़ा एंव हिंदी दिवस का महत्व बताते हुए कहा कि हिन्दी विश्वभर दूसरी सबसे ज्यादा बोले जाने वाली भाषा है । उन्होंने संस्थान के सभी कार्मिकों को खुले मन से राजभाषा को अपनाने एवं उसकी प्रयोग को बढ़ाने केलिए प्रोत्साहित किया। इसके अतिरिक्त मंच पर उपस्थित प्रशासनिक अधिकारी श्रीम ति मोंटीया रीता डिसिल्वा ने हिंदी भाषा के विषय में अपने मौलिक विचार सभा में रखे और प्रशासनिक कार्यों में हिन्दी की प्रतिदिन हो रहे बढोत्तरी के बारे में बताया तथा संस्थान के राजभाषा कार्यान्वयन को सराहा ।

इस संस्थान की राजभाषा अधिकारी डॉ मतला जूलियट गुप्ता ने सभा में उपस्थित सभी को हिंदी पखवाड़े के दौरान आयोजित होने वाले विभिन्न कार्यक्रमों की रूप रेखा के बारे में सभी कर्मियों को अवगत कराया। पखवाड़े में आयोजित किये गए विभिन्न कार्यक्रम निम्नलिखित है :

क्र सं.	प्रतियोगिता का नाम	दिनांक
१	संस्थान के कार्मिकों के बच्चों के लिए चित्रकला एवं प्रतिभा दर्शन प्रतियोगिताएं	06.09.2022
२	सुलेख प्रतियोगिता- सभी कर्मचारियों के लिए	07.09.2022
३	हिंदी टिप्पण एवं प्रारूप लेखन प्रतियोगिता - सभी कर्मचारियों के लिए	08.09.2022
४	सामान्य ज्ञान प्रश्नोत्तरी - सभी कर्मचारियों के लिए	12.09.2022
५	आशुभाषण प्रतियोगिता - सभी कर्मचारियों के लिए	14.09.2022
६	हिंदी काव्यपाठ प्रतियोगिता - सभी कर्मचारियों के लिए	14.09.2022
७	अंतरकार्यालयिन हिन्दी निबंध प्रतियोगिता-गोवा के सभी सरकारी कार्यालयों के कमचारियों के लिए	15.09.2022
८	कम्प्यूटर पर यूनिकोड में टाइपिंग- सभी कर्मचारियों के लिए	16.09.2022
९	सामान्य ज्ञान प्रश्नोत्तरी का अंतिम दौरा	22.09.2022

पखवाड़े का समापन समारोह 23 सितम्बर को डॉ नरेंद्र प्रताप सिंह, पूर्व निदेशक एंव एमेरिटस वैज्ञानिक, मुख्य अतिथि, श्री संदीप लोटलीकर, सह-प्राद्यापक , पीइएस कॉलेज, फोंडा, सम्मानीय अतिथि एवं संस्थान के निदेशक डॉ प्रवीण कुमार के उपस्थिति में सम्पन्न हुआ। कार्यक्रम का शुभारंभ आईसीएआर गीत एवं मान्यवरों के हाथो दीप प्रज्वलन के साथ हुआ। श्री राहुल कुलकर्णी, सहायक मुख्य तकनीकी अधिकारी ने कार्यक्रम का सूत्रसंचालन किया। गया। संस्थान के माननीय निदेशक डॉ प्रवीण कुमार ने अतिथियों काआदर-सत्कार पुष्पगुच्छ एवं मानचिन्ह के साथ किया। संस्थान की राजभाषा अधिकारी डॉ मतला जूलियट गुप्ता ने हिन्दी पखवाड़े के दौरान आयोजित विभिन्न प्रतियोगिताओं एवं कार्यक्रमों का संक्षिप्त में विवरण प्रस्तुत किया पखवाड़े के दौरान आयोजित विभिन्न प्रतियोगिताओं के विजेताओं को मान्यवरों के हाथो पुरस्कृत किया गया। उन्होंने अपनी भाषण में हिन्दी पखवाड़े के सफल आयोजन केलिए संस्थान के सभी कर्मचारियों एवं राजभाषा प्रकोष्ठ को बधाई देते हुए सभी को राजभाषा का कार्यान्वयन में वर्षभर सतत बढ़ोत्तरी करने केलिए प्रोत्साहित किया। कार्यक्रम के सम्माननीय अथिति श्री संदीप लोटलीकर ने अपने भाषण में राजभाषा की देश एवं विश्वभर बढ़ते प्रभाव पर अति मनोरंजक भाषण दिया।। मुख्य अतिथि डॉ नरेंद्र प्रताप सिंह ने संस्थान को हिन्दी पखवाड़े की सफलता पर सराहा एवं दिल से राजभाषा को अपनाने के लिए प्रेरित किया । सह-राजभाषा अधिकारी, श्रीमति श्रेया बर्वे, निजी सहायक ने आभार ज्ञापन प्रस्तुत किया।

चित्रकला स्पर्धा

प्रतिभादर्शन प्रतियोगिता

सुलेख प्रतियोगिता

निबंध लेखन प्रतियोगिता

भाकृअनुप - केन्द्रीय तटीय कृषि अनुसंधान संस्थान में हिंदी कार्यशाला का आयोजन

भाकृअनुप - केन्द्रीय तटीय कृषि अनुसंधान संस्थान में दिनांक 24.02.2022 को हिंदी कार्यशाला का आयोजन किया गया था, इस कार्यशाला का विषय ''डिजिटल प्लैटफार्म पर राजभाषा हिंदी'' और इस विषय के मार्गदर्शक वक्ता थे, डॉ राकेश शर्मा, वरिष्ठ राजभाषा अधिकारी, राष्ट्रीय समुद्र विज्ञान संस्थान गोवा।

संस्थान के उप राजभाषा अधिकारी श्री. शशि विश्वकर्मा ने मुख्य वक्ता का परिचय उपस्थित मान्यवरों को कराया। माननीय निदेशक महोदय डॉ प्रवीण कुमार ने पुष्पगुच्छ देकर मुख्य वक्ता डॉ राकेश शर्मा का स्वागत किया और विषय के महत्व के बारे मे अपने विचार प्रस्तुत कर सभी गणमान्यों को अवगत कराया। डॉ राकेश शर्मा ने 'डिजिटल प्लैटफार्म पर राजभाषा हिंदी' यह विषय सभागृह में उपस्थित सभी स्तर के कर्मचारियों को परीचित कराया और हिंदी को आसान तरीके से केसे प्रस्तुत किया जाए उसपर विस्तार रुप से सभी को अवगत कराया। उन्होने हिंदी की सबसे आसान टंकण विधि के बारे मे जानकारी दी ताकि हिंदी के कार्यों मे कोई बाधा न आए।उक्त कार्यशाला में संस्थान के सभी स्तर के कुल 45 वैज्ञानिको/अधिकारियों/कर्मचारियों ने भाग लिया था।कार्यशाला के अंत में संस्थान के माननीय निदेशक महोदय डॉ प्रवीण कुमार और राजभाषा अधिकारी श्री राहुल कुलकर्णी ने सभी को आभार एंव धन्यवाद प्रकट किया।

भाकृअनुप - केंद्रीय तटीय कृषि अनुसंधान संसथान में ''कार्यालयीन पत्राचार'' विषय पर राजभाषा कार्यशाला

भाकृअनुप - केंद्रीय तटीय कृषि अनुसंधान संस्थान के प्रशासनिक कार्यों में राजभाषा के उपयोग को बढ़ावा देने के लिए दिनांक 24.06.2022 के दोपहर 3.00 बजे सम्मलेन कक्ष में ''कार्यालयीन पत्राचार'' विषय पर कार्यशाला का आयोजन संस्थान की राजभाषा अधिकारी एवं वरिष्ठ वैज्ञानिक डॉ. म तला जूलियट गुप्ता द्वारा किया गया था।

कार्यशाला में कार्यालयीन पत्राचार के बुनियादी तत्वों जैसे की कार्यालयीन पत्रों के प्रकार, उनकी भाषा एवं प्रकृति, स्वरूपगत ढाचों आदि के बारे में जानकारी प्रदान की गई अथवा विविध पत्रों यथा सरकारी पत्र, अर्ध सरकारी पत्र, अनुस्मारक, पावती, पृष्ठांकन, कार्यालय आदेश, परिपत्र आदि पर चर्चा एवं अभ्यास करवाया गया था। इस कार्यशाला में केंद्रीय हिंदी निदेशालय के मानव संसाधन विकास मंत्रालय के विडियो के प्रयोग से कार्यशाला को रोमांचक बनाया गया। इस कार्यशाला में संस्थान के 15 कर्मचारियों ने भाग लेकर लाभ उठाया।

भाकृअनुप - केंद्रीय तटीय कृषि अनुसंधान संसथान में ''टिप्पण का बुनियादी ज्ञान'' विषय पर कार्यशाला का आयोजन

भाकृअनुप - केंद्रीय तटीय कृषि अनुसंधान संस्थान के प्रशासनिक कार्यों में राजभाषा के उपयोग को बढ़ावा देने के लिए दिनांक 20.08.2022 के अपरान्ह 3.30 बजे सम्मलेन कक्ष में ङ्कटिप्पण का बुनियादी ज्ञानङ्क विषय पर कार्यशाला का आयोजन संस्थान के सहायक श्री. विश्वास शर्मा द्वारा किया गया था।

कार्यशाला में टिप्पण लेखन के बारे में विस्तारपूर्वक ज्ञान दिया गया जैसे की टिप्पण की परिभाषा, उसका महत्व, मूल संरचना , टिपण्णी के प्रकार , उसकी विशेषताएं , टिप्पण का उद्देश्य , उन्होंने यह भी बताया की टिप्पणी का प्रस्तुतीकरण कैसा होना चाहिए, जैसेकि अधिकारियों के पास समय की कमी रहती है और इस बात को ध्यान में रखकर आवश्यकता अनुसार कम-से-कम शब्दों में अधिक-से-अधिक आशय व्यक्त करना ताकि पढ़ने वालों को अपना निर्णय तुरन्त देने में कठिनाई महसूस न हो। इस कार्यशाला में संस्थान के 24 कर्मचारियों ने भाग लेकर लाभ उठाया।

भाकृअनुप - केन्द्रीय तटीय कृषि अनुसंधान संस्थान में ''कार्यालय संचालन में राजभाषा का योगदान'' विषय में राष्ट्रीयस्तर पर हिन्दी कार्यशाला का आयोजन

भाकृअनुप - केन्द्रीय तटीय कृषि अनुसंधान संस्थान में दिनांक 15.11.2022 को हिन्दी कार्यशाला का आयोजन ऑनलाइन माध्यम द्वारा किया गया था। इस कार्यशाला का विषय ''कार्यालय संचालन में राजभाषा का योगदान'' और मार्गदर्शक वक्ता श्री राजीव रंजन, मुख्य जनसम्पर्क अधिकारी - हरियाणा पावर यूटिलिटीस हरियाणा सरकार थे । संस्थान की राजभाषा अधिकारी डॉ मतला जूलियट गुम्मा ने कार्यशाला में उपस्थित सभी का स्वागत किया । माननीय निदेशक म होदय डॉ. प्रवीण कुमार ने इस कार्यशाला के मुख्य वक्ता का परिचय उपस्थित मान्यवरों को कराया। श्री राजीव रंजन ने अपने संबोधन में कहा की हिन्दी हमारी राजभाषा ही नहीं बल्कि मातृभाषा भी है। हिन्दी भाषा को माता का दर्जा देते हुए उन्होने ज़ोर दिया की वैज्ञानिक संस्थानो में अपने शोध कार्यों एवं विकास किए तकनीकियों का ज्ञान हिन्दी या स्थानीय भाषाओं में उसके मुख्य हितधारकों यात: किसान भाइयों एवं बहनों तक पहुँचाए ताकि वे उन्हें सहजता से अपना सकें। अंत में उन्होने राजभाषा के महत्व और उसे सरलता एवं सहजता से अपनाने के विषय पर प्रकाश डाला।

Events organized at ICAR –CCARI, Goa

Seminars, webinars, workshop, awareness programmes, campaigns and meets organized

National symposium on Self-Reliant Coastal Agriculture-2022

ICAR-CCARI, Goa organized a three days "National Symposium on Self-Reliant Coastal Agriculture" during 11-13 May, 2022 under *Azadi ka Amrit Mahotsav*. Shri Shripad Yesso Naik, Hon'ble Union Minister of State (Tourism, Shipyard and Waterways) Govt. of India was the Chief Guest of the inaugural function. Shri Nilesh Cabral, Hon'ble Minister of Environment, Legislative affairs, Law & Judiciary and Public Works Department, Govt. of Goa, Shri A. K. Mishra, IAS, Secretary (Agriculture, AH& VS), Govt. of Goa, Shri Mahesh Patil, Chairman, Goa State Pollution Control Board and Dr. Suresh Kumar Chaudhari, Deputy Director General (NRM), ICAR, New Delhi were the Guest of Honours. The inaugural function was also graced by Padma Shri Awardee Shri Amai Mahalinga Naik, Dr. Nevil Alphonso, Director of Agriculture, Dr. Agostinho Misquita, Director, Department of Animal Husbandry and Veterinary Services, Dr. Shamila Monteiro, Director of Fisheries, Directors and Ex-Directors of different ICAR Institutes. The inaugural function was attended by 160 participants physically and 100 participants virtually from different Institutes and Universities across the country.

One day State level workshop on *Kulagar*

ICAR-CCARI, Goa organized One day State level workshop on Kulagar on 26 May, 2022 for farmers and *Kulagar* stakeholders under *Azadi ka Amrit Mahotsav*. Shri Narendra Sawaikar, Chairman, Goa *Bagayatdar Sahakari*, Ponda, Goa was the Chief Guest of the workshop. Dr. Milind R Bhirud, General Manager, NABARD, Goa, Shri. Nevil Alphonso, Director, Directorate of Agriculture, Goa, Shri R. Ganesh, Assistant General Manager, Canara Bank, Goa and Shri Sachin Gharat, Chief Manager, Sales & Business Development, State Bank of India, Goa, were the Guest of Honours. Around 120 people attended the programme.

Campaign on Processing & Storage of Food grains & Pulses

ICAR–CCARI, Goa organized a campaign on "Processing & Storage of Food grains & Pulses" on 24 January, 2022. Dr. Parveen Kumar, Director, ICAR – CCARI inaugurated the campaign.

The program was attended by 35 farmers and farm women.

Awareness Program on Organic Farming and Kisan Mela

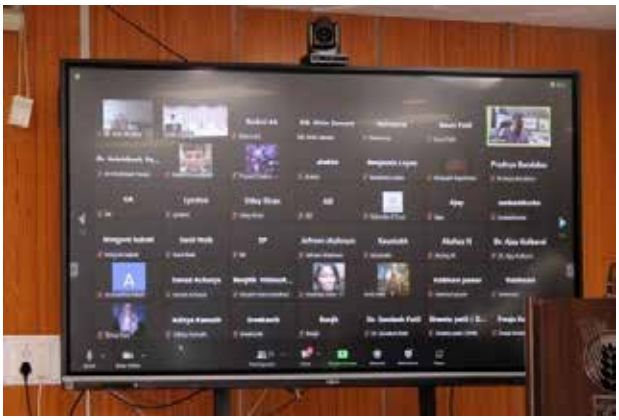
ICAR-CCARI, Goa organized an Awareness program on Organic Farming and Kisan Mela as a part of *Kisaan Bhagidari Prathmikta Hamari Abhiyaan*" under *Azadi Ka Amrit Mahotsav* on 26th April, 2022. Smt. Nirmala Sawant, Ex MLA, Cumbharjua, was the Chief Guest and Sri Uttam Murgaonkar, Sarpanch, Carambolim was the Guest of Honour. The programme was attended by 102 participants.

Awareness program on bamboo cultivation

ICAR–CCARI, Goa organized an awareness program on bamboo cultivation as a part of *Kisan Bhagidari Prathmikta Hamari* campaign under *Azadi Ka Amrit Mahotsav* on 25thApril, 2022. The program was attended by 42 participants.

National Campaign on "Emerging Aquaculture Systems and Practices"

On the occasion of 'National Fish Farmers Day, 2022', ICAR-CCARI, Goa, organised a national campaign on "Emerging Aquaculture Systems and Practices", through an online webinar on "Seaweed Aquaculture" on 11th July, 2022 under *Azadi Ka Amrut Mahotsav*. Dr. Vaibhav Mantri, Sr. Principal Scientist, CSMCRI, Bhavnagar, Gujarat was the resource person and a total of 70 participants attended the webinar.



Rabies awareness program on World Rabies Day

ICAR-CCARI, Goa in collaboration with Mission rabies India conducted a rabies awareness program for the Institute staff on 29th September, 2022. Dr. Murugan Appupillai, education director, Mission Rabies India was the chief guest and he gave a talk on rabies awareness. The program was attended by staff including scientists, technical officers, supporting staff, and contractual staff. The scientists had interaction with the chief guest about rabies disease mainly in livestock.

Web casting of PM *Kisan Samman Sammelan*

ICAR–CCARI, Goa organized the PM's address to the nation through webcasting programme at Sanquelim Municipal Council Hall, Sanquelim on *Kisaan Samman Sammelan* programme organized at ICAR– IARI, New Delhi on 17th October, 2022 under *Azadi ka Amrit Mahotsav*. Shri Vinay D. Tendulkar, Hon'ble Member of Parliament, Rajya Sabha, was the Chief Guest and Shri Kundan Fulari, Chairperson, Bicholim Municipal Council was guest of honour. During the webcasting all farmers witnessed the address by Hon'ble Prime Minister. The programme was attended by 168 farmers and farm women and councillors of Sanquelim and Bicholim.

Hon'ble Governor of Goa launched 'Rejuvenation of *khazan* lands' research project

A program was organized by the agriculture and food processing committee of Goa Chamber of Commerce and Industry (GCCI) on 19 November. 2022 for the launch of a research project on the rejuvenation of *Khazan* lands (coastal saline soils) of Goa being implemented by ICAR-CCARI, Goa. Shri P.S. Sreedharan Pillai, Hon'ble Governor of Goa was the chief guest of the program.

Dr. Parveen Kumar, Director, Shri. Sandeep T. Nadkarni, Ex-Chief Engineer, Water Resource Department, Goa. Mr. Ralph de Souza, President, GCCI were also present.

Days Celebrated

National Girl Child Day

ICAR–CCARI, Goa celebrated National Girl Child Day on 24th January, 2022. Dr. Parveen Kumar, Director, ICAR–CCARI, Goa was the Chief Guest and Mrs. Chaya Kadkade, Project Officer, Women & Child Development, Government of Goa, was Guest of Honor. During the programme two Anganwadi worker were felicitated for their contribution towards Girl Child Development. The program was attended by 35 *Anganwadi* workers of Department of Women & Child Development, Government of Goa.

Piggery Farmers' Field Day

The piggery farmers' field day programme was organized during 24-25th January, 2022 at ICAR-CCARI, Goa. A team of scientist visited the farms of 15 progressive pig farmers from Nagoa-Verna, Loutlim and Raigini-Bandora, Aldona and Khorjuva villages. Awareness on scientific pig rearing and demonstration of nutritional, breeding and reproductive management was highlighted to the farmers. The farmers were also provided with mineral blocks and vaccination of stocks was done by Classical Swine Fever vaccine to around 100 nos. of pigs of aforementioned villages. Blood samples (35 nos.) were collected from the Agonda Goan pigs of these places for DNA repository in the institute gene bank.

World Pulse Day

ICAR-CCARI, Goa celebrated 'World Pulse Day' on 10th February, 22 at Parra village of Goa. Farmers were enlightened about the importance of celebrating World Pulsed Day and were briefed about the biological nitrogen fixation by legumes and pulses and its usefulness in reducing the use of fertilizers. Emphasis was also given on increasing pulse production and productivity. The programme was attended by 39 farmers.

International Women's Day

ICAR - CCARI, Goa celebrated, International Women's Day on 8th March, 2022, at ICAR – Krishi Vigyan Kendra, North Goa. Mrs. Sulakshana Sawant, Social Worker, was Chief Guest and Dr. Parveen Kumar, Director, ICAR – CCARI, Goa were guest of honour. The program was attended by 152 farm women from different villages of North Goa and Institute staff.

Field Day on Scientific Coconut Cultivation

ICAR–CCARI, Goa organized a Field Day on Scientific Coconut Cultivation, under *Azadi Ka Amrit Mahotsav* at Assonora, Bardez, Goa on 21st March, 2022. The programme was attended by 30 farm women.

33rd Foundation Day

ICAR-CCARI, Goa celebrated its 33rdFoundation Day on 1stApril, 2022. Shri Arun Kumar Mishra, IAS, Secretary (Animal Husbandry & Veterinary Services, Social Welfare, Power, Environment) Government of Goa was the Chief Guest and Dr. Dinesh Kannan, IFS, Conservator of Forest (Conservation) was the Guest of honour. The foundation day was also graced by Dr. Agostinho Misquita, Director, Department of Animal Husbandry and Veterinary Services, Dr. Shamila Monteiro, Director of Fisheries, Shri D. V. Vinod, IIS, Deputy Director, PIB, Bro. Prem Sg., Director & Principal of Montfort Academy and retired Institute staff.

8thInternational Day of Yoga

The 8thInternational Yoga Day was celebrated at ICAR-Central Coastal Agricultural Research Institute, Goa under *Azadi ka Amrit Mahotsav* with much enthusiasm and zeal. Mass yoga demonstrations were held from 18th to 20th June 2022 between 7:00 to 8:00 AM. On 21st June the employees of the institute performed live yoga demonstration, lead by yoga guru Sh. Shailendra Gupta.

Piggery Farmers' Field Day

ICAR-CCARI, Goa organized a field day for piggery farmers on 27th July 2022 under ICAR-AICRP on Pig. Scientists visited the progressive pig farmers' fields in Agassaim and Cortalim villages of Goa. Awareness among the farmers was created for scientific pig rearing emphasizing nutritional, breeding as well as reproductive management and on pig diseases, especially Swine Fever. The stocks (around 200 nos. of pigs) in the aforementioned villageswere vaccinated with the Classical Swine Fever (CSF) vaccine. Blood samples were collected to study the pre-CSF and post-CSF titre content. The farmers were also provided with deworming medicines (around 250 doses) for pigs.

World Nature Conservation Day

ICAR–CCARI, Goa celebrated the 'World Nature Conservation Day' on 28th July, 2022, as a part of Azadi Ka Amrut Mahotsav. The theme of the program was 'Cut down on Plastic Use'. The program was organized in collaboration with St. Michael High School, Taleigao and was attended by 145 students and teachers.

Van Mahotsav in collaboration with Goa Forest Department

ICAR–CCARI, Goa celebrated *Van Mahotsav* on 1st August, 2022 in collaboration with the Forest Department Goa under the *Azadi Ka Amrit Mahotsav*. Shri Rajiv Kumar Gupta, IFS, Principal Chief Conservator of Forests, Goa was the Chief Guest of this function. Dr. Parveen Kumar, Director of ICAR-CCARI, Goa welcomed the guests. A total of 100 participants were present on the occasion and actively participated in the tree seedling planting of Sandalwood (*Santalum album*), Red Sanders (*Pterocarpus santalinus*) and Malabar Neem (*Melia dubia*).

World Coconut Day

World coconut day was celebrated at ICAR-CCARI, Goa on 2nd September, 2022. During the event, twenty two farmers, farm workers & *padelis* participated in the event. Dr. Parveen Kumar, Director ICAR-CCARI chaired the inauguration and briefed the participants about the World Coconut day, its genesis and importance of coconut in sustainable livelihoods of coconut growers and health of consumers. The trainees visited the experimental fields and nursery of the institute and attended a demonstration of the coconut climbing device, which was also practiced by few of the trainees. Participants visited the virgin coconut oil plant at ICAR-KVK, North Goa and coconut-fodder plot.

World Egg Day 2022

Ethnic egg recipe competition was organized at ICAR-CCARI on 14th October 2022 to mark the occasion of World Egg Day 2022. A total of 20 ethnic recipes were presented and judged for the best recipes. On this occasion, a lecture on "Eggs for better life" was delivered by Dr. R. Solomon Rajkumar, Senior Scientist (Livestock Products Technology) highlighting their versatility and the benefits they bring to people of all ages. During the valedictory function, Mrs. Varsha Naik, Faculty of Food Science, Nutrition and Dietetics, Goa College of Home Science emphasized the "Eat right" concept of a balanced diet and especially the inclusion of eggs in the right proportion. Dr. Parveen Kumar, Director, ICAR-CCARI reminded the gathering that an egg is excellent in terms of nutritional content as well as affordability. ICAR-CCARI celebrated world egg day by distributing eggs and creating awareness about egg consumption under STC on 14th October 2022 in government primary school, Arla-Keri, Ponda (Goa). The objective was to create awareness about eggs of various species like quail, duck, turkey, guinea fowl which are fit for human consumption and to highlight the importance of consuming eggs. A total of 50 students of the school received various inputs like fertile eggs, table eggs (500 no's) quail eggs (1000no's) and writing kits.

World Soil Day 2022

ICAR celebrated the World Soil Day on 5thDec. 2022 at ICAR-CCARI, Goa. Shri Shripad Yesso Naik, Ministry of Tourism and Port, Shipping and Waterways, Government of India graced the occasion as Chief Guest. Dr Himanshu Pathak, Secretary (DARE) & Director General (ICAR) Guest of Honour joined the programme in the virtual mode. Dr S. K. Chaudhari, Deputy Director General (Natural Resource Management), ICAR, New Delhi and Guest of Honour briefed the audience about the importance of soil in food production. More than 100 farmers joined physically and about 6000 scientists, technical staff of ICAR joined the program virtually across the nation. On this occasion, soil health cards were also distributed to 100 farmers.

Kisaan Diwas

ICAR–CCARI Goa celebrated 'Kisaan Diwas' on 23rd December, 2022 in collaboration with Agriculture Technology Management Agency (ATMA) – North Goa and Zonal Agriculture Office, Pernem. Around 50 farmers and farm women participated in this programme.

Participations in exhibitions/ Programmes

Participation in *Krishi Mahotsav*

ICAR–CCARI, Goa participated in the *Krishi Mahotsav* at Quepem, South Goa on 4th January, 2022. The program was inaugurated by Shri Narendra Singh Tomar, Hon'ble Union Minister of Agriculture & Farmers Welfare. In presence of Dr. Pramod Sawant, Hon'ble Chief minister, Goaand Shri Chandrakant Babu Kavlekar, Hon'ble Deputy Chief minister and Minister of Agriculture, Goa. Dr. Parveen Kumar, Director, ICAR–CCARI felicitated the Chief Guest Shri Narendra Singh Tomar, Hon'ble Union Minister of Agriculture & Farmers Welfare. ICAR–CCARI participated in the exhibition by showcasing various institute technologies for the benefit of farmers. More than 3000 farmers visited our stall and got information of agricultural technologies.

International Science Film Festival exhibition

ICAR-CCARI Goa participated in the International Science Film Festival exhibition as part of *Kisaan Bhagidari Prathmikta Hamari Abhiyaan* under *Azadi Ka Amrit Mahotsav* on 28th April, 2022 at Panaji, Goa. The exhibition was inaugurated by Dr. Pramod Sawant, Hon'ble Chief Minister, Govt. of Goa. A total of 305 farmers, students and teachers visited our stall and showed interest in learning many of our technologies like new cashew varieties, salt tolerant rice varieties, vermi-composting, virgin coconut oil, fodder varieties, bypass fat, plant propagation and protection.

Memorandum of Understanding/ Agreement Signed

ICAR-CCARI, Goa inks MoA with KVASU, Kerala for Establishment of FPO/SHGs for Tribal Farmers

A Memorandum of Agreement (MoA) was signed on 21.03.2022 between ICAR-Central Coastal Agricultural Research Institute (ICAR-CCARI), Goa and Kerala Veterinary and Animal Sciences University (KVASU), Pookode, Kerala for collaboration and for the establishment of Farmer Producer Organization (FPO)/Self Help Groups (SHGs)/Community Organizations (COs) of Tribal farmers of Coastal Districts of Kerala.

ICAR-CCARI, Goa inks Tripartite Agreement with Krishi Vigyan Kendra, South Goa and Directorate of Industries, Trade and Commerce (DITC), Goa for establishing CIC under PMFME scheme

A Tripartite Agreement was signed by ICAR-CCARI, Goa with Krishi Vigyan Kendra, South Goa and Directorate of Industries, Trade and Commerce (DITC), Goa for establishing a Common Incubation Centre (CIC) under Pradhan Mantri Formalisation of Micro food processing Enterprises (PMFME) scheme on 01-04-2022 at ICAR-CCARI, Goa. ICAR-CCARI, Goa will act as a Mentor Institute and play a key role in the establishment of the CIC, demonstration and operation. The CIC is expected to benefit entrepreneurs of South Goa district in processing coconut and local seasonal fruits.

ICAR-CCARI, Goa inks Memorandum of Understanding (MoU) with Professor Jayashankar Telangana State Agricultural University (PJTSAU), Hyderabad for promotion of students' training and quality postgraduate research

A Memorandum of Understanding (MoU) was signed between ICAR-CCARI, Goa with Professor Jayashankar Telangana State Agricultural University (PJTSAU), Hyderabad on 30th March, 2022 for promotion of students' training and quality postgraduate research. The two Institutions, having discussed fields of common research interests and allied activities, decided to enter into long-term collaboration for promotion of students' training and quality postgraduate research in cutting edge areas.

ICAR-CCARI, Goa inks MoA with a-IDEA, NAARM, Hyderabad

The ICAR-Central Coastal Agricultural Research Institute (ICAR-CCARI), Goa signed a Memorandum of Agreement (MoA) with Association for Innovation Development of Entrepreneurship in Agriculture (a-IDEA), Technology Business Incubator of ICAR National Academy of Agricultural Research Management (NAARM), yderabad, Telangana on 8th July 2022. Both the parties recognised their respective strengths and mutually agreed to co-operate for accessing the laboratory infrastructure facilities and mentoring under the Incubation programme of a-IDEA, NAARM which aims to promote entrepreneurship in agriculture and allied sectors.

ICAR-CCARI, Goa inks MoA with Milestone Resorts, Goa for promoting agro-ecotourism

ICAR-Central Coastal Agricultural Research Institute (ICAR-CCARI), Goa signed a Memorandum of Agreement (MoA) with the Milestone Resorts, Candolim, Goa on 22nd September 2022 for promoting agro-ecotourism. The Institute will undertake contract research on the "Assessment of agro-ecotourism conceptual framework models in an island ecosystem of Goa".

PMFME Sponsored Training Programmes for SHG Seed Capital Beneficiaries of Goa

Six training programmes, funded by Pradhan Mantri Formalization of Micro Food Processing Enterprises for Seed Grant Self Help Group Beneficiaries were organized at ICAR-CCARI during the year 2022. The training was co-ordinated by Dr. Mathala Juliet Gupta, Senior Scientist (AS&PE). The beneficiaries were trained on various aspects of the PMFME Scheme, establishing an enterprise &marketing, branding, sales & distribution, digital marketing, food safety &standards, *Udyami* Registration, GST registrations and its returns, packaging technology & FSSAI packaging and labelling requirement, food domains, basics and economics of value addition, hands on demonstration in lab on processing, value addition for major fruits, vegetable and plantation and spice crops of Goa at Post-Harvest laboratory of ICAR-CCARI and VCO unit of KVK, North Goa. The trainers were Dr. Mathala Juliet Gupta, Mrs. Sunetra Talulikar, SMS (Home Science), KVK North Goa, Er. Vinod Atkari, Assoc. Prof. Ag. Engg. Don Bosco College of Agriculture, Sulcorna, Sh. Pravin Sabnis, Sh. Atul Anand Desai, Food Safety Officer, FDA, Bambolim, Goa.

PMFME Trainings - 2022

Sl. No.	Name of the training	Date	Number of beneficiaries	Block name
1.	New Beneficiary Training on Fruits & vegetables crop processing	06/06/2022	21	Ponda, Sattari, Pernem, Bicholim, Bardez
2.	Seed Capital SHG Training	16/12/2022	24	Bardez
3.	Seed Capital SHG Training	20/12/2022	21	Bicholim
4.	Seed Capital SHG Training – Batch I	21/12/2022	22	Bardez
5.	Seed Capital SHG Training – Batch II	21/12/2022	21	Bardez
6.	Seed Capital SHG Training	27/12/2022	17	Bicholim

Distinguished Visitors

Board of Trustees for CIFOR-ICRAF visited the FLD trial of ICAR-CCARI, Goa

On the 3rd December, 2022, Board of Trustees (BoT) for CIFOR- ICRAF visited the Front Line Demonstration (FLD) trial of released varieties and promising superior lines of cashew established by ICAR-CCARI, Goa, at Ziltawadi, Canacona, Goa. The field trial have been established in a participatory model with scheduled tribe farmers of the Ziltawadi Farmer Self Help Group under the Scheduled Tribe Component funded by the Government of India. The BoT members interacted with the tribal farmers and appreciated the work done by the ICAR-CCARI, team in promoting plantation-based agroforestry systems, viz., cashew-based agroforestry systems and coconut-arecanut-based agroforestry systems, for the upliftment of small and marginal farmers in coastal regions of India.

Shri Vijay Kumar, Member of Parliament, Gaya, Bihar visits ICAR- CCARI, Goa

Shri Vijay Kumar, Member of Parliament, Gaya, Bihar visited ICAR-CCARI, Goa on 22nd April 2022. Dr. Parveen Kumar, Director, ICAR CCARI, briefed the guest about the mandate, significant achievements and ongoing activities of the Institute. Later on, Shri Vijay Kumar visited Institutes experimental plots and discussed about the red rice varieties grown in Goa and their feasibility in Bihar condition.

Deputy Director General (Natural Resource Management) visited ICAR- CCARI, Goa.

Dr. Suresh Kumar Chaudhari, Deputy Director General (Natural Resource Management), ICAR, New Delhi visited Institute on 07 November, 2022. He inaugurated the Central Instrumentation Facility (CIF) at the Institute. After the inauguration of CIF, a meeting with the scientific, technical, administrative and skilled support staff of ICAR was organized at the Conference Hall. He has emphasised collaborating with various coastal institutes to develop action plans. He has stressed on having two model outreach programmes in team mode, one in North Goa and another in South Goa.

Delegates of AdaptNET project visited ICAR-CCARI

Delegates participated in the final conference of the Adapt NET project (Strengthening Research, Education and Innovation for Climate Smart crops in Southeast Asia) held in Goa during 13-15 visited ICAR-CCARI on 14th June 2022.

ADG (IP&TM) visited ICAR-CCARI, Goa

Dr K. Srinivas, Assistant Director General (Intellectual Property & Technology Management) visited ICAR-CCARI, Goa and interacted with the scientists about IPR and ABI related issues including ICAR branding. He emphasized on advertising about institute technologies in social media platforms like Instagram and LinkedIn. He has also discussed about how to increase the revenue generation out of the institute technologies.

Date	Name of Visitor	Designation/ Institute/ Place
06-01-2022	Dr. S. K. Malhotra	Ex-Agriculture & Horticulture Commissioner, Government of India
06-01-2022	Dr. Venkatesh Hubballi	Director DCCD, Cochin
01-04-2022	Shri Arun Kumar Mishra, *IAS*	Secretary (Animal Husbandry & Veterinary Services, Social Welfare, Power, Environment) Government of Goa
01-04-2022	Dr. Dinesh Kannan, *IFS*	Conservator of Forest (Conservation)
01-04-2022 11-05-2022 24-06-2022	Dr. Agostinho Misquita	Director, Directorate of Animal Husbandry and Veterinary Services, Government of Goa
01-04-2022 11-05-2022	Dr. Shamila Monteiro	Director, Directorate of Fisheries, Government of Goa
22-04-2022	Shri Vijay Kumar	Member of Parliament, Gaya, Bihar
11-05-2022 05-12-2022	Shri Shripad Yesso Naik	Hon'ble Union Minister of State (Tourism, Shipyard and Waterways) Govt. of India
11-05-2022	Shri Nilesh Cabral	Hon'ble Minister of Environment, Legislative affairs, Law & Judiciary and Public Works Department, Govt. of Goa
11-05-2022	Shri A. K. Mishra, *IAS*	Secretary (Agriculture, AH& VS), Govt. of Goa

11-05-2022	Shri Mahesh Patil	Chairman, Goa State Pollution Control Board
11-05-2022 07-11-2022 05-12-2022	Dr. Suresh Kumar Chaudhari	Deputy Director General (NRM), ICAR, New Delhi
11-05-2022	Shri Amai Mahalinga Naik	Padma Shri Awardee Farmer
11-05-2022 26-05-2022	Nevil Alphonso	Director, Directorate of Agriculture, Government of Goa
26-05-2022	Shri Narendra Sawaikar	Chairman, Goa BagayatdarSahakari, Ponda
26-05-2022	Dr. Milind R Bhirud	General Manager, NABARD, Goa
01-08-2022	Shri Rajiv Kumar Gupta, *IFS*	Principal Chief Conservator of Forests, Goa
07-11-2022	Dr. Javed Rizvi	Director, CIFOR-ICRAF, Asia
07-11-2022	Dr. Chandrashekhar Biradar	Country Director, CIFOR-ICRAF
07-11-2022	Dr. Shiv Kumar Dhyani	Country Coordinator, CIFOR-ICRAF
07-11-2022	Dr. A. Arunachalam	Director, ICAR-Central Agroforestry Research Institute, Jhansi

Research Advisory Committee

The IX Research Advisory Committee (RAC) for ICAR- Central Coastal Agricultural Research Institute was constituted for a period of three years from 14/08/2020 to 13/08/2023. The composition of RAC is given below.

Sl.No.	Name and address	
1.	Dr. Tapas Bhattacharya Ex- Vice Chancellor, Dr BSKKV, Dapoli, Bunglow No 11, Jayanti Nagari 2, BESA Nagpur – 4440031, Maharashtra	Chairman
2.	Dr. MA Shankar Ex- Director of Research, UAS, Bengaluru, 1st Main Road, HGH layout, Ganganagar, Bengaluru- 560032, Karnataka	Member
3.	Dr. V. L. Deopurkar Ex- Director of Research, MAFSU Om Bangla, Plot No-88, Sangam Society, Bibvewadi, Pune – 411037, Maharashtra	Member
4.	Dr. M. R. Dinesh Ex-Director, ICAR-IIHR, Bengaluru	Member
5.	Dr. Baban Ingole Visiting Scientist, ESSO-National Centre for Polar & Ocean Research, Vasco, Goa	Member
6.	Dr. Anupam Mishra Vice-Chancellor, CAU, Imphal	Member
7.	Dr. Adlul Islam Assistant Director General (SWM) NRM, ICAR, KAB-II, Pusa, New Delhi - 110012	Member
8.	Dr. Parveen Kumar Director, ICAR-CCARI, Goa	Member
9.	Dr. R. Solomon Rajkumar Senior Scientist, ICAR-CCARI, Goa.	Member Secretary

The second meeting of IX RAC was held during 27-28th August, 2022 at the Institute. The meeting was chaired by Dr. Tapas Bhattacharyya, Chairman, and attended by following members Dr. M A Shankar, Dr. M. Dinesh, Dr. Baban Ingole, Dr. Anupam Mishra, Dr. Adlul Islam, Dr. Parveen Kumar and Dr. R. Solomon Rajkumar, Member Secretary, along with Scientists of the Institute and Programme Co-ordinator and Subject Matter Specialists, KVK, North Goa. At the outset Dr. Parveen Kumar, Director of the Institutewelcomed the dignitaries and briefed the committee about the

ongoing research projects along with research achievements of the past year. The Member Secretary, RAC presented the action taken report on the recommendations of the first meeting of IXRAC which was followed by the presentation of the research achievements along with detailed action taken report by In-Charges of Sections. The chairman and members of RAC appreciated the achievements made with the scientific and technical manpower.

The approved RAC recommendations are as follows:

1. Coastal Agricultural Information System (CAIS) should be converted to a viable Coastal Agricultural Information Technology (CAIT) to meet the challenges of fragile coastal ecosystem.
2. Strategies for crop production, molecular characterization and broadening of genetic base with respect to prioritised horticultural and other crops should be further strengthened.
3. Integrated Nutrient Management (INM) and Integrated Pest and Disease Management (IPDM) practices should be worked out for the varieties released from the institute for various crops.
4. Technologies to enhance milk production and management of mastitis and infertility in livestock should be developed.
5. Enhancement of the estuarine fish production through technological interventions required.

Institute Research Council Meeting

The 33rdAnnual Institute Research Council meeting of the Institute was held during 22-26th August 2022. The meeting was chaired by Dr. Parveen Kumar, Director of the Institute. He welcomed all the scientists and highlighted about the importance of this meeting. In the inaugural remarks, Chairman, IRC and Director, Dr. Parveen Kumar, briefed the house about the Institute achievements in the last one year. Dr. K. P. Ramesha, Principal Scientist and Head, ICAR-NDRI, Bengaluru, was present on the first day of the meeting as special invitee to review the ongoing institute and externally funded projects in animal sciences and fisheries section. The scientists made their deliberations on the actions taken on recommendations of last IRC meeting and research activities carried out during last one year. The chairman reviewed all the projects thoroughly and made critical comments for the further improvement of projects.

The IRC reviewed the progress made under various research projects for the year 2021-22 and finalized the technical programmes of the ongoing research projects for the year 2022-23. The details of IRC are as follows:-

Dr. Parveen Kumar	Director, ICAR-CCARI, Goa	Chairman
All Project Leaders	ICAR-CCARI, Goa	Members
Dr. Manohara K. K.	Senior Scientist (Genetics & Plant Breeding) ICAR–CCARI, Goa	Member Secretary

Institute Management Committee

The Institute Management Committee is constituted for financial and administrative guidance of Institute by the council for a period of three years from 22/06/2020 to 21/06/ 2023. Following is the composition of the IMC:

Name	Address	Designation
Dr. Parveen Kumar	Director ICAR – CCARI, Old Goa	Chairman
Shri Nevil Alfanso	Director of Agriculture Directorate of Agriculture, Govt. of Goa, Krishi Bhavan, Tonca, Caranzalem, Goa.	Member
Dr. B N Sawant,	Associate Director of Research RFRS, Vengurla, 416516	Member
Dr. P C Haldvanekar	Associate Dean College of Horticulture, Dr. BSKKV, Dapoli	Member
Dr. Jagdish Rane	In-charge Head School of Drought Stress Management, ICAR-NIASM, Malegaon, Baramati -413 115	Member
Dr. J. Loka	Principal Scientist & I/c. Karwar Research Centre of CMFRI, Karwar, Karnataka	Member
Dr. Ravi Bhat	Acting Head Division of Crop production, ICAR-CPCRI, Kudlu P.O Kasargod	Member
Dr. K N Bhilegaonkar	I/c IVRI regional Station Agriculture College Campus, Shivajinagar, Pune	Member
Dr. Adlul Islam	ADG (S&WM) NRM Division ICAR, New Delhi	Member
Shri Saurabh Muni	Sr. Finance & Accounts Officer IARI, New Delhi	Member
Smt. Montia Rita D'Silva	Administrative Officer ICAR-CCARI, Old Goa	Member Secretary

The 51st Institute Management Committee (IMC) Meeting of the institute was held on 15th June, 2022. The IMC members appreciated the research and extension achievements made by ICAR-CCARI in the last one and a half year and congratulated the Director and entire team of ICAR-CCARI.

Interface meeting with Line Departments of Goa State

ICAR-Central Coastal Agricultural Research Institute (ICAR-CCARI), organized an interface meeting with officers of Directorate of Agriculture, Department of Animal Husbandry and Veterinary Services, and Directorate of Fisheries, Government of Goa on 24th June 2022 at ICAR-CCARI, Old Goa under *Azadi Ka Amrit Mahotsav,* to discuss various researchable issues pertaining to agriculture and allied sectors. Dr. Parveen Kumar, Director, ICAR-CCARI, Dr. Agostinho Misquita, Director, Department of Animal Husbandry and Veterinary Services, Shri. Shiwanand Wagle, Deputy Director of Agriculture (Extension), graced the meeting. The meeting was attended by 45 participants including all the Scientists of ICAR-CCARI, Programme Coordinator and Subject Matter Specialists of KVK North and South Goa, and officers from line departments. Officers from Goa Biodiversity Board and Forest department also participated in the meeting and given their valuable inputs. During the meeting, action points pertaining to decisions of the last year meeting was discussed. New agenda points received for the current meeting were discussed in length and action points were formulated to address the same. The meeting was co-ordinated by Dr. Manohara, K. K., Member Secretary, Interface meeting.

Stakeholders meet on kokum and jackfruit

ICAR-CCARI, Goa organized 'Stakeholders meet on Kokum and Jackfruit' on 22nd July 2022 in zoom platform under *Azadi ka Amrit Mahotsav*. Dr. Parveen Kumar, Director, ICAR-CCARI emphasised the relevance of kokum and jackfruit crops in his introductory remarks and explained the research activities carried out by ICAR-CCARI in these crops. Around 50 participants from different coastal states interacted in the meeting and expressed the research and promotional needs in these crops.

Institute

Sr. No.	Name	Designation	Additional Charge
Research Management			
1.	Dr. Parveen Kumar	Director	
Scientific Staff			
2.	Dr. SK Singh (Uptill 30-06-2022)	Principal Scientist (Soil Science)	
3.	Dr. A. Raizada (From 11-05-2022)	Principal Scientist (Agroforestry)	NRM
4.	Dr. V Arunachalam	Principal Scientist (Horticulture)	Horticultural Science
5.	Dr. R Ramesh	Principal Scientist (Plant Pathology)	Crop Science,
6.	Dr. A R Desai	Principal Scientist (Horticulture)	
7.	Dr. Manohara K K	Senior Scientist (Plant Breeding)	IRC
8.	Dr. Mathala Juliet Gupta	Senior Scientist (Agricultural Structures and Process Engineering)	TSP
9.	Dr. Shirish D. Narnaware (From 02-05-2022)	Senior Scientist (Veterinary Pathology)	Animal and Fishery Science
10.	Dr. R Solomon Rajkumar	Senior Scientist (Livestock Products Technology)	RAC/RKVY
11.	Dr. R Maruthadurai	Senior Scientist (Agricultural Entomology)	Library
12.	Dr. Gokuldas P P	Senior Scientist (Animal Reproduction)	KRISHI Portal
13.	Dr. Mahajan GR	Senior Scientist (Soil Science)	AKMU Cell ,
14.	Dr. Shripad Bhat	Senior Scientist (Agric.Economics)	PME/ IPR / PIMS
15.	Dr. Susitha Rajkumar	Senior Scientist (Vet. Pathology)	
16.	Dr. Sreekanth GB	Senior Scientist (Fisheries Res. Manag.)	
17.	Dr. Uthappa AR	Scientist (Agroforestry)	
18.	Dr. Chaudhari Ganesh Vasudeo	Scientist (Vegetable Science)	
19.	Shri Trivesh S Mayekar	Scientist (Fish Genetics and Breeding)	
20.	Dr. Maneesha SR (uptill 30-08-2022)	Scientist (Fruit Science)	
21.	Dr. Paramesha V	Scientist (Agronomy)	
22	Dr. Bappa Das	Scientist (Agricultural Meteorology)	

23.	Dr. Sujeet Desai	Scientist (Land and Water Management Engineering)	HRD
24	Dr. Nibedita Nayak	Scientist (Poultry Science)	
25	Dr. Amiya Ranjan Sahu	Scientist (Animal Genetics and Breeding)	
Technical Staff			
1.	Ms. MadinaSollapuri	Assistant Chief Technical Officer (Estate)	
2.	Mr. Vinod Ubarhande	Farm Superintendent	On Study Leave
3.	Mr. Rahul Kulkarni	Senior Technical Officer (Agronomy)	
4.	Mr. Sidharth K. Marathe	Senior Technical Officer (PME Cell)	
5.	Ms. Pranjali Wadekar	Senior Technical Officer (AKMU)	
6.	Mr. Edward Crasto (Uptil31-05-2022)	Technical Officer (Stockman)	
7.	Mr. Yoganand Gaude	Technical Officer (Electrical)	
8.	Mr. Suresh M Gomes	Technical Officer (Tractor Driver)	
9.	Mr. Omar Illroy Francisco De Ursula	Sr. Technical Assistant	
10.	Mr. Prakash Parwar	Sr. Technician	
11.	Mr. Gokuldas Gawas	Sr. Technician	
12	Mr. Datta Velip	Sr. Technician	
13.	Mr. Laxman Naik	Sr. Technician	
Administrative & Accounts Staff			
1.	Ms. Montia Rita D'Silva	Administrative Officer	
2.	Smt. Anupama N K. (From 09-12-2022)	Finance & Accounts Officer	
3.	Ms. Lizette Maria Carmel Noronha	Private Secretary	
4.	Ms. Sneha Arlekar	AssistantAdministrative Officer	Works
5.	Ms. Pratibha Sawant	Assistant Administrative Officer	Accounts
6.	Ms. Sohini Sawant	Assistant	Estt./ Bills
7.	Ms. Tarika Ussapkar	Personal Assistant	
8.	Mr. Vinod Pagi	Assistant	
9.	Ms Bushra Ansari	Stenographer Grade III	
10.	Ms. Chitra Kankonkar	UDC	
13.	Mr. Vyas Hiren Kumar	UDC	
14.	Ms. Sujatha S. Kamble	LDC	
15.	Ms. Swati Khandeparkar	LDC	
16.	Ms .Kushmala Chalawadi	LDC	
17.	Smt. Sarita Shelko	LDC	

Skilled Supporting Staff	
1.	Mr. Subhash Melekar
2.	Mr. DhakuKankonkar
3	Mr. Ashok Gadekar
4.	Mr.Chimmnu Tivrekar (Uptil 31-05-2022)
5.	Mr. Anil Khandeparkar
6.	Ms. Maria S Dias
7.	Mr. Giri Madkaikar
8.	Mr. Umesh Marcelkar
9.	Ms. Prafulla Khandeparkar

10.	Ms. Rekha U Naik
11.	Ms. Lalitha Naik
12.	Ms. Partibha Folkar
13.	Mr. Ravi S Kadam
14.	Mr. Vilas P Gaonkar
15.	Mr. Prabhakar Goankar
16.	Mr. Sitaram Kuncolikar
17.	Ms. Janika S Shirodkar
18.	Mr. Shanu G Velip
19.	Mr. Nitin J Naik
20.	Mr. Prallhad Zambaulikar

KVK

Sr. No.	Name	Designation	Additional Charge
Technical Staff			
1.	Mr. HRC Prabhu	Subject Matter Specialist T-9 (Plant Protection)	Programme Co-ordinator
2.	Ms. Sunetra Talaulikar	Subject Matter Specialist T-9 (Home Science)	
3.	Dr. Sanjay Kumar Udharwar	Subject Matter Specialist T-6 (Animal Science)	Study Leave
4.	Dr. Monica Singh	Subject Matter Specialist T-6 (Agricultural Extension)	
5.	Mr. Shashi Vishwakarma	Senior Technical Officer	
6.	Mr. Vishwajeet Prajapati	Technical Officer	
7.	Mr. Dilkush Velip	Technical Assistant (Driver)	
8.	Mr. Payak J Padkar		
Administrative Staff			
1.	Mr. Vishwas Sharma	Assistant	
2.	Ms. Shreya C. Barve	Stenographer Grade III	

Staff activities

Foreign Deputation:

1) Dr. Mahajan Gopal Ramdas, Senior Scientist (Soil Science) has been permitted to avail Fulbright Nehru Fellowship 2021-22 at University of California Riverside United States for a period of nine monthsw.e.f 31-03-2022.

2) Dr. R. Solomon Rajkumar, Senior Scientist (Livestock Products Technology) to receive International Association for Food Protection (IAFP) International student Award 2022, awarded during his Ph.D programme (in-service) 2018-2021 & to participate in various session of IAFP 2022 at Pennsylvania, USA during 31-07-2022 to 03-08-2022

Post-Doctoral Fellowship:

1) Dr. Sreekanth G.B., Senior Scientist (Fisheries Resource Management) has been deputed for study leave for pursuing the Post-Doctoral Fellowship 2022-23 in Aquatic Environment Management (AEM) at Keral University of Fisheries and Ocean Studies (KUFOS), Kochi for a period of one year w.e.f. 15-10-2022.

Study Leave:

1) Shri Vinod A. Ubarhande, Farm Suptd/ACTO has been granted study leave for the academic year 2021-2022 for pursuing Ph.D. at college of Agriculture, Hyderabad, w.e.f. 15-01-2022.

Appointments/ Joining

Name	Post	Date of Joining
Smt. Anupama N K	Finance & Accounts Officer	09-12-2022

Promotions

Name/designation of the Officials	Promoted/Granted higher Grade Pay in the Pay band/level	Date of promotion
Smt. Shreya C. Barve, Steno Gr-III	Personal Assistant	01-01-2022
Dr. R. Solomon Rajkumar, Scientist (LPT)	Placed in Level 12 (pre-revised pay Rs. 15600-39100 + RGP Rs. 8000 /- and re-designated as **Sr. Scientist** from 30-06-2021 i.e. the date of acquiring Ph. D	09-11-2019
Dr. Maruthadurai R. Scientist (Entomology)	Placed in Level 12 (pre-revised pay Rs. 15600-39100+RGP Rs. 8000 /-) and re-designated as **Sr. Scientist**	27-04-2020
Dr. P.P. Gokuldas, Scientist (Animal Reproduction)	Placed in Level 12 (pre-revised pay Rs. 15600-39100+ RGP Rs. 8000 /-) and re-designated as **Sr. Scientist**	25-06-2020
Shri Trivesh S. Mayekar Scientist (Fish Genetics & Breeding)	Placed in Level 11 (pre-revised pay Rs. 15600-39100+ RGP Rs. 7000 /-)	01-01-2019
Dr. Paramesha V. Scientist (Agronomy)	Placed in Level 11 (pre-revised pay Rs. 15600-39100+ RGP Rs. 7000 /-)	01-07-2019
Dr. Bappa Das Scientist (Agricultural Meteorology)	Placed in Level 11 (pre-revised pay Rs. 15600-39100+ RGP Rs. 7000 /-)	01-07-2019
Dr. Maneesha S.R. Scientist (Fruit Science)	Placed in Level 11 (pre-revised pay Rs. 15600-39100+ RGP Rs. 7000 /-)	18-10-2019
Dr. Sujeet Desai Scientist (L&WME)	Placed in Level 11 (pre-revised pay Rs. 15600-39100+ RGP Rs. 7000 /-)	01-01-2020
Dr. Manohara KK Senior Scientist (Plant Breeding)	Placed in Level 13 (A) (pre-revised pay Rs. 374000-67000+ RGP Rs. 9000 /-)	21-04-2021

Dr. Mahajan Gopal Ramdas Scientist (Soil Science)	Placed in Level 12 (pre-revised) pay Rs. 15600-39100 + RGP Rs. 8000 /-) and re-designated as **Sr. Scientist**	02-07-2021
Shri Shashi Vishwakarma, Technical Officer	Senior Technical Officer	20-12-2020
Shri Vishwas Sharma, Assistant	1st MACP in the Pay Level 7 (on completing 10 years of continue service)	21-05-2022
Shri Suresh Gomes, Tractor Driver (T-4)	Promoted to the next higher level in T-5 (Technical Officer-Tractor Driver) in Cat-II in pay Level 7	24-01-2022
Shri DilkushVelip, Driver T-2 (KVK)	Promoted to the next higher pay level in T-3 (Technical Assistant-Driver) in Cat-II in pay Level 5	26-03-2022
Dr. Shripad Bhat, Scientist (Agri. Economics).	Placed in Level 12 (pre-revised) pay Rs. 15600-39100 +RPG Rs. 8000 /-) and re-designated as **Sr. Scientist**	15-09-2021
Dr. Susitha Rajkumar, Scientist (Veterinary Pathology)	Placed in Level 12 (pre-revised) pay Rs. 15600-39100 +RPG Rs. 8000 /-) and re-designated as **Sr. Scientist**	02-02-2022
Dr. Sreekanth G.B., Scientist (FRM)	Placed in Level 12 (pre-revised) pay Rs. 15600-39100 +RPG Rs. 8000 /-) and re-designated as **Sr. Scientist**	30-05-2022

Transferred from ICAR-CCARI

Name	Post held	Transfer to	Date of transfer
Dr. Maneesha S.R.	Scientist (Fruit science)	ICAR-Indian Institute of Spices Research, Kozhikode, Kerala	30-08-2022

Transferred to ICAR-CCARI

Name	Post held	Transfer from	Date of joining
Dr. A. Raizada	Principal Scientist (Agroforestry)	ICAR-MGIFRI, Motihari	11-05-2022
Dr. Shirish D. Narnaware	Senior Scientist (Veterinary Pathology)	ICAR- NRC on Camel, Bikaner, Rajasthan	02-05-2022

Superannuation

Name	Post held	Date of Retirement
Shri Edward Crasta	Technical Officer	31-05-2022
Shri Chimno Dattu Tivrekar	Skilled Support Staff	31-05-2022
Dr. Surendra Kumar Singh	Principal Scientist (Soil Science)	30-06-2022

Annexure-B

ICAR- CENTRAL COASTAL AGRICULTURAL RESEARCH INSTITUTE, GOA

ANNUAL ACCOUNT 2022-23

Details of Institute Govt. Grant expenditure for the year 2022-23

(Rs in Actuals)

S. No.	Head	Allocation Govt.Grant 2022-23	Allocation Internal Resource + Additional amount provided by HQ out of Council's share (2022-23)	TOTAL ALLOCATION 2022-23	Expenditure (Govt.Grant) 2022-23				Expen-diture (Revenue Gener-ation) 2022-23	TOTAL EXPENDITURE 2022-23
1	2	3	4	5 (3 + 4)	6				7	8 (6 + 7)
					NEH	TSP	SCSP	Other than NEH TSP & SCSP		
1	Works									
	A. Land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B. Building									
	i. Office building	9271294.00	0.00	9271294.00	0.00	0.00	0.00	9271294.00	0.00	9271294.00
	ii. Residential building	0.00	0.00	0.00	0.00	0.00	0.00		0.00	
	iii. Minor Works	499965.00	0.00	499965.00	0.00	0.00	0.00	499965.00	0.00	499965.00
2	Equipments	2741464.00	0.00	2741464.00	0.00	1769000.00	1000000.00	2741464.00	0.00	5510464.00
3	Information Technology	1665650.00	0.00	1665650.00	0.00	0.00	0.00	1665650.00	0.00	1665650.00
4	Library Books and Journals	85956.00	0.00	85956.00	0.00	0.00	0.00	85956.00	0.00	85956.00
5	Vehicles & Vessels	1918371.00	0.00	1918371.00	0.00	0.00	0.00	1918371.00	0.00	1918371.00
6	Livestock	195000.00	0.00	195000.00	0.00	0.00	0.00	195000.00	0.00	195000.00
7	Furniture & fixtures	558300.00	0.00	558300.00	0.00	0.00	0.00	558300.00	0.00	558300.00
8	Others	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total – CAPITAL (Grants for creation of Capital Assets)	16936000.00	0.00	16936000.00	0.00	1769000.00	1000000.00	16936000.00	0.00	19705000.00
1	Establishment Expenses (Salaries)									
	i. Establishment Charges	104275000	0.00	104275000.00	0.00	0.00	0.00	103197482.00	0.00	103197482.00
	ii. Wages	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	iii. Overtime Allowance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total – Establishment Expenses (Grant in Aid - Salaries)	104275000.00	0.00	104275000.00	0.00	0.00	0.00	103197482.00	0.00	103197482.00

1	Pension & Other Retirement Benefits	16600000.00	0.00	16600000.00	0.00	0.00	0.00	16342431.00	0.00	16342431.00
2	T.A.									
	A. Domestic TA / Transfer TA	988559.00	0.00	988559.00	0.00	0.00	0.00	988559.00	0.00	988559.00
	B. Foreign TA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total – Traveling Allowance	*988559.00*	*0.00*	*988559.00*	0.00	*0.00*	*0.00*	*988559.00*	*0.00*	*988559.00*
3	Research & Operatinal Expenses									
	A. Research Expenses	9531068.00	0.00	9531068.00	0.00	0.00	0.00	9531068.00	0.00	9531068.00
	B. Operational Expenses	20159952.00	0.00	20159952.00	0.00	6000000.00	0.00	20159952.00	0.00	26159952.00
	Total - Research & Operational Expenses	*29691020.00*	*0.00*	*29691020.00*	0.00	*6000000.00*	*0.00*	*29691020.00*	*0.00*	*35691020.00*
4	Administrative Expenses									
	A. Infrastructure	8671527.00	0.00	8671527.00	0.00	0.00	0.00	8671527.00	0.00	8671527.00
	B. Communication	107294.00	0.00	107294.00	0.00	0.00	0.00	107294.00	0.00	107294.00
	C.Repair & Maintenance			0.00	0.00	0.00	0.00	0.00		0.00
	i. Equipments, Vehicles & Others	2007721.00	0.00	2007721.00	0.00	0.00	0.00	2007721.00	0.00	2007721.00
	ii. Office building	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	iii.Residential building	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	iv. Minor Works	2275394.00	0.00	2275394.00	0.00	0.00	0.00	2275394.00	0.00	2275394.00
	D. Others (excluding TA)	4977995.00	0.00	4977995.00	0.00	0.00	0.00	4977995.00	0.00	4977995.00
	Total - Administrative Expenses	*18039931.00*	*0.00*	*18039931.00*	*0.00*	*0.00*	*0.00*	*18039931.00*	*0.00*	*18039931.00*
5	Miscellaneous Expenses									
	A. HRD	97731.00	0.00	97731.00	0.00	0.00	0.00	97731.00	0.00	97731.00
	B. Other Items (Fellowships, Scholarships etc.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C. Publicity & Exhibitions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D. Guest House – Maintenance	1655759.00	0.00	1655759.00	0.00	0.00	0.00	1655759.00	0.00	1655759.00
	E. Other Miscellaneous	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total - Miscellaneous Expenses	*1753490.00*	*0.00*	*1753490.00*	*0.00*	*0.00*	*0.00*	*1753490.00*	*0.00*	*1753490.00*
	Total --Grants in Aid - General	67073000.00	0.00	67073000.00	0.00	6000000.00	0.00	66815431.00	0.00	72815431.00
	Grand Total (Capital + Establishment + General)	188284000.00	0.00	188284000.00	0.00	7769000.00	1000000.00	186948913.00	0.00	195717913.00
6	Loans and Advances	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00

NOTES

Celebration of World Egg Day on 14.10.22 under the STC program

Distribution of indigenous poultry birds and eggs under the STC program

Distribution of traditional fishing gear to fishermen at Divar Island, Goa, under the STC program

View of the approach road to the agro-ecotourism unit at CCARI, Goa

View of the screening trials of salt tolerant rice varieties at CCARI Farm