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भा.कृ.अनु.प. - केन्द्रीय तटीय कृषि अनुसंधान संस्थान, गोवा
ICAR - Central Coastal Agricultural Research Institute, Goa

(DARE, Ministry of Agriculture & Farmers' Welfare, Govt. of India)

Ela, Old Goa - 403 402, Goa, India



Women farmers working paddy field (Digha, West Bengal) | ©Pavel Rout 2023



ICAR-CCARI

ANNUAL REPORT 2023



Indian Council for Agricultural Research
केन्द्रीय तटीय कृषि अनुसंधान संस्थान
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Farmers cultivate artistry in the paddy fields (Karwar, Karnataka) | ©Aditya Satish Birkodi 2023

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Mission

The Institute was started with a mission to achieve, "Introduction and improvement of all potential crops and various species / breeds of livestock and scientific exploitation of various aquatic resources for improving fish production"

Mandate

- Researches on field and horticultural crops, livestock, and fisheries relevant to 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





Preface

The coastal eco-region of India is a diverse and vulnerable geo shape that covers about 10% of the total geographic area with 82 coastal districts stretched in nine states and two UTs, 7517 km of coastline, 16% of the total human and 19.5% of the livestock population. The coastal eco-region is also susceptible to natural disasters such as cyclones, super cyclones, flash floods events, landward ingress of sea salinity and coastal erosion. In addition, anthropogenic stressors such as coastal urbanization, pollution, habitat degradation, and overexploitation have significant impacts on the coastal eco-region. The management of agriculture in this eco-region is challenging, which requires applied and strategic research programmes, networking with the stakeholders and extension of the agricultural technologies and packages of practices. Being the flagship

institute for the development of coastal agriculture in India, ICAR-CCARI is in the process of developing climate-resilient crop and animal varieties, energy and resource-efficient integrated farming systems, farmer-centric and eco-friendly technologies, package of practices of natural resource management, livestock and fishery, and framework for agro-eco-tourism (AET).

To address the inadequacy of quality planting material in the coastal region, the institute has developed 11 varieties of six horticultural crops and recommended them for release. In addition, the institute came up with ten multiple stress-tolerant lines of rice that can withstand coastal salinity, partially tolerant to complete submergence and lodging. The institute drafted a policy for the promotion of sustainable AET in Goa and





submitted it to the Government of Goa. To promote public-private partnership (PPP) in agriculture research and development, the AET model of CCARI is currently evaluated under PPP mode in association with Udbhav Vriksha Pvt. Ltd. To act as a repository of coastal agriculture database, the institute developed a Coastal Agricultural Information System: A Geoportal with information on >300 parameters which will be beneficial for researchers/ farmers, state departments, and policymakers. To facilitate adaptation strategies in the vulnerable coastal climate, an agricultural vulnerability map was prepared for all 82 coastal districts of India. To disseminate pest and disease invasion alerts for the coastal region, habitat suitability maps of selected insect pests were prepared and information on its management was provided to agricultural departments of the coastal states. For the first time, a climate-resilient cross-bred pig variety, "GOYA" was developed and submitted for release for the coastal eco-region.

The institute developed three climate-resilient IFS models viz., low-land rice-based model, upland plantation crop-based model and fish-livestock-horticulture-based model, which have been certified by ICAR for expansion in the coastal eco-region. To assess the water resource availability for coastal agriculture, the qualitative and quantitative profile of groundwater was spatially mapped for the coastal districts. The package of practices (PoP) for cauliflower cultivation was developed for the first time for Goa state and shared to Directorate of Agriculture. In order to promote ethnic foods along the coastal region, technology was developed for two shelf stable ready-to-eat food products through retort processing. To facilitate exsitu conservation of the livestock germplasm of the coastal region and evaluate their growth performance Godavari buffalo from Andhra Pradesh was introduced into the experimental farm of CCARI. To mitigate the antimicrobial resistance in livestock and promote ethno-

veterinary medicates, herbal extracts and phyto-genic additives were developed for dairy animals and backyard poultry. A novel controlled breeding technology for enhancing productivity in indigenous goats was developed, which increased kidding rate by 26% than conventional mating. The major microflora of the reproductive tract of dairy cattle was characterized using microbiological and molecular tools.

ICAR-CCARI and Kerala Veterinary and Animal Sciences University (KVASU) jointly established and registered - A Community-based "Small Scale Dairy Processing Unit" for about 200 tribal women farmers of Thrissur district for marketing of dairy products in the brand- "SAMSUDDHA". A total of 25 incubatees from five coastal states incubated in the agri-business incubation unit of the institute and converted to 13 startups with a total annual turnover of ₹ 70.20 lakhs. To disseminate the technologies and PoPs along the coastal region, the institute and ICAR-KVK, North Goa organized a total of 318 activities such as capacity building, awareness programmes, health camps, exhibitions, field days and farmer-scientist interface that benefitted >30000 farmers including 57% women in the coastal region. Under the national campaign on "*Viksit Bharat Sankalp Yatra*", the institute conducted farmer-scientist interface in 102 panchayats that benefitted about 13500 participants in Goa. Through the sub-component programmes of Govt. of India such as DAPST, DAPSC and other initiatives, the institute conducted extensive outreach programmes in all the coastal states that together benefitted about 1000 farmers. The institute scientists published a total of 69 research papers above 6.0 NAAS Score in peer-reviewed journals, with 23 of them have NAAS scores 10 and above. With the scientific support from the institute, Geographical Indication (GI) was awarded to two unique germplasm of Goa; 1) Goa Mankurad Mango and 2) Goa Cashew in the year 2023.



Two progressive farmers guided by the ICAR-CCARI team were honored with national awards viz., Shri Sanjay Anant Patil (IARI Innovative farmer award-2023), Shri Deelip P Narulkar (Millionaire Farmer of India Award-2023). During 2023 institute scientists received four NAAS awards; one fellowship, one associateship, and two young scientist awards. The Institute also organized a National Symposium on “Climate Smart Agronomy for Resilient Production Systems and Livelihood Security” in collaboration with the Indian Society of Agronomy, New Delhi at Goa during 22-24 November 2023, which was attended by about 550 delegates from the country. The institute was privileged to organize a special session on “Coastal Agriculture” in the 16th Agricultural Science Congress at Kochi during 10-13 October 2023. Two scientific staff of CCARI completed professional academic excellence programmes/conferences abroad at Michigan State University, USA and Hannover, Germany. The institute signed seven national MoU and started establishing linkage with five international organizations in 2023. The Institute has also awarded competitive financial research and development grants worth ₹191.62 lakhs from funding agencies such as the PMKSY, DST-SERB, NASF, NICRA, NABARD, Seed project, IMD, DCCD, DASD and AICRP. The institute has also received two contract research projects worth ₹43.70 lakhs for promotion of AET. The major infrastructure developed during the period were a central instrumentation facility, biogas

demonstration unit, drainage channel and children's park. Under the special cleanliness drive “Mission Swacchata 365”, a total of 34 programmes were undertaken to make the institute neat, clean and green. The institute's presence in mass media and social media was significant through success stories, popular articles and news highlights. As an initiative on mainstreaming the special section of the society, the institute also conducted awareness programmes on agriculture and allied sectors for the blind, hearing and speech-impaired students from Goa.

This document is a bonafide record of the research and extension carried out by ICAR-CCARI, Goa in 2023. We welcome submissions from esteemed colleagues for refining and strengthening our scientific endeavors for coastal agriculture. We also place on record our sincere gratitude for the guidance and support received from the developmental departments and other institutes in the coastal states, farmers, fishermen and other stakeholders and the funding organizations. I would hereby express my sincere gratitude, on behalf of the ICAR-CCARI team, to Dr. Himanshu Pathak, Secretary DARE and DG, ICAR, Dr. Suresh Kumar Chaudhari, Deputy Director General (NRM), ICAR, and the committed officials and staff of SMD NRM, ICAR for their consistent guidance and unwavering support.

Parveen Kumar
Director, ICAR - CCARI

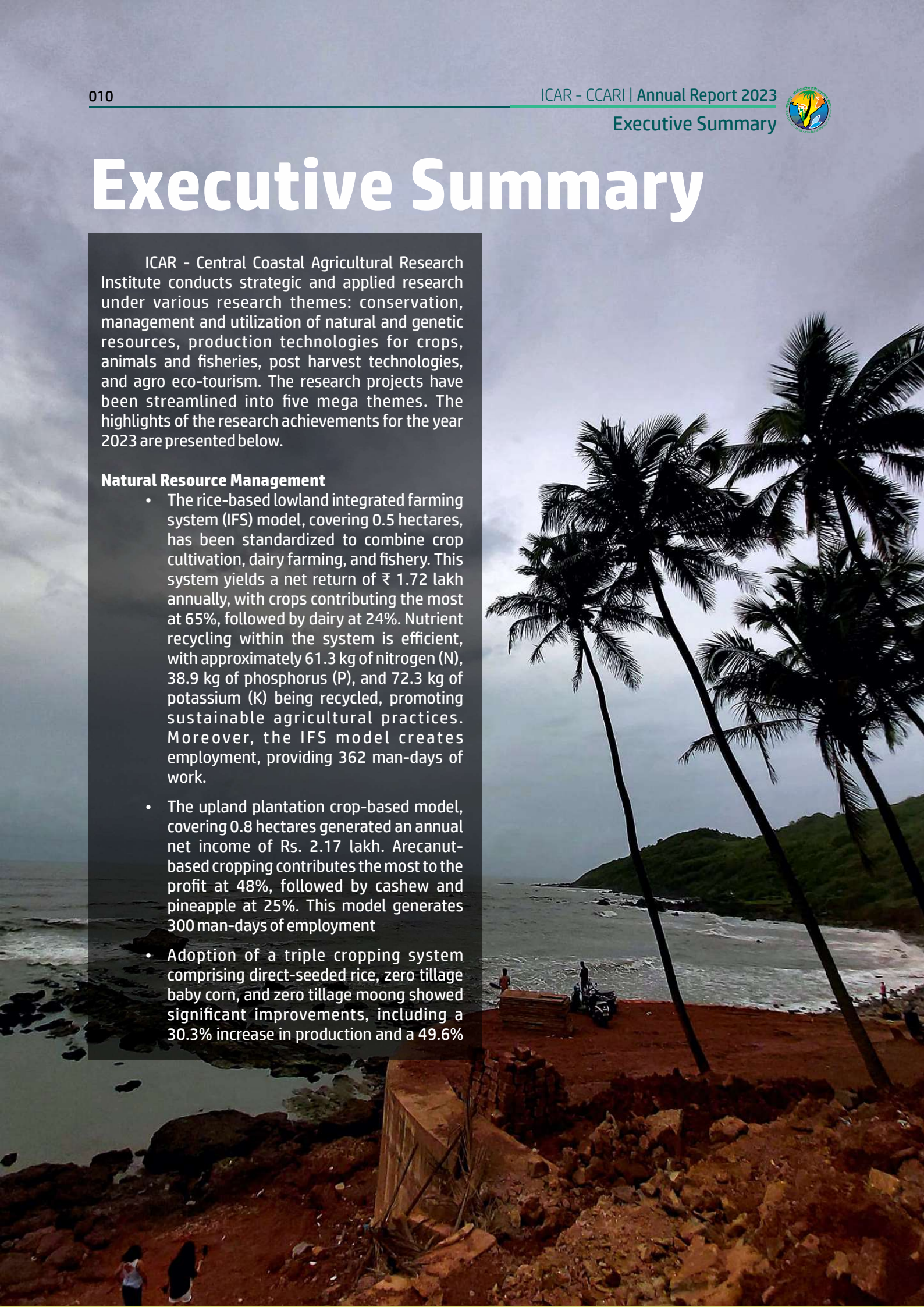


Executive Summary

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 the research achievements for the year 2023 are presented below.

Natural Resource Management

- The rice-based lowland integrated farming system (IFS) model, covering 0.5 hectares, has been standardized to combine crop cultivation, dairy farming, and fishery. This system yields a net return of ₹ 1.72 lakh annually, with crops contributing the most at 65%, followed by dairy at 24%. Nutrient recycling within the system is efficient, with approximately 61.3 kg of nitrogen (N), 38.9 kg of phosphorus (P), and 72.3 kg of potassium (K) being recycled, promoting sustainable agricultural practices. Moreover, the IFS model creates employment, providing 362 man-days of work.
- The upland plantation crop-based model, covering 0.8 hectares generated an annual net income of Rs. 2.17 lakh. Arecanut-based cropping contributes the most to the profit at 48%, followed by cashew and pineapple at 25%. This model generates 300 man-days of employment
- Adoption of a triple cropping system comprising direct-seeded rice, zero tillage baby corn, and zero tillage moong showed significant improvements, including a 30.3% increase in production and a 49.6%





Executive Summary

improvement in profitability compared to traditional farming practices. Gross carbon input increased by 127%.

- Extreme weather indices have been calculated for coastal districts of Kerala 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). Boruta feature selection algorithm was used to identify the important extreme weather indices causing rice yield loss.
 - EC of groundwater is fresh (<750 $\mu\text{S}/\text{cm}$) in the west coast and moderate (750-2250 $\mu\text{S}/\text{cm}$) in the east coast, except for a few districts in the states of Gujarat and Andhra Pradesh which are mineralized (>3000 $\mu\text{S}/\text{cm}$). The total Alkalinity (200-600 ppm) and Chloride content (250-1000 ppm) of groundwater in coastal regions are within the permissible limit.
 - Nitrate level in the west coast is within the permissible limit (< 45 ppm) whereas in the east coast it is beyond the permissible limit (>45 ppm) which could be attributed to non-point source pollution of groundwater through nitrate leaching.
 - Fluoride levels in the coastal region are within desirable (<1.0 ppm) and permissible (1.0-1.5 ppm) values with few patches beyond permissible limits in the coastal districts of Andhra Pradesh and Gujarat.
 - Employed Random Forest Model using Sentinel-2 satellite data to map the agroforestry system in Goa and evaluated coconut-based silvopastoral system for higher fodder productivity.
 - CAIS, an interactive Geoportal, integrates diverse data sets and technologies for coastal agricultural management benefiting stake holders and fostering innovation.
- the hybrids and varieties from 45 DAP to 90 DAP. Kashi Anmol recorded a green chilli yield of 8.75 t/ha; Arka Meghana recorded a green chilli yield of 4.39 t/ha.
- Wilt incidence in tomato grafts ranged from 0 to 10% after 63 days of planting. In resistant hybrids, wilt incidence was 10 to 19%. However, in the seedlings of Kashi Adarsh and Kashi Chayan, the wilt incidence was 44 to 63%. The highest yield (43 t/ha) was recorded in the resistant hybrids.
 - Application of Goa Bio-2 along with spraying of chitosan/spinosad reduced the leaf curl virus disease (28 to 34% reduction compared to control) and increased the yield (31 to 35%).
 - The wood borer diversity in cashew plantations revealed that the species *Neoplocaederus ferrugineus* and *N. obesus* were the major ones. The wood borers damaging cashew plantations were dominated by the family Cerambycidae followed by Platypodinae. The probability of distribution of CSRB under current and future climatic conditions is highly concentrated in the entire coastal states of India.
 - Entomopathogenic fungus viz., *Beauveria bassiana* and *Metarhizium anisopliae* caused significant mortality on various larval stages of CSRB. Early instar grubs were found to be highly susceptible to *B. bassiana* and *M. anisopliae*. The percent mortality varies from 40-90%.
 - A total of one hundred forty rice germplasm accessions, including landraces, wild relatives, and advanced breeding lines, were characterized for various agro-morphological traits.
 - The RIL population derived from Jaya x Goa Dhan 2 cross were evaluated under both normal and stress condition during the Kharif 2023 and 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.
- ### Crop Science
- Performance of ChiLCV disease-resistant chilli hybrids showed that ChiLCV disease incidence (PDI) was more than 70% in all



Horticulture Science

- About 11 horticultural crop varieties (Goa Butki Supari 1, Goa Cashew 5 (Tudal-1), Goa Cashew 6 (HB 21/05), Goa Kokum 1, Goa Kokum 2, Goa Kokum 3, Cardozo Mangurad Mango, Goa Jaiphal 1, Goa Jaiphal 2, Goa Jaiphal 3, Goa Cinnamon 1) were recommended for commercial cultivation in the state of Goa by state-level variety release committee (SVRC).
 - Promising varieties in the pipeline for future release are Goa Amaranth 2 (AtR18), Goa Amaranth 3 (AtR60), Goa Coconut 1, Goa Cassava 1, Goa Cashew 7 (Bardez 9), Goa Cashew 8 (HB 27/05), Goa Cashew 9 (Valpoi-2) and Goa Cashew 10 (FMDGI-1).
 - A tea mosquito bug-tolerant cashew germplasm was identified and scored for incidence, proline, catalase content, and leaf vein arrangement details. Cashew trees surviving stem and root borer incidence in a pest hotspot experimental plot identified, and screened for bark firmness, proline and catalase contents.
 - Coconut water is investigated in detail including physiochemical parameters. The weight and volume of water showed a significant correlation ($r = 0.73$). The fruit weights for tender nuts ranged from 723 to 3053 g with a mean of 1411 g. The FTIR analysis showed characteristic absorption peak of glucose in coconut water the range of 1027 cm^{-1} to 1039 cm^{-1} and 1077 to 1079 cm^{-1} showing 100% importance at 1029 cm^{-1} by four of multivariate models.
 - Seeds of Sirsi arecanut acclimatized at Ponda, Goa raised for nursery and further evaluation for yield. Seedlings of Annapurna, (Niu Lekha Dwarf Selection) from ICAR-CIARI Portblair are planted for evaluation.
 - Seed garden of the large-fruited dwarf statured coconut (D6) variety Goa Coconut 1 with green fruits is established. Demonstration plots of the coconut+pineapple+passion fruit cropping model were established at five locations in Goa benefiting 23 individual farmers. Demonstration plots of banana variety Kaveri Kanchan developed by ICAR-NRC
- Banana were established at three locations.
- A waterlogging tolerant cassava germplasm collected from flood-affected region in Kerala showed good tuber yield under arecanut as intercrop.
 - Jasmine germplasm native to Goa was characterized using morphological traits. The Shannon Weaver Index calculated values of diversity for length and breadth of jasmine bud were 0.551 and 0.435 respectively and the Gini index of length and breadth were (0.14) & (0.02).
 - 'Gyno-CisHybrid' attempted successfully in the dioecious cucurbit 'Sahyadri gourd (*Momordica sahyadrica*)'. 'Gyno-Cis' is composed of two words 'Gyno' and 'Cis'; the word 'Gyno' has its origin in the Greek language (gyné) meaning 'female'. 'Cis' on the other hand is a Latin word meaning 'on this side of' which is used to denote something 'on the same side'. 'Gyno-Cis Hybrid' stands for a hybrid derived from two genetically female genotypes.
 - Transplanting of Pusa Ashwini, healthy seedlings successfully produced marketable cauliflower curds after 50 to 60 days and yielded 100.3 (rabi 2022-23) to 163.3 q/ha (rabi 2021-22) and a curd yield (individual curd weight ranged from 301 g (rabi 2022-23) to 490 g (rabi 2021-22)).
 - Similarly, Pusa Meghna cauliflower variety successfully produced marketable curds by 50 to 60 days from transplanting only at Verlem (Sanguemtaluka) and estimated with 104.7 to 203.3q/ha curd yield (individual curd weight ranged from 314g to 610g).
 - An average leaf yield of 377.65 q/ha and 344.00q/ha with multiple harvests were estimated in the Mustard green entries 2021-MGVAR-3 and 2021-MGVAR-6 respectively. Entry 2022/CHIHVB-5 recorded 107.23q/ha pod yield under the Chilli Hybrid/Hot Pepper – IET trial.
 - Six, Eight and Seven entries from trials Okra (YVMV) Varietal AVT-II, Okra (YVMV) Varietal Resistant AVT-I and Okra (YVMV) Varietal Resistant IET, respectively recorded 0% YVMV incidence at 100 days



Executive Summary

after sowing.

- Enhanced butter extraction efficiency was observed by improved thermal and bio-thermal methods combined with mechanical dehulling of kokum seeds using in-house machines developed at the institute.
- The fermentation process significantly influenced the phenolic content, antioxidant activity, and anthocyanin levels in kokum wine. Co-inoculation with our strains appeared to enhance these properties synergistically, suggesting the importance of microbial diversity in fermentation. The observed antioxidant activity and anthocyanin content highlight the potential health benefits of kokum wine consumption.
- Process standardisation for RTE Jackfruit Xacuti was done using the programmable Water Shower Retort of AGNI Food hub. The stored retorted products displayed stability and no puffing due to spoilage was observed.
- A total of 14 new incubates were registered during 2023 at ICAR CCARI Agri Business Centre, AGNI and six continued their incubation phase for one more term (Jan – Dec 2023). Six incubatees graduated during this year and 9 incubatees have registered their business. Through its various activities AGNI has generated a revenue of Rs.7,21,920/-.
- Twenty training programmes with a total of 856 participants, funded by Pradhan Mantri Formalization of various beneficiaries were organized at ICAR-CCARI during the year 2023 by Master Trainer, Dr. Mathala Juliet Gupta.
- A total of 37 machinery suitable for multi-enterprise farming systems of Goa were evaluated on farm and performance evaluation reports given.
- (3.8%), brucellosis (3.8%), abortion (2.5%), retention of placenta (1.3%), cervicitis (1.3%) and prolapse (1.3%). The pathogens identified from these conditions were *E. coli*, *Brucella abortus*, *Bacillus* spp, *Streptococcus pluranimalium* and *Theileria orientalis* and *Staphylococcus* spp. including *S. chromogenes*, *S. cohnii* and *Mammaliicoccus sciuri*.
- In Shweta Kapila cattle, rectal temperature and respiration rate was numerically significant during hot period than cold period. The increase in enzymatic activity was not significant during hot period indicating less tissue damage during heat stress and better adaptability. The significant increase in Na and Cl and decrease in K serum ion concentration indicated better thermotolerance ability. Sequencing results revealed four novel SNPs (g.C1011T, g.A1209G, g.C1324T and g.T3814A) in HSP90 gene of Shweta Kapila cattle.
- Using digital Pulse Wave Doppler Ultrasound Imaging technology, testicular function in Shweta Kapila was recorded. Peak Systolic Velocity (ranged from 4.98 ± 0.02 to 12.01 ± 0.26 m/s), End diastolic velocity (ranged from 3.72 ± 0.03 to 5.09 ± 0.16 m/s) and Resistive index (RI) measured along the different regions of testicular artery. The findings could be useful information on testicular hemodynamics and normal reference values of testicular perfusion in indigenous SK bulls.
- Process of packaging Goan Prawn Curry in Retort Pouches has been standardized and the commercial sterility was performed as per the standards of IS: 2168 (1971) at the 45th day. Samples in thioglycollate 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. The technology is ready for licensing and commercialization.
- Using the disc diffusion method, the methanolic extracts of herbs showed antimicrobial properties against target

Animal and Fishery Sciences

- The important reproductive problems recorded in dairy cattle from Goa and Maharashtra were repeat breeding (20.3%), anestrus (6.3%), endometritis



- bacterial pathogens and yielded a MIC of *Glycyrrhiza glabra* (Mulethi), *Curcuma aromatica* and *Aegle marmelos* (Bael) were 0.048 - 0.1953, 1.562 - 3.125 and 0.097-0.390mg/ml respectively against *Staphylococcus* sp.
- Important disease outbreaks diagnosed in dairy cattle include *Theileriosis* and *Babesiosis*. There were 14 disease outbreaks in pigs, most of which were mixed bacterial and viral infections and septicemia due to *Pasteurella multocida* /*Streptococcus*/ *E. coli* infection and PCV-2 infection.
 - There were four disease outbreaks in poultry, which included Newcastle disease and *E. coli septicaemia*, *Coryza* and *Mycoplasma synoviae* infection, and mixed infection of Marek's Disease, *Avian Leucosis* and *Salmonella pullorum* (1).
 - An outbreak of Foot rot due to *Fusobacterium necrophorum* and *E. coli septicaemia* with two mortalities in the herd of four-horned antelope maintained at wild life sanctuary in Goa.
 - The sperm morphometric characteristics such as Rugosity, Regularity, ratio, Ellipticity, and Form were $0.817 \pm 0.003 \mu\text{m}^2/\text{pixel}^2$ and 0.91 ± 0.007 , 0.546 ± 0.006 , 1.854 ± 0.020 , $817.46 \pm 2.85 \mu\text{m}^2/\text{pixel}^2$ respectively, for Agonda Goan pig.
 - The survival and growth rates of the Asian Seabass were compared in four different systems (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). The survival rates for T1, T2, and T3 were 72%, 66.6%, and 54%, respectively, resulting in total production of 656.64 kg, 1772.89 kg, and 1382.4 kg, respectively. The average fish weights were 1.52 ± 0.11 kg, 1.33 ± 0.15 kg, and 1.28 ± 0.13 kg in T1, T2, and T3, respectively. The capital efficiency (BCR-%) was greater for T1 (194.60) compared to T2 (159.16) and T3 (132.22).
 - A Community-based "Small Scale Dairy Processing Unit" for the tribal farmers of Vaniyampara Village of Coastal District of Thrissur with the budgetary allocation of Rs. 9.91 lakhs under financial support from STC in collaboration with Kerala Veterinary and Animal Sciences University, Wayanad, Kerala. Three capacity training programs in value-added milk products were conducted and a training manual was published.
 - An exclusive tribal women SHG-Micro Enterprise group "SAMSUDDHA" for marketing dairy products were registered under the Kudumbashree-poverty eradication and women empowerment programme implemented by the State Poverty Eradication Mission (SPEM) of the Government of Kerala
 - Five capacity building programmes on ornamental fisheries were conducted benefitting 91 SHG members. Four small-scale demonstration units were established under this project- 1) Institute, 2) Diwar Island, 3) Assonora, and 4) Cumbarjua. Two field exposure visits were conducted (1- Cumbarjua & Panjim, and 2- Sawantwadi) in which around 27 members of the SHG participated.
- ### Agro eco-tourism
- The technology for the agro eco-tourism has been commercialized for ₹17.70 lakhs to the M/S Milestone Resorts, Candolim, Goa in the form of a Contract Research Project on the Assessment of agro eco-tourism conceptual framework models in an island ecosystem of Goa.
 - The institute drafted a policy for the promotion of sustainable AET in Goa and submitted it to the Government of Goa.
 - To promote public-private partnership (PPP) in agriculture research and development, the AET model of CCARI is currently evaluated under PPP mode in association with Udbhav Vriksha Pvt. Ltd.



कार्यकारी सारांश

भा.कृ.अनु.प. - केंद्रीय तटीय कृषि अनुसंधान संस्थान प्राकृतिक और आनुवंशिक संसाधनों का संरक्षण, प्रबंधन और उपयोग, फसल उत्पादन तकनीक, पशु और मत्स्य पालन, कटाई उपरांत प्रबंधन, प्रसंस्करण एवं मूल्य वर्धन तकनीकों और कृषि पर्यावरण-पर्यटन इत्यादि विषयों पर अनुसंधान करता है। वर्ष 2023 के मुख्य अनुसंधान उपलब्धियों की टिप्पणियाँ निम्नलिखित हैं:

प्राकृतिक संसाधन प्रबंधन

- धान आधारित तराई एकीकृत कृषि प्रणाली (आई.एफ.एस.) मॉडल (क्षेत्रफल - 0.5 हेक्टेयर), को फसलोत्पादन, डेयरी और मत्स्य पालन के संयोजन हेतु मानकीकृत किया गया है। यह प्रणाली सालाना 1.72 लाख रुपये का शुद्ध लाभ देती है, जिसमें फसलों का योगदान सबसे अधिक (65%) और डेयरी का 24% है। इस प्रणाली में अवशेष के पुनर्चक्रण द्वारा लगभग 61.3 कि.ग्रा. नाइट्रोजन (एन), 38.9 कि.ग्रा. फॉस्फोरस (पी), और 72.3 कि. ग्रा. पोटेशियम (के) का कुशलतापूर्वक पुनरावृत्ति होता है। इस मॉडल से टिकाऊ कृषि पद्धतियों को बढ़ावा के अतिरिक्त 362 मानव-दिनों रोजगार का सृजन होता है।
- उपभूमि के लिए रोपण फसल-आधारित 0.8 हेक्टेयर क्षेत्रफल के मॉडल में सुपारी, काजू, नारियल और पशुधन शामिल हैं। इससे 2.17 लाख रुपये की वार्षिक शुद्ध लाभ प्राप्त हुआ, जिसमें सुपारी-आधारित फसल में सबसे अधिक योगदान (48%) और उसके बाद काजू और अनानास का 25% योगदान है। यह मॉडल 300 मानव-दिवस के रोजगार एवं लगभग 75.3 कि.ग्रा. नाइट्रोजन (एन), 48.3 कि.ग्रा. फॉस्फोरस (पी), और 87.3 कि.ग्रा. पोटेशियम (के) आदि पोषक तत्वों का प्रभावी ढंग से पुनर्चक्रण करता है।
- सीधी बुआई वाले धान, जीरो-टिलेज बेबी कॉर्न और जीरो-टिलेज मूंग को शामिल करने वाली तिहरी फसल प्रणाली को अपनाने से पारंपरिक कृषि पद्धतियों की तुलना में पर्यावरणीय सूचकांकों में वृद्धि पाई गई। मुख्यतः उत्पादन में 30.3%, लाभप्रदता में 49.6% सकल कार्बन इनपुट में, जोकि ग्रीनहाउस गैस उत्सर्जन में कमी और कार्बन भंडारण में वृद्धि

का लक्षण है, 127% वृद्धि पाई गई। जमीन के ऊपर के बायोमास उत्पादन में 33.9% की वृद्धि हुई, जो बेहतर संसाधन उपयोग और पोषक चक्रण को दर्शाता है। मृदा कार्बन स्टॉक में भी 51.3% की वृद्धि हुई, जो मृदा स्वास्थ्य और उर्वरता में वृद्धि का संकेत है। कुल मिलाकर, सीधी बुआई वाली चावल-जीरो टिलेज बेबी कॉर्न-जीरो टिलेज मूंग प्रणाली टिकाऊ कृषि और मृदा के स्वास्थ्य के लिए एकीकृत फसल और संरक्षण जुताई प्रथाओं की क्षमता पर प्रकाश डालती है।

- दैनिक अधिकतम, न्यूनतम तापमान और वर्षा डेटासेट का उपयोग करके केरल के तटीय जिलों के लिए चरम मौसम सूचकांक की गणना की गई है। प्रत्येक संकेतक के लिए थ्रेसहोल्ड स्तरों की पहचान उपज विसंगति सूचकांक (वाई.ए.आई.) के साथ प्रतिकूलीकरण द्वारा की गई। बोरुटा फ्रीचर चयन एल्गोरिदम द्वारा धान की उपज में क्षति के महत्वपूर्ण चरम मौसम सूचकांकों की पहचान की गई। चरम मौसम की घटनाओं का धान की उत्पादकता पर नकारात्मक प्रभाव पाया गया।
- भूजल काई.सी. पश्चिमी तट में ताज़ा (<750 $\mu\text{S}/\text{सेमी}$) और पूर्वी तट में मध्यम (750-2250 $\mu\text{S}/\text{सेमी}$) पाया गया। गुजरात और आंध्र प्रदेश राज्यों के कुछ जिलों, जो खनिजयुक्त हैं (> 3000 $\mu\text{S}/\text{सेमी}$) को छोड़कर तटीय क्षेत्रों में भूजल की कुल क्षारीयता (200-600 पी.पी.एम.) और क्लोराइड सामग्री (250-1000 पी.पी.एम.) अनुमेय सीमा के भीतर पाई गई।
 - पश्चिमी तट में नाइट्रेट का स्तर अनुमेय सीमा (<45 पी.पी.एम.) के भीतर है, जबकि पूर्वी तट में यह अनुमेय सीमा (>45 पी.पी.एम.) से अधिक है, जिसे नाइट्रेट लीचिंग के माध्यम से भूजल के नॉन-पॉइंट स्रोत प्रदूषण के लिए जिम्मेदार ठहराया जा सकता है।
 - तटीय क्षेत्र में फ्लोराइड का स्तर वांछनीय (<1.0 पी.पी.एम.) और अनुमेय (1.0-1.5 पी.पी.एम.) मूल्यों के भीतर है और आंध्र प्रदेश और गुजरात के तटीय जिलों में अनुमेय सीमा से परे कुछ पैच हैं।



फसल विज्ञान

- ChiLCVरोग-प्रतिरोधी मिर्च संकरों के प्रदर्शन से पाया गया कि बुवाई के 45 से 90 दिनों तक सभी संकरों और किस्मों में ChiLCV रोग की घटना (PDI) 70% से अधिक थी। काशी अनमोल ने हरी मिर्च की उपज 8.75 टन/हेक्टेयर दर्ज की; अर्का मेघना ने हरी मिर्च की उपज 4.39 टन/हेक्टेयर दर्ज की।
- रोपण के 63 दिनों के बाद टमाटर की कलमों में विल्ट की घटना 0 से 10% तक होती है। प्रतिरोधी संकरों में, मुरझाने की घटना 10 से 19% थी। हालाँकि, काशी आदर्श और काशी चयन के पौधों में, मुरझाने की घटना 44 से 63% थी। प्रतिरोधी संकरों में सबसे अधिक उपज (43 टन/हेक्टेयर) दर्ज की गई।
- चिटोसन/स्पिनोसैड के छिड़काव के साथ गोवा बायो-2 के प्रयोग से पत्ती कर्ल वायरस रोग में कमी आई (नियंत्रण की तुलना में 28 से 34% की कमी) और उपज में वृद्धि हुई (नियंत्रण की तुलना में 31 से 35% की वृद्धि)।
- काजू के बागानों में तना-छिद्रक (सी.एस.आर. बी.) के विविधता के अध्ययन द्वारा पाया गया कि *नियोप्लोकेडेरस फेरुगिनस* और *एन. ओबेसस* प्रजातियाँ प्रमुख थीं। काजू के बागानों को नुकसान पहुंचाने वाले तना-छिद्रक का प्रभुत्व परिवार *सेरामबाइसीडे* और उसके बाद *प्लैटीपोडिने* का था। वर्तमान और भविष्य की जलवायु परिस्थितियों में सी.एस.आर. बी. के वितरण की संभावना भारत के संपूर्ण तटीय राज्यों में अत्यधिक केंद्रित है।
- एंटोमोपैथोजेनिक कवक जैसेकि *ब्यूवेरिया बैसियाना* और *मेटारिज़ियम एनिसोप्लिया* ने उपयोग द्वारा सी.एस.आर. बी. के विभिन्न लार्वा चरणों में महत्वपूर्ण क्षति पाया गया। शुरुआती इंस्टार ग्रब *ब्यूवेरिया बैसियाना* और *मेटारिज़ियम एनिसोप्लिया* के प्रति अत्यधिक संवेदनशील (मृत्यु दर 40-90%) पाए गए।

बागवानी विज्ञान

- लगभग 11 बागवानी फसल की किस्में (गोवा बुटकी सुपारी 1, गोवा काजू 5 (टुडल-1), गोवा काजू 6 (एचबी 21/05), गोवा कोकम 1, गोवा कोकम 2, गोवा कोकम 3, कार्डोजो मनकुराद आम, गोवा जयफल 1, गोवा जयफल 2, गोवा जयफल 3, गोवा दालचीनी 1) को राज्य स्तरीय किस्म विमोचन समिति (एस.वी.आर.सी.) द्वारा गोवा राज्य में

व्यावसायिक खेती के लिए अनुशंसित किया गया।

- भविष्य में रिलीज के लिए पाइपलाइन में गोवा अमरंथ 2 (एटीआर18), गोवा अमरंथ 3 (एटीआर60), गोवा नारियल 1, गोवा कसावा 1, गोवा काजू 7 (बार्डेज 9), गोवा काजू 8 (एचबी 27/05), गोवा काजू 9 (वालपोई-2) और गोवा काजू 10 (एफएमडीजीआई-1) आशाजनक किस्में हैं।
- एक टी-ट्री मच्छर बग-सहिष्णु काजू जर्मप्लाज्म की पहचान की गई है और रोग-संवेदन, प्रोलाइन, कैटालेज़ सामग्री और पत्ती शिरा व्यवस्था आदि विवरण के लिए स्कोर किया गया। कीट हॉट-स्पॉट प्रायोगिक क्षेत्र में तने और जड़ छिद्रक प्रतिरोधी काजू के पेड़ों की पहचान एवं उनके छाल की दृढ़ता, प्रोलाइन और कैटालेज़ सामग्री की जांच की गई है।
- नारियल पानी की फिजियो-केमिकल मापदंडों का विस्तारपूर्वक जांच पर पाया गया है कि नारियल के वजन और पानी की मात्रा में एक महत्वपूर्ण सह-संबंध (आर = 0.73) है। नरम नटों का वजन 723 से 3053 ग्राम (औसत 1411 ग्राम) था। एफ.टी.आई.आर. विश्लेषण ने नारियल पानी में ग्लूकोज के विशिष्ट अवशोषण शिखरों 1027 सेमी⁻¹ से 1039 सेमी⁻¹ और 1077 से 1079 सेमी⁻¹ की रेंज में दिखे, जो चार बहुभिन्नरूपी मॉडलों के लिए महत्वपूर्ण हैं।
- हरे एवं बड़े आकार के गरी वाले बौने कद के नारियल (D6) किस्म गोवा कोकोनट¹ का सीड गार्डन स्थापित किया गया है। नारियल+अनानास+पैशन फ्रूट के क्रॉपिंग मॉडल के प्रदर्शन प्लॉटों को गोवा के पांच लक्ष्यों पर स्थापित किया गया, जिससे 23 व्यक्तिगत किसानों को लाभ हुआ। आईसीएआर-एनआरसी केले द्वारा विकसित केले की किस्म कावेरी कंचन के प्रदर्शन प्लॉट तीन स्थानों पर स्थापित किए गए हैं।
- केरल के बाढ़ प्रभावित क्षेत्र पर पाए जल-जमाव-सहिष्णु कसावा जर्मप्लाज्म ने अंतरफसल के रूप में सुपारी के तहत अच्छी कंद उपज दिखाई।
- गोवा के एक क्षेत्रीय प्रजाति चमेली जर्मप्लाज्म को चिह्नित करने के लिए रूपात्मक लक्षणों का उपयोग किया गया था। शैनन वीवर इंडेक्स ने चमेली की कली की लंबाई और चौड़ाई के लिए क्रमशः 0.551 और 0.435 के विविधता मूल्यों की गणना की, और लंबाई और चौड़ाई का गिनी सूचकांक (0.14) और (0.02) पाया गया।
- एकलिंगाश्रयी ककड़ी वर्ग के 'सह्याद्री लौकी (मोमोर्डिका सह्याद्रिका)' में सफलतापूर्वक गाइनो-सीस-हाइब्रिड' का



कार्यकारी सारांश

प्रयास किया गया।

- फूलगोभी के प्रजाति पूसा अश्विनी की रोपाई से, स्वस्थ पौधों से 50-60 दिनों के अवधि में सफलतापूर्वक विपणन योग्य 100.3 (रबी 2022-23) और 163.3 (रबी 2021-22) क्विंटल प्रति हेक्टेयर की पैदावार हुई और व्यक्तिगत गोभी का वजन 301 ग्राम (रबी 2022-23) से लेकर 490 ग्राम (रबी 2021-2021) था।
- पूसा मेघना फूलगोभी किस्म ने वेल्लेम (सांगेम तालुका) में रोपाई के 50 से 60 दिनों के बाद सफलतापूर्वक 104.7 से 203.3 क्विंटल/ हेक्टेयर उपज एवं व्यक्तिगत फूल का वजन 314 से 610 ग्राम तक पाया गया।
- सरसों की हरी प्रविष्टियाँ 2021-MGVAR-3 और 2021-MGVAR-6 में एकाधिक कटाई के साथ क्रमशः 377.65 q/ha और 344.00 q/ha की औसत पत्ती उपज का अनुमान लगाया गया। पेपर-आईईटी हाइब्रिड/हॉट मिर्च परीक्षण के तहत प्रविष्टि 2022/सीएचआईएचवाईबी-5 ने 107.23 क्विंटल/हेक्टेयर की फली उपज दर्ज की।
- परीक्षणों से छः, आठ और सात प्रविष्टियाँ ओकरा (YVMV) वैरिएटल AVT-II, ओकरा (YVMV) वैरिएटल रेसिस्टेंट AVT-I, और ओकरा (YVMV) वैरिएटल रेसिस्टेंट IET में क्रमशः बुआई के 100 दिन बाद 0% YVMV घटना दर्ज की गई।
- संस्थान में विकसित इन-हाउस मशीनों का उपयोग करके कोकम के बीजों की यांत्रिक छीलन के साथ संयुक्त उन्नत थर्मल और बायो-थर्मल तकनीक से बड़ी हुई मक्खन निष्कर्षण दक्षता देखी गई।
- किण्वन प्रक्रिया ने कोकम वाइन की फेनोलिक सामग्री, एंटीऑक्सीडेंट गतिविधि और एंथोसायनिन स्तर को महत्वपूर्ण रूप से प्रभावित किया। हमारे उपभेदों के संचरण ने इन गुणों को सहक्रियात्मक रूप से बढ़ाया, जो किण्वन में माइक्रोबियल विविधता के महत्व का सुझाव देता है। एंटीऑक्सीडेंट गतिविधि और एंथोसायनिन सामग्री कोकम वाइन के सेवन के संभावित स्वास्थ्य लाभों को बढ़ाती है।
- सेवन के लिए तैयार कटहल की शाकुत्ती के लिए प्रक्रिया मानकीकरण अग्नि फूड हब के प्रोग्रामेबल वॉटर शावर रिटॉर्ट का उपयोग करके किया गया। भंडारित किए गए उत्पादों में स्थिरता देखी गई और सड़न के कोई लक्षण नहीं पाए गए।
- संस्थान के एग्री-बिजनेस सेंटर, AGNI में 2023 के दौरान कुल 14 नए इनक्यूबेट पंजीकृत किए गए, और छः; ने एक

और साल की अवधि (जनवरी - दिसंबर 2023) के लिए अपने इनक्यूबेशन चरण को जारी रखा। इस वर्ष के दौरान छः इनक्यूबेटियों ने स्नातक की उपाधि प्राप्त की, और 9 इनक्यूबेटियों ने अपना व्यवसाय पंजीकृत किया। अपनी विभिन्न गतिविधियों के माध्यम से, AGNI ने 7,21,920/- रुपये का आय अर्जित किया।

- मास्टर ट्रेनर डॉ. मतला जूलियट गुप्ता ने 2023 में आईसीएआर-सीसीएआरआई में प्रधानमंत्री सूक्ष्म खाद्य उद्यम औपचारिकीकरण योजना के तहत 856 प्रतिभागियों के लिए बीस प्रशिक्षण कार्यक्रमों का आयोजन किया।
- गोवा की बहु-उद्यम कृषि प्रणालियों के लिए उपयुक्त कुल 37 मशीनरी का मूल्यांकन किया गया और प्रदर्शन मूल्यांकन रिपोर्ट दी गई थी।

पशु एवं मत्स्य विज्ञान

- गोवा और महाराष्ट्र के डेयरी मवेशियों में दर्ज की गई महत्वपूर्ण प्रजनन समस्याएं पुनरावृत्त प्रजनन (20.3%), एनेस्ट्रस (6.3%), एंडोमेट्रिटिस (3.8%), ब्रुसेलोसिस (3.8%), गर्भपात (2.5%), प्लेसेंटा का प्रतिधारण (1.3%) %, सर्वाइटिस (1.3%) और प्रोलैप्स (1.3%) थीं। इन स्थितियों में ई. कोली, ब्रुसेला एबॉर्टस, बैसिलस एसपीपी, स्ट्रेप्टोकोकस प्लुरिमिलियम और थीलेरिया ओरिएंटलिस और स्टैफिलोकोकस एसपीपी थे। जिसमें एस. क्रोमोजेन्स, एस. कोहनी और मैमलीइकोकस स्किउरी पहचाने गए रोगजनकों में शामिल हैं।
- श्वेत कपिला मवेशियों में, जाड़ों की तुलना में गर्मियों के दौरान मलाशय का तापमान और श्वसन दर संख्यात्मक रूप से महत्वपूर्ण थी। गर्मियों के दौरान एंजाइमैटिक गतिविधि में वृद्धि महत्वपूर्ण नहीं थी, जो गर्मी के तनाव के दौरान कम ऊतक क्षति और बेहतर अनुकूलनशीलता का संकेत देती है। Na और Cl में उल्लेखनीय वृद्धि और K सीरम आयन सांद्रता में कमी ने बेहतर थर्मोटॉलरेंस क्षमता का संकेत दिया। अनुक्रमण परिणामों से श्वेत कपिला मवेशियों के HSP90 जीन में चार नए SNPs (g.C1011T, g.A1209G, g.C1324T और g.T3814A) पाए गए हैं।
- डिजिटल पल्स वेव डॉपलर अल्ट्रासाउंड इमेजिंग तकनीक का उपयोग करके, श्वेत कपिला में लम्बवत के क्रिया का रिकॉर्ड किया गया। अधिकतम सिस्टोलिक वेग (4.98±0.02 से 12.01±0.26 मी./से. तक), अंतिम



- डायस्टोलिक वेग (3.72 ± 0.03 से 5.09 ± 0.16 मी./से. तक) और प्रतिरोधक सूचकांक (आर.आई.) वृषण धमनी के विभिन्न क्षेत्रों पर मापा गया है। इसके निष्कर्ष वृषण थर्मोडायनामिक्स और स्वदेशी श्वेत कपिला बैलों में वृषण पेरफूशन के सामान्य संदर्भ मूल्यों के लिए उपयोगी जानकारी सिद्ध हो सकता है।
- रिटॉर्ट पाउच में गोवा प्रॉन करी की पैकेजिंग की प्रक्रिया को मानकीकृत किया गया है और 45वें दिन आईएस: 2168 (1971) के मानकों के अनुसार वाणिज्यिक स्टरिलिटी का प्रदर्शन किया गया।
- डिस्क प्रसार विधि का उपयोग करते हुए, जड़ी-बूटियों के मेथनॉलिक अर्क ने लक्ष्य जीवाणु रोगजनकों के खिलाफ रोगाणुरोधी गुण प्रदर्शन किए और ग्लाइसीराइजा ग्लबरा (मुलेठी), करकुमा एरोमेटिका और एगल मार्मेलोस (बेल) का एम.आई.सी. स्टैफिलोकोकस एसपी के खिलाफ क्रमशः 0.048 - 0.1953, 1.562 - 3.125 और 0.097-0.390 मिली. ग्रा. /एमएल पाया गया।
- डेयरी मवेशियों में निदान की जाने वाली महत्वपूर्ण बीमारियों में थेलेरियोसिस और बेबेसियोसिस शामिल हैं। शूकरों में 14 बीमारियों का प्रकोप था, जिनमें से अधिकांश मिश्रित जीवाणु और वायरल संक्रमण और पाश्चुरेला मल्टीसिडा / स्ट्रेप्टोकोकस / ई कोलाई संक्रमण और पीसीवी -2 संक्रमण के कारण सेप्टीसीमिया थे।
- पोल्ट्री में चार बीमारियों का प्रकोप हुआ, जिसमें न्यूकैसल रोग और ई कोलाई सेप्टीसीमिया, कोरिजा और माइकोप्लाज्मा सिनोविया संक्रमण, और मारेक रोग, एवियन ल्यूकोसिस और साल्मोनेला पुलोरम (1) का मिश्रित संक्रमण शामिल था।
- गोवा में वन्य जीवन अभयारण्य में रखे गए चार सींग वाले मृगों के झुंड में फूसोबैक्टीरियम नेक्रोफोरम और ई कोली सेप्टीसीमिया के कारण फुटराट के प्रकोप से दो की मृत्यु हुई।
- रगोसिटी, नियमितता, अनुपात, अण्डाकारता और रूप जैसी शुक्राणु रूपमिति विशेषताएँ अगोंडा गोवा सुअर के लिए क्रमशः $0.817 \pm 0.003 \mu\text{m}^2 / \text{पिक्सेल}^2$ और $0.9 \pm 0.007, 0.546 \pm 0.006, 1.854 \pm 0.020, 817.46 \pm 2.85 \mu\text{m}^2 / \text{पिक्सेल}^2$ थीं।
- श्रीनिधि पक्षियों में ए.आई. और कंप्यूटर सहायता से वीर्य विश्लेषण की प्रक्रियाओं को मानकीकरण किया गया। 95.6% की औसत प्रजनन क्षमता और 77.9% की हैचबिलिटी के साथ संस्थान इकाइयों के चयनित झुंडों में पोल्ट्री ए.आई. को सफलतापूर्वक अपनाया गया है।
- एशियाई सीबास की उत्तरजीविता और वृद्धि दर की तुलना चार अलग-अलग प्रणालियों में की गई (टी1 - 600 सीबास + 2000 तिलापिया + 500 आईएमसी + 40000 एसआईएफ, बिना वातन के, टी2 - 2000 सीबास + 2000 तिलापिया + 20000 एसआईएफ, वातन के साथ, और टी3 - 2000 सीबास + 2000 तिलापिया + 20000 एसआईएफ, बिना वातन के)। टी1, टी2 और टी3 की उत्तरजीविता दर क्रमशः 72%, 66.6% और 54% थी, जिसके परिणामस्वरूप कुल उत्पादन क्रमशः 656.64 कि.ग्रा., 1772.89 कि.ग्रा. और 1382.4 कि.ग्रा. हुआ। टी1, टी2 और टी3 में मछली का औसत वजन क्रमशः 1.52 ± 0.11 कि.ग्रा., 1.33 ± 0.15 कि.ग्रा. और 1.28 ± 0.13 कि.ग्रा. था। टी1 (194.60) की पूंजी दक्षता (बीसीआर-%) टी2 (159.16) और टी3 (132.22) की तुलना में सबसे अधिक पाया गया।
- सजावटी मत्स्य पालन पर पांच क्षमता निर्माण कार्यक्रम आयोजित किए गए, जिससे 91 एसएचजी सदस्यों को लाभ हुआ। इस परियोजना के तहत चार लघु-स्तरीय प्रदर्शन इकाइयाँ 1) संस्थान, 2) दिवार द्वीप, 3) असोनोरा, और 4) कुम्बारजुआ में स्थापित की गईं। दो फ्रील्ड एक्सपोजर दौरे (1-कुम्बारजुआ और पंजिम, और 2- सावंतवाड़ी) आयोजित किए गए जिसमें एस.एच.जी. के लगभग 27 सदस्यों ने भाग लिया।



Weather Report



Weather report

(January 2023 to December 2023)

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

Meteorological Observatory
 Agro-meteorological Observatory, KVK farm, ICAR-CCARI, Old Goa, Goa

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

Soil temperature

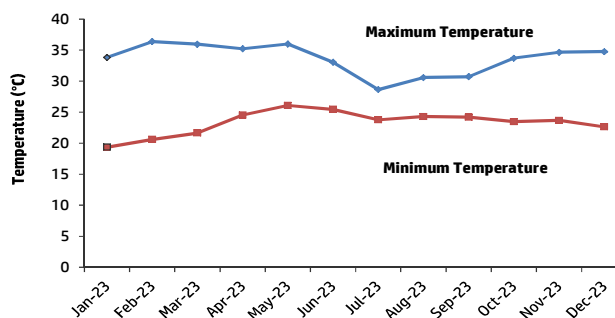
The ranges of mean monthly soil temperature recorded in morning hours at 5, 10, and 20 cm depths were 24.2-32.2 °C, 26.0-34.9 °C and 26.7-36.7 °C, respectively and for afternoon observation were 28.9-51.3 °C, 28.1-44.1 °C and 26.9-38.0 °C.

Sunshine hours

The mean monthly sunshine hour recorded ranged from 0.5 hours (July 2023) to 9.0 (February 2023). As expected, mean monthly sunshine hours were lower during the rainy season compared to the rest of the months of the year.

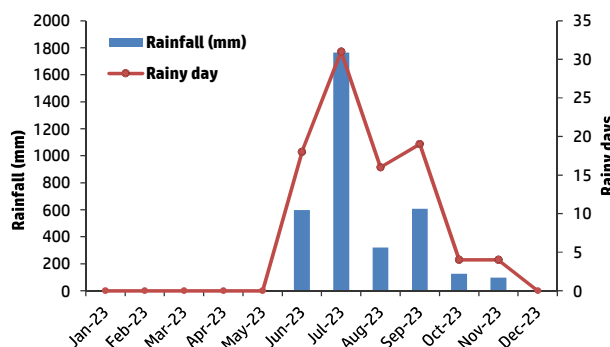
Air temperature

The mean monthly maximum temperature from January 2023 to December 2023 varied from 26.4 °C (July 2023) to 39.0 °C (March 2023), whereas the mean minimum temperature varied from 16.5 °C (January 2023) to 28.5 °C (May 2023)



Rainfall and rainy days

The total rainfall received during January 2023 to December 2023 was 3509.9 mm. A total of 3286.9 mm was received during kharif (June 2023 to September 2023). The annual rainfall for this year was 862.0 mm higher than that of 2022 (2647.9 mm). Total number of rainy days observed was 92 and was lower compared to last year (101 days).

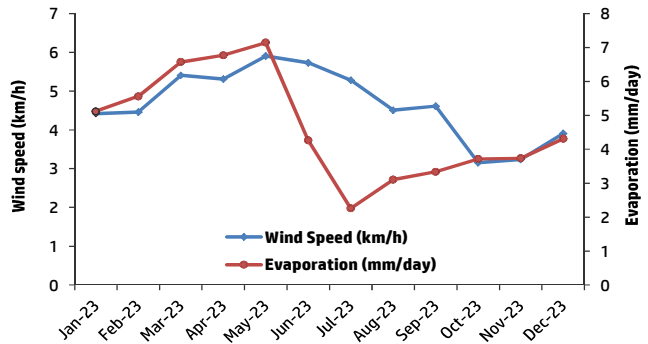




Weather Report

Wind speed

Mean monthly wind speed ranged from 3.15 km/h (October 2023) to 5.90 km/h (May 2023). Mean monthly wind speed started decreasing from May 2023 to October 2023 and it increased thereon.



Evaporation and relative humidity

Daily evaporation was measured using a USWB-Class A open pan evaporimeter. The total water evaporated from January 2023 to December 2023 was 1638.0 mm. The highest monthly morning and afternoon relative humidity was observed during July 2023, respectively, whereas the corresponding lowest was recorded during December and February 2023.

Particular of weather parameter	Value	Date
Highest maximum temperature	39.0 °C	04-03-2023
Lowest minimum temperature	16.5 °C	10-01-2023
Highest rainfall	164.0 mm	28-06-2023
Highest evaporation	10.9 mm	04-05-2023
Highest wind speed	13.6 km/h	30-09-2023
Maximum sunshine hours	11.4 h	17-05-2023

The average annual rainfall 3510 mm was recorded this year which is 862 mm higher than of last year

Important dates of observations during January 2023 to December 2023 with the highest and lowest values of weather parameter

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	33.8	19.4	83.5	36.7	4.42	8.8	5.1	0.0	0	3.2	3.1
Feb	36.4	20.6	82.4	35.1	4.46	9.0	5.6	0.0	0	3.7	0.3
Mar	35.9	21.6	79.4	37.5	5.41	8.3	6.6	0.0	0	3.7	1.0
Apr	35.2	24.5	86.3	52.3	5.31	8.1	6.8	0.0	0	3.8	1.3
May	36.0	26.1	81.8	50.0	5.90	8.7	7.1	0.0	0	4.0	3.7
Jun	33.0	25.4	90.4	68.5	5.73	5.5	4.3	597.0	18	4.6	4.7
Jul	28.6	23.8	95.0	88.3	5.28	0.5	2.3	1763.4	31	5.1	5.0
Aug	30.6	24.3	91.3	75.2	4.51	3.9	3.1	320.2	16	4.9	4.4
Sep	30.7	24.2	94.8	77.4	4.61	3.6	3.3	606.3	19	4.2	3.9
Oct	33.7	23.5	92.0	61.2	3.15	5.6	3.7	126.2	4	3.3	2.4
Nov	34.7	23.7	87.3	54.2	3.24	6.1	3.7	96.8	4	3.0	1.2
Dec	34.8	22.6	75.6	41.2	3.91	7.6	4.3	0.0	0	3.0	1.6

Mean monthly weather parameters recorded at ICAR-CCARI from January 2023 to December 2023.



Research Achievements Natural Resource Management





Evaluation of natural farming practices under plantation crop-based system

Gopal R. Mahajan, Raizada A., Paramesha V., Arunachalam V., Ramesh R., Maruthadurai R., Shripad Bhat, Uthappa A. R., Sujeet Desai, Amiya R. Sahu, Rahul Kulkarni and Parveen Kumar

Natural farming for achieving climate resilient and sustainability

The project endeavors to assess the productivity, profitability, sustainability, and input-use efficiencies of various natural farming practices within a plantation-based farming system. It also aims to evaluate soil health, crop quality, and carbon sequestration associated with these practices. Additionally, environmental impacts will be assessed through the Life Cycle Assessment (LCA) of different management practices within plantation-based farming. In the project's initial phase, an experimental site is identified within farmers' fields through a baseline survey and initial soil characterization. Different scenarios of natural farming practices were identified and initiated for implementation. Further, the different scenarios of natural farming will be tested for productivity, profitability, soil health, carbon sequestration, and several other parameters.



Coconut + pepper intercropping system



Genesis of soils and associated evaporates for sustainable land use options and carbon management in the coastal region of India

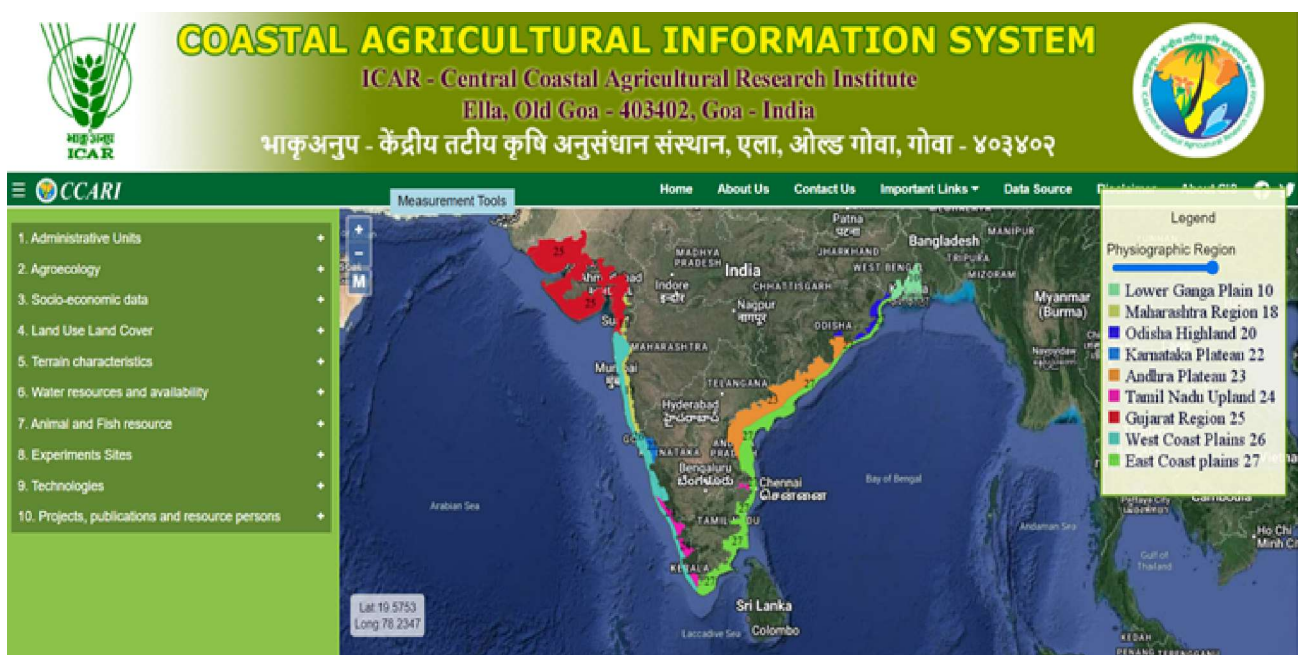
Gopal R. Mahajan, Sujeet Desai, Bappa Das and Sreekanth G. B.

An online and interactive Geoportal 'Coastal Agricultural Information System (CAIS)' was developed and launched in 2022. CAIS presents and displays datasets of more than 300 parameters, on socio-economics, land use, livestock utilization, crop production, land degradation, water resources, wastelands, salt-affected soils, climate, and rainfall with coastal districts as administrative boundary. CAIS utilized fine-to-coarse resolution remote sensing data, digital elevation models, published maps, and other relevant data sources. It has extensive information on the soils of coastal regions. Moreover, CAIS facilitates seamless interoperability between open pages, allowing for the integration of data and agro-technology to develop an innovative agribusiness framework in conjunction with existing natural resource information. The geoportal has received more than 6000 views from stakeholders. The technology is designed for a wide spectrum of stakeholders like R&D organizations, state agencies, farmers, researchers, data scientists, etc.

Recent data on crop suitability mapping, land

degradation in the Mandovi River basin, coastal groundwater data, etc. has been generated and will be incorporated in the geoportal for the benefit of the stakeholders. Also, the technology is being disseminated through workshops, demonstrations, and social media platforms.

CAIS, an interactive Geoportal, integrates diverse datasets and technologies for coastal agricultural management, benefiting stakeholders and fostering innovation



User interface of the CAIS



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

Paramesha V., Parveen Kumar and Gopal R. Mahajan

The research investigated the impact of conservation and conventional tillage methods on six distinct rice-based cropping systems, examining grain yield, aboveground biomass, energy efficiency, economics, and soil carbon stock. The cropping systems analyzed included puddled transplanted rice (PTR)-PTR, direct-seeded rice (DSR)-DSR, rice-moong, rice-cowpea, and rice-baby corn. The results revealed significant variations in Rice Equivalent Yield (REY) influenced by tillage practices. Notably, the triple cropping system of direct-seeded rice-zero tillage baby corn-zero tillage moong demonstrated a noteworthy increase in production (REY-12.4 t/ha) and profitability (Net return-1.66 lakh/hectare). Conversely, the traditional farmer's practice (PTR-PTR) exhibited considerably lower yield and net returns. The treatment T7 - MBR + DSR-RR + ZT baby corn - BBR+ZT Moong showed the highest estimated gross carbon input (3.45 Mg/ha) attributed to increased above-ground biomass production (16.1 t/ha). Similarly, this treatment demonstrated the highest soil carbon stock (31.9 Mg C/ha), while the farmer's practice recorded the lowest values. Regarding energy output, T7 recorded the highest total energy output (248315 MJ/ha). Conversely,

conservation tillage practices across different cropping systems resulted in lower energy input due to reduced machinery and diesel usage. In summary, the study highlighted 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, underscoring the potential of specific cropping systems and conservation practices for enhancing sustainability and productivity in rice-based agriculture.

Triple cropping system of direct seeded rice zero tillage baby corn zero tillage moong are superior in terms of production, profitability, carbon input, and soil carbon stock



View of the experimental lowland IFS plot



Research Achievements - Natural Resource Management



View of the conservation agri experimental plot

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)	9.5 ^c	12.1 ^c	1.50 ^d	20.9 ^d	148005	1.18 ^d
T ₂ - DSR+BM - ZT Cowpea	10.7 ^b	13.9 ^c	1.77 ^b	27.8 ^b	171360	1.59 ^b
T ₃ - DSR-ZT Moong-ZT Baby corn	12.5 ^a	15.5 ^a	1.93 ^b	28.6 ^b	245616	1.68 ^a
T ₄ - DSR-ZT Moong-ZT moong	11.9 ^a	14.9 ^b	1.82 ^b	28.9 ^b	193973	1.59 ^b
T ₅ - DSR+BM-ZT Moong	9.76 ^c	11.1 ^d	1.40 ^d	25.2 ^c	181160	1.34 ^c
T ₆ - DSR-Sweet corn	10.5 ^b	13.4 ^d	1.69 ^c	21.8 ^d	219050	1.37 ^c
T ₇ -MBR + DSR-RR + ZT baby corn – BBR+ZT Moong	12.9 ^a	16.1 ^a	3.45 ^a	31.9 ^a	248315	1.82 ^a

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

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



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

Paramesha V., Parveen Kumar, Manohara K. K., Shripad Bhat and Sukanta K. Sarangi

Farm trials were conducted on Diwar Island to improve cropping intensity in salt-affected coastal saline soil to enhance sustainability and livelihood security. The study had three main objectives: increasing cropping intensity under coastal saline soils to double farmers' income, assessing the production, profitability, and sustainability of different cropping systems in such soils, and quantifying various ecosystem services and environmental impacts associated with these cropping systems.

Boosting cropping intensity in salt-affected coastal soils for enhanced sustainability and livelihoods security

Various rice-based cropping systems were selected, including rice-cowpea, rice-moong, rice-sweet corn, rice-baby corn, rice-chili, rice-okra, rice-

leafy vegetables, and rice-rhodes grass. Among these, Rice-Bhendi exhibited the highest rice equivalent yield and gross return, producing 4.7 quintals and ₹ 88,570/- per hectare, respectively. Rice-Sweetcorn and Rice-Chili had comparable rice equivalent yields of 2.4 and 1.6 quintals per hectare, respectively. Rice-cluster bean and Rice-Baby corn showed rice equivalent yields of 1.7 and 1.6 quintals per hectare, respectively, but Rice-Baby corn had a higher gross return of ₹ 77,890, while Rice-cluster bean had a lower gross return of ₹29,640. Rice-Cowpea had the lowest rice equivalent yield at 0.71 quintals per hectare among all cropping systems but still generated a relatively high gross return of ₹ 78,530. In summary, Rice-Bhendi stands out for its high rice equivalent yield and gross return, and Rice-Baby corn also performs well in terms of gross return. Rice-Sweetcorn, Rice-Chili, Rice-cluster bean, and Rice-Cowpea exhibit varying levels of yield and profitability. It's worth noting that the germination of moong and the establishment of Rhodes grass were severely affected under coastal saline conditions.



View of the okra plot



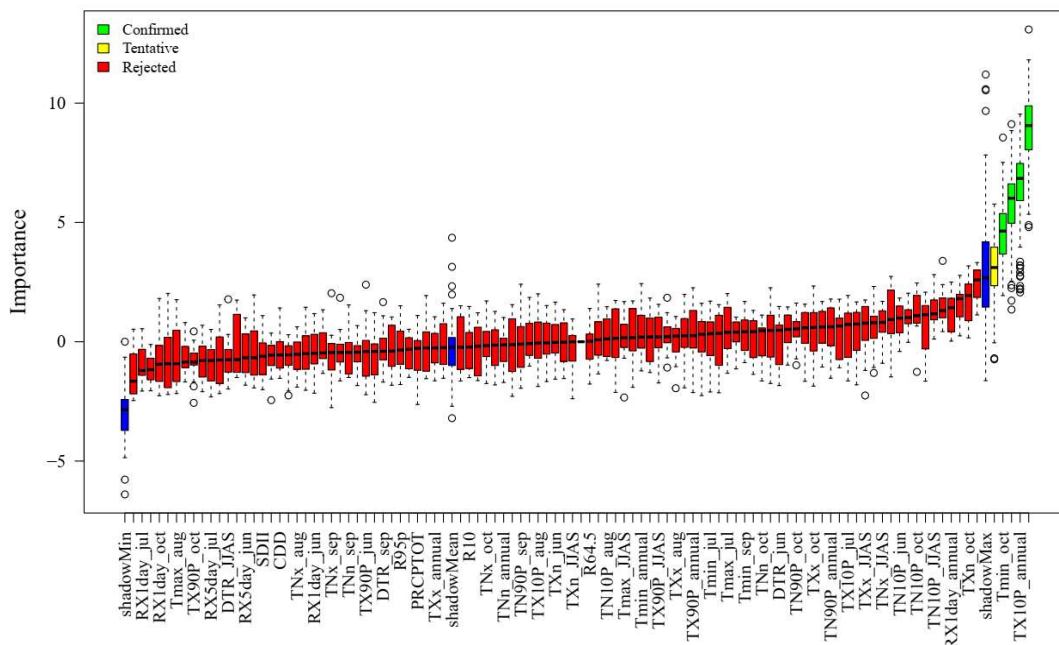
Impact assessment of extreme weather events on productivity of major crops in coastal region of India

Bappa Das, Raizada A., Arunachalam V. and Manohara K. K.

Developing mitigation and adaptation measures requires the identification of important extreme weather indices affecting crop yields as well as thresholds beyond which crop yields are impacted. Using the daily maximum, minimum temperature, and rainfall dataset obtained from the India Meteorological Department, Pune from 1966 to 2017, different extreme weather indices have been calculated for 6 weather stations of coastal Kerala. 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 showed that increasing the temperature-related indices had mostly a negative impact on rice yield beyond the threshold except for the percentage of days when maximum temperature (TX) and minimum temperature (TN) < 10th percentile for monsoon (TX10P_JJAS and TN10P_JJAS). All the precipitation-based extreme weather indices had a positive

influence on rice yield for Kottayam, Kozhikode, Kollam, and Trivandrum districts except for the annual count of days when precipitation ≥ 10 and 20 mm (R10 and R20) for Trivandrum district while for Kannur district negative impact was recorded. For the Alleppey district, except for annual total precipitation in days with rainfall ≥ 1 mm (prcptot), R20 and R95p showed a positive influence on rice yield. The threshold values will help to develop climate-resilient varieties suitable for the coastal regions. Boruta feature selection algorithm was used for the identification of important temperature and precipitation-based extreme weather indices

Critical temperature and precipitation thresholds impacting rice yields in coastal Kerala were identified



Results of Boruta algorithm for identification of important temperature and precipitation-based extreme weather indices causing rice yield loss for Thiruvananthapuram district

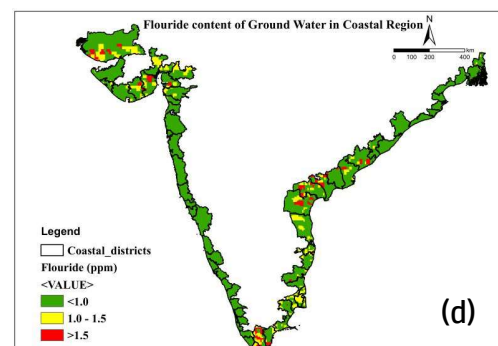
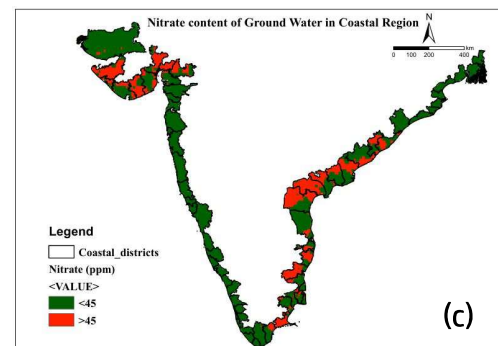
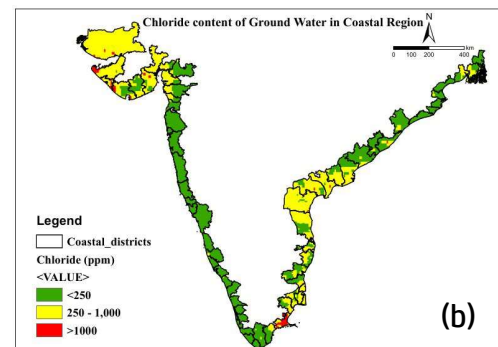
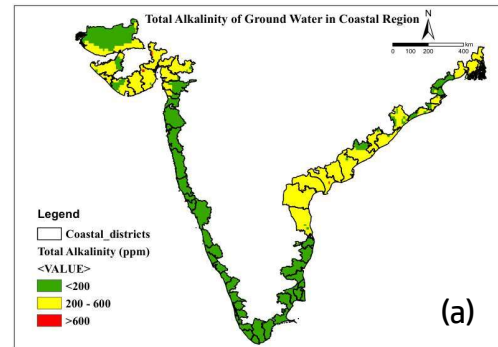
Assessment and mapping of trends in the hydro-climatic variables over the west and east coast regions of India

Sujeet Desai, Bappa Das and Sreekanth G. B.

Groundwater is one of the most important sources of fresh water for irrigation, drinking, and domestic usage in the coastal region. Due to the changing climate, the erratic rainfall distribution is resulting in increasing water demand. As a result, the over-exploitation of groundwater is leading to the deterioration of groundwater quality. A study was carried out to assess the spatial variability of groundwater quality in the coastal region. The data of 20 groundwater quality parameters from >2500 observation wells covering the coastal district of India was collected and analyzed.

Assessing groundwater quality in coastal regions crucial for sustainable water management amidst climate-induced water demand changes

The results revealed that EC of groundwater in the west coast is fresh i.e. <750 $\mu\text{S}/\text{cm}$ and moderate, 750-2250 $\mu\text{S}/\text{cm}$ in the east coast, except for a few districts in the state of Gujarat and Andhra Pradesh which are mineralized (>3000 $\mu\text{S}/\text{cm}$). The Total Alkalinity and Chloride content of groundwater in coastal regions are within the permissible limit ranging from <200 ppm to 200-600 ppm and <250 ppm to 250-1000 ppm respectively. Nitrate levels in the west coast are within the permissible limit (< 45 ppm) except for the coastal districts of Gujarat, whereas in the east coast, it is beyond the permissible limit (>45 ppm) in the districts of Andhra Pradesh and Tamil Nadu. The fluoride levels in the coastal region are within desirable (<1.0 ppm) and permissible (1.0-1.5 ppm) values with few patches beyond the permissible limit (>1.5 ppm) in the coastal districts of Andhra Pradesh and Gujarat. The spatial variability of groundwater quality parameters in the coastal region is shown in Figure.



Spatial variation of groundwater quality coastal region
(a) Total Alkalinity, (b) Chloride, (c) Nitrate, (d) Fluoride



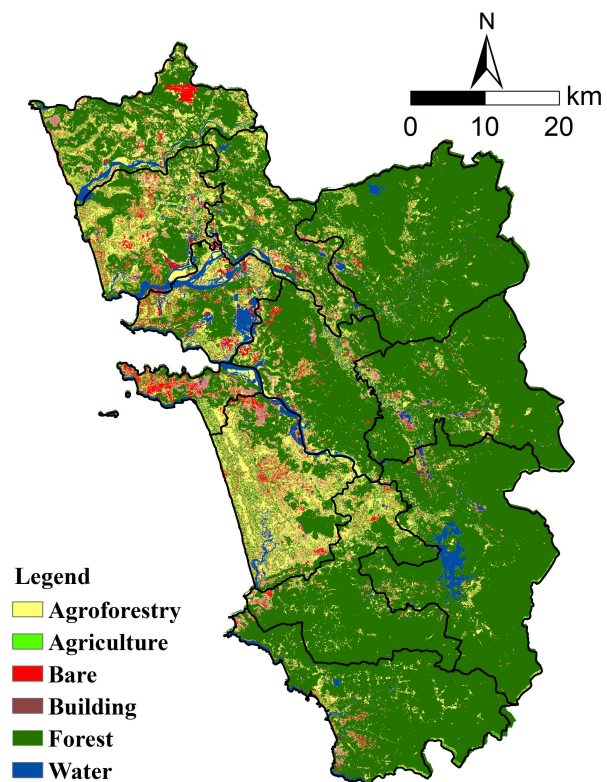
Assessment and development of agroforestry systems for improved livelihood and climate change mitigation in coastal regions of India

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

To map the agroforestry system in Goa, a field survey was conducted to collect ground truth data for Kulagar (a traditional agroforestry system of the Konkan region), agriculture, bare soil, built-up area, forest, and water bodies. A random forest (RF) model was built using the ground truth of respective classes as the dependent variable while ten bands (blue, green, red, near-infrared, redEdge1, redEdge2, redEdge3, shortwave infrared 2, shortwave infrared 3) and 28 spectral indices derived from Sentinel-2 satellite data (20 m resolution) were used as the independent variable. During the calibration the overall accuracy of RF was 79.02% and during validation accuracy was 75.86%. Based on the RF model the area under the Kulagar agroforestry system in Goa is 100.98 sq km (2.67 % of the geographical area) (Fig 1).

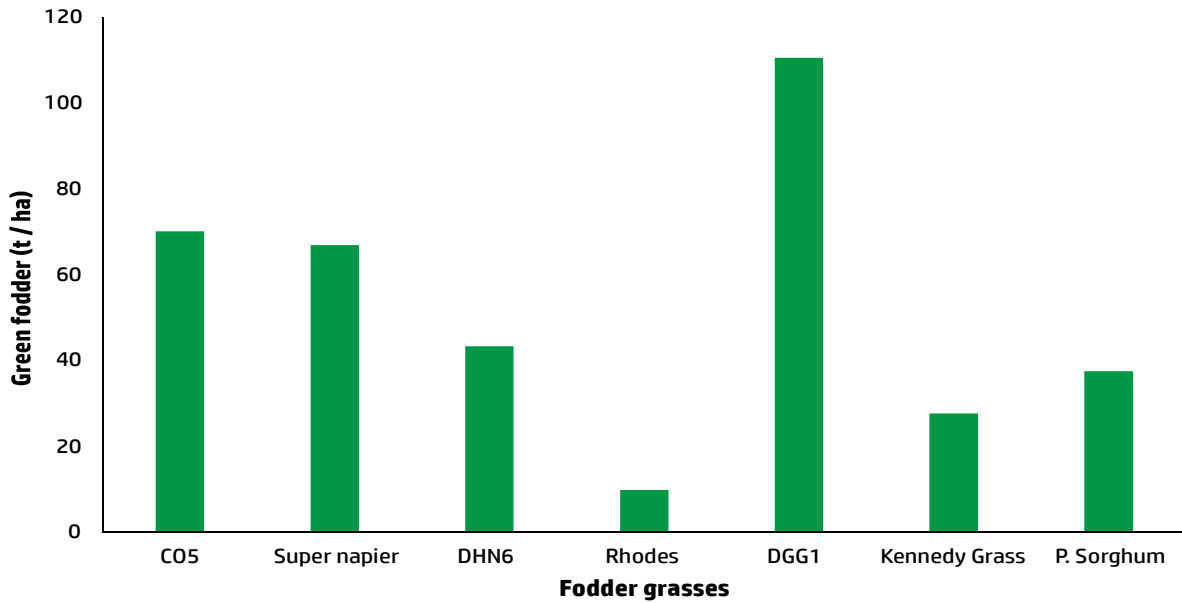
During 2023 in the coconut-based silvopastoral trial highest green fodder yield was recorded in DGG1 (110.60 t/ha) followed by C05 (66.92 tons/ha). The study also revealed that green fodder yield was highest in continuous contour trench plots (58.74 t/ha) followed by staggered trench (52.00 t/ha). In the bamboo germplasm collection consisting of 14 different bamboo species established in the year 2021, different biometric observations were recorded. The highest collar diameter (mm) was recorded in *Bambusa vulgaris* (37.42 mm) followed by *Dendrocalamus hamiltonii* (36.75 mm) and lowest in *Dendrocalamus asper* (22.71 mm). The highest height was recorded in *D. latiflorus* (6.07 m) followed by *B. vulgaris* (5.45 m) and the least in *Dendrocalamus asper* (2.78 m). In the bamboo germplasm established in the year 2022 consisting of 35 species, the highest collar diameter was recorded in *B. vulgaris* (wamin) (38.17mm) and the least in *Dinochloa andamanica* (1.99 mm). The highest height was recorded in *B. vulgaris* (wamin) (5.98 m) and the lowest in *Dinochloa andamanica* (0.32 m).

Employed Random Forest model using Sentinel-2 satellite data to map the Kulagar agroforestry system in Goa





Research Achievements - Natural Resource Management



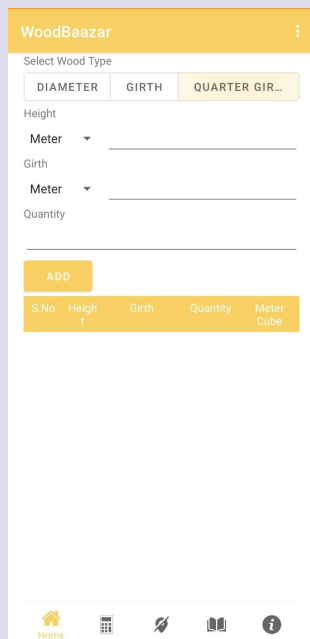
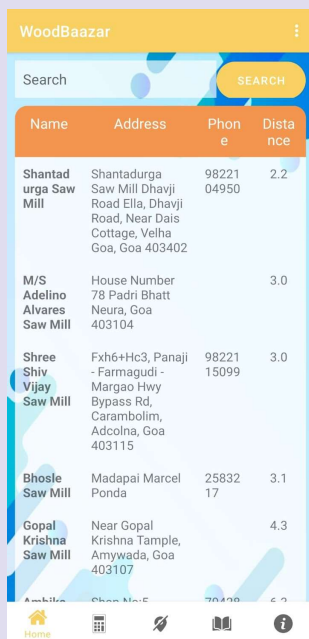
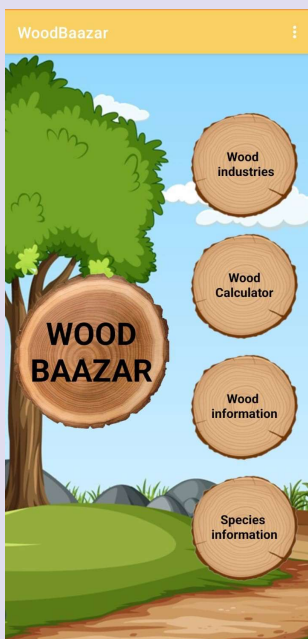
Green fodder yield of different fodder grasses under a coconut-based Silvi-pastoral

Developed Android App “Wood Bazaar”



Developed an android platform app “Wood Bazaar” which provides information about various wood based industries with their GPS location and market available in India. It also provides basic information of important wood producing species of India. The Android platform also helps in calculating the round wood volume and sawn wood volume using biometric data.

This application acts as a unified platform, where different stakeholders of agroforestry and tree plantation sector can easily get the information about different wood based industries. This platform will help the tree growers to get better price for their product through bypassing the middlemen / brokers and thereby increasing the income of agroforestry farmers.



Wood Bazaar - a digital information platform for agroforestry farmers





Research Achievements

Crop Science



Nurturing growth together: women farmers transplanting paddy (Digha, West Bengal) | © Pavel Rout 2023



Integrated management of major diseases of tomato and chilli in Coastal regions

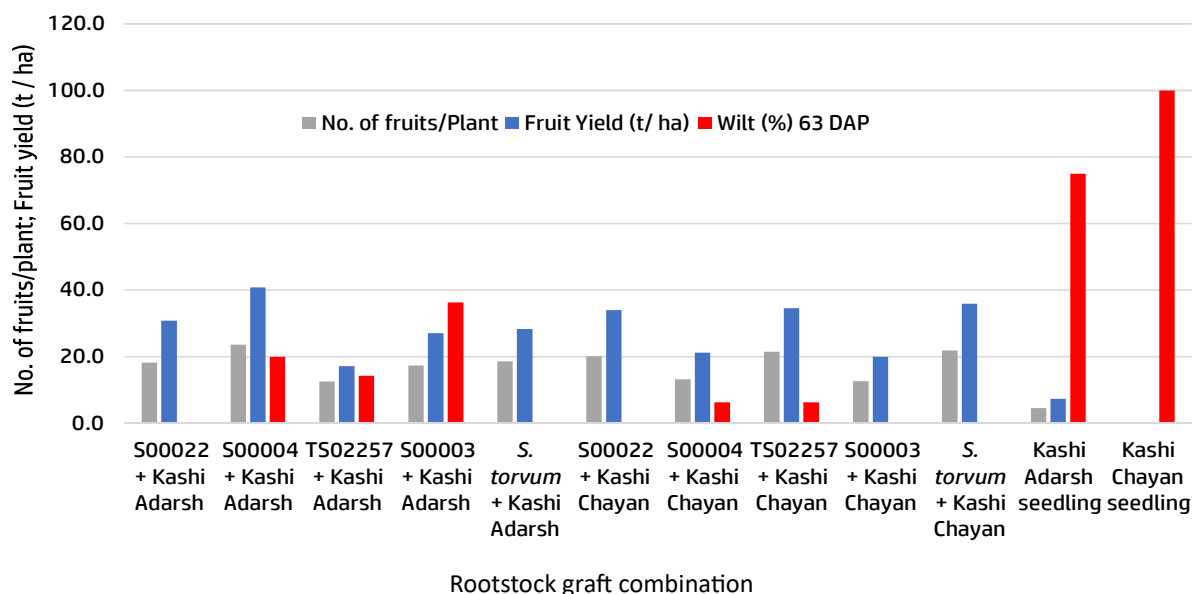
Ramesh R. and Maruthadurai R.

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 a greenhouse with *R. solanacearum* inoculation for the second year. Bacterial wilt incidence was recorded till 28 days post-inoculation. Kashi Adarsh grafts made on all the rootstocks showed less than 10% wilt incidence. In case of Kashi Chayan grafts made on all rootstocks, wilt incidence was less than 20%. While the wilt incidence was 95 to 100% in the case of seedlings and grafts of Kashi Adarsh and Kashi Chayan. Tomato grafts from the combination of five bacterial wilt-resistant rootstocks (S00003, S00004, S00022, TS02257 and *S. torvum*) and two tomato scions (Kashi Adarsh and Kashi Chayan) were evaluated along with resistant hybrids (Arka Rakshak and Arka Samrat) in the field. Wilt incidence in tomato grafts ranged from 0 to 10% after 63 days of planting. In resistant hybrids, wilt incidence was 10 to 19%. However, in the seedlings of Kashi Adarsh and Kashi Chayan, the wilt incidence was 44 to 63%.

The highest yield (43 t/ha) was recorded in the resistant hybrids. Among the graft combinations, the highest yield was recorded in S00004 + Kashi Adarsh / Chayan and TS02257 + Kashi Adarsh / Chayan (26 to 29 t/ha). In another experiment where the pathogen inoculated tomato grafts of the same combination were evaluated in the field. Wilt incidence in tomato grafts ranged from 0 to 36% after 63 days of planting. However, in the seedlings of Kashi Adarsh and Kashi Chayan, the wilt incidence was 75-100%.

Tomato grafts from the combination of five bacterial wilt-resistant rootstocks and two scions reduced the bacterial wilt incidence under Coastal climate



Performance of tomato grafts made on bacterial wilt rootstocks in field at ICAR - CCARI



Evaluation of soil application of lime and bio-formulations on tomato bacterial wilt

Soil application of different levels of lime (0, 4, 6, 8 and 10 t / ha) and two bio-formulations (Goa Bio-1 and Goa Bio-2) were evaluated for the incidence of bacterial wilt of tomato in a greenhouse with pathogen inoculation. Results of two independent experiments over two months indicated that the wilt incidence was not significantly reduced in the treatments compared to the control. This is due to the young seedlings (30 days old) used and inoculated with pathogens. However, the experiment in the field under natural conditions will be conducted to know the effect.



Tomato field view at ICAR - CCARI

Field evaluation of ChiLCV disease-resistant chilli hybrids



Chilli field view at ICAR - CCARI

Five ChiLCV disease-resistant chilli hybrids (Arka Gagan, Arka Tanvi, Arka Saanvim, Arka Yashasvi (H 8) and Arka Tejasvi) 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 are being evaluated in two locations. ChiLCV disease incidence (PDI) was more than 70% in all the hybrids and varieties from 45 DAP to 90 DAP. In the second experiment conducted at Ela farm indicated that ChiLCV disease incidence (PDI) was more than 50% at 45 DAP; 70% from 60 DAP to 90 DAP in all the hybrids and varieties. Kashi Anmol recorded a green chilli yield of 8.75 t / ha; Arka Meghana recorded a green chilli yield of 4.39 t / ha.

Genetic improvement of rice for coastal agro-ecosystem

Manohara K. K. and Paramesha V.

Germplasm collection, conservation and characterization

A total of one hundred and fifty-four rice germplasm accessions, including landraces, wild relatives, and advanced breeding lines, were assessed for various agro-morphological traits. The

experiment was conducted using an Augmented block design during the Kharif season of 2023. Significant variation was observed across all traits.

Population development and advancement of mapping populations

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 plant in the population for further advancement. The details of the populations are given below.

Generation	No of populations	List of populations maintained
F ₅	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 ₆	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 ₇	1	Jaya × Goa Dhan 2
F ₁₃	1	Pusa 44 × Goa Dhan

Population development and advancement of mapping populations



Field view of rice germplasm block at ICAR - CCARI



Collection of single panicles for advancement

Evaluation of advanced breeding lines under normal conditions (rainfed shallow lowland) - Station trial year II.

Thirty-eight promising advanced breeding lines, along with seven check varieties, were evaluated under rainfed shallow lowland conditions at the Institute farm. The results indicated that there was sufficient variability among the tested lines. Days to 50% flowering ranged from 93 to 120 days, plant height ranged from 102 cm to 207.33 cm, productive tillers per hill ranged from 5.67 to 12.83, panicle length ranged from 21.03 cm to 34.15 cm, grains per panicle ranged from 61.50 to 160.17, percent fertility ranged from 52.84% to 93.22%, and grain yield ranged from 3285.72 kg / ha to 7845.24 kg / ha. The highest grain yield of 7845.2 kg / ha was recorded in ABL18, followed by 7397.6 kg / ha in

ABL17, 7095.2 kg / ha in ABL 24, 6952.4 kg / ha in ABL 38, 6809.5 kg / ha in ABL33 and 6483.3 in ABL15. Among the five checks tested, Jaya recorded the highest grain yield (6021.4 kg / ha). The average grain yield among the tested lines is 5534.08 kg / ha.

Among 38 promising advanced breeding lines the highest grain yield of 7845 kg/ha was recorded in ABL18



Population development and advancement of mapping populations



Research Achievements - Crop Science

Thirty-eight promising advanced breeding lines, along with seven check varieties, were evaluated under rainfed shallow lowland conditions at the Institute farm. The results indicated that there was sufficient variability among the tested lines. Days to 50% flowering ranged from 93 to 120 days, plant height ranged from 102 cm to 207.33 cm, productive tillers per hill ranged from 5.67 to 12.83, panicle length ranged from 21.03 cm to 34.15 cm, grains per panicle ranged from 61.50 to 160.17,

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Evaluation of advanced breeding lines under stress conditions (coastal saline soils)



Bio-ecology and integrated management of cashew stem and root borers in the coastal region of India

Maruthadurai R., Ramesh R. and Bappa Das

Stem and root borer diversity in the cashew ecosystem

The damage caused by stem and root borer is one of the major limiting factors for the production and productivity of cashews. Stem borer-affected cashew trees beyond the recovery were selected for the intensive sampling. Selected trees were cut into 1 m long sections and cross-sectioned. The total number of larvae, pupae/cocoons and adults of wood borers were recorded. A total of ten species of wood borers belonging to four families of coleopterans were recorded from the borer-affected cashew trees. On average, 25.36 grubs of *Neoplocaederus spp.* were found to be feeding on a single tree. The maximum number of cocoons/pupae per tree was found in the species of *Neoplocaederus spp.*, followed by *Batocera rufomaculata*. Early instars of cerambycid grubs were primarily found in the outer bark region. Matured grubs, cocoons and adults of cerambycid were recorded in the heartwood region. Among the wood borers damaging the cashew plantation, the species *Neoplocaederus ferrugineus* and *N. obesus* were the major ones. The mango stem borer *B. rufomaculata*, buprestid *Belionota prasina*, ambrosia beetle *Euplatypus parallelus* and other cerambycids viz., *Xylotrechus subscutellatus* and *Coptops aedificator* was also found to be attacking the stem borer infested cashew trees. The wood borers damaging cashew plantations were dominated by the family Cerambycidae followed by Platypodinae.



Grub & Adult of *Neoplocaederus ferrugineus*



CSRB infested stem and root region of cashew



Evaluation of Entomopathogenic fungus for the management of CSRB

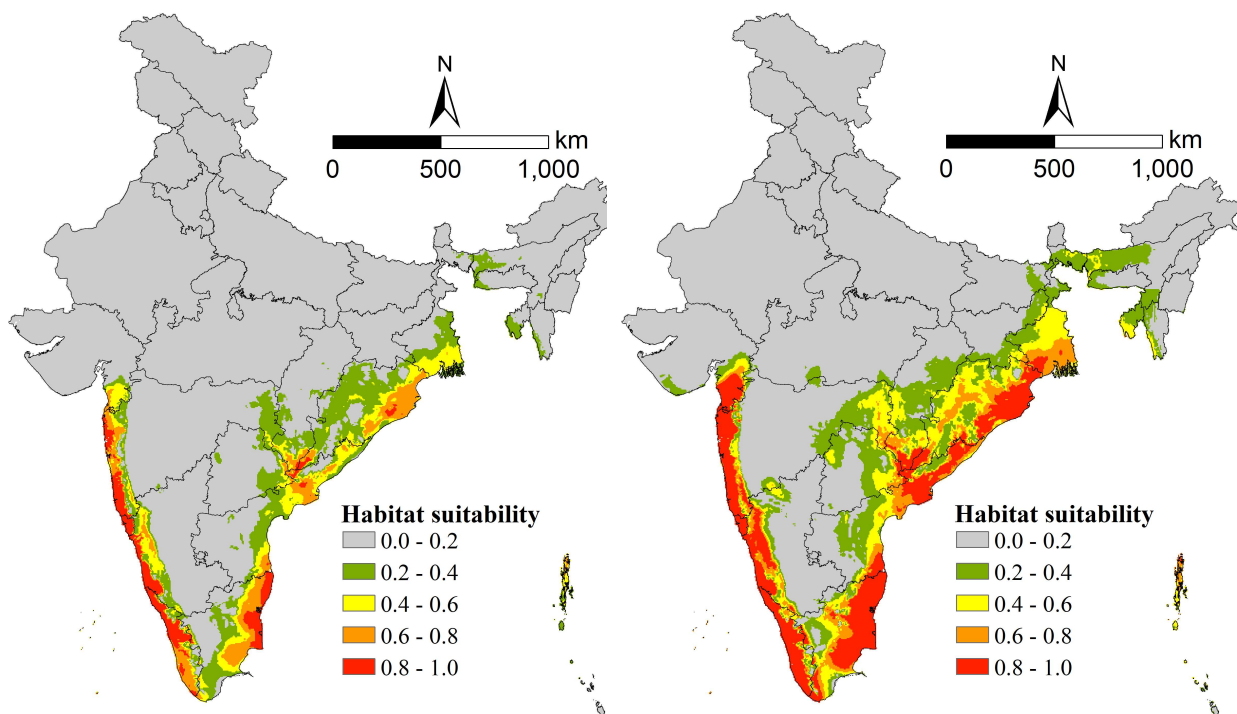
Entomopathogenic fungus viz., *Beauveria bassiana* and *Metarhizium anisopliae* were evaluated for the management of cashew stem and root borer under laboratory conditions. Field-collected grubs of *N. ferrugineus* were reared individually on fresh cashew bark pieces in an insect breeding dish. Different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

instars, were selected for the immersion exposure bioassay. Both the fungus caused significant mortality in various larval stages of CSRB. Early instar grubs were found to be highly susceptible to *Beauveria bassiana* and *Metarhizium anisopliae*. The percent mortality varies from 40-90%.

Potential distribution of *Neoplocaederus ferrugineus* under future climate change scenario

Stem and root borer *Neoplocaederus ferrugineus* one of the major insect pests of cashew. The present study aimed to predict the distribution of CSRB under present and future climate change scenarios with 19 bioclimatic variables through Maximum Entropy (MaxEnt) niche modelling. Occurrence records of CSRB were mainly collected through roving survey and from secondary sources. Bioclimatic data was downloaded from worldclim database. The MaxEnt model performed significantly better than the random predictions. The probability of occurrence of CSRB under current and future climatic condition is highly concentrated in the entire coastal states of India.

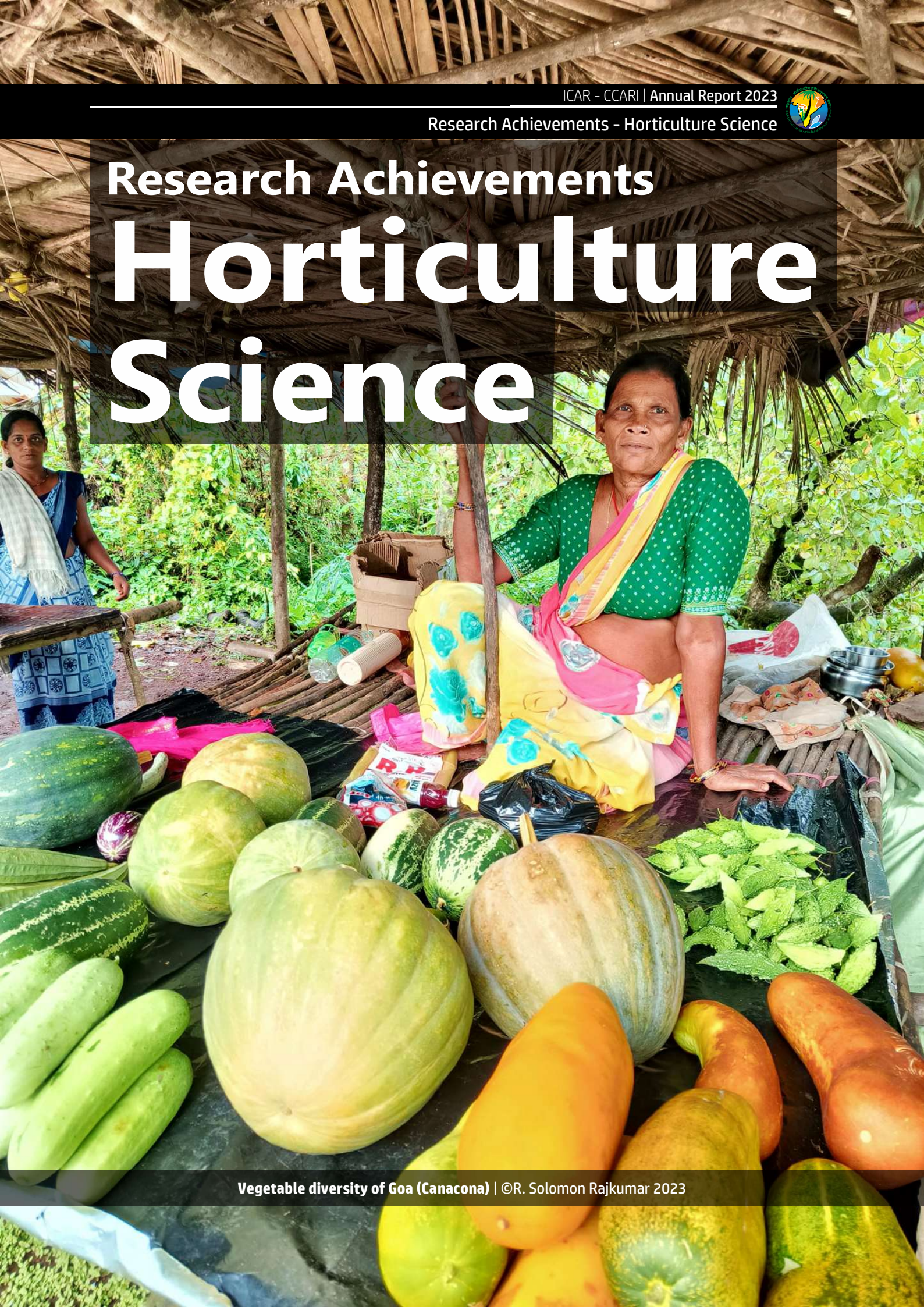
Predicted potential distribution of *Neoplocaederus ferrugineus* under future climate change scenario in coastal region



Current and future distribution of CSRB



Research Achievements Horticulture Science



Harnessing palms for sustainable livelihoods of coastal India

Arunachalam V., Bappa Das and V Paramesha

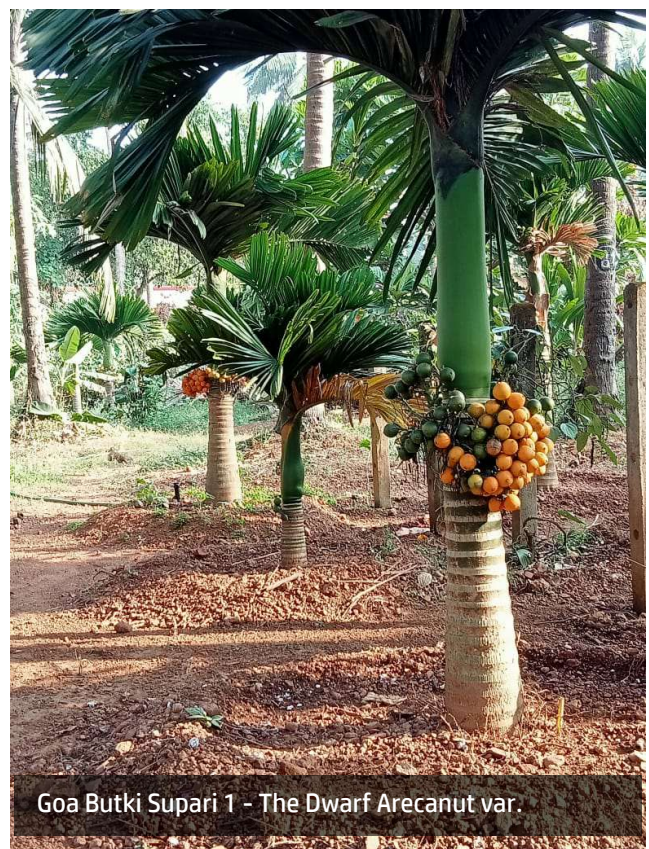
Seedlings of Annapurna, (Niu Lekha Dwarf Selection) from ICAR-CIARI Port Blair are planted for evaluation. A seed garden of the large-fruited dwarf-statured coconut (D6) variety (Goa Coconut 1) with green fruits is established. Demonstration plots of the coconut+pineapple+passion fruit cropping model were established at five locations in Goa benefiting 23 individual farmers.

Goa Butki Supari 1 with short stature is recommended for release by the state variety release committee for the state of Goa

The weight and volume of water collected from each sample also showed a significantly good correlation ($r = 0.729$). With an average weight of 1411g, whole fruit weights for tender nuts ranged from 723 to 3053g. Similarly, in mature coconuts, weights were recorded in the range of 376 to 1456g with an average value of 801g. Fruit weight varied depending on the variety of coconut palms chosen. The amount of water gathered from tender coconuts is significantly greater than that from the corresponding mature counterpart. About 139 to 475 ml of water is obtained from each of the tender nuts, compared to 10 to 390 ml from mature nuts. The tender and mature samples had a mean water content of 295 and 128 ml, respectively.

The contents of 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. The nitrate content of coconut water may be dangerous if it exceeds the prescribed limits, but has not been studied. The study compares the ease of analysis and environmental green chemistry of nitrate estimation of coconut water by four different

techniques (UV-visible spectroscopy, tri-stimulus colorimeter equipment, mid-infrared spectroscopy, and an Android application color grab). A set of 80 coconut water samples of different stages /varieties are used in the study. Android application color grab assisted nitrate estimation is comparable to U.V-Visible Spectrophotometry as positive correlations of absorbance of the reaction with reagent at 410 nm with b value from Color Grab app-Lab($r=0.97$), as well as Tri-stimulus colorimeter ($r=0.98$). Fourier Transformed Infrared Spectroscopy at 1351 to 1341 cm^{-1} wave numbers for coconut water samples, nitrate standards varying from 10 to 10,000 ppm, and spiked standards of coconut water were analyzed by cubit and partial least square analysis. The analytical greenness (AGREE score) method is used to understand the environmental, and occupational hazards methods, by 12 criteria. The mid-infrared spectroscopy recorded the highest analytical greenness with a score of 0.91 out of 1.0.



Goa Butki Supari 1 - The Dwarf Arecanut var.



The concentration of glucose in tender and mature coconut water samples by DNSA method was found as 445.83 ± 78.65 , and 440.52 ± 73.89 mg/ml respectively. The mid-infrared spectroscopy analysis displayed characteristic glucose peak at 1027 cm^{-1} to 1039 cm^{-1} or 1077 to 1079 cm^{-1} with maximum importance at 1029 cm^{-1} by four multivariate models (Gaussian process with radial basis function kernel), k-nearest neighbours, multivariate adaptive regression spline, support vector machine with radial basis function kernel.

Foliar glucose content in areca palms showed significance in discriminating tall and dwarf varieties of arecanut. A study is taken up to measure the foliar glucose level using a UV Visible spectrophotometer, Color Grab android app to measure the color change

of sample on reaction with the DNSA (3,5-dinitro salicylic acid) reagent and non-invasive reagent free mid-infrared spectra method. Hue of the color of the reaction records a high negative (-0.959) correlation with glucose content. Multivariate analysis methods of absorbance of infrared spectra at wavenumbers from 650 to 4000 cm^{-1} using the elastic net and partial least square recorded high (0.99) regression coefficients of dry powdered arecanut leaves. Seeds of Sirsi arecanut acclimatized at Ponda, Goa are raised for nursery and further evaluation for yield.

Goa Butki Supari 1 with short stature is recommended for release by the state variety release committee for the state of Goa.





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

Arunachalam V. and Maneesha S. R.

The project has been initiated to evolve ornamental crop-based livelihood opportunities for coastal farmers. Five orchid species native to Goa were maintained. Anthurium varieties were maintained under a shade net house. Jasmine germplasm from Goa is characterized by qualitative and quantitative traits. About four germplasm accessions of *Jasminum sambac* from four locations (Bicholim, Ponda, Canacona, Marmugoa) of Goa state of India were characterized for 54 traits. Shannon Weaver diversity index and Gini index Fresh weight of flower bud was highest in J7 (0.265 ±0.066) and lowest was observed in J2 (0.178± 0.044). Using the Shannon-Wiener Index (SWI) of the diversity of fresh weight of flower bud showed the highest diversity in J7 (0.880) and the lowest were observed in J4 (0.144). The SWI index of flower bud weight was 0.56 and the Gini index of the same was only 0.04. The longest flower bud length was seen as J8 (3.825

±0.667) and J7 was seen to be the lowest (2.216 ±0.333). The breadth of the flower bud showed the highest diversity J7 (0.655) and the lowest was observed in J2 (0.261). The SWI calculated was observed that the length and breadth of the jasmine bud were 0.551 and 0.435 respectively and the Gini index of length and breadth were (0.14) & (0.02).

Jasmine varieties of Goa were characterized for 54 qualitative and quantitative fruits

Characters	SWI	Gini index	Characters	SWI	Gini index
Fresh weight of flower bud	0.56	0.04	Whiteindex	0.59	0.07
Flower bud length	0.55	0.14	Plant growth habit	0.788	0.31
Flower bud breadth	0.44	0.02	Ridges on the stem	0.294	0.01
Calyx length	0.82	0.05	Leaf arrangement	0	0
No. of Calyx teeth	0.42	0.04	Shape of leaf blade	0.514	0.18
Size of Calyx lobes	0.68	0.06	Intensity of green colour	0.522	0.08
Flower diameter	0.74	0.1	Leaf tip	0.483	0.03
Flower stalk length	0.69	0.03	Shape of base of leaf blade	0.574	0
No. of petals	0.75	0.26	Flower bearing habit	0.625	0.14
Petal length	0.51	0.02	Flower bearing position	0.573	0.14
Petal breadth	0.58	0.03	Boldness of flower bud	0.427	0.03
No. of stamens	0.18	0.01	Flower bud shape	0.614	0.12
Anther length	0.18	0.03	Flower bud colour	0.423	0.05
Filament length	0.68	0.04	Shape of open Corolla	0.293	0.05
Stigma+Style length	0.68	0.05	Shape of Corolla lobe	0.29	0.08
HunterLab l value	0.69	0.03	Flower petal tip	0.304	0.11
HunterLab a value	0.52	0.03	Reflexing of flower	0.265	0.06
HunterLab b value	0.75	0.11			

Shannon-weaver index and Gini index values



Impact analysis of ICAR-CCARI technologies

**Shripad Bhat, A. R. Desai, Manohara K. K., Gopal R. Mahajan, Paramesha V.,
Amiya R. Sahu and Monica Singh**

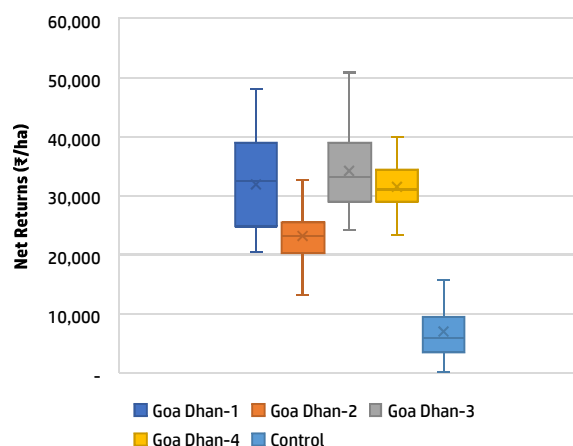
Impact assessment of the agri-horti interventions carried out by the Institute under the Scheduled Tribe Component (STC) program in a community-owned farm of Gaondongrim village of Canacona Taluka in South Goa was undertaken. The 10 ha farm area is collectively owned by 33 tribal farm families and before the interventions, half of the farm area was barren land.

The interventions of ICAR-CCARI technologies increased the farm employment from 730 man-days/year (2017-18) to 1,697 man-days per year (2022-23)

Interventions implemented were: (i) rejuvenation of barren land through the planting of improved cashew varieties, (ii) improved nutrient and production technologies, (iii) effective utilization of interspace and available natural resources, and (iv) value addition through the 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 (657 for coconut and 73 for banana) per year (2017-18 – before interventions) to 1,697 man-days per year (2022-23–after the interventions). The family labor income increased from ₹1,29,500 to ₹8,18,060 (an increase of ₹6,88,560) and the net returns from ₹(-)1,44,250 to ₹2,87,127 (an increase of ₹4,31,377) after the interventions. Due to these agri-horti interventions, besides improved employment opportunities at the farm, labor productivity in terms of gross returns per man-day and net returns per man-day also improved. The gross returns per manday increased from ₹214 to ₹598 with an improvement of 179% and the net returns per manday increased to ₹169 registering a growth of 186%.

The Goa Cashew-1 variety was compared with the control/ non-descript local variety to assess the economic impact. The yield levels of Goa cashew-1 were higher compared with the control. The total gross returns and net returns obtained under Goa Cashew-1 were ₹1,46,791 and ₹77,012, respectively. While control/non-descript local variety obtained ₹64,211 gross returns and ₹30,182 net returns. The benefit-cost ratio was higher with Goa Cashew-1 (2.29) compared to control (2.09).

The institute's salt-tolerant paddy varieties (Goa Dhan 1, Goa Dhan 2, and Goa Dhan 3) were compared with the local traditional salt-tolerant variety, korgut, by analyzing the data collected from 150 farmers (30 for each variety). The average landholding sizes of sample farmers ranged from 1.77 acres to 2.08 acres and the area under paddy ranged from 0.73 to 0.92 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 3.28 t/ha (net return of ₹34,158/ha) in Goa Dhan 3, 3.18 t/ha (₹31,958/ha) in Goa Dhan 1, 3.01 t/ha (₹31,408/ha) in Goa Dhan 4 and 2.58 t/ha (₹23,125/ha) in Goa Dhan 2, while it was 1.88 t/ha (₹6,948/ha) in Korgut.



Box-plot comparing net returns from Institute's salt tolerant rice varieties with control (Korgut)

Improvement of indigenous mango, cashew, and jackfruit

Arunachalam V., Ramesh R. and Maruthadurai R.

The new project was initiated with the following four specific major thematic areas viz., resistance/ tolerance in mango for fruit fly, anthracnose, resistance/ tolerance in cashew for tea mosquito bug, stem and root borer, seed composition variability in jackfruit and suitable poly-embryonic rootstocks for mango.

Based on earlier pest incidence data specific mango varieties with less susceptible (Costa, Arka Anmol, Ratna), and high susceptible (Arka Aruna, Amrapali) to fruit fly incidence were shortlisted for study. About 55 trees of 15 years and above age seven cashew varieties were shortlisted for the screening of tea mosquito bug pest incidence work. A tea mosquito bug-tolerant cashew genotype of three promising trees with varying mechanisms of tolerance was identified and scored for pest incidence, proline, catalase content, and leaf vein arrangement details. Leaf vein distance, length, and width of leaf, branching point distance as per sitting, and feeding pattern of insect from the margin of the leaf in healthy and infested leaves were recorded.

About 27 trees of 15 years and above the age of different cashew varieties, accessions, and hybrids free from borer infestation to date in the hotspot of the pest-infested block are shortlisted for

the screening of stem and root borer pest incidence work. An equal number of infested and recovered or unrecovered trees of the same age are selected in the neighborhood and included in the study for comparison. The circumferences of the branch, and firmness, proline, and catalase content of the bark of healthy and infested trees were recorded.

Starch composition in jack fruit seeds and its varied end uses are reviewed. Seeds are collected and stored for the estimation of biochemical parameters.

Five poly-embryonic mango varieties (Vellaikolumban, Nekkare, Kurukkan, Turpentine, and EC-95862) are shortlisted for study on salinity tolerance screening and grafting study.

A tea mosquito bug-tolerant cashew genotype of three promising trees with varying mechanisms of tolerance was identified



- Tea mosquito bug resistance by recuperation in cashew leaf after infestation
- Tea mosquito bug resistance by whitish discoloration in cashew leaf
- Leaf vein branching in relation to adult tea mosquito bug sitting and feeding



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

Mathala J. Gupta, R. Solomon Rajkumar, Desai A. R., Ramesh R., Shripad Bhat and Monica Singh

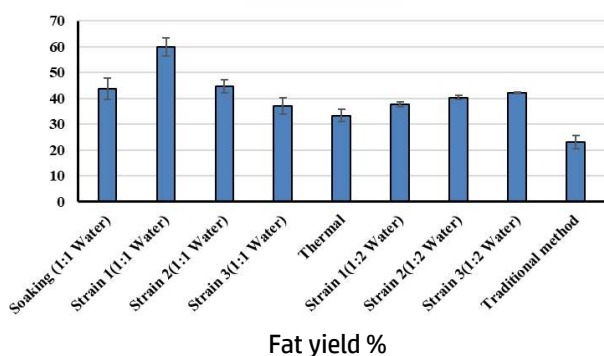
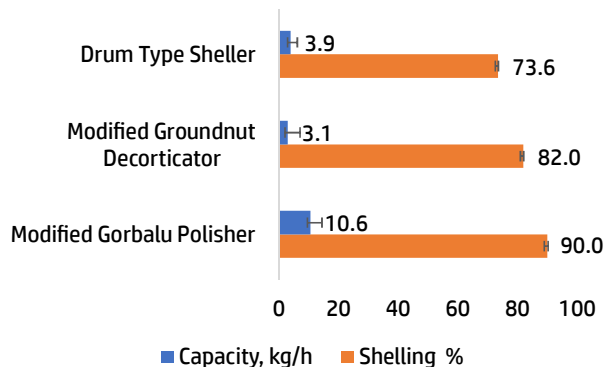
Kokum Seed-Based Vegan Butter

Kokum seed-based butter gives a good vegan substitute for commercial butter and can substitute cocoa butter in the preparation of chocolates and confectionery. Efforts are on to develop an improved and hygienic methodology for kokum seed-based butter extraction.

The emphasis is to maximize the extraction quantity and quality of kokum seeds-based butter. Two machines have been developed and standardized at the institute for decortication of kokum seeds, and one machine, developed by a local manufacturer has been evaluated.

An improved and hygienic methodology for kokum seed-based butter extraction has been standardized

Totally eight pre-treatments for improving kokum butter extraction were studied. The quality of butter extracted was also analyzed for melting point, specific gravity, color, acid value, iodine value, etc. was studied for the various pre-treatments. The samples have been sent to the food testing lab for Saponification value, FFA percentage, and Composition analysis. The results in terms of butter yield are summarised in the figure given below.



Kokum syrup-based wine

Kokum (*Garcinia indica*) wine is a traditional beverage with potential health benefits due to its antioxidant properties. This study aims to evaluate the fermentation process and antioxidant activity of kokum wine using different microbial cultures. Kokum wine was prepared using a combination of sequential and co-inoculation fermentation techniques. Different microbial cultures, labelled as w_c , w_{s_1c} , w_{s_2c} , $w_{s_1s_2c}$, along with their combinations (w_{s_1+c} , w_{s_2+c} , $w_{s_1s_2+c}$), were employed. Total phenolics were measured using the Folin-Ciocalteu method, expressed as mg of gallic acid equivalents per 100 ml (mg GAE/100 ml). Antioxidant activity was determined by DPPH (2,2-diphenyl-1-picrylhydrazyl) assay and expressed as a percentage. Anthocyanin content was measured spectrophotometrically and reported in mg/L.

The quality of kokum wine was notably influenced by the fermentation dynamics and the microbial strains employed, particularly discernible between co-inoculation and sequential inoculation

techniques. Throughout the fermentation process, significant variations were observed in total phenolic content, antioxidant activity, and anthocyanin content, especially on the final day of fermentation (Day 16), showcasing the impact of these techniques on the final wine quality. When comparing the fermentation methods w_{s_1c} , w_{s_2c} , and $w_{s_1s_2c}$ with w_{s_1+c} , w_{s_2+c} , and $w_{s_1s_2+c}$, distinct differences emerge across various parameters. Co-inoculation methods, exemplified by $w_{s_1s_2c}$, generally exhibited higher total phenolic content compared to sequential inoculation methods w_{s_1+c} , w_{s_2+c} , and $w_{s_1s_2+c}$. For example, on the final day of fermentation, $w_{s_1s_2c}$ recorded a total phenolic content of 275.42 mg GAE/100 ml, surpassing the levels observed in w_{s_1+c} , w_{s_2+c} , and $w_{s_1s_2+c}$, which ranged from 255.10 mg GAE/100 ml to 267.34 mg GAE/100 ml. Similarly, co-inoculation methods demonstrated higher antioxidant activity, with $w_{s_1s_2c}$ exhibiting an antioxidant activity of 14%, while w_{s_1+c} , w_{s_2+c} , and $w_{s_1s_2+c}$ displayed lower



Kokum wine



activities ranging from 4.55% to %. Antioxidant activity levels varied among the fermentation methods, ranging from 4.55% to 14.20%. ws_1s_2+c displayed the highest activity at 14.20%, followed by ws_2+c at 10.80%. Conversely, ws_1+c and ws_1s_2c showed lower activities at 4.55% and 5.68%, respectively. On the final day of fermentation, the anthocyanin content varied among the different fermentation methods. Notably, ws_1c displayed the highest anthocyanin content at 5.01 mg/L, followed closely by ws_2c at 6.18 mg/L. Conversely, ws_1s_2+c exhibited the lowest anthocyanin content at 3.17 mg/L. Interestingly, ws_1+c and ws_1s_2c showed intermediate levels of anthocyanin content, measuring 5.84 mg/L and 5.24 mg/L, respectively. The fermentation process significantly influenced the phenolic content, antioxidant activity, and

anthocyanin levels in kokum wine. Microbial combinations appeared to enhance these properties synergistically, suggesting the importance of microbial diversity in fermentation. The observed antioxidant activity and anthocyanin content highlight the potential health benefits of kokum wine consumption. This study demonstrates the dynamic changes in phenolic content, antioxidant activity, and anthocyanin levels during kokum wine fermentation. The wine has been kept for six months for maturation after which it will be analyzed for aromatics and hedonics. Further research on the microbial communities and their interactions could provide insights into optimizing the production of kokum wine with enhanced health-promoting properties.

RTE Jackfruit *Xacuti*

Based on data gathered from different SHGs and housewives involved in jackfruit processing, the Jackfruit *Xacuti* recipe was standardized. Based on literature available on other curries with jackfruit-based parameters were used to retort pouch-blanch jackfruit slices suspended in *Xacuti* gravy. The gravy, water and jackfruit piece mixture were optimized at five distinct levels. Retorting using the programmable Water Shower Retort machine of the institute was done. The packages did not display any puffing due to spoilage. Sensory evaluation will be used to determine the ultimate product. The water shower retort machine 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 1.5 bar and an over pressure of 2.1 bars for 55.76 min was maintained during each process cycle. The total process time and process conditions have been standardized using the programmable

retort. The F_0 Value calculated based on core temperatures and lethal rates was 3.57 ± 0.38 . The product will be evaluated further.



Jackfruit Xacuti packed in retort pouches

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

Arunachalam V., Desai A. R. and Bappa Das

The citizen science data from Nature Conservation Foundation Mysore on phenology data of mango across India from 2014 to 2022. A total of 45512 data points was obtained from Season watch group. The data was analyzed to understand the flowering pattern.

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

Ganesh V. Chaudhari, A. R. Desai, R. Ramesh, Maruthadurai R. and Shripad Bhat

To enrich the vegetable basket of the coast, particularly of Goa, non-traditional vegetables like Potato (*Solanum tuberosum*) and Cauliflower (*Brassica oleracea* var. *botrytis*) were evaluated for their suitability under coastal conditions. The available varietal technology, including the new

potato entries, of these non-traditional vegetables mentioned were evaluated under Goa conditions. The planting material of 'Kufri Lima' was not shared by ICAR-CPRI due to some issue with planting tubers. Kufri Lima was therefore omitted from the evaluation trial rabi 2022-23.

Sr. no.	Potato (<i>Solanum tuberosum</i>)	Cauliflower (<i>Brassica oleracea</i> var. <i>botrytis</i>)
1	Kufri Kiran	Amazing
2	Kufri Surya	Pusa Ashwini
3	Kufri Pukhraj	Pusa Kartiki
4	Kufri Thar -1	Pusa Meghna
5	WS-09-609	Pusa Sharad
6	P-85	-
Seed source	ICAR-CPRI	F ₁ purchased from vegetable seed purchased from vegetable seed shop & ICAR-IARI

Non-traditional vegetables like potato and cauliflower were evaluated for the suitability under coastal conditions

List of varieties evaluated in different vegetable crops

Potato (*Solanum tuberosum*) varieties / entries evaluation

Potato being a non-traditional crop for Goa, a varietal/entries evaluation trial was conducted on a 144 sqm area (15°00'33.6"N, 74°14'31.3"E) in Saljini village in the South Goa district to check the feasibility of Potato cultivation. The planting material of potatoes were brought from ICAR-CPRI. It was planted in four replications with a 6 sqm / plot area for each variety/entry per replication. A spacing of 60 cm x 20 cm (row to row x plant to plant) was followed. The ridges and furrows planting layout was adopted and all the cultural practices were done meticulously. The rabi 2022-23 trial took 82 days at the farmer's field. The data recorded were analyzed using RBD design. When the total tuber yield was considered 'Kufri Surya' recorded a statistically significant tuber yield of 118.2 q/ha, over the rest of the evaluated varieties/entries.

The crop was observed to be susceptible to bacterial wilt and confirmed pathologically as the chief reason resulting in reduced yield levels. Therefore more than 20g size individual potato tuber yield from the trial was also considered variety / entry-wise. 'Kufri Surya' showed 36.2 q/ha tuber yield which was numerically highest compared to the var. / entries tested.



Harvest from Kurfi Surya of rabi



Varieties	Mean, total potato tuber yield	Mean, >20g size individual potato tuber yield
Kufri Kiran	55.5	33.4
Kufri Surya	118.2	36.2
Kufri Pukhraj	12.9	00.0
Kufri Thar 1	27.0	20.7
WS-09-609	69.8	35.2
P-85	66.4	30.9
C.D. (5%)	37.6	12.3
C.V.	45.0	33.3

Potato tuber yields (extrapolated) q/ha

Cauliflower (*Brassica oleracea var. botrytis*) varieties / entries evaluation

Cauliflower is yet another non-traditional crop for Goa, the quality Varietal/F1seeds (Table 1) acquired from the Division of Vegetable Science, ICAR-IARI, New Delhi, along with a ruling commercial Cauliflower F1 was included for its performance evaluation in Verlem village (South Goa) as well as on the Institute farm, Old Goa (North Goa) during rabi 2022-23. The seeds were sown in pro-trays. The variety/hybrid-wise healthy seedlings of 34 days were transplanted at a spacing of 60 X 50 cm(row to row x plant to plant) on the Bhumika Self-help group's farm (15°02'40.2"N 74°14'54.1" E), at Verlem as well as on Institute's farm 'B' location (15°29'46.3"N 73°55'01.5" E), Old Goa and cauliflower cultivation practices were followed precisely.

After 40 days from transplanting (74 days after seed sowing) cauliflower varieties viz., Pusa Ashwini and Pusa Kartiki reached marketable curd

size respectively of 386 g, 315 g at Verlem location. However, it took 57 days from transplanting (91 days after seed sowing) for 'Pusa Ashwini' to reach a marketable curd size of 301 g. Similarly, the 'Pusa Meghna' reached marketable curd size 42 days from transplanting (76 days after seed sowing) at the Verlem location and yielded 314 g.



Cauliflower trial at Verlem

Varieties	Trial at Verlem		Trial at CCARI	
	Av. curd wt.(g)	Days to harvest after transplanting (from sowing)	Av. curd wt.(g)	Days to harvest after transplanting (from sowing)
Pusa Ashwini	386	40 (74)	301	57 (91)
Pusa Kartiki*	315	40 (74)	288	59 (93)
Pusa Sharad*	405	56 (90)	319	68 (102)
Pusa Meghna*	314	42 (76)	232	54 (88)
Pvt. Hybrid	384	85 (119)	No curd initiation	90 (124)

Cauliflower variety-wise performance in Goa

*Buttoning (33-52%), Ricyness (>78%), and Loose-curd (>26) were observed respectively in Pusa Kartiki, Pusa Sharad, and Pusa Meghna varieties at the Old Goa location.



Gyno-Cis Hybrid in Sahyadri gourd (*Momordica sahyadrica*)

Sahyadri gourd (*Momordica sahyadrica*) collections (SET A: sixteen dioecious male vine and SET B: sixteen dioecious female vine) evaluated on the Institute's farm 'C' location (15°29'17.0"N, 73°55'22.2"E) and utilizing some of the collections from SET B the 'Gyno-Cis hybrids' were attempted successfully. The pollen grains from such phenotypically hermaphrodite flowers were examined with Alexander's stain as well as with the Hanging drop technique using 3% sucrose solution to ensure pollen viability and functionality respectively. Further, *Momordica sahyadrica* Dioecious-Female (DF) genotypes were successfully pollinated by pollen grains obtained from induced hermaphrodite (HM) but genetically Dioecious-Female genotypes of *Momordica sahyadrica*. There the seeds of a cross between two genetically female genotypes, which is otherwise unattainable naturally, were harvested and in the Kharif 2023 season, the six 'Gyno-Cis Hybrids' (3A, 3B-2, 3B-4, 19A, 19B-2, 19B-3) were grown and observed.

Gyno-Cis hybrids took 14 to 15 days from anthesis and pollination to reach a flower to the fruit-harvesting maturity. The average weight recorded ranged from 23.81 to 33.93 g/fruit. The average fruit length ranged from 6.40 to 9.17 cm whereas the fruit diameter ranged from 3.13 to 3.73 cm. In dioecious crops the clonal selection has persisted as a key technique to utilize the naturally existing yield potential, however, the 'Gyno-Cis hybrids' may be looked at as an approach beyond selection.

Six 'Gyno-Cis Hybrids' (3A, 3B-2, 3B-4, 19A, 19B-2, 19B-3) Sahyadri gourd (*Momordica sahyadrica*) were grown and observed

Mother Parent
(Dioecious Female- DF)



Pollen Parent
(Dioecious Female but induced hermaphrodite-HM)



Gyno-Cis Hybrid





Research Achievements Animal and Fishery Sciences



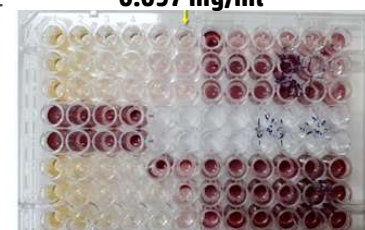
Prevalence, impact and management of the economically important diseases of dairy animals in coastal India

Susitha Rajkumar and Shirish Narnaware

The dried herbs were procured from ICAR – Directorate of Medicinal and Aromatic Plants Research (DMAPR), Anand. The collected dried herbs were Long pepper (*Piper longum*), Bael (*Aegle marmelos*), Mandukparni (*Centella asiatica*), Mamejava (*Enicostemma littorale*), Mulethi (*Glycyrrhiza glabra*), Ambahaldi (*Curcuma aromatica*). The dried plants material was extracted in methanol (25g/250ml methanol). Screening of herbal extracts for antibacterial effect against *Staphylococcus haemolyticus* and *S. epidermidis* by disc diffusion test on Mueller Hinton agar (MH agar) showed that the most effective herbs were *Glycyrrhiza glabra* (Mulethi), *Curcuma aromatica* and *Aegle marmelos* (Bael). The Minimum Inhibitory Concentration (MIC) of *Glycyrrhiza glabra* (Mulethi) root was 0.048–0.1953, *Aegle marmelos* fruit was 1.562–3.125 and *Curcuma aromatica* was 0.097–0.390 mg/ml against *Staphylococcus* sp.



0.097 mg/ml



Micro-titre plate showing MIC of *Curcuma aromatica* (Ambahaldi) for *S. haemolyticus* and disc diffusion test showing zone of inhibition by *Glycyrrhiza glabra* (Mulethi) extract (100 µg/ml)

Extract	Average diameter of zone for <i>S. haemolyticus</i> (mm)	Average diameter of zone for <i>S. epidermidis</i> (mm)
<i>Piper longum</i> (Pippali/long pepper)	11	Nil
<i>Centella asiatica</i> (Mandukparni)	Nil	Nil
<i>Enicostemma littorale</i> (Mamejava)	Nil	Nil
<i>Glycyrrhiza glabra</i> (Mulethi)	12	15
<i>Andrographis paniculata</i> (Kirayata)	Nil	Nil
<i>Curcuma aromatica</i> (Ambahaldi)	13	13
<i>Aegle marmelos</i> (Bael)	11	12
Enrofloxacin	35	26

Antimicrobial potency of herbal extracts against *Staphylococcus haemolyticus* & *S. epidermidis* by disc diffusion method

Extract	MIC against <i>S. haemolyticus</i> (mg/ml)	MIC against <i>S. epidermidis</i> (mg/ml)
<i>Enicostemma littorale</i> (Mamejava)	25	25
<i>Centella asiatica</i> (Mandukparni)	12.5	12.5
<i>Andrographis paniculata</i> (Kirayata)	12.5	12.5
<i>Piper longum</i> (Pippali/long pepper)	100	100
<i>Glycyrrhiza glabra</i> (Mulethi)	0.048	0.1953
<i>Plectranthus ambonicus</i> (Indian mint)	25	25
<i>Aegle marmelos</i> (Bael fruit)	1.562	3.125
<i>Curcuma aromatica</i> (Ambahaldi)	0.097	0.390
<i>Enicostemma littorale</i> (Mamejava)	25	25

Minimum inhibitory concentration (MIC) of herbal extracts against *Staphylococcus haemolyticus* & *S. epidermidis*

***Glycyrrhiza glabra* root, *Aegle marmelos* fruit and *Curcuma aromatica* were having antimicrobial potency against *Staphylococcus* sp.**



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

The findings of the study could be helpful in generating useful information on testicular hemodynamics and normal reference values of testicular perfusion in indigenous *Shweta Kapila* bulls

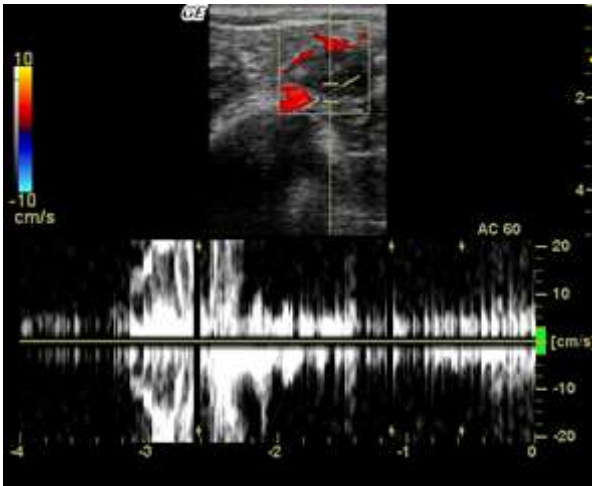
As a value addition to the conventional breeding soundness examination, detailed evaluation of testicular function was carried out using advanced digital Pulse Wave Doppler Ultrasound Imaging technology for the first time in indigenous cattle. A digital colour doppler ultrasound imaging machine Logiq® Book XP with multi-frequency linear array probe was employed for the study. Major pulse wave doppler ultrasound attributes include Peak systolic velocity (PSV), End diastolic velocity (EDV) and Resistive index (RI) measured along the various regions of the Testicular Artery (TA). The mean peak SV ranged from 4.98±0.02 to 12.01±0.26 m/s and mean EDV ranged

from 3.72±0.03 to 5.09±0.16 m/s in different parts of the TA in screened *Shweta Kapila* bulls. Significantly higher ($P<0.05$) values of peak SV (12.01±0.26 m/s) were recorded in spermatic cord part of TA. The EDV and PSV values measured in the regions of the spermatic cord were significantly ($P<0.05$) variable among the bulls and within individual bulls. Less variability of Resistive index (RI) was observed for values measured in different regions of the TA in the same bull. The findings of the study could be helpful in generating useful information on testicular hemodynamics and normal reference values of testicular perfusion in indigenous *Shweta Kapila* bulls.

Major seminal traits including qualitative and quantitative semen attributes were recorded for reproductive characterization of Agonda Goan breed of indigenous pig employing sperm head dimensions and derived morphometric indices using multi-scan and semi-automated image analysis software. Sperm head dimensions including length and width of sperm head, head area, perimeter and tail length were measured, and these basic morphometric parameters were used to calculate additional derived morphometric indices characterising the sperm head viz. Ellipticity, Elongation, Rugosity, Form and Regularity. The mean length of sperm head and total sperm length were measured as 11.06±0.06 μm and 69.31±0.26 μm , respectively. Other recorded basic parameters were mean head width (6.01±0.05 μm), Head area (59.62±0.42 μm^2),

Parameter	Testis	Spermatic cord part of TA	Marginal part of TA	Intra-testicular branches of TA
PSV, m/s	Right	12.32 ± 0.24 ^a	5.11 ± 0.02 ^b	4.93 ± 0.03 ^b
	Left	11.70 ± 0.28 ^a	4.94 ± 0.03 ^b	5.02 ± 0.02 ^b
EDV, m/s	Right	5.14 ± 0.17 ^a	3.91 ± 0.03 ^b	3.80 ± 0.03 ^b
	Left	5.03 ± 0.16 ^a	3.75 ± 0.02 ^b	3.63 ± 0.03 ^b

PW Perfusion characteristics (Mean ± SEM) measured in various regions of the Testicular Artery

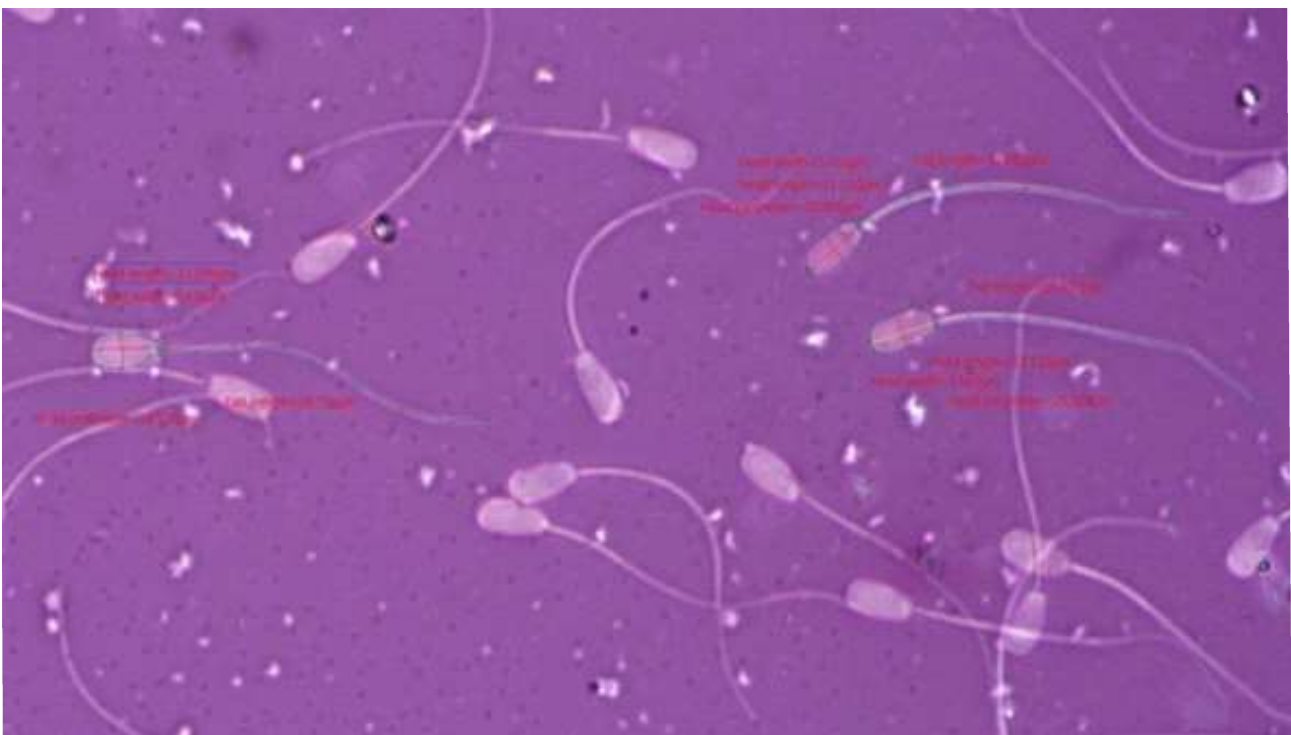


Ultrasonograms of testicular perfusion analysis

Head Perimeter ($29.24 \pm 0.15 \mu\text{m}$) and Tail length ($58.25 \pm 0.26 \mu\text{m}$). Rugosity or Roughness, which specifies the amorphous shape of the head, was $0.817 \pm 0.003 \mu\text{m}^2/\text{pixel}^2$ and Regularity index, indicating the spermatozoal head symmetry, was 0.91 ± 0.007 . Other derived sperm morphometric indices were Ratio (0.546 ± 0.006), Ellipticity (1.854 ± 0.020), Elongation (0.296 ± 0.005) and Form ($817.46 \pm 2.85 \mu\text{m}^2/\text{pixel}^2$). These findings indicated that the complete sperm morphometry engaging

derived morphometric indices can define the sperm head shape more accurately and can be used as a valuable supportive tool for further studies on indigenous boar semen morphology and sperm classification.

Basic seminal parameters like ejaculate volume, sperm concentration, live count, and progressive motility in Agonda Goan pigs were recorded and compared with LWY and crossbreds. Major parameters like ejaculate volume and sperm concentration were significantly lower ($p \leq 0.05$) in Agonda Goan pigs while reaction time and refractory period were significantly longer ($p \leq 0.05$) indicating that indigenous Agonda Goan pigs are difficult semen donors with poor libido. Standardized Artificial Insemination (AI) using liquid boar semen combined with controlled breeding involving estrus induction and synchronization was also carried out in the Institute and farmers' field. A total of 435 piglets were born through 96 numbers of AI and 63 numbers of farrowing with a success rate of 72% 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 76 numbers of pig farmers were benefited generating overall employment of 22,609 man-days with income generation of ₹122.88 lakhs rupees.



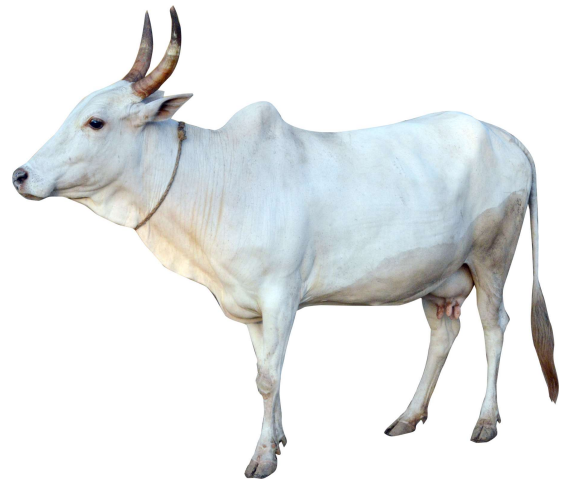
Sperm morphometric evaluation in Agonda Goan pig



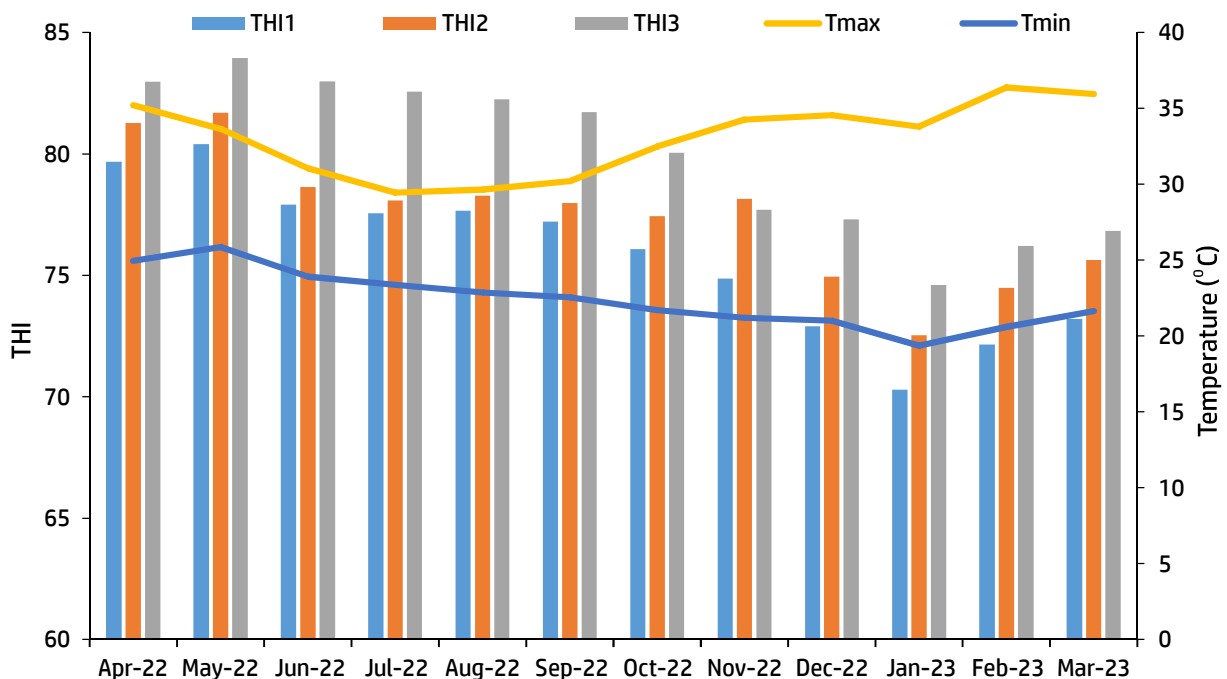
Genetic variability studies for thermotolerance in selected breeds of livestock under coastal environment

Amiya R. Sahu and Gokuldas P.P.

The temperature and humidity data for the year 2022-23 was accessed from the institute's meteorological observatory station. Temperature-humidity index (THI) indicated April to May month as extremely hot period and December to February month as a cool period of the year. Based on the THI result the blood samples were collected from native Shweta Kapila cattle (n=52) from different places of Goa. Rectal temperature and respiration rate recorded during hot and cold period were analyzed. The enzymatic activity of serum samples of different animals was estimated by a Biophotometer (Eppendorf™). The serum ion concentration of the samples was estimated by Spectrophotometer reading. Genomic DNA was isolated from blood samples by phenol chloroform isoamyl alcohol method. DNA quality and quantity were checked. Oligonucleotide primers for HSP90 and HSP70 genes were designed by Primer 3 input version 0.4.0 software. The Standardization of amplification was carried out for all the regions.



Shweta Kapila cow



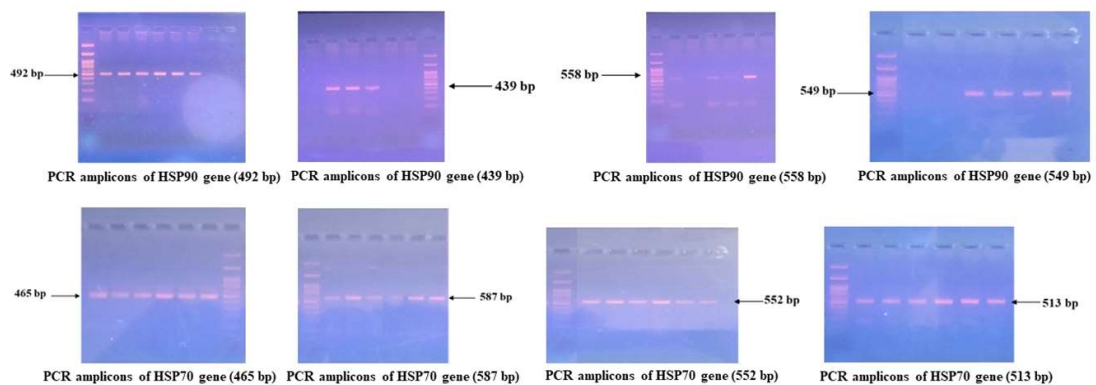
Temperature-humidity index (THI) during summer and winter months

4 novel SNPs were detected in the Exon 3, Exon 5 and Exon 10 regions of HSP90 gene of Shweta Kapila cattle

PCR amplicons of six random samples of Shweta Kapila cattle were sequenced for each amplified regions in both forward and reverse directions. Sequence results were analyzed using EditSeq and SeqMan of LASERGENE software version 7.1.0 (DNASTAR Inc., USA). Gene sequences were analysed for both forward and reverse reads using reference sequence of cattle HSP90 gene obtained from NCBI GenBank (Accession number: XM_019983599). On analysing sequences four novel SNPs (g.C1011T, g.A1209G, g.C1324T and g.T3814A) were detected in the Exon 3, Exon 5 and Exon 10 regions of HSP90 gene. Some of the sequences of HSP90 and HSP70 are yet to be analyzed.

No.	Gene	Region	Primer Sequences (5'-3')	Annealing temp (°C)	Size (bp)
1	HSP90	Exon 3	F: TGAGAGCTTGACCGATCCCAGTAA R: TGCCCAAGATAAACAGCCACAAGT	57.3	492
2	HSP90	Exon 5	F: CCGGTTTTGTGATGGAGAGGTGAC R: TGGGGCATCGGGGAACAGAAT	57.3	439
3	HSP90	Exon 7	F: TCTTTGGATTTTGGGTTTACA R: AAGATCGACGGGCGCATTTACT	55.6	558
4	HSP90	Exon 10	F: CTTAGGGGTGTTAGGTGTCTTTTG R: GATCCTGTTGGCATGTGTCTGG	59.3	549
5	HSP70	5'UTR	F: GCTTCCGACACCCGCTATC R: GAACGCCTTGGTCTCCCCTTGT	57.3	465
6	HSP70	Exon 1	F: CGCGGGGCTGAACGTGCTGAGG R: TGAGGTCGCGCCGTTGAAGAAGT	53.3	587
7	HSP70	Exon 2	F: CTTCAACGGGCGCGACCTCAACAA R: GACACCCTCTCGCGCTGGACCTC	57.3	552
8	HSP70	Exon 3	F: AGATCAGCGAGGCGGACAAGAAGA R: TACAAAGCAAAACACAGGACACAG	59.3	513

Details of PCR amplifications



Sequencing and identification of polymorphism



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 R. Sahu and Monica Singh

Phytogenic feed additives such as *Shyama tulsi* (*Ocimum tenuiflorum*), *Moringa* (*Moringa oleifera*), *Chekurmanis* (*Sauropus androgynus*), *Kalmegh* (*Andrographis paniculate*), *Alpinia* (*Alpinia galanga*), *Turmeric* (*Curcuma longa*) and *Ginger* (*Zingiber officinale*) were used in this study. Active constituents of these herbal additives were evaluated through GC-MS profiling. Network analysis was carried out for these compounds with binding targets.

GC-MS analysis of rhizomes of *Alpinia* revealed various compounds based on molecular weight. Similarly, the active constituents evaluated by GC-MS profiling of *Shyama tulsi* leaves. The binding DB database was used to identify binding targets and their associated functions or pathways of different herbal compounds. Cytoscape v3.9.0 software was used to build networks among identified compounds and their targets.

No.	Compound Name	Molecular weight
1	1-HEPTEN-4-OL, 4-PROPYL-	156
2	CYCLOHEXANOL, 3,5-DIMETHYL-	128
3	6-METHYLHEPT-4-EN-1-YL ISOBUTYRATE	198
4	7-OCTEN-3-OL, 2,6-DIMETHYL-	156
5	CYCLOHEXANOL, 3,5-DIMETHYL-	128
6	5-HEPTEN-2-OL, 6-METHYL-	128
7	7-OCTEN-1-OL, 3,7-DIMETHYL-, (S)-	156
8	7-OCTEN-1-OL, 3,7-DIMETHYL-, (S)-	128
9	SILANE,TRIMETHYL-1,2-PROPADIENYL-	112
10	CITRONELLOL	156

B:C ratio for rearing 10 birds increased to 2.21 from 1.82.

GC-MS Profiling of *Sauropus androgynus* (*Chekurmanis*)

An impact study of various technological interventions in breeding, feeding and other management aspects of backyard poultry farming was done for 180 backyard poultry farmers from Goa, Karnataka and Maharashtra. The study revealed that there was a 33% increase in average poultry flock size with a 155% increase in the adoption of breeding practices. There was increase in 118-man days with own backyard poultry farming in addition to other agricultural activities. The average consumption of eggs had

increased by 34 numbers and poultry meat by 6.4 kg over 2 years of study period. Awareness about vaccination schedules in poultry and skill improvement for doing vaccination has reduced various incidences of diseases in poultry. Nutrient requirement of poultry and feeding of supplementary feed were adopted by all farmers after feeding interventions like formulation of feed and use of addition of herbal feed additives. Considering the cost of production and return, the B:C ratio for rearing 10 birds increased to 2.21 from 1.82.

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

(Inter-Institutional Project with ICAR-CIFT, Kochi)

R. Solomon Rajkumar, C. O. Mohan, Mathala Juliet Gupta, Susitha Rajkumar and Trivesh Mayekar

The formulation of the traditional Goan Prawn Curry with Kokum rind and Tamarind as souring agents was standardized based on the information collected from housewives, and cooks, and preliminary trials and hedonic scale sensory evaluation were conducted. The preparation of gravy/curry medium and prawns was done separately. The best recipe was selected based on the Hedonic scale sensory evaluation by a selected consumer panel (Chart no 1). The gravy with Kokum rind as a souring agent has been selected for further processing. The retortable pouches having three-layer configuration of 12 μ PET ALOX / 15 μ Nylon/70 μ 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) at ICAR-Central Institute of Fisheries Technology, Kochi, Kerala. 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). 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 $\pm 0.1^\circ\text{C}$ and a response time of 0.2 s, were used. The retort temperature (RT) was maintained at 121.1°C and air pressure was

Goan Prawn curry in retort pouches is commercially sterile and the product is ready for the commercialization



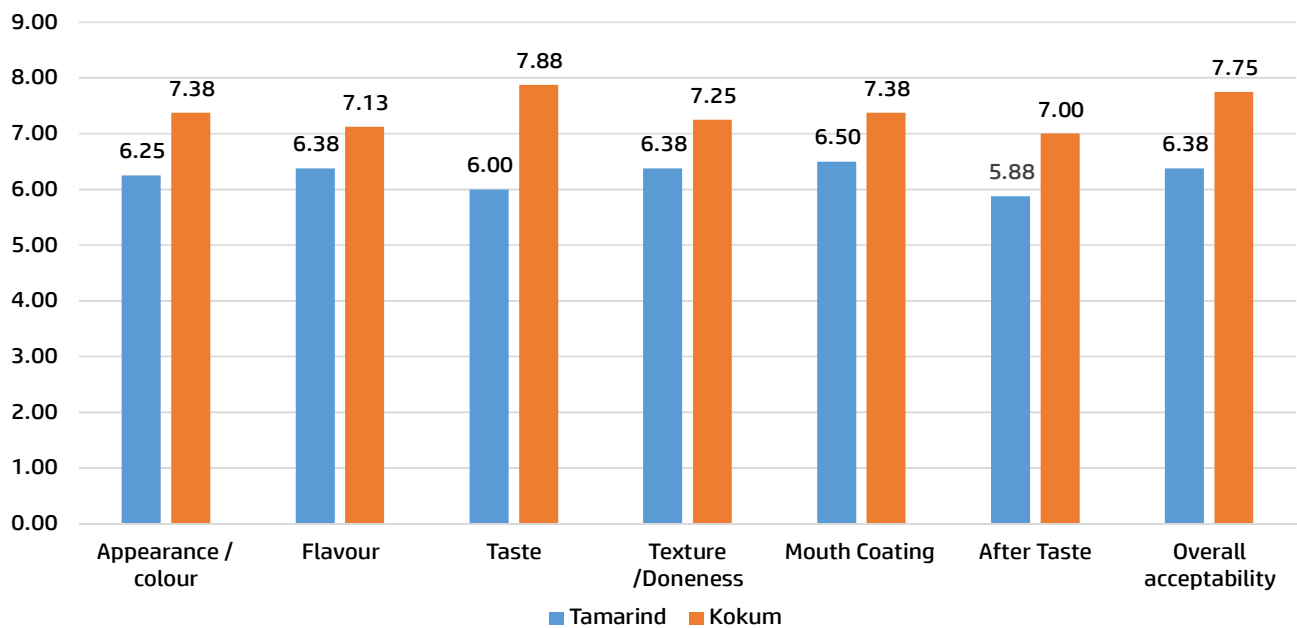
Traditional Goan Prawn Curry



Research Achievements - Animal and Fishery Sciences

maintained at 28 psi throughout the heating and cooling periods. The lag factor for heating (J_h), the slope of the heating curve (fh), 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 (TB) were calculated. The parameters were determined by plotting temperature deficit (RT - Tc) on semi-log paper. Total process time (TB) 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 Goan Prawns curry in retort pouches is commercially sterile and the product is ready for the commercialization.



Selection of best recipe by Hedonic scale Sensory evaluation (8 panel)



Shelf stable Goan Prawn curry in retort pouches



Mill wall Model 24 rotary retorting system (ICAR-CIFT, Kochi)

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

Shirish Narnaware, Gokuldas P. P. and Susitha Rajkumar

To determine the prevalence of major infectious reproductive disorders in dairy cattle of West coast region, different dairy farms located in coastal areas of Goa and Maharashtra were visited, history of the herd was collected and biological samples such as blood, cervical swabs and uterine swabs were collected from dairy cattle of 11 farms.

The important reproductive problems recorded in dairy cattle were repeat breeding (20.25%), anestrus (6.32%), endometritis (3.79%), brucellosis (3.79%), abortion (2.53%), retention of placenta (1.26%), cervicitis (1.26%) and prolapse (1.26%). For confirmation of bacterial isolates, the genomic DNA was isolated from the bacterial colonies and PCR was carried out using the oligonucleotide primers for amplification of *EcA1r* gene of *E. coli*, *gap* gene of *Staphylococcus* spp and *tuf* gene of *Streptococcus* spp. The amplified PCR products were further sequenced using Sanger sequencing and the gene sequences obtained were matched with the NCBI genbank database using BLAST analysis. Based on microbiological and molecular diagnosis the bacteria identified from different reproductive conditions were *Staphylococcus* spp. such as *S. chromogenes*, *S. cohnii* and *Mammaliococcus sciuri*, *E. coli*, *Brucella abortus*, *Bacillus* spp and *Streptococcus pluranimalium* whereas from one cervical swab sample from Sindhudurg yeast was identified.

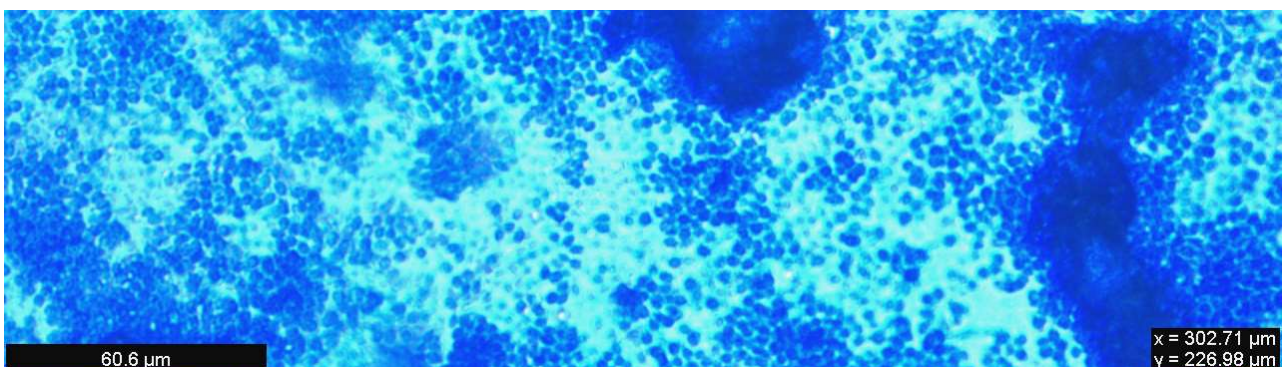
For diagnosis of brucellosis Rose Bengal Plate Test (RBPT) was performed on all the serum samples of which 3 samples from Sikeri and Usgao Gaushala detected positive. The cytological examination of the reproductive tract using the Cytobrush technique and the Whiteside test performed on uterine discharge samples detected three cases of endometritis. A total of 62 blood DNA samples from Goa and Maharashtra were screened for



Sample collection from dairy farms

hemoprotozoan parasites 15 samples were detected positive for *Theileria orientalis* and one sample from Sikeri Gaushala was detected positive for *B. abortus*. Experiments on developing a nutri-hormonal protocol aimed at regulating low plasma progesterone (P4) levels and negative energy balance have been initiated. This nutri-hormonal protocol can be useful in addressing repeat breeding and infertility in dairy animals in the coastal region.

This nutri-hormonal protocol can be useful in addressing repeat breeding and infertility in dairy animals



Yeast cells stained with lactophenol cotton blue stain.



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

Trivesh Mayekar, Sreekanth G.B., Gopal R. Mahajan, Manohara K.K., R. Solomon Rajkumar and Paramesha V.

The survival and growth rates of the Asian seabass were compared in four different systems (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). The survival rates for T1, T2, and T3 were 72%, 66.6%, and 54%, respectively, resulting in total production of 656.64 kg, 1772.89 kg, and 1382.4 kg, respectively. The average fish weights were 1.52 ± 0.11 kg, 1.33 ± 0.15 kg, and 1.28 ± 0.13 kg in T1, T2, and T3, respectively. To provide nutritional food security to rural populations Carp mola polyculture and silver carp culture were evaluated. A powdered feeding method was followed with a rate of 5% body weight at two times daily during the culture period.

Pangasius fish attained a growth of 40-50 cm and 950-1050 g in one year

For controlling excess algal growth silver carp plays a major role and it reached a size of 40-50 cm and 950-1050 g within six months.

Pangasius seeds of 7-9 cm (2-4 g) were stocked (stocking density one fish per m²) in 500 m² pond and fed with pelleted feed (28% protein 4% lipid) at a rate of 5% body weight twice a day. The Pangasius fish attained a growth of 40-50 cm and 950-1050 g in one year.



Juvenile

Adult

Asian Seabass - Pre-grow & Grow-out pond



(a)



(b)



(c)

a. *Amblypharyngodon mola* (Mola carplet)

b. *Hypophthalmichthys molitrix* (Silver carp)

c. *Pangasius pangasius*



Research Achievements

Agro

Eco-Tourism





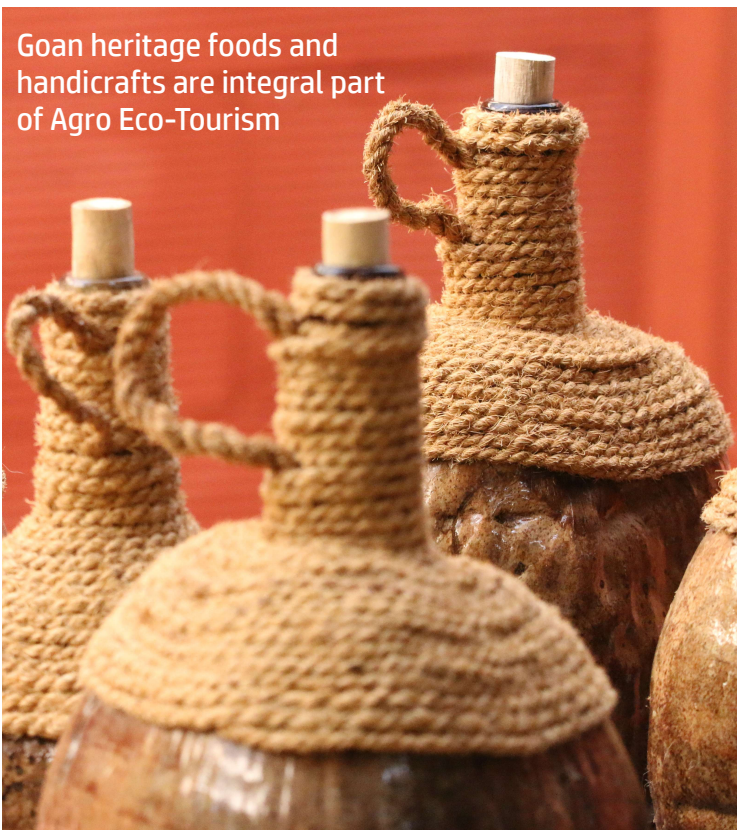
Prospects and promotion of agro eco-tourism in coastal region of India

R. Solomon Rajkumar, Parveen Kumar, Chaudhari Ganesh Vasudeo, Mahajan Gopal Ramdas, Maruthadurai R., Mathala J. Gupta, R. Ramesh, Shripad Bhat, V. Arunachalam, Sreekanth G.B., Sujeet Desai, Trivesh Suresh Mayekar, Uthappa A.R. and Nibedita Nayak

Agro-ecotourism is the modern concept to boost tourism activity on farms. It offers scope for the integration of farming activities, the tourism industry and the farm business. It is one of the livelihood strategies to link tourism with agricultural services, products, and experiences to satisfy the needs of both farmers and tourists. Considering the potential of this niche paradigm, a conceptual framework for the promotion of agro-ecotourism as a multidimensional farming enterprise in coastal regions of India has been developed. As a part of this project, 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 'Dhanavanatari Vatika' (1670m²) with 150 species of medicinal and aromatic plants and a model 'Nakshatra Vatika' has been established as an 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

Goan heritage foods and handicrafts are integral part of Agro Eco-Tourism



AET technology is being adopted by the stakeholders of the tourism industry and the institute AET centre is being operational in a PPP mode



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Research Achievements - Agro Eco-Tourism

to the farmers. Five agro-ecotourism start-ups from two states (Goa and Karnataka) have been registered through consultancy and technical support of ICAR-CCARI. The technology has been commercialized for ₹17.70 lakhs to the M/S Milestone Resorts, Goa in the form of a Contract Research Project on the Assessment of agro-ecotourism conceptual framework models in an island ecosystem of Goa. Further, the technology is being adopted by the stakeholders of the tourism industry (M/S Udbhav Vriksh, Goa) and the institute Agro-eco-tourism centre is being operational in a Public-Private-Partnership (P-P-P) mode and generated a revenue of ₹26 lakhs for five years. Further a draft policy for 'Promotion and regulation of AET in Goa' has been submitted to the Directorate of Tourism, Govt of Goa.

A draft policy for 'Promotion and regulation of AET in Goa' has been submitted to the Directorate of Tourism, Govt of Goa



The landscape of M/S Milestone Resorts, Candolim, Goa (under Contract Research Project on Assessment of agro-ecotourism conceptual framework models in an island ecosystem of Goa)

Paddy based agro eco-tourism in the coastal region (Rajahmundry, Andhra Pradesh)





AICRP Centers





All India Co-ordinated Research Project on Integrated Farming Systems

Paramesha V., Parveen Kumar, Manohara K. K., R. Solomon Rajkumar, Gopal R. Mahajan, Uthappa A. R., Gokuldas P. P., Trivesh Mayekar,

Rice-based lowland integrated farming system

Standardized integrated farming system model of 0.5 ha of land in typical lowland conditions in Goa. This model integrates various elements including crops such as rice, cowpea, moong, finger millet, and vegetables, alongside fodder production, dairy farming, a fish pond, FYM unit, and a kitchen garden. In the year 2023, the system yielded 21 quintals of rice, 625 kilograms of baby corn, 654 cobs of sweet corn, 180 kg of finger millet, 61.2 kilograms of moong, 65 kilograms of cowpea, and 3.5 tons of fodder maize. Additionally, the dairy component produced 1355 liters of milk. The net return from the system amounted to Rs. 1.72 lakh, with crops contributing the highest percentage (65%), followed by dairy (24%). The cropping system module generated 9520 kilograms of crop straw/stover, 7800 kilograms of green fodder, and 968 kilograms of crop residue, which were recycled within the system as animal feed and organic manure. Moreover, 6500 kilograms of cow dung were also recycled. The model employed 362 man-days during

the year. Through residue recycling, approximately 61.3 kg of nitrogen (N), 38.9 kg of phosphorus (P), and 72.3 kg of potassium (K) were effectively recycled within the system. Overall, the rice-based farming model showcased successful crop production, dairy farming, and efficient residue utilization, leading to a significant net return. Additionally, the system offered employment opportunities while effectively recycling nutrients, thereby enhancing sustainability and productivity.

Adoption of IFS increased yield by 238% and net income by 112% over farmers practice



Rice-based lowland integrated farming system at ICAR - CCARI

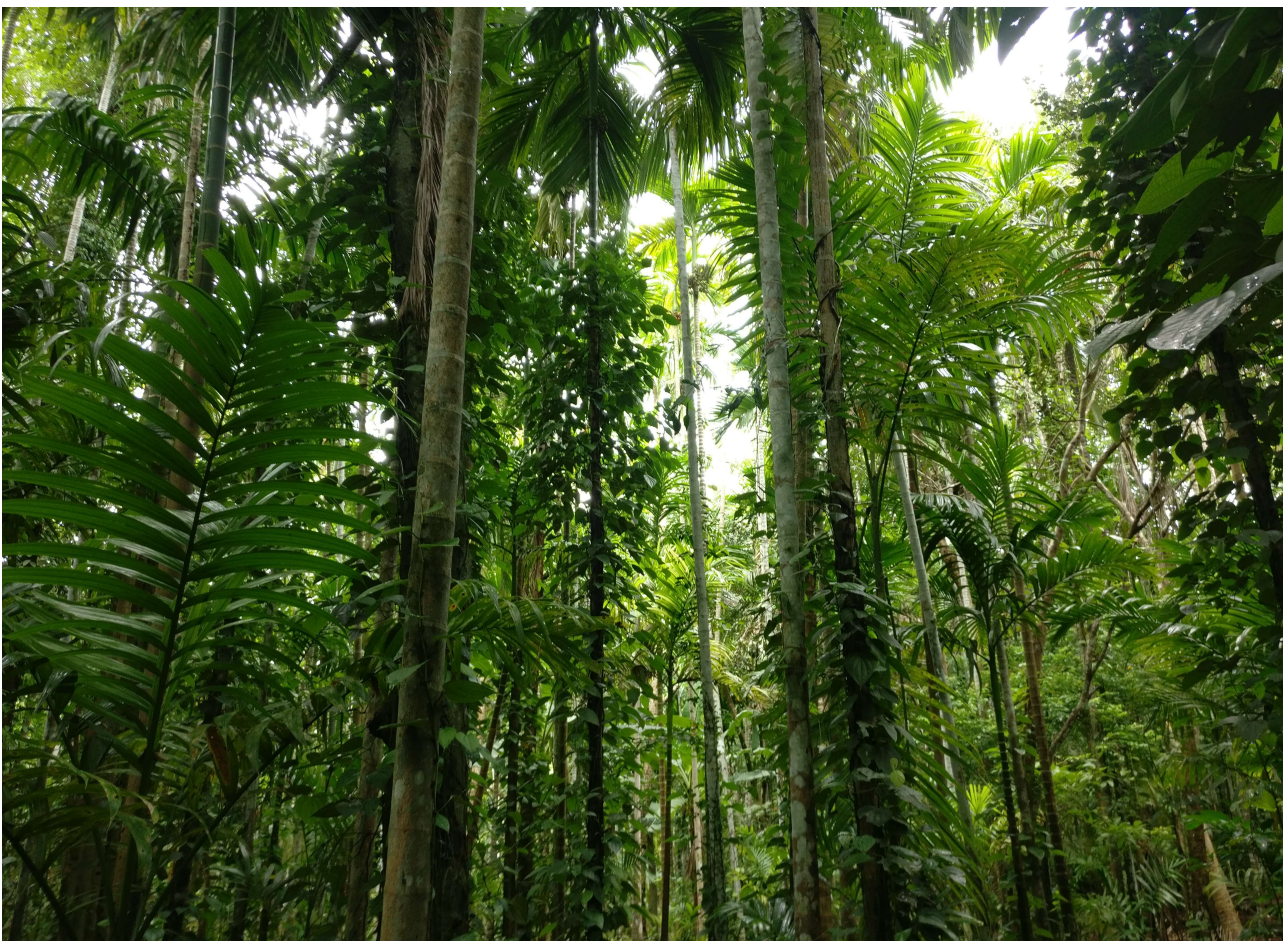


Plantation crop-based upland integrated farming system

A farming model tailored for upland environments in Goa, covering 0.8 hectares, integrates various enterprises including plantation crops, goatery, duckery, compost unit, and water harvesting ponds. The cropping system comprises combinations like cashew and pineapple, coconut and pineapple with turmeric, and arecanut with banana and turmeric. This model yielded a net income of Rs. 2.17 lakh annually, with the highest contribution to net profit coming from the arecanut-based cropping system, followed by the cashew and pineapple system, underscoring the economic viability of these crops within the model. Additionally, the model generated 300 man-days of employment, fostering local livelihoods and rural development. Through residue recycling, approximately 75.3 kilograms of nitrogen (N), 48.3 kilograms of phosphorus (P), and 87.3 kilograms of potassium (K) were recycled, mitigating the necessity for external fertilizer purchases and

emphasizing sustainable practices. In essence, the upland farming model in Goa exhibited profitability, employment generation, and effective nutrient recycling. By prioritizing lucrative crops such as arecanut and cashew, incorporating turmeric, and embracing sustainable methodologies, the model exemplified a sustainable and economically feasible approach to upland farming in Goa.

IFS generated net income of 2.17 lakhs / annum and provided employment of 295 man days



Plantation crop-based upland integrated farming system at ICAR - CCARI



All India Co-ordinated Research Project on Seed (Crops)

Manohara K. K.

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 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, Karjat3, and Sahbhagi Dhan. A small quantity of TL seed production was taken up in green gram varieties TM

96-2 and IPM 2-14. The details of seed production for the year 2023 were given below.

Total 19.2 quintals of quality seeds produced and distributed during kharif and rabi season

Quantity of seeds produced at the Institute farm at ICAR - CCARI

Crop	Variety	Class of seed	Quantity (Quintal)
Paddy	Goa Dhan1	Breeder seed	5.0
	Goa Dhan2	Breeder seed	2.0
	Goa Dhan3	Breeder seed	5.0
	Goa Dhan4	Breeder seed	2.0
	Jaya	Truthfully labelled seed	0.7
	Jyothi	Truthfully labelled seed	0.5
	Sahbhagi Dhan	Truthfully labelled seed	1.5
	Karjat 3	Truthfully labelled seed	0.5
Cowpea	Goa Cowpea 3	Breeder seed	1.5
Green gram	TM 96-2	Truthfully labelled seed	0.5
Total quality seed produced at the Institute farm during <i>Kharif</i> and <i>Rabi</i> season (2023-24)			19.2

Front line demonstration on paddy variety Sahbhagi Dhan & participatory seed production in farmers' field

18 Front Line Demonstration on drought tolerant paddy variety Sahbhagi Dhan was taken up in farmer's fields in Goandongrim and Cotigao villages of Canacona block. The grain yield of the Sahbhagi Dhan ranged from 44 q/ha to 48 q/ha

compared to 29 q/ha to 33 q/ha in the check varieties. The Sahbhagi Dhan variety is superior to locally grown varieties both in terms of grain yield and straw yield.



Paddy seed production plots at ICAR - CCARI



All India Co-ordinated Research Project on Cashew

Desai A. R. , Arunachalam V. and Ganesh V. Chaudhari

Germplasm collection, conservation, evaluation, characterization and cataloguing

A field Germplasm-bank having 88 germplasm accessions representing the following groups is being maintained.

Jumbo nut types: 10 accessions, Bold nut types: 40 accessions, Medium nut and high yielders: 13 accessions, High yielders / cluster bearers: 23 accessions, Dwarf canopy types: 2 accessions. Total Germplasm: 88 accessions.

Ten bold nut accessions identified from the Field Germplasm bank were evaluated under a replicated trial along with two checks (Goa cashew - 1 and 2) for 8 harvesting seasons (2017 to 2023). The mean nut size varied from 7.63 g (Bardez-8/98) to 11.71 g (Tiswadi -3) with a higher shelling percentage (>28%), bigger apple size and higher TSS in most of the accessions.

Germplasm collection, hybridization and selection experiments over years at ICAR CCARI Old Goa resulted in the identification of the following improved varieties suitable for commercial cultivation in Goa state with high nut yield and other desirable traits. The following two varieties Goa Cashew 5 and 6 are recommended by the state variety release committee for commercial cultivation in the state of Goa.

Two cashew varieties Goa Cashew 5 & 6 are recommended by the state variety release committee for commercial cultivation in the state of Goa

Goa Cashew 5 (Tudal -1)

Selection from germplasm collected Tudal village Canacona Taluk, South Goa District, Goa state semi spreading canopy and a pyramidal shaped panicle, high nut yield (7.03 kg/tree) over an average of eight years of harvest, higher shelling percentage (28.7 %) and W180-W210 kernel grade Bigger and juicy apples will contribute for higher Feni yield



Goa Cashew 5 (Tudal -1) kernel and fruit



Goa Cashew 6 (HB 21/05)

The hybridization of Valpoi-7 x Tiswadi-3, and selection with a semi-spreading canopy, and a pyramidal-shaped panicle cluster bearing, high nut yield (10.28 kg/tree) over an average of eight years of harvest, higher shelling percentage (31.2 %) and W180-W210 kernel grade Bigger and juicy apples (78 g).



Goa Cashew 6 (HB 21/05) kernel and fruit

Goa Cashew 7 (Bardez 9)

Selection from germplasm collected from Porvorim village of Bardez Taulk, North Goa District Goa state with an upright and compact canopy high nut yield (11.17 kg/tree) over the average of ten years of harvest, higher shelling percentage (27.5 %) and W180-W210 kernel grade Bigger and juicy apples (85 g).

Goa Cashew 8 (HB 21/05)

The hybridization of Valpoi-7 x Tiswadi-3, and selection with a semi-spreading canopy, and a pyramidal-shaped panicle cluster bearing, high nut yield (10.28 kg/tree) over an average of eight years of harvest, higher shelling percentage (31.2 %) and W180-W210 kernel grade Bigger and juicy apples (78 g).

Goa Cashew 9 (Valpoi-2)

Selection from germplasm collected from Valpoi village of Sattari Taulk, North Goa District Goa state with an upright and compact canopy high nut yield (7.21 kg/tree) of bold nuts (Nut weight of 11.56 g) over an average of ten years of harvest, higher shelling percentage (28.9 %) and Bigger and juicy apples (92.7 g).

Goa Cashew 10 (FMGDI-1)

Selection from germplasm collected from Farmagudi village of PondaTaulk, South Goa District Goa state with an upright and compact canopy high nut yield (11.51 kg/tree) over an average of ten years of harvest, higher shelling percentage (28.8 %) and Bigger and juicy apples (72.6 g), Nut weight of 7.74 g.

All India Co-ordinated Research Project on Palms

Arunachalam V.

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 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 work out 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 from July 2014-June 2015. Coconut nut yield per palm during the year after intercropping is 80 nuts per palm per year. The yield data of intercrops during Jan-Dec 2023 is given below:

Sr. No.	Treatment	Crop & part harvested	Yield of intercrop (kg/ha)
T ₁	Coconut + Black pepper + Papaya + Drumstick	-	-
T ₂	Coconut + Black pepper + Heliconia	Heliconia flowers*	14,773
T ₃	Coconut + Black pepper + Banana + Lemon	-	-
T ₄	Coconut + Black pepper + Passion fruit + Pineapple	Pineapple fruits	220.3
T ₅	Coconut + Black pepper + Annona	-	-
T ₆	Coconut + Black pepper + Crossandra	Crossandra flowers	71.89

* stem/ha

The experiment is concluded with the recommendation of coconut + pineapple + passion fruit as a profitable cropping system model for Goa state. The technology was demonstrated in five locations at farmers' fields in Goa state. Economics of the models during the current year is listed below:

Coconut + Black pepper + Passion fruit + Pineapple system was found productive and profitable

Sr. No.	Treatments	Net return (Total gross return-total cost)	B:C (Net return/total cost) 2023
T1	Coconut + Papaya	51820	0.75
T2	Coconut + Heliconia	81364	1.81
T3	Coconut + Banana + Lemon	51820	0.75
T4	Coconut + Passion fruit + Pineapple	58429	0.85
T5	Coconut + Annona	51820	0.75
T6	Coconut + Crossandra	80577	1.17
T7	Coconut Monocrop	68620	1.32

Evaluation of varieties and establishment of mother blocks and production of quality planting material in Arcanaut. Nucleus seed gardens for varieties - Goa centre

The nucleus seed garden of Hirehalli Dwarf was established in different phases and is being maintained with currently 314 surviving palms of which 94 are available at the reproductive stage. The performance of the progenies at five years of age is given below:

Trait	Mean	Standard Error
Plant height (cm)	224.1	7.2
Number of nodes above mark	19.81	0.77
Stem circumference at 15 cm above ground (cm)	45.27	1.98
Number of leaves on crown	8.56	0.16
Length of leaf (cm)	79.77	2.76
Petiole length (cm)	1.64	0.18
Internodal length (cm)	2.17	0.13



Number of primary leaflets	31.73	1.03
Crown length (cm)	153.48	4.75
Length of leaf sheath (cm)	53.69	1.61
Width of leaf sheath (cm)	38.32	1.44

All India Co-ordinated Research Project on Vegetable Crop

Ganesh V. Chaudhari and Ramesh R.

Trials conducted under the project

Sr. No.	Name of trial/s	Number of entries received	Number of entries germinated and tested	Best-performing entries (Yield q/ha or % YVMV incidence)
1	Mustard Green/ Laipatta AVT I	06	06	2021-MGVAR-3 (377.65 q/ha) 2021-MGVAR-6 (344.00 q/ha) with multiple harvests
2	Okra (YVMV) Varietal AVT II	08	08	2020/OKYVVARRES-1(0%), 2020/OKYVVARRES-2(0%), 2020/OKYVVARRES-3(0%), 2020/OKYVVARRES-4(0%), 2020/OKYVVARRES-6 (0%), 2020/OKYVVARRES-7 (0%), at 100 days after sowing
3	Okra (YVMV) Varietal Resistant AVT I	10	10	2021/OKYVVRES-1(0%), 2021/OKYVVRES-3(0%), 2021/OKYVVRES-4(0%), 2021/OKYVVRES-5(0%), 2021/OKYVVRES-6(0%), 2021/OKYVVRES-7(0%), 2021/OKYVVRES-8(0%), 2021/OKYVVRES-9 (0%) at 100 days after sowing
4	Okra (YVMV) Varietal IET	09	09	2019/OKYVRES-1 (0%), 2019/OKYVRES-2 (0%), 2019/OKYVRES-3 (0%), 2019/OKYVRES-4 (0%), 2019/OKYVRES-5 (0%), 2019/OKYVRES-6 (0%), 2019/OKYVRES-9 (0%), at 100 days after sowing
5	Chilli Hybrid/Hot Pepper IET	07	07	2022/CHIHVB-5 (107.23q/ha)
6	Tomato (ToLCV) Hybrid AVT II	08	08	Trials vitiated due to heavy incidence of bacterial wilt disease and reported to the AICRP-VC Project Coordinating cell
7	Tomato Hybrid Det. AVT II	07	07	
8	Tomato Hybrid Det. AVT I	06	-	
9	Tomato (ToLCV) Hybrid Det. IET	07	-	
10	Tomato (ToLCV) Varietal Det. IET	07	-	

Mustard green Advance Varietal Trial (AVT): sowing date 22.11.2022, spacing 20 × 10 cm

Okra Initial Evaluation Trial (IET) and Advance Varietal Trial I / II (AVT I / II): sowing date 07.02.2023 and 06.02.2023/ 06.02.2023, spacing 60 × 30 cm

Chilli (IET): Transplanting date: 20.01.2023, spacing 60 × 50 cm

Tomato trials (IET, AVT I, AVT II): Transplanting date 30.11.2022, spacing 60 × 50 cm



All India Co-ordinated Research Project on Pigs

Amiya R. Sahu

The growth performance of the crossbred pig variety (Goya) in the sixth generation was 1.125 ± 0.05 kg (n=344) as birth weight, 6.25 ± 0.47 kg (n=269) as weaning weight after 30 days of weaning, and 59.76 ± 5.09 kg (n=15) as marketing weight at eight months of age. The mortality rate was 5.23% in pre-weaning and 0.92% in post-weaning period. Artificial insemination service was provided to the needy farmers at their doorstep and improved germplasms were supplied for breeding. The centre provided fundamental knowledge to the farmers and entrepreneurs in scientific practices of pig rearing through different trainings, demonstrations, and piggery farmers' field days. Beneficiaries under Tribal Sub Plan and Schedule Caste Sub Plan components were supplied with different inputs for self-sustainable farming and the improvement of their livelihood. Pig breeds of four genetic groups viz., indigenous Agonda Goan, exotic Large White Yorkshire, 50% crossbred, and 75% crossbred (75% exotic inheritance) were maintained on the farm. The selection of pigs and breeding were followed as per the technical program of AICRP on pigs. One breeding boar was allotted for mating to three breeding sows in 1:3 ratio. Artificial insemination (AI) was strictly followed for breeding the sows both in the farm and field. A total of 67 number of AI was carried out in the

year 2023 comprising 43 in the institute herd and 24 in the farmers' field. A total of 286 piglets were produced in 41 numbers of farrowing from the sows. In this reporting year, total germplasms supplied were 216 numbers benefiting 85 farmers including beneficiaries under STC and SCSP program generating Rs. 7,67,726/- (Seven Lakh sixty-seven thousand seven hundred twenty-six only) rupees.

Artificial insemination (AI) was strictly followed for breeding the sows both in the farm and field



GOYA pig



Externally Funded Projects





Assessment of carbon footprint in the integrated farming system through the life cycle assessment for sustainability and climate resilience

(Funded by: ICAR - NICRA, CRIDA, Hyderabad)

Paramesha V., Arunachalam V., Trivesh S. Mayekar, Uthappa A.R. and Gokuldas P. P.

Data were gathered from 70 arecanut based IFS in the state of Goa, India. Data envelopment analysis revealed the average technical efficiency of arecanut farms to be 0.89, suggesting potential resource savings of up to 11% with a mean economic saving of \$413 per hectare per year without compromising arecanut yield. Major energy consumption in the system was attributed to human labour, irrigation, manures, and chemical fertilizers. Life cycle assessment identified on-farm emissions as the primary hotspot for respiratory inorganics, terrestrial acid/nutria, and aquatic acidification impact categories. Arecanut production had the highest negative impact on human health, followed by ecosystem quality. The global warming potential of arecanut production was calculated to be 959.87 and 2399.25 kg CO₂ eq. per tonne and per hectare, respectively.

Integrated farming system for climate resilience, sustainability and food security



Integrated farming system in coastal region of Karnataka | ©Rohan TC



Land shaping methods and integrated farming system approach for improving Livelihood security of farmers under Khazan lands of Goa

(Funded by: NABARD, Goa)

Gopal R. Mahajan, Raizada A., Shripad Bhat, Sujeet Desai, Uthappa A. R., Paramesha V. and Parveen Kumar

The experimental site underwent thorough characterization, particularly focusing on the soil profile of the typical salt-affected coastal soils (coastal saline soils) formed due to saline water ingress. Notably, the soil pH exhibited a declining trend with depth, signifying an acidic nature overall. The upper layers displayed relatively higher pH (values), which progressively decreased downwards. Specifically, pH dropped from 6.39 to 4.29 within the first 120 cm, subsequently reaching 3.35 at 150 cm, and reaching its lowest point of 2.75 at 200 cm depth. This observation underscores that depths exceeding 120 cm possess excessive acidity, posing a significant challenge for water quality in the constructed farm ponds.

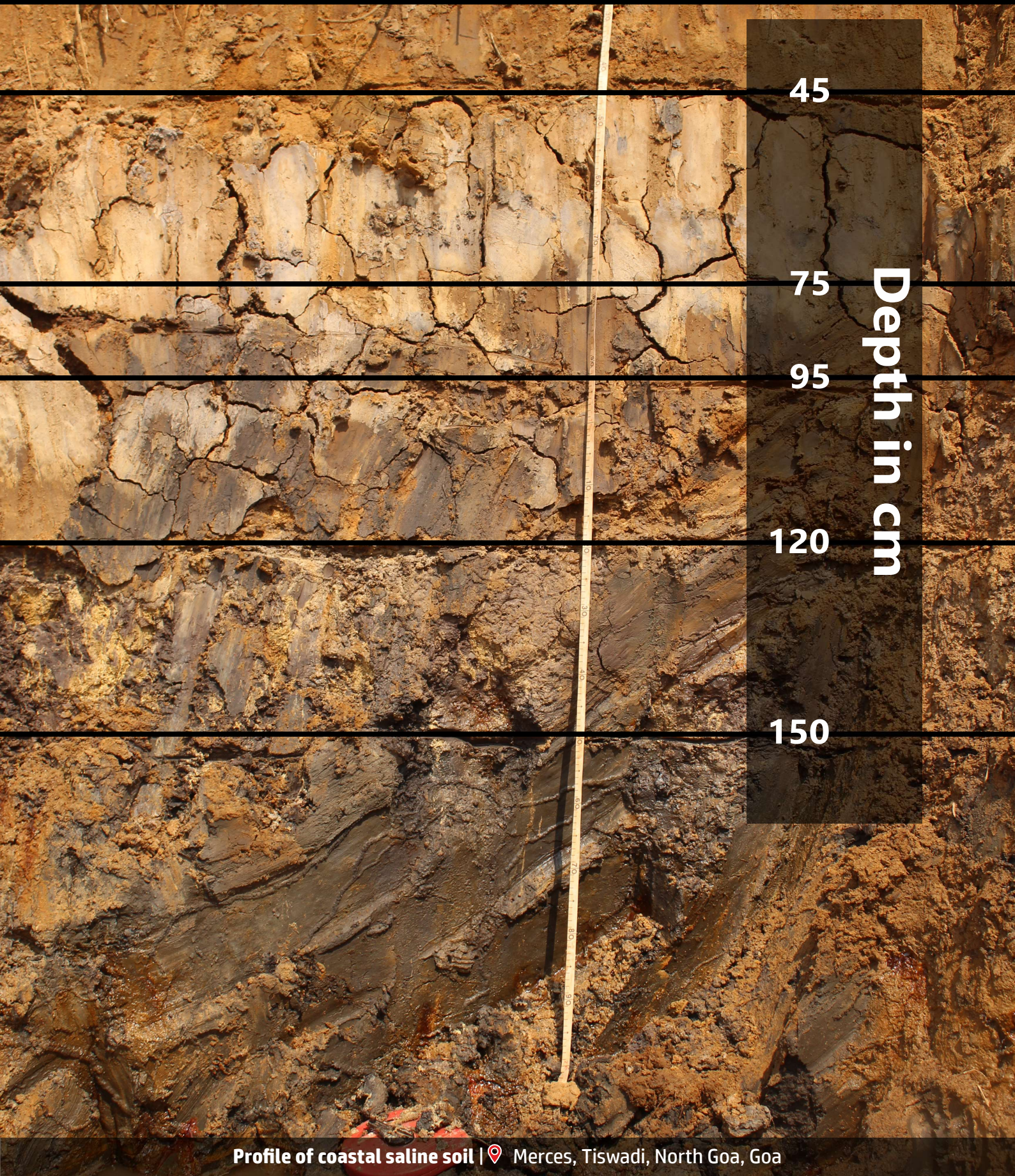
The soil's available iron content exhibited an increasing trend with depth. Values were lowest, ranging from 49-55 ppm, in the upper layers down to 45 cm, then rose to 129-156 ppm between 45-120 cm. Subsequently, iron content increased further to 220 ppm at 150 cm and peaked at 952 ppm at 200 cm depth. Layers spanning 75-120 cm and 150-200 cm contained elevated iron levels, making a significant contribution to soil acidity. Meanwhile, available manganese levels remained moderate, ranging from 16-36 ppm down to a depth of 150 cm, but notably surged to 160 ppm at 150-200 cm depth. Beyond depths of 120 cm, constructing farm ponds could exacerbate soil and water acidity, potentially limiting aquacultural activities.

The electrical conductivity of the saturation paste extract (EC_e) displayed a range between 12.2 and 14.5 dS m⁻¹ in the upper soil layers down to 95 cm, but notably increased thereafter, reaching 18.7 dS m⁻¹ at 120 cm, further escalating to 21.3 at 150 cm, and peaking at the highest value of 40.4 dS m⁻¹ at 200 cm. This pattern suggests the presence of a saline groundwater table at depths of 120 cm and below. Soil salinity exhibited uniformity in the upper layers down to 95 cm, with strong salinity classifications based on the EC_e values.

Furthermore, the experimental field underwent land shaping, allocating areas as follows: farm ponds (1-5- 2.0 m depth) (10%), low lying area (65%), and elevated bunds (25%). During the summer months (May), strongly acidic pH and very high salinity were recorded. However, pond 4 maintained desirable, near-neutral pH in monsoon until December 2023, attributed to natural flushing of salts and other ionic contents.

Notably, salinity in pond 4 decreased from 64.49 dS/m in May 2023 to 0.74 dS/m in June. Similar salinity variation patterns were observed in ponds 1 and 2. Pond 3 exhibited good water quality due to its construction atop a slope where the impact of salinity was minimal.

In coastal saline soils determining pond depth during land shaping necessitates careful consideration of profile sampling, excavating beyond Iron rich layers can significantly raise acidity of pond water



Profile of coastal saline soil | 📍 Mercas, Tiswadi, North Goa, Goa



Identification of forest fire-prone areas in Goa and their management

(Funded by: Department of Forest, Govt. of Goa)

Uthappa A .R., Raizada A. and Bappa Das

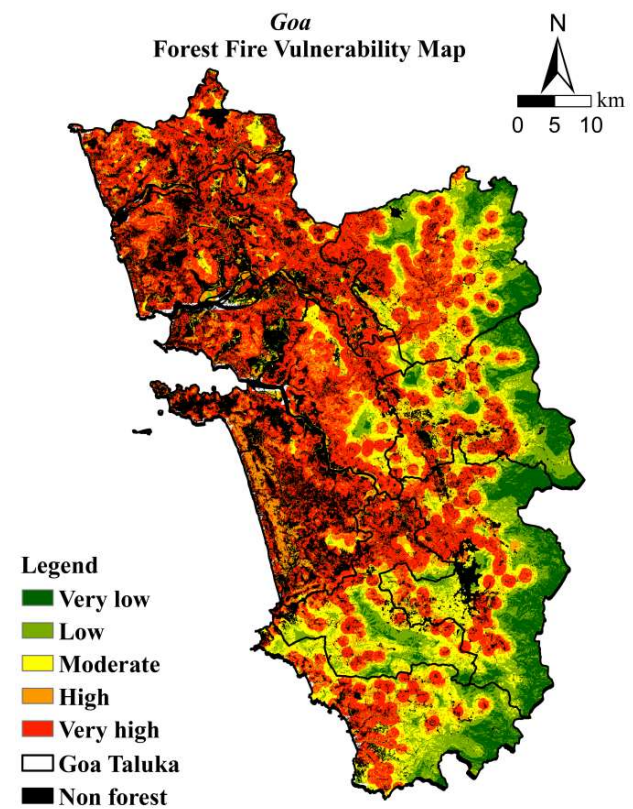
The project was undertaken with the objectives of identifying different causal factors of forest fires in Goa, identifying and mapping forest fire-prone areas through remote sensing and GIS, and suggesting mitigation measures to manage forest fires in Goa. After extensive field surveys, results reveal that past events of fire incidents in the forests may be due to several reasons that have occurred simultaneously viz., extended periods of dry hot temperatures, increased availability of fuel (litter & dry grass) on the forest floor, inaccessible areas in many forest areas, accidental or intentional fires which have spread rapidly and lack of adequate measures for fire control.

Significant area of forest cover in Goa are high vulnerable to forest fire

Forest areas susceptible to fire have been mapped using remote sensing techniques and Geographic Information System (GIS). Nine variables (forest cover map, distance from settlement, distance from road, NDVI, slope, aspect, topographic wetness index, elevation) were considered and through the analytical hierarchy process (AHP) forest fire-prone areas were classified into five different classes. The findings reveal that a significant area of forest cover (1077.7 sq. km) in Goa now exhibits a high vulnerability to forest fire, with an additional 491.58 sq. km classified as highly vulnerable, and 543 sq. km falling into the moderately vulnerable category. Various mitigation measures, including mechanical, biological, administrative, capacity building, and legal strategies, have been proposed. Implementing these measures will protect forest areas from fires and enhance hydrological functioning and forest recovery in affected zones.



Forest Fire affected areas of Goa



Forest fire vulnerability map of Goa.

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

(Funded by: PMKSY, Govt. of Goa)

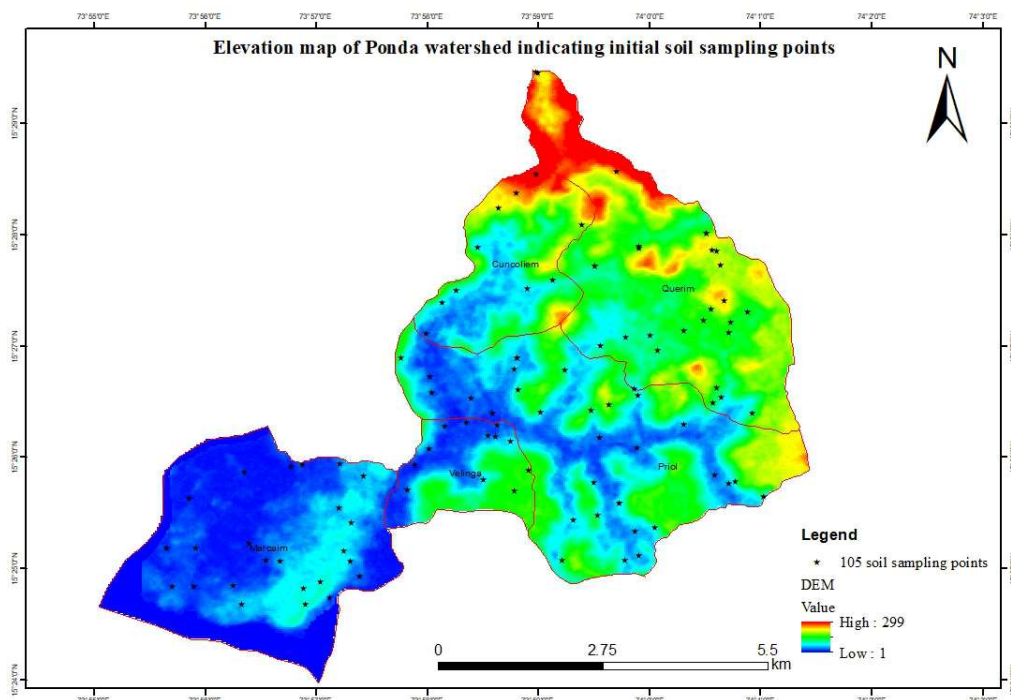
Sujeet Desai, Raizada A. , Gopal R. Mahajan, Uthappa A. R. , Bappa Das and Paramesha V., Shripad Bhat, Gokuldas P. P. and Rahul Kulkarni

As part of the watershed development initiative, a total of 13450 number of planting material, comprising of mango, coconut, cashew, and black pepper, were distributed to farmers across three panchayats during monsoon season.

Site-specific solutions were advocated for optimizing the overall water management system of the watershed area

This distribution aimed to address and promote sustainable agricultural practices in Kulagars. Under institution and capacity-building component, an awareness program was conducted

to emphasize water conservation through the watershed approach and a comprehensive three-day training program was organized by focusing on Scientific Livestock Farming for Sustainable Livelihood. Within the Livelihood Action Plan (LAP) component, a training cum orientation program was organized specifically for Self-Help Groups (SHGs). Seasonal (pre- and post-monsoon) measurements of the groundwater table were conducted in 65 wells across the watershed. Exploration of numerous springs and streams within the watershed area involved a detailed assessment and estimation of the works to enhance water storage, conveyance, and utilization. This evaluation was instrumental in devising site-specific solutions for optimizing the overall water management system of the watershed area. Around 105 soil samples were collected from the watershed area for analysis of soil physico-chemical properties.



Elevation map of Ponda watershed indicating initial soil sampling points



Biodiversity of Hoverflies of the Protected Areas of Goa

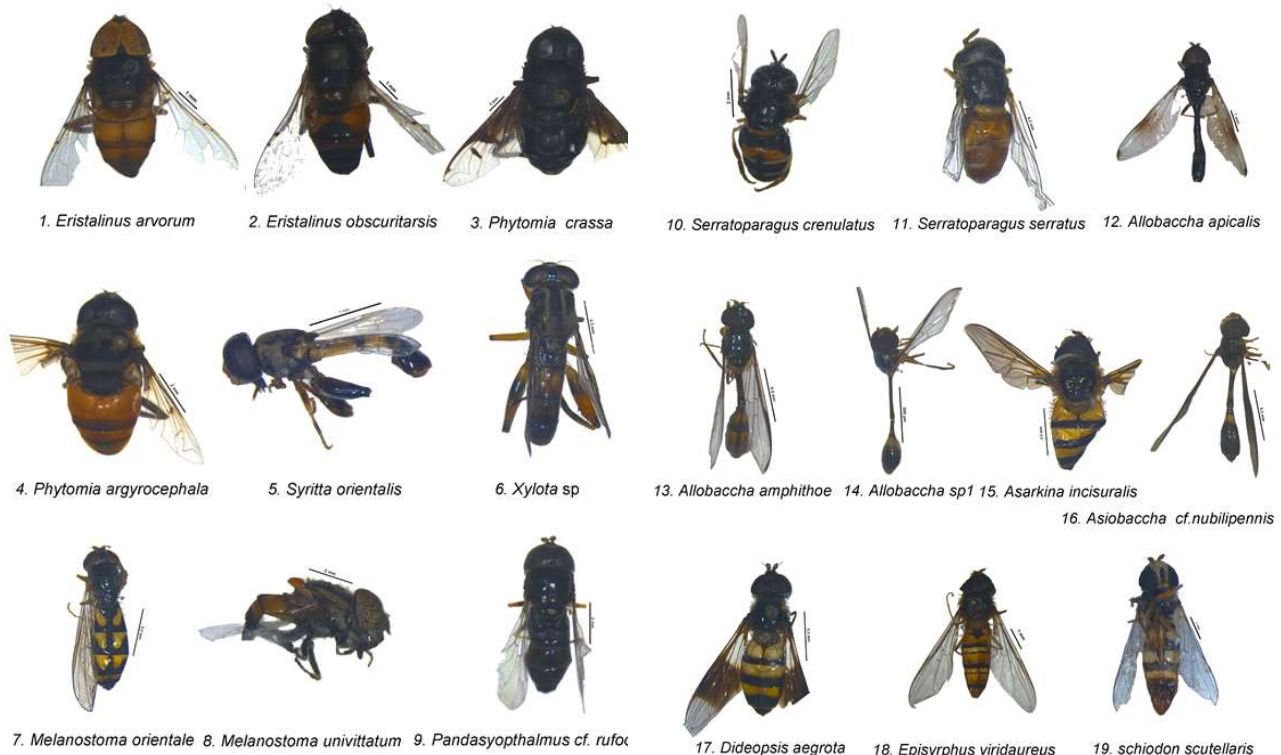
(Funded by: Department of Forest, Govt. of Goa)

Maruthadurai R., and Anooj (KAU, Kerala)

A total of 19 species of hoverflies in 14 genera in 5 tribes and 2 subfamilies have been reported from periodic surveys and collection done in various protected areas of Goa from March 2023 to March 2024. Out of the 19 species of hoverflies reported here, 17 species and 12 genus are new record for Goa. Out of the 19 species recorded 13 are predatory 5 are saprophytic and one is saproxylic in larval feeding behaviour.

Maximum number of species (11) was recorded from Bondla WLS, followed by Madei WLS (9). Diverse habitat viz. Marshes with luxuriant Pandanus growth, lake ecosystem, riverine ecosystem and garden land with ornamental flowers was the main reason for such higher number of syrphids in Bondla. The Wet riverine patch with climbers, rotting wood and dense canopy in Madhei also supported good syrphid species.

A total of 19 species of hoverflies have been reported from various protected areas of Goa



Hoverflies of protected areas of Goa



Network Project on Functional Genomics & Genetically Modification (NPFGGM) in Crops

(Funded by: ICAR, New Delhi)

Manohara K. K.

To identify Quantitative Trait Loci (QTL) governing seedling stage salinity tolerance in Goa Dhan 2 (a selection from salt-tolerant landrace Korgut), a RIL population was developed using Goa Dhan 2, a salt-tolerant variety with low yield, and Jaya, a salt-sensitive variety with high yield. During

Kharif 2023, this RIL population was phenotyped for yield and its attributing traits under normal and salinity stress conditions. All the traits exhibited significant variation both under normal and stress conditions.

Evaluation of RIL population under normal and stress condition

The trial was laid out in augmented RCBD design at the Institute farm under rainfed shallow low land conditions. Analysis of variance revealed significant differences among all the Recombinant Inbred Lines tested. Days to fifty per cent flowering ranged from 61 to 135 days with a mean of 98.71 days, plant height ranged from 88.60 to 247.8 days with a mean of 162.79 cm, productive tillers per hill ranged from 3.6 to 12.8 with a mean of 6.52, panicle length ranged from 21.24 to 40.66 with a mean of 30.66, grains per panicle ranged from 18.6 to 276 with a mean of 127.72, per cent fertility ranged from 34.78 to 96.46 with a mean of 77.34, test weight ranged from 22.75 to 40.87 with a mean of 31.70 and grain yield ranged from 341.46 kg/ha to 9985.0 kg/ha with a mean grain yield of 4324.95 kg/ha.

The trial was laid out in augmented RCBD design at Chorao Island coastal saline condition. Analysis of variance revealed significant differences among all the Recombinant Inbred Lines tested. Days to fifty per cent flowering ranged from 82 to 136 days with a mean of 108.62 days, plant height ranged from 88.40 to 205.40 days with a mean of 147.89 cm, productive tillers per hill ranged from 3.4 to 13.00 with a mean of 7.37, panicle length ranged from 13.34 to 37.34 with a mean of 25.88, grains per panicle ranged from 27.06 to 158.60 with a mean of 87.73, per cent fertility ranged from 33.46 to 96.12 with a mean of 78.17, test weight ranged from 17.05 g to 39.41 g with a mean of 28.05 g and grain yield ranged from 166.67 kg/ha to 8727.26 kg/ha with mean grain yield of 2520.24 kg



Evaluated RIL population under normal & stress condition and attained yield of 4324 kg/ha & 2520 kg/ha, respectively

View of RIL population under rainfed shallow lowland situation



	DFF	PHT (cm)	NPT	PL (cm)	GPP	PF	TW (g)	GY (kg/ha)
Mean	98.71	162.79	6.52	30.60	127.72	77.34	31.70	4324.95
Range	74.00	159.20	9.20	19.42	257.40	61.68	22.13	9643.54
Minimum	61.00	88.60	3.60	21.24	18.60	34.78	22.75	341.46
Maximum	135.00	247.80	12.80	40.66	276.00	96.46	40.87	9985.00
Standard Error	0.89	2.29	0.10	0.21	2.35	0.65	0.22	123.68

Descriptive statistics for different agronomic characters and grain yield in RIL population under normal condition

	DFF	PHT (cm)	NPT	PL(cm)	GPP	PF	TW (g)	GY (kg/ha)
Mean	108.62	147.89	7.37	25.88	87.73	78.17	28.05	2520.24
Range	54.00	117.00	9.60	24.00	131.54	62.66	25.36	8560.60
Minimum	82.00	88.40	3.40	13.34	27.06	33.46	17.05	166.67
Maximum	136.00	205.40	13.00	37.34	158.60	96.12	39.41	8727.26
Standard Error	0.75	1.88	0.10	0.18	1.54	0.66	0.22	90.38

Descriptive statistics for different agronomic characters and grain yield in RIL population under stress condition

Note: DFF: Days to 50% flowering; PHT: Plant height; NPT: Number of productive tillers per hill; PL: Panicle length; GPP: Grains per panicle; PF: Percent fertility; TW: Test weight GY: Grain yield;



Trial laid out at Chorao Island in coastal saline condition.



Production and formulation technology refinement of bacterial bio-agents for soil borne plant disease management under coastal ecosystems - Phase II

(Funded by: ICAR, New Delhi)

Ramesh R., and Maruthadurai R.

Soil and rhizosphere samples were collected from disease suppressive vegetable fields. Ten promising bacteriophages against bacterial wilt pathogen obtained from these fields indicated their antibacterial activity against *R. solanacearum* (9 isolates of *R. solanacearum* representing different hosts/ geographical locations). All phages are specific to *R. solanacearum* only. No non-specificity is observed. Based on the clear zone of inhibition, 3 phages and their combination are used in in-planta evaluation in tomato crop. Results indicated that the phages and their combination reduced the incidence of bacterial wilt disease in tomato (40-80% reduction compared to control) up to two weeks.

Application of Goa Bio-2 along with spraying of chitosan / spinosad reduced the leaf curl virus disease (28 to 34% reduction compared to control)

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. The treatments include talc and capsule formulations of (*Bacillus methylotrophicus*) RCh6-2b and STC-4. The black pepper cuttings were treated either in nursery (500 mg capsule/ 50 g talc formulation per plant) 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 18 months. Less disease incidence in Rch6-2b capsule

(18%) and talc formulations (34%) compared to chemical (65%) and control (80%) treatments. Plant height was significantly higher in the treatments (170-259 cm) compared to untreated control (104 cm) 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 reduced disease incidence (16.78%) compared to untreated control (67.0%) and increased plant vigour.

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

Talc based bio-formulation (Goa Bio-2: *B. methylotrophicus* RCh6-2b) was mass produced and distributed to the farmers of Goa in more than 150 chilli disease management field demonstrations. Treatments include, Nursery application of Goa Bio-2 @ 50g/ m²; soil application of Goa Bio-2 @ 1g/plant after transplanting. Spraying of chitosan @50ppm/ or spinosad @ 0.03% at 15, 30, 45 and 60 DAP. There

was no incidence of wilt or other soil borne diseases in the bio-agent treated fields. Results from 42 field demonstrations (7 villages) indicated that application of Goa Bio-2 along with spraying of chitosan/ spinosad reduced the leaf curl virus disease (28 to 34% reduction compared to control) and increased the yield (31 to 35% increase compared to control)



District Agro-Met Unit (DAMU), North Goa

(Funded by: India Meteorological Department, Govt. of India)

Bappa Das, Navyashree S., Arunachalam V., Ramesh R., Prabhu H. R. C., Maruthadurai R., Gokuldas P. P., Paramesha V. and Nibedita Nayak

About 136 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 6000 farmers twice every week. A total of 104 advisory bulletins are issued during the year 2023. In addition to the biweekly bulletins, disseminate daily weather forecasts and nowcast information to farmers. Impact-based forecasts (IBFs) for agriculture are also prepared by DAMU based on severe weather warnings issued by the IMD. In order to spread awareness of these services among the farming community 3 Awareness Programmes were organised in 2023 which included 160 participants in total. The feedback analysis revealed that weather-based agro-advisory service is a useful tool for

A total of 104 advisory bulletins are issued in 136 WhatsApp groups covering 195 villages disseminating agro-advisories to 6000 farmers twice every week

enhancing the production and income of coastal farmers.

Development programmes on spices and aromatic plants



(Funded by: MIDH, DASD, Kozhikode)

Desai A. R., Arunachalam V. and Ganesh V. Chaudhari

A total of 25600 rooted cuttings and 5000 grafts of black pepper (Paniyur-1, Paniur-5, Thevum and Shakti varieties) were produced and supplied to the Farmers in Goa and adjoining konkan region of Maharashtra, Karwar (Karnataka), and also SC and ST under SCSP & STC programmes. A total of 2.02 tonnes of Ginger seed rhizomes were produced, besides 32000 of portray plantlets. Around 5.35 tons of turmeric seed rhizomes of Pratibha, Pragati, Salem, Sudarshan, Pitambar and Waigaon varieties were produced and supplied to KVK (North Goa), Directorate of Agriculture, Govt. of Goa and Farmers. About 22,000 portray plantlets of turmeric, 2,500 nos. of Cinnamon layers (Konkan Tej) and seedlings, curry leaf seedlings (Var.Suhasini) and 500 Numeq grafts (Plagiotrophic) of Konkan Swad and ICAR selections were produced and supplied to farmers. FLDs on Participatory Demonstration of Cinnamon intercropping in coconut were established.



AGNI - Agri-Business Incubation Center

(Funded by: ICAR - NAIF Component II)

Mathala J. Gupta, R. Solomon Rajkumar and Shripad Bhat



A total of 14 new incubates were registered during 2023 and six continued their incubation phase for one more term (January – December 2023). Six incubates graduated during this year and 9 incubates have registered their business. The areas of businesses were fisheries and animal reproduction, organic farming, biocontrol formulations for diseases and pests, waste management, horticulture and food Processing. Through its various activities AGNI has generated a revenue of ₹7,21,920/-

To identify the best agri start-up ideas from the ignited young minds <40 years of age and nurture them through incubation support from AGNI

a Young Agri-entrepreneurs Conclave 2023 was organized between 31 January-February 1, 2023. A total of 42 young entrepreneurs, students and farmers from 6 states (Goa, Maharashtra, Gujarat, Karnataka, Kerala and Tamil Nadu) registered for this program. Eleven ideas were selected by the panellists for free incubation at AGNI.

A total of 14 new incubates were registered and 6 startups were launched during 2023



Startups launched during 2023



Young Agri-Entrepreneur's Conclave 2023



Seed Production in Horticultural Crops

(Funded by: ICAR, New Delhi)

Arunchalam V.

A waterlogging tolerant cassava germplasm was obtained from Kerala was evaluated as an intercrop to test the submergence tolerance. About a total of 48 plants were planted with four treatments as follows- 1) submergence tolerant accession in normal soil, 2) submergence tolerant accession submerged soil, 3) submergence susceptible accession in normal soil, and 4) submergence susceptible accession in submerged soil. The waterlogging tolerant cassava recorded twice the tuber yield than susceptible check variety in waterlogged condition. Tolerant genotype (Goa Cassava 1) produced lesser leaves and heavier tubers than susceptible check especially in waterlogged soil. Seed multiplication of breeder seeds of high pigment content amaranth variety Goa Amaranth 2 (AtR18), root knot nematode trapping amaranth variety Goa Amaranth 3 (AtR60), is taken up. Demonstration plot of banana variety Kaveri Kanchan developed by ICAR-NRC Banana were established at three locations.

A revenue of Rs 5.0 Lakhs was generated during April to Dec 2023 from the sale of elite quality planting material (Areca nut, coconut, Mango, Cashew, Black pepper, Lemon, and ornamental plants) and farm produce.

The waterlogging tolerant cassava recorded twice the tuber yield than susceptible check variety in waterlogged condition



Leaf of pigment rich Goa Amaranth 2



Tubers of waterlogging tolerant Goa Cassava 1



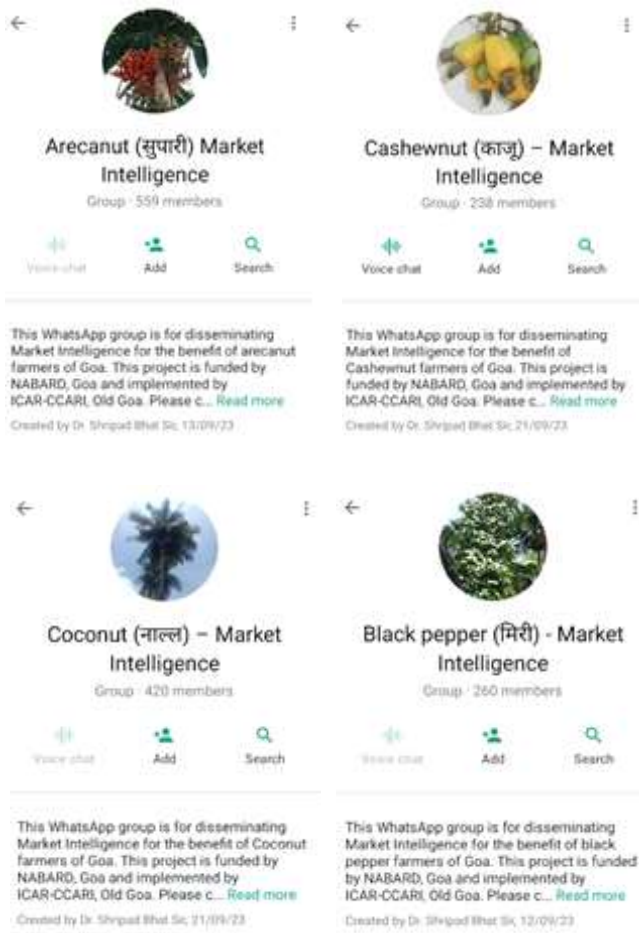
Market Intelligence for Horticultural Crops for Improving Livelihoods of Farmers in Goa

(Funded by: NABARD, Goa)

Shripad Bhat and Arunachalam V.

A total of 40 market intelligence advisories, summarized in Konkani and English languages, were shared with a total of 1,470 farmers of Goa through four dedicated WhatsApp groups (Arecanut - 559 farmer group members, Coconut - 419 farmers, Cashewnut - 238 farmers & Black pepper - 260 farmers). Further, as traders and exporters demand good quality of black pepper, videos on bulk density and getting good returns from black pepper were shared with farmers (370 views) through a dedicated YouTube channel. A training programme on importance of market intelligence and strategies for earning higher farm income was conducted at farmers' place, Mardol, Ponda on 03-12-2023 in which 30 farmers actively participated.

Market intelligence advisories in Konkani and English were shared with 1,470 farmers of Goa through four dedicated WhatsApp groups



Various Whatsapp groups created for market intelligence



Arecanut harvest ready for market (Savoi-verem, Goa)



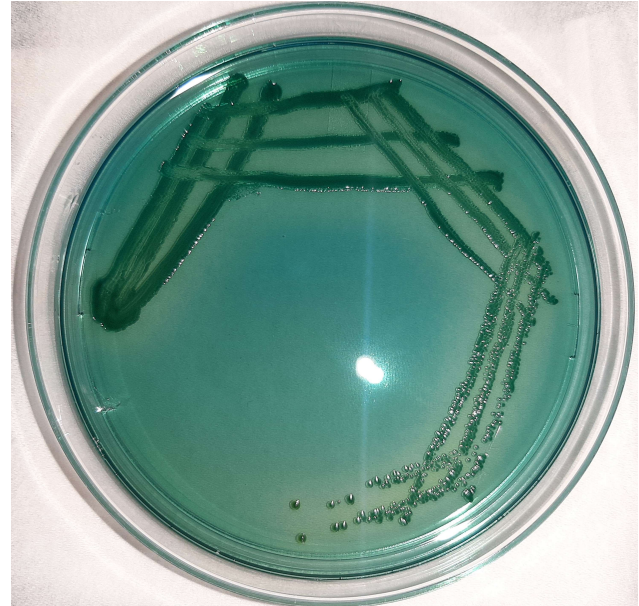
National Animal Disease Epidemiology Network

(Funded by: ICAR - NIVEDI, Bengaluru)

Susitha Rajkumar and Shirish Narnaware

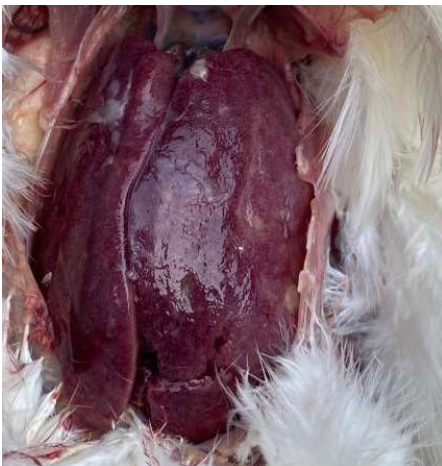
A total of 14 disease outbreaks in pigs were reported, most of which were mixed bacterial and viral infections and the important diseases diagnosed were, septicemia due to *Pasteurella multocida* /*Streptococcus* /*E. coli* infection and PCV-2 infection. Important diseases diagnosed in cattle include Theileriosis (12 cases), and Babesiosis (7). There were four disease outbreaks in poultry, which included Newcastle disease (1), Coryza and *Mycoplasma synoviae* infection (2), *E. coli* septicaemia (1), mixed infection of Marek's Disease, Avian Leucosis and *Salmonella pullorum* (1). An outbreak of Foot rot due to *Fusobacterium necrophorum* and *E. coli* septicaemia with two mortalities in herd of four horned antelope maintained at wild life sanctuary in Goa.

A mortality was reported in a breeder poultry farm at Goa during February to March 2023 in multiple flocks of age ranging from 2 to 28 weeks. The only clinical signs observed were reduced feed intake, soiled vent and listlessness prior to death and mortality of around 300 birds was noticed over period of 3 weeks. On post mortem examination congested lungs, enlarged, fragile liver and spleen with presence of diffuse white foci on liver, flabby immature ovarian follicles, enteritis and peritonitis with accumulation of yolk material in the abdomen. PCR using tissue DNA samples showed the samples

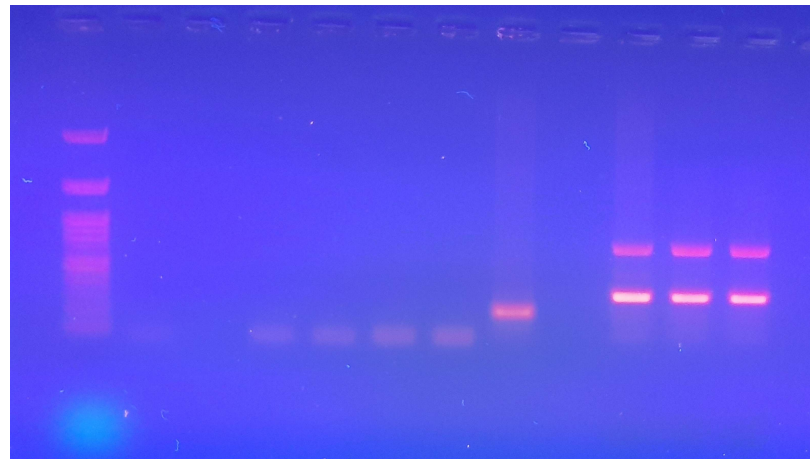


Dark green colonies of *Salmonella* sp.

The mortality in breeder poultry reported due to concurrent infection with *S. pullorum* and ALV, MDV and immunosuppression induced by the viruses



Poultry carcass showing enlarged liver with diffuse white foci



Multiplex PCR amplifying the *ybgL* and *stn* genes of *S. pullorum*

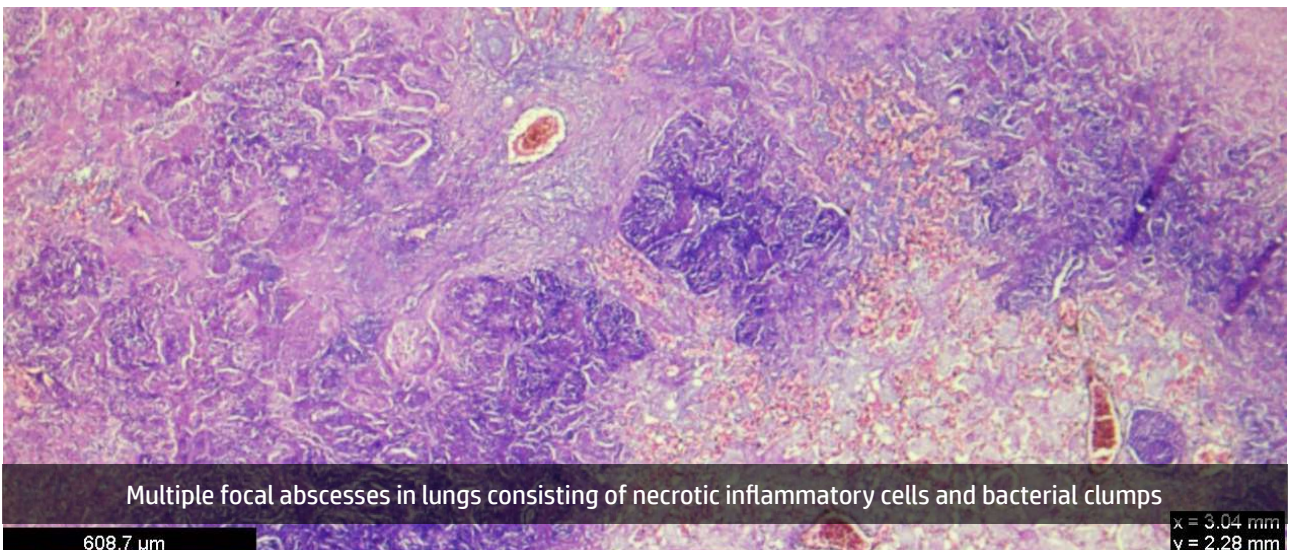
were positive for ALV, MDV and *Salmonella* sp. *Salmonella* sp. could be isolated on Hekton enteric agar, which was confirmed by multiplex PCR as *Salmonella enterica* serovar *Gallinarum* biovar *Pullorum*. The 16srRNA gene was sequenced and analysed through NCBI BLAST, which showed 99.06% similarity to *Salmonella enterica* subsp. *Entericaserovar Gallinarum* strain SG1. The results showed that the mortality could be due to concurrent infection with *S. pullorum* and ALV, MDV and due to the immunosuppression induced by the viruses. The *Salmonella* infection might have occurred due to purchase and introduction infected chicks from an infected flock.

An outbreak of contagious foot rot was reported in a herd of four horned antelopes (*Tetracerus quadricornis*) in a wildlife sanctuary at Goa during the month of February 2023, two deaths and clinical signs of anorexia, and limping were reported in few animals. Post mortem examination showed generalised congestion of skeletal muscles and viscera and presence of blood clots and multiple necrotic foci over the diaphragm, pleura and lungs. Microscopically lungs showed coagulative necrosis, alveolar edema, congestion and haemorrhage and skin showed zones of coagulative necrosis, inflammation, congestion, haemorrhage and thrombosis in the dermis. PCR targeting *lktA* gene could detect presence of *F. necrophorum* in tissue DNA from the interdigital skin, lung and liver. *F. necrophorum* and *E. coli* could be isolated from heart blood and were confirmed by PCR. Phylogenetic analysis showed that the *F. necrophorum* sequence from present study GFN 1 grouped closely with isolates from Australia, China, Pakistan and Iraq and another Indian isolate from goat.



PCR amplification of *lktA* gene of *F. necrophorum*

An outbreak of Foot rot due to *Fusobacterium necrophorum* and *E. coli* septicemia in herd of four horned antelope at wild life sanctuary in Goa was investigated





Entrepreneurship development and livelihood improvement through training and demonstration of ornamental fish culture

(Funded by: NABARD, Goa)

Trivesh Mayekar and Sreekanth G. B.

A total of five capacity building programmes were conducted in which total of 91 SHG members got trained under this project. They were given practical hands-on training on breeding of ornamental fishes, larval rearing, disease management and maintenance of brooders and young ones, aquarium tank fabrication, and preparation of ornamental fish feed. A total of five training programs were conducted in the institutes with SHG members for hands-on experience in field of ornamental fisheries. Four small-scale demonstration units were established under this project- 1) Institute, 2) Diwar Island, 3) Assonora, and 4) Cumbarjua. Two field exposure visits were conducted (1- Cumbarjua & Panjim, and 2- Sawantwadi) in which around 27 members of the SHGs participated.



Training and capacity building programme on sustainable ornamental fish culture at Diwar Island



Aquarium established by SHGs under NABARD project



Seed Project Fisheries component

(Funded by: ICAR, New Delhi)

Trivesh Mayekar and Sreekanth G. B.

During this year, a total of 2000 ornamental fish seeds (Guppy, molly, platy, sword tail, gourami, gold fish and barbs), 20 kg of fish feed, 200 kg of freshwater fish brooders, 100 posters on fisheries resources, 400 seedlings of aquatic plants were produced and sold to the farming community. Fish diversity assessment of Nanda Lake, the first Ramsar site in Goa yielded a total of 20 indigenous fish species. The captive breeding and larval rearing

protocol were standardized for the two species of ornamental purpose *Pethia setnai* and *Haludaria pradhani*. Regular natural breeding of other indigenous fishes such as *Rasbora dandia*, *Dawkinsia filamentosa* and *Systemus sarana* is being carried out. A total of 56,000 nos. of SIFs seed was produced during 2023.

Angelfish- *Pterophyllum scalare*



Malabar danio-*Devario malabaricus*



Filament barb-*Dawkinsia filamentosa*



Black moscow guppy-*Poecilia reticulata*



Melon barb-*Haludaria pradhani*



Indigo barb-*Pethia setnai*





Promotion of improved indigenous backyard poultry through scientific interventions for sustainable poultry production and livelihood security in Goa

(Funded by: NABARD, Goa)

Nibedita Nayak, Amiya R. Sahu and Shirish Narnaware

Interaction with 65 farmers of Bardez taluka was conducted with respect to their socio-economic status, flock characteristics, marketing information, management strategies, predominant diseases and preventive health care, schemes availed and backyard poultry. Fifty farmers were selected for distribution of various inputs like chicks, feed, feeders, waterers. One bulletin was prepared in Marathi with different chapters like - Know your poultry Breeds and Varieties, Status of poultry farming in Goa, Poultry Scheme of Goa and Central Government and "Promotion of improved indigenous backyard poultry through scientific interventions.



Backyard poultry unit at Guirim, Parra, Goa

Poultry Seed Project

(Funded by: ICAR, New Delhi)

Nibedita Nayak

The average body weights of female and male Shrinidhi birds were increased from 35.95 g and 43.88 g for day old chicks, to 1.76 kg and 3.46 kg at the end of 57th week. Average body weight of Gramapriya was 30 g at hatching and 1.3 g at 18th week. Hen housed egg production for a longer period (21 – 57 week) with 321 layer birds was 57.47. Fertility rate and hatchability varied between 72-91% and 50-81% respectively. The distribution of chicken, duck and quail including fertile eggs and growers (a total count of 17881) to 293 farmers earned a revenue of ₹ 3,95,566/-



Distribution of inputs through poultry seed project (STC component)



Significant Achievements



Awards & Recognitions



National Academy of Agricultural Sciences

NAAS Awards 2023



NAAS Fellow 2023 - Dr. Parveen Kumar



NAAS Associateship 2023 (Fisheries Science) & NAAS Young Scientist Award 2023 (Animal Sciences)
Dr. Sreekanth G. B.



NAAS Young Scientist Award 2023 (NRM)
Dr. Bappa Das



Significant Achievements - Awards & Recognitions

No	Award/Fellowship	Awardee
Fellowship / Awards by NAAS		
1.	NAAS Fellow 2023	Dr. Parveen Kumar
2.	NAAS Associateship 2023	Dr. Sreekanth G B
3.	NAAS Young Scientist Award 2023	Dr. Sreekanth G B
4.	NAAS Young Scientist Award 2023	Dr. Bappa Das
Fellowship/Awards by other Academies		
1.	Fellow of the Indian Academy of Horticultural Sciences 2023	Dr. Parveen Kumar
2.	Associate of West Bengal Academy of Sciences 2023	Dr. Bappa Das
Fellowship/Awards by Professional Societies		
1.	Fellow of the Indian Society of Soil Sanity and Water Quality	Dr. Parveen Kumar
2.	Young Scientist Award 2023 by Indian Society of Soil Sciences	Dr. Gopal R Mahajan
3.	P.S. Deshmukh Young Agronomist Award by Indian Society of Agronomy	Dr. Paramesha, V
4.	Fellow of Plant Protection Association of India 2023	Dr. R Maruthadurai
5.	AMST-Best Doctoral Thesis Award	Dr. R Solomon Rajkumar
6.	IPSA-Young Scientist Award	Dr. Nibedita Nayak
7.	Best Oral Presentation (1st place) in the International Seminar on Exotic and Underutilized Horticultural Crops: Priorities & Emerging Trends held during October 17 -19, 2023 at ICAR-IIHR, Bengaluru	Dr. Ganesh Chaudhari
8.	Best Poster Presentation Award in the International conference on Feeding the future through sustainable eco - friendly innovations in rangeland, forages and animal sciences held during 02 -04, December, 2023 at UAS, Bangalore, India.	Dr. Uthappa A R
9.	Best Poster Presentation award in the national seminar on "Abiotic stress management for sustainable millet based production systems" held during 22 to 23 August, 2023 at ICAR-NIASM, Baramati, Maharashtra, India.	Dr. Uthappa A R
Recognition by Goa State Biodiversity Board		
1.	GSBB Appreciation-Applied Biodiversity Researcher 2023	Dr. V. Arunachalam Dr. Mathala J Gupta Dr. R. Solomon Rajkumar Dr. Amiya R Sahu
Best AICRP Award		
1.	AICRP on IFS under the ICAR - Institute Category for the period from 2020-2022 by ICAR-IIFSR, Modipuram	Dr. Paramesha V Dr. Parveen Kumar Dr. Manohara K K Dr. Gokuldas PP Dr. Sreekanth GB Dr. Trivesh Mayekar
Recognition as Faculty/Members of Various Committees		
1.	PG faculty in the discipline of Animal Reproduction ICAR Indian Veterinary Research Institute (Deemed University), Bareilly, U.P.	- Dr. Gokuldas P P
2.	Member of Goa Chamber of Commerce and Industry Agriculture and Food Processing Committee	- Dr. R Solomon Rajkumar



Significant Achievements - Awards & Recognitions

International/National Fellowships and Travel Grants

1.	United States Department of Agriculture, USDA - FAS Scientific Exchange Program Fellowship (SEP) 2023	Dr Sujeet Desai
2.	Post-Doctoral Fellowship in Aquatic Environment Management at Kerala University of Fisheries and Ocean Studies, Kochi, Kerala during 2022-2023.	Dr. Sreekanth G B
3.	Distinguished fellow of the Bay of Bengal Programme Inter-Governmental Organization (BOBP -IGO)	Dr. Sreekanth G B
4.	British Poultry Science Travel Grant awarded by British Poultry Science, Scotland, U.K to attend International European Symposium on Poultry Genetics 2023 held in Hannover, Germany from 8 -9 November, 2023.	Dr. Amiya Ranjan Sahoo

ICAR - CCAR Institute Awards 2023

1.	Best Scientist Award	Dr. Gokuldas P P Dr. Uthappa A R
2.	Best Worker (Technical)	Shri Shasi Vishwakarma Shri Prakash Pawar
3.	Best Worker (Administrative)	Smt. Pratibha Sawant Smt. Sohini Sawant
4.	Best Worker (Skilled Support Staff)	Shri Subash Melekar Smt. Pratibha Folkar
5.	Best Worker (Project Staff)	Shri Sandeep Sawant Smt. Atasha D'Mello
6.	Team Awards Dr R Solomon Rajkumar Dr. V. Paramesha Shri Rahul Kulkarni Shri Vishwajeet Prajapati Dr. Trivesh Mayekar Dr. Monica Suresh Singh	Dr. A R Desai Dr. Sujeet Desai Dr. Manohara K K Dr. Shripad Bhat Dr. Paramesha V Dr. Ganesh V Chaudhari Dr. Gopal R Mahajan Dr. M J Gupta
7.	Director's Appreciation Award	Dr. Susitha Rajkumar Shri H R C Prabhu Shri Hiren Kumar Vyas Smt. Lalitha Naik



Innovative Kulaghar farmer of Goa Shri Sanjay Anant Patil nominated by ICAR-CCARI, Goa conferred with IARI -Innovative Farmer Award 2023



Publications

The institute scientists published a total of 69 research papers (NAAS score > 6.0) among which 23 are NAAS score > 10. The average publications per scientist is 3.19.

Research Articles

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- Aravind KS, Vashisth A, Das B and Krishnan P (2023) Multi stage wheat yield estimation using multiple linear, neural network and penalised regression models. *Mausam* 74(3): 833-846.
- Arunachalam V, Vanjari SS, Paramesh V, Vishwakarma S, Prabhu DC, Dsouza AV and Fernandes CM (2023) Variation in plant traits and nutrient uptake among banana varieties in shaded agroecology under areca nut canopy. *Technology in Agronomy* 3, doi: 10.48130/TIA-2023-0015.
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Significant Achievements - Publications

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Significant Achievements - Publications

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- Narnaware SD** and **Ranjan R** (2023) Reproductive disorders in female dromedary camels of India. In: 16th Agricultural Science Congress, 10-13 October 2023, Kochi, Kerala.



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Video



- Desai AR, Bhat S and Kumar P (2023) Video on "Nutmeg Pericarp Taffy". ICAR-Central Coastal Agricultural Research Institute, Old Goa, Goa. <https://youtu.be/M4VqBypPpmM>.



Significant Achievements - Publications

Publications	Authors/ Editors/ Publishers
Reports	
Annual Report (2022), 156 p	Parveen Kumar, Raizada A, Manohara KK, Shirish D Narnaware, Shripad Bhat Bappa Das and Monica Singh
Annual Report (2021) (Hindi), 60 p	Parveen Kumar, Raizada A, Mathala J Gupta and Shashi Vishwakarma
Souvenir and Abstracts of National Symposium on Self Reliant Coastal Agriculture, 208 p	Parveen Kumar, Arunachalam V, Bappa Das, Gokuldas PP, Susitha Rajkumar, Trivesh S Mayekar and Uthappa AR
Leherein (Hindi Magazine), 99 p	Parveen Kumar, Mathala J Gupta, Shashi Vishwakarma and Shreya Barve
Technical Bulletins	
Eco-friendly integrated pest and disease management technologies in major vegetable crops of Goa, Technical Bulletin 73, 54 p	Maruthadurai R and Ramesh R
Soil erosion status, priority treatment areas, conservation measures for different districts of Goa, pp. 34. ICAR-IISWC, Dehradun, India. Technical Bulletin No.: TB-05/V/E-2023, ISBN-978-93-94687-30-1	Singh, A.K., Dinesh, D., Singh, G., Jinger, D., Mandal, D., Dogra, P., Kumar, G., Kaushal, R., Roy, T., Islam, S., Desai, S., Mahajan, G.R., Raizada, A., Kumar, Parveen and Madhu. M. 2023.
Extension Folders	
Artificial Insemination technology for sustainable goat production in coastal region, Extension Folder 104	Gokuldas PP, Susitha Rajkumar, Amiya R Sahu and Shirish D Narnaware
Economic feeding of backyard poultry Extension Folder 105	Nibedita Nayak, Amiya R Sahu and Shirish Narnaware
लम्पि वायारस (एल एस डी) आजार बद्दल विचारली जाणारी सर्वसामान्य प्रश्ने व त्यांची उत्तरे Extension Folder 106	Shirish Narnaware, Susitha Rajkumar, Gokuldas PP and Nibedita Nayak
Production and marketing scenarios of Arecanut in India Extension Folder 107	Shripad Bhat, Arunachalam V and Parmesha V
Duck production and management for coastal Farmers Extension Folder 108	Nibedita Nayak, Amiya R Sahu, Atasha D'Mello and Parveen Kumar
Fresh water ornamental fishes of Goa: Biology and commercial potential - Part I & II Extension Folder 108 and 109	Trivesh Mayekar, Sreekanth GB and Sharan Sawal
Integrated management of invasive Rugose Spiraling Whitefly, <i>Aleurodicus rugioperculatus</i> Martin Extension Folder 110	Maruthadurai R and Ramesh R
Integrated management of invasive Fall armyworm, <i>Spodoptera frugiperda</i> Extension Folder 111	Maruthadurai R and Ramesh R
A glimpse of saline -tolerant rice varieties developed for coastal saline soils Extension Folder 112	Manohara K. K. and Parmesha V.
A glimpse of Cowpea and Moong Varieties recommended for rice fallow area n Goa Extension Folder 113	Manohara K. K. and Parmesha V.
Nutmeg Pericarp Taffy Extension Folder 114	AR Desai, Shripad Bhat and Dinesh Kumar



Significant Achievements - Publications

Extension Folder No. 104/2023

Artificial Insemination technology for sustainable goat production in coastal region

ICAR-Central Coastal Agricultural Research Institute
Ela, Old Goa, Goa - 403 402
(An ISO 9001:2015 Certified Institute)

Extension Folder No. 105 | 2023

Economic feeding of Backyard poultry

ICAR - Central Coastal Agricultural Research Institute
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

वित्तरा पत्रिका क्र. 106/2023

विस्तार पत्रिका

लम्पी वायरस (एलएसडी) आजारा बद्दल विचारली जाणारी सर्वसामान्य प्रश्ने व त्यांची उत्तरे

भाकूअप - केंद्रीय किनारी कृषि संशोधन केंद्र
जुने गोवे, गोवा - ४०३४०२
फोन: ०८३२-२९९३०९५/ २९९३०९७;
ई-मेल: director.ccan@icar.gov.in;
वेबसाईट: www.ccan.icar.gov.in

Extension Folder No. 107/2023

Production and Marketing scenarios of Arecanut in India

ICAR-Central Coastal Agricultural Research Institute
Ela, Old Goa, Goa - 403 402
(An ISO 9001:2015 Certified Institute)

Extension Folder No. 108 | 2023

Duck Production and Management for Coastal Farmers

Under STC funded
ICAR - Central Coastal Agricultural Research Institute
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

Extension Folder No. 109/2023
Product No. 34/2023

FRESH WATER ORNAMENTAL FISHES OF GOA: Biology & Commercial Potential Part - I

भा.कू.अनु.प. - केंद्रीय तटीय कृषि अनुसंधान संस्थान
दहा, जुने गोवा, गोवा
ICAR - Central Coastal Agricultural Research Institute
Ela, Old Goa, Goa

Extension Folder No. 110 | 2023

Integrated management of invasive Rugose Spirling Whitefly *Aleurodicus rugipericulatus* Martin

भा.कू.अनु.प. - केंद्रीय तटीय कृषि अनुसंधान संस्थान
(तटस्थ कृषि अनुसंधान संस्थान)
दहा जुने गोवा, गोवा, भारत
ICAR - Central Coastal Agricultural Research Institute
(Indian Council of Agricultural Research)
Old Goa - 403 402, Goa, India.

Extension Folder No. 111 | 2023

Integrated Management of invasive Fall armyworm *Spodoptera frugiperda* (J. E. Smith)

भा.कू.अनु.प. - केंद्रीय तटीय कृषि अनुसंधान संस्थान
(तटस्थ कृषि अनुसंधान संस्थान)
दहा जुने गोवा, गोवा, भारत
ICAR - Central Coastal Agricultural Research Institute
(Indian Council of Agricultural Research)
Old Goa - 403 402, Goa, India.

Extension Folder No. 112/2023

A GLIMPSE OF SALINE-TOLERANT RICE VARIETIES DEVELOPED FOR COASTAL SALINE SOILS

ICAR - Central Coastal Agricultural Research Institute
(Indian Council of Agricultural Research)
Old Goa, North Goa - 403402, Goa
(An ISO 9001:2015 Certified Institute)

Extension Folder No. 113/2023

A glimpse of Cowpea and Moong Varieties recommended for rice fallow area in Goa

ICAR - Central Coastal Agricultural Research Institute
(Indian Council of Agricultural Research)
Old Goa, North Goa - 403402, Goa
(An ISO 9001:2015 Certified Institute)

Extension Folder No. 114 | 2023

Nutmeg Pericarp Taffy

ICAR-Central Coastal Agricultural Research Institute
Ela, Old Goa, Goa - 403 402, India
(An ISO 9001:2015 Certified Institute)

वार्षिक प्रतिवेदन 2022

Annual Report 2022

भाकूअनुप - केंद्रीय तटीय कृषि अनुसंधान संस्थान
ICAR - Central Coastal Agricultural Research Institute
Old Goa (Goa) - 403 402

वार्षिक प्रतिवेदन 2021

Annual Report 2021

भाकूअनुप - केंद्रीय तटीय कृषि अनुसंधान संस्थान, गोवा

लहरे

Technical Bulletin No. 73

भा.कू.अनु.प. - केंद्रीय तटीय कृषि अनुसंधान संस्थान
(तटस्थ कृषि अनुसंधान संस्थान)
दहा जुने गोवा, गोवा, भारत
ICAR - Central Coastal Agricultural Research Institute
(Indian Council of Agricultural Research)
Old Goa - 403 402, Goa, India.

Eco-friendly integrated pest and disease management technologies in major vegetable crops of Goa

भा.कू.अनु.प. - केंद्रीय तटीय कृषि अनुसंधान संस्थान
(तटस्थ कृषि अनुसंधान संस्थान)
दहा जुने गोवा, गोवा, भारत
ICAR - Central Coastal Agricultural Research Institute
(Indian Council of Agricultural Research)
Old Goa - 403 402, Goa, India.

Extension Folders (No. 104 to 114)

Annual Report 2022, Hindi Annual Report - 2021, Leherein (Hindi magazine) & Technical Bulletin No. 73



IPR & ITMU Activities

Patent Applications Filed/Processed

Process for Preparing Cashew Apple Crunch and Resultant Food Product Thereof (PA# 201621012413)

The source and geographical information were shared with the IPR Attorney (M/s Krishna & Saurastri Associates LLP, Mumbai) and the patent hearing was attended by the IPR Attorney and the information and affidavit were submitted to the Indian Patent Office on September 20, 2023. Currently, in order for grant of patent under section 43, awaiting for the approval of National Biodiversity Authority (NBA).



Process for Preparing Nutmeg Taffy and Resultant Food Product Thereof (PA# 201621012414)

The information on geographical location was sent to the IPR Attorney and duly signed Access and Benefit Sharing (ABS) agreement and Internationally Recognised Certificate of Compliance (IRCC) form for NBA application were sent to the IPR Attorney on December 05, 2023. Currently, in order for grant of patent under section 43, awaiting for the approval of National Biodiversity Authority (NBA).



Method and System for Detection of Stem and Root Borer Infestation (PA# 202221006557)

The patent hearing was attended by the IPR Attorney and the complete specification was filed on February 06, 2023. The Patent Application was published in the Indian Patent Office Journal on August 11, 2023



Trademark applications filed

Trademark application for ICAR-CCARI logo (TM Application No. 6161275) was submitted to the Trade Marks Registry of Intellectual Property Office (IPO) through IPR Attorney on October 23, 2023



ICAR-CCARI logo

Geographical Indications

The Institute provided technical inputs to the Goa State Council for Science & Technology, Goa for filing GI applications and the following GIs were granted:

1. Goa Mankurad Mango: GI granted on August 01, 2023
2. Goa Cashew (Kaju / Caju): GI granted on October 03, 2023



Plant & Animal Variety

Plant varieties

The ITMU of the Institute facilitated in submitting the proposals for release of 11 varieties of 6 horticultural crops to the State Variety Release Committee (SVRC), Goa.

All the 11 varieties were recommended for release by the SVRC of Goa on September 12, 2023.



Goa Cashew - 5



Goa Cashew - 6



Goa Kokum - 1



Goa Kokum - 2



Goa Kokum - 3

Goa
Butki Supari - 1

Goa Jayphal - 1



Goa Jayphal - 2



Goa Jayphal - 3



Cardozo Mankurad



Goa Dalchini - 1



Animal Variety

Updated information on the "Goya" pig variety was submitted to National Research Centre on Pig on October 2023.

Contract Research/MoA/MoUs Signed (06)

- ICAR-CCARI, Goa collaborated with Udbhav Vriksh Ltd., Goa for the "Evaluation of the feasibility of operation of the Agro-eco-tourism centre in a Public-Private-Partnership (P-P-P) mode" of its Agro-ecotourism unit with the licence fee of Rs. 26,00,000 from December, 2023 for a period of five years.
- A Memorandum of Understanding (MoU) was signed between ICAR-CCARI, Goa and Forest Department, Goa on January 25, 2023 for undertaking project by the Institute on "Identification of forest fire-prone areas in Goa and their management" with a project cost of Rs. 2,00,000 for six months.
- ICAR-CCARI, Goa signed an MoU with the Forest Department, Goa on February 03, 2023, for undertaking contract research by the Institute on "Biodiversity of Hoverflies (Insecta: Diptera: Syrphidae) of the Protected Areas of Goa" with a project cost of Rs. 5,00,000 for a period of one year.
- ICAR-CCARI, Goa signed an MoU with National Innovation Foundation, Gandhinagar, Gujarat on March 09, 2023, to foster collaboration in carrying out advanced research in areas of validation and value addition of outstanding indigenous practices.
- ICAR-CCARI, Goa signed an MoU with the University of Agricultural Sciences, Raichur, Karnataka on March 30, 2023, for facilitating Research and Students Training/ Postgraduate Research.
- A Memorandum of Agreement (MoA) was signed between ICAR-CCARI, Goa and ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI), Bengaluru on July 06, 2023 for cooperation in conducting research.



Other Meetings, Outreach Activities & Events

- Discussion was held with Shri Deepak, Parab, Project Scientist, Goa State Council for Science & Technology, Goa regarding modalities for securing GI for Goan Pork Sausage on January 18, 2023
- Preliminary discussion was held with TEAM 24, Panaji, Goa for possible collaboration and commercialization of the Institute Technologies on March 29, 2023
- An interface meeting with Dronier Avigation & Fly Cocobot team was held for exploring possible collaboration on April 24, 2023.
- ITMU organized the “World Intellectual Property Day” celebration with the theme of Women and IP: Accelerating Innovation and Creativity on April 26, 2023. Dr. Shripad Bhat, Sr. Scientist (Agril. Economics) & Nodal Officer, ITMU delivered a lecture on “Role of ITMU in Intellectual Property Management” and a total of 45 participants attended this event.
- The ITMU of the Institute and ICAR-KVK, North Goa jointly organized the ICAR Technology Day celebration on July 18, 2023 at Talaulim village of Ponda Taluka, Goa, wherein a total of 34 participants including farmers & agri-entrepreneurs attended programme.
- In the Entrepreneurship Development Program organized by ICAR-CCARI ABI (AGNI), Dr. Shripad Bhat, Sr. Scientist (Agril. Economics) & Nodal Officer, ITMU delivered an online lecture on Agripreneurship and Agricultural Marketing on September 22, 2023 to incubatees and aspiring incubatees.
- Dr. Dinesh Kumar, Research Associate, ITMU of the Institute delivered a lecture on “Activities of ITMU and IPR Cell” to 25 students of Goa College of Agriculture, Goa on October 27, 2023
- Two Institute Technology Management Committee (ITMC) meetings were held on May 29, 2023 and September 26, 2023 to discuss various agendas related to IP portfolio of the Institute



Technology day celebration at Talaulim, Goa



Technology Evaluation

Company	Machine Tested
M/s. Fortune Agro -Impex, Bengaluru	Unipole Aluminium Ladder (30 feet) Battery powered Chain Saw Petrol powered Chain Saw Secateur (Battery Operated)
M/s. Maben's Engineering Solutions	Post Hole Digger (Earth Auger) Battery Powered Knapsack Sprayer Weed/Brush Cutter Petrol powered Chain Saw Chaff Cutter (2 Hp) & (5 Hp) Coconut Dehusker Rotary Power Weeder
M/s. Omkar Krishi Yantra Udyog, Brahmakarmali	Multi-tasking Agro Machine
M/s. Sri Ranganatha Agri Shop, Urugadur Shimoga	Mountfield Pro Aluminium 10 Feet & 20 Feet Ladder Manned Coconut Tree Climber (Standing Type) Mountfield Pro Double Wheel Barrow (Manual) Mountfield PRO Pepper decorticator Mountfield PRO Power Sprayer with Honda GX80 Engine Mountfield Pro Arecanut Debuncher Mountfield Pro Arecanut Dehusker (3 , 4, 6 & 8 Conveyor Belt -Motorized) Mountfield Pro Arecanut (Gorabalu) Polisher (Drum type) Mountfield Pro Load Cart MFP 135 & Cart-380 Mountfield PRO Self Propelled Load Cart-480 Mountfield Pro Arecanut (Gorabalu) Polisher (Stone type) Mountfield PRO Arecanut Boiler
M/s. V Agro Tech, Bengaluru	Arecanut Dehusker (10 Conveyor Belt -Motorized) V Agro Tech Arecanut Boiler V Agro Tech Arecanut (Gorabalu) Polisher (Drum type) V Agro Tech Pepper Decorticator V Agro Tech Telescopic Pole (70 Feet)
M/s. Suntec Agri Equipment (India), Bengaluru	Electric Compressor Power Sprayer
M/s. Ratnagiri Impex, Bengaluru	Petrol powered Chain Saw

A total of 37 machines were evaluated on the farm and performance reports were issued

List of machines evaluated by ICAR - CCARI



Arecanut dehusker
(10 belt)



Gorbalu polisher



Pepper thresher



Arecanut
boiler



Dump cart



Arecanut
de-buncher



Ongoing Research Projects

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.	Gopal R Mahajan	Sujeet Desai, Bappa Das & Sreekanth G B	2020 – 24
2.	Evaluation of natural farming practices under plantation crop-based system	Gopal R Mahajan	Parveen Kumar, A Raizada, Paramesha V, Arunachalam V, R Ramesh, Maruthadurai R, Shripad Bhat, Uthappa A R, Sujeet Desai, Amiya R Sahu, Rahul Kulkarni & Shashi Vishwakarma	2023-28
3.	Study of conservation tillage practices for sustainability of rice based cropping systems in west coast of India	Paramesha V	Gopal R Mahajan & Parveen Kumar	2019-24
4.	Evaluation of potential rice-based cropping systems under salt affected coastal saline soils for enhancing cropping intensity, sustainability and livelihood security	Paramesha V	Manohara K K, Sukanata K Sarangi, Shripad Bhat & Parveen Kumar	2022-26
5.	Impact assessment of extreme weather events on productivity of major crops in coastal region of India	Bappa Das	A Raizada, Arunachalam V & Manohara K K	2022-25
6.	Assessment and mapping of trends in hydro-climatic variables over west and east coast regions of India	Sujeet Desai	Bappa Das & Sreekanth G B	2019-23
7.	Assessment of climate change impact on the crop and irrigation water requirement of major crops of west coast region	Sujeet Desai	Bappa Das, Paramesha V & Jitendra Kumar	2023-25
8.	Assessment and development of agroforestry systems for improved livelihood and climate change mitigation in coastal regions of India	Uthappa A R	Desai A R, A Raizada, Shripad Bhat, Gopal R Mahajan, Paramesha V, Sujeet Desai, Bappa Das, R Solomon Rajkumar, Nagaratna B. Biradar & Vinod Kumar	2021-25
Horticulture Sciences				
9.	Harnessing palms for sustainable livelihoods of coastal India	V Arunachalam	Paramesha V & Bappa Das	2020-24
10.	Agro-biodiversity, nursery techniques, and post-harvest technology of ornamental crops for livelihood diversification in coastal India	V Arunachalam	MJ Gupta	2021- 23

**Significant Achievements - Ongoing Research Projects**

11.	Identification of edaphic and climate factors affecting mango production in coastal region and its management	V Arunachalam	Sujeet Desai & Bappa Das	2020-23
12.	Improvement of Indigenous Mango, Cashew and Jackfruit	V Arunachalam	R. Ramesh & R Maruthadurai	2023-28
13.	Collection, evaluation of genetic resources and management of fruit and spices	AR Desai	Sujeet Desai, Paramesha V & Nibedita Nayak	2011 – 23
14.	Integrated strategies for crop improvement and organic production in cashew for coastal climate resilience	AR Desai	Manohara K K & Paramesha V	2020-23
15.	Assessment and development of cropping systems based on harvest and postharvest management technologies for coastal India	MJ Gupta	R Ramesh, Shripad Bhat, R Solomon Rajkumar, Monica Singh & Chaudhari G V	2020-24
16.	Assessment and strengthening of vegetable production in coastal region through acquisition, utilization of local germplasm and strategic introduction of commercial vegetables.	Chaudhari G V	R Ramesh, Maruthadurai R & Shripad Bhat	2021-25
17.	Impact analysis of ICAR-CCARI technologies	Shripad Bhat	Manohara K K, Gopal R Mahajan, Paramesha V, Amiya R Sahu & Monica Singh	2021-24
Crop Science				
18.	Integrated management of major diseases of tomato and chilli in coastal regions	R Ramesh	R Maruthadurai Ganesh Chaudhari Manohara KK	2022-27
19.	Genetic improvement of rice for coastal agro-ecosystem	Manohara K K	Paramesha V	2020-25
20.	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				
21.	Studies on prevalence, etio pathology and management of infectious reproductive disorders in dairy cattle of west coast region	Shirish Narnaware	Susitha Rajkumar & Gokuldas P P	2022-25
22.	Serological and molecular diagnosis of PPR (Peste Despetits Ruminants) in small ruminants and developing preventive strategies in coastal region	Susitha Rajkumar	Shirish Narnaware, Bappa Das & Shivasharanappa N	2020-23
23.	Prevalence, impact and management of the economically important diseases of dairy animals in coastal India	Susitha Rajkumar	Shirish Narnaware	2019-23
24.	Alternative herbal strategies for management of bovine mastitis	Susitha Rajkumar	Shirish Narnaware	2023-26
25.	Conservation of major farm animal resources in the coastal region through evaluation of seminal traits, semen processing and preservation	Gokuldas P P	Amiya R Sahu	2020-25
26.	Genetic variability of thermo tolerance in selected breeds of livestock under coastal environment	Amiya R Sahu	Gokuldas P P	2020-25



Significant Achievements - Ongoing Research Projects

27.	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 R Sahu & Monica Singh	2019-24
28.	Development of ready-to-eat (RTE) animal and fish based traditional of coastal India by retort processing	R Solomon Rajkumar	C O Mohan, M J Gupta, Susitha Rajkumar & Trivesh Mayekar	2021-25
29.	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 G B, Gopal R Mahajan, Manohara K K, R Solomon Rajkumar & Paramesha V	2020-24

Agro Eco-Tourism

30.	Prospects and promotion of agro ecotourism in coastal region of India	R Solomon Rajkumar	Parveen Kumar, V Arunachalam, M J Gupta, Gopal R Mahajan, Sujeet Desai, R Ramesh, R Maruthadurai, Shripad Bhat, Uthappa A R, Trivesh Mayekar, Chaudhari G V & Nibedita Nayak	2017-23
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All India Co-ordinated Research Project (AICRP) Centers

No	Project Title	PI	Co-PI (s)	Duration
1.	AICRP on Integrated Farming Systems	Paramesha V	Parveen Kumar, Gopal R Mahajan, Sreekanth G B, Gokuldas P P, Manohara K K, Uthappa A R, R Solomon Rajkumar & Trivesh Mayekar	2021-26
2.	AICRP on Seed (Crops)	Manohara KK		2021-26
3.	AICRP on Palms	V Arunachalam		2021-26
4.	AICRP on Cashew	V Arunachalam		2021-26
5.	AICRP on Vegetables	Chaudhari G V	R Ramesh	2021-26
6.	AICRP on Pig	Amiya Ranjan Sahu		2021-26

Externally Funded Projects

No	Project Title	PI	Co-PI (s)	Duration
NABARD				
1.	Land shaping methods and integrated farming system approach for improving livelihood security of farmers under khazan lands of Goa	Gopal Mahajan	Shripad Bhat, Sujeet Desai, Uthappa A R, Paramesha V & Parveen Kumar	2022-25
2.	Entrepreneurship development & livelihood improvement through training & demonstration of sustainable ornamental fish culture in Goa	Trivesh Mayekar	Sreekanth G B	2022-24
3.	Market intelligence for horticultural crops	Shripad Bhat		2023-25
4.	Promotion of improved indigenous backyard poultry	Nibedita Nayak		2023-25



Significant Achievements - Ongoing Research Projects

PMKSY, DOLR, Govt. of India				
5.	Sustainable natural resource conservation and livelihood improvement through integrated watershed management in Goa	Parveen Kumar	Sujeet Desai, A Raizada Gopal R Mahajan, Uthappa A R, Paramesha V, Bappa Das, Gokuldas P P & Monica Singh	2021-26
Coconut Development Board				
6.	Layout of demonstration plots and organic farming coconut	V Arunachalam		2022-24
MIDH, DASD				
7.	Centrally sponsored MIDH scheme through DASD, Kozhikode	V Arunachalam		2018-23
Government of Goa				
8.	Biodiversity of hoverflies of the protected areas of Goa	Maruthadurai R	Anooj S S	2023-24
9.	Identification of forest fire prone areas in goa and their management	Uthappa AR	A Raizada &Bappa Das	2023
Contract Research Project				
1.	Assessment of Agro eco-tourism conceptual framework models in an island ecosystem of Goa (Sponsored by M/S Milestone Resorts, Goa)	Parveen Kumar	R Solomon Rajkumar, Manohara K K, Shripad Bhat, Sreekanth G B, Sujeet Desai, Paramesha V & Uthappa A R	2022-25
ICAR				
10.	Network Project on Functional Genomics & Genetically Modified crops	Manohara KK		2021-26
11.	Production and formulation technology refinement of bacterial bio-agents for soil borne plant disease management under coastal ecosystems- Phase II	R Ramesh	Maruthadurai R	2021-26
12.	District Agro-Met Unit, North Goa	Bappa Das	Navyashree S, Arunachalam V, Ramesh R, Prabhu H R C, Maruthadurai R, Gokuldas P P, Paramesha V& Nibedita Nayak	2021-26
13.	Seed production in agricultural, horticultural crops and fisheries	Manohara KK	V Arunachalam & Sreekanth G B	2006-26
14.	Poultry seed project	Nibedita Nayak		2021-26
15.	National Animal Disease Epidemiology Network	Susitha Rajkumar		2021-26
16.	Agri-Business Incubator	MJ Gupta	R Solomon Rajkumar & Shripad Bhat	2021-26
17.	National Agriculture Innovation Fund (NAIF), Component - I (ITMU)	Shripad Bhat		2021-26
18.	Assessment of carbon footprint in integrated farming system through life cycle assessment for sustainability and climate resilience	Paramesha V	V Arunachalam, Uthappa A R, Gokuldas P P & Trivesh Mayekar	2021-24



Transfer of Technology





Krishi Vigyan Kendra (North Goa)

ICAR-Krishi Vigyan Kendra, North Goa was established at the Institute in 1983 for carrying out technology assessment, demonstration for its application and capacity development in agriculture and allied sectors at local agro-climatic conditions.

A total of 42 training programs were organized in 2023, with 1369 participants. The most important training programs focused on natural farming, vermicomposting, organic input production, advanced crop & animal production technologies, biotic and abiotic stress management, and entrepreneurship development for the benefit of farmers/ farm women, rural youths and extension functionaries.

A total of 42 training programs were organized involving 1369 participants



Training on beekeeping



Training on natural farming



Dr. Pramod Sawant, Hon'ble Chief Minister, Goa, Shri Rohan Khaunte, Hon'ble Minister for Tourism and IT, Shri Sadanand S. Tanavade, Hon'ble MP (Rajya Sabha), Shri Premendra Shet, Chairman, GSHCL and Dr. Deviyan Rane, Chairman, GSFDC visited KVK stall during Cashew Festival 2023



KVK is actively involved in conducting 281 different type of extension activities involving 30,473 farmers such as field days, exposure visits, exhibitions, sammelans, agro-advisories, webinars, soil health camps, farmer visits, TV shows, campaigns, diagnostic visits, scientist-farmer interaction, radio talks, celebration of important days etc. In addition, KVK also uses different social media platforms such as WhatsApp, Facebook, You Tube and Twitter for mass dissemination of information.

KVK is also actively involved in celebration of important days such as Kisan Diwas, World Bee Day, World Food Day, World Environment Day, International Women Day and World Soil Day etc. It

Conducted 281 extension activities involving 30,473 farmers

actively participated in the government's flagship Viksit Bharat Sankalp Yatra campaign, visiting 102 village panchayats North Goa district. A total of 13540 people, including 5754 men and 7786 women, participated in this campaign.



Ragi Idli and sevai made during training.



Training on millet processing and value addition for the Home Science students



Transfer of Technology - Krishi Vigyan Kendra (North Goa)

During 2023, three on-farm experiments were undertaken in the adopted communities to evaluate the performance of four crop varieties viz., paddy (Goa Dhan -3 and Goa Dhan - 4), brinjal (Goa Brinjal – 1 and Goa Brinjal - 2), and Napier grass (CO-5 and Super Napie) covering 11 farmers.

ICAR – KVK, North Goa conducted 07 FLDs on the latest varieties / technologies on farmers' field viz: salt-tolerant rice (Goa Dhan -1), Sweet corn (Golden COB -F-1), High-yielding watermelon (Arka Manik), Kodo millet (RK 390 -25), Proso millet (TNAU -202), Finger millet (GPU – 67) & Cashew stem and

Conducted 3 OFTs and 7 FLDs involving 67 farmers

root borer management with chloropyriphos & mechanical removal of larve, involving 56 farmers and covering 6.5 ha.

Externally funded research projects

TDC-National Innovations in Climate Resilient Agriculture (NICRA)

KVK received Rs. 11.28 lakh under TDC-NICRA to demonstrate climate-resilient technologies in Mayem village. A Custom Hiring Center (CHC) was established under this project and inaugurated by Mr. Premanand Seth, MLA, Bicholim on 13th September 2023. Under this TDC-NICRA project following resilient technologies were demonstrated:

Crop	Technology demonstrated	Variety	No. of Farmers	Area (ha) / No
Rice	Goa Dhan-1+ Goa Bio 1	Goa Dhan-1	10	15
Cashew + Finger millet	Cashew + Finger millet (var. GPU 67)	Finger millet (var. GPU 67)	3	0.5
Cashew	Multi species planting of Vengurla	Vengurla 3, 4, 7 and 9	5	3
Dairy	Feeding of Mineral mixture to dairy cattle	Mineral mixture	22	22
NRM	Desilting of open wells	-	02	02

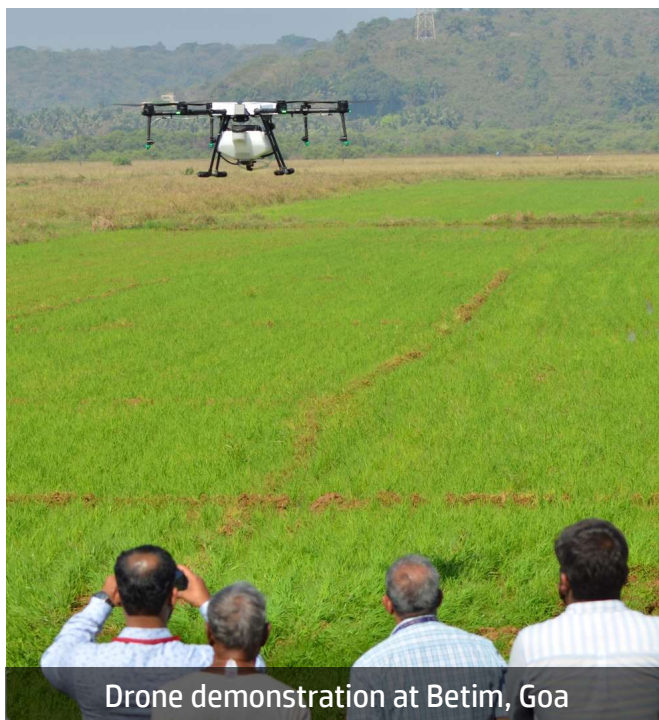


Awareness training programme under NICRA at Mayem, Goa



Activities under Agri drone under sub-mission on agricultural mechanization

A spraying demonstration using drone was organized at Batim village, Pilar, on 12/01/2023, in collaboration with Fr. George Quadros, Don Bosco Loutolim Society, Raia. The demonstration was attended by more than 25 farmers and officers from the Department of Agriculture.



Drone demonstration at Betim, Goa

Activities under out scaling of Natural Farming through KVK

Under the natural farming project, eighteen programs, such as training, awareness campaigns, and workshops, were organized, benefiting 791 beneficiaries, including 425 farmers and 366 farm women. Mass awareness has been created through workshops covering five North Goa district talukas. Natural farming practices for bhendi, cluster beans, and cashews have been demonstrated in eight farmers' fields in North Goa. Eight participants received demonstration kits containing a plastic drum, jaggery, and gram flour as part of the program.



Interaction with Natural Farming farmer at Savoi-verem, Goa



Training & Capacity Building

Trainings conducted

Date	Training Topic/Programme	Participants	Venue
Dr. Nibedita Nayak			
24 to 29-03-2023	Skill Development and Poultry Entrepreneurship Training cum Demonstration	Farmers	ICAR - CCARI
Shri Trivesh Suresh Mayeker			
27-03-2023	Training programme on Ornamental Fish Culture	Farmers	ICAR - CCARI
28-08-2023	Capacity building cum training programme on Aquaculture	Farmers	ICAR-CCARI
02-08-2023	Training programme on Ornamental Fish Culture for women Self-help group	Farmers	ICAR - CCARI
Shri Vinod Ubarhande			
18 to 19-10-2023	Training programme on 'Skill building of young minds for agriculture as an enterprise'	Students	ICAR - CCARI
Dr. Amiya R. Sahu			
03-05-2023	Training-cum-Field Demonstration on Scientific pig rearing	Farmers	Chinchinim, Salcete, Goa
Dr. Shripad Bhat			
08-12-2023	Training programme on market intelligence for farmers	Farmers	Kunkaliem, Mardol, Ponda
Dr. Shirish Narnaware			
20 to 22-12-2023	Training Programme on "Scientific Livestock Farming for Sustainable Livelihood	Farmers	ICAR - CCARI

Lectures delivered / by the Scientist

Date	Lecture Topic/Programme	Participants	Venue
Dr. R Ramesh			
27-11-2023	<i>Ralstonia solanacearum</i> : A versatile plant pathogenic bacterium	Teachers	Virtual platform by Goa University
28-11-2023	Biological control of soil-borne plant diseases	Teachers	Virtual platform by Goa University
Dr. Shirish Narnaware			
24-03-2023	Importance of backyard poultry farming: Science and Practice	Trainees	ICAR-CCARI, Goa
26-03-2023	Importance of Vaccination, deworming and bio -security measures in poultry farming	Trainees	ICAR-CCARI, Goa
11-08-2023	Bacterial diseases of poultry their diagnosis and management	Trainees	ICAR-CCARI, Goa.
06-09-2023	Disease prevention and management of pig farms	Trainees	ICAR-CCARI, Goa



Transfer of Technology - Training & Capacity Building

29-09-2023	Scope and importance of commercial dairy farming	Trainees	ICAR-CCARI, Goa
25-10-2023	Research and development in animal science and fisheries sector at ICAR - CCARI, Goa	Trainees	ICAR-CCARI, Goa
20-12-2023	Scope and Importance of Animal husbandry in coastal region	Trainees	ICAR-CCARI, Goa
21-12-2023	Important diseases of dairy animals and their management	Trainees	ICAR-CCARI, Goa
22-12-2023	Important diseases of pigs and their management	Trainees	ICAR-CCARI, Goa
Dr. R. Solomon Rajkumar			
28-03-2023	Value-added poultry products, their packaging and marketing	Farmers	ICAR-CCARI, Goa
29-08-2023	Natural Farming Unit as an agro - ecotourism park	Faculty	UAS, Dharwad, Karnataka
06-09-2023	Pig processing and marketing in Goa	Farmers	ICAR-CCARI, Goa
14-09-2023	Technologies for value addition of livestock and marine produce	Entrepreneurs	ICAR-CCARI, Goa
31-10-2023	Scope of Agro -ecotourism in coastal regions of India	Students	ICAR-CCARI, Goa
Dr. Gopal R. Mahajan			
08-06-2023	Millets for nutritional security and prosperity in the coastal region	Farmers and stakeholders	ICAR-CCARI, Goa
18 to 19-10-2023	Skill building of young minds for agriculture as an enterprise	Students and faculty	ICAR-CCARI, Goa
18-10-2023	Farmers-Stakeholders-Scientists interaction visit -cum-meet on 'Khazan lands'	Farmers and stakeholder	Merces, Tiswadi, Goa
25 to 31-10-2023	Rural Awareness Work Experience (RAWE) on Coastal Agricultural Research and Development	Students	ICAR-CCARI, Goa
21-12-2023	Processing and value addition of the cattle dung	Farmers	ICAR-CCARI, Goa
21-12-2023	'Recycling of wastewater and its use in agriculture	Farmers	ICAR-CCARI, Goa
08-06-2023	Millets for nutritional security and prosperity in the coastal region	Farmers and stakeholders	ICAR-CCARI, Goa
Dr. Susitha Rajkumar			
28-03-2023	Avian health care management (Viral and fungal diseases)	Farmers	ICAR-CCARI, Goa
21-12-2023	Important diseases of goats and their management	Farmers	ICAR-CCARI, Goa
22-12-2023	Important diseases of poultry and their management	Farmers	ICAR-CCARI, Goa
28-03-2023	Avian health care management (Viral and fungal diseases)	Farmers	ICAR-CCARI, Goa
Dr. Sreekanth GB			
11-02-2023	Fish in water: becoming an enthusiast	Students	KUFOS, Payyannur
02-03-2024	Developing climate -smart integrated Agri-Aqua systems (IAAS) for improving the rural livelihood	Delegates	KUFOS, Kochi
22-03-2023	Aqua-tourism and opportunities	Farmers	Kadamakudy Islands
08-05-2023	Ecosystem services of estuarine ecosystems: classification, identification and evaluation	Delegates	Dr BSKKV Dapoli



Transfer of Technology - Training & Capacity Building

Dr. Gokuldas PP			
26-03-2023	Artificial Insemination: Scope and prospects in poultry farming	Farmers	ICAR-CCARI, Goa
30-10-2023	Reproductive health care and AI in dairy animals	Students	ICAR-CCARI, Goa
Dr. Ganesh Chaudhari			
16-01-2023	Vegetable cultivation management during rabi season in Goa.	Farmers	Amona, Goa
20-06-2023	Orientation to the vegetable research	Farmers	ICAR-CCARI, Goa
27-10-2023	Vegetable cultivation in Goa	Students	ICAR-CCARI, Goa
Dr. Sripad Bhat			
23-02-2023	Impact assessment and economic analysis of Watershed projects	Farmers	Priol, Ponda, Goa
25-04-2023	Marketing Opportunities for Important Crops of Goa	Board of Directors of Farmers Producers Organizations (FPOs)	ICAR-KVK, North Goa
02-09-2023	Role of Market Intelligence in Earning Higher Farm Income	Farmers	Arlem Raia, Salcete-Goa
22-09-2023	Agripreneurship and Agricultural Marketing	ABI incubates & aspiring incubatees	Virtual platform by ICAR-CCARI, Goa
27-10-2023	Agriculture Economics and its Applications	Students	ICAR-CCARI, Old Goa
08-12-2023	Role of market intelligence for horticultural crops for improving livelihood of farmer in Goa	Farmers	Kunkaliem, Mardol, Ponda
Dr. Bappa Das			
24-03-2023	Remote sensing and GIS application in agriculture	Students	Virtual platform by Vellore Institute of Technology
17-09-2023	Overview of available crop models	Students	Virtual platform by International Rice Research Institute in partnership with Sri Sri University, Odisha
Dr. Sujeet Desai			
23-02-2023	Watershed Concept and Soil and Water Conservation	Farmers	Priol Panchayat Hall, Ponda
20-12-2023	Importance of Livestock in Integrated Watershed Management: Success Stories	Farmers	ICAR-CCARI, Goa
Dr. Amiya Ranjan Sahu			
24-03-2023	Poultry breeds suitable for coastal climate and their breeding	Trainees	ICAR-CCARI, Goa
25-03-2022	Production practices for quality chick production and hatchery management	Trainees	ICAR-CCARI, Goa
25-10-2023	Scope of pig farming in coastal areas of India	Trainees	ICAR-CCARI, Goa
Dr. Uthappa AR			
21-02-2023	Soil faunal diversity and its role in ecosystem health	Trainees	ICAR-CCARI, Goa
Dr. Nibedita Nayak			
24-03-2023	Importance of backyard poultry farming: Science and Practice	Trainees	ICAR-CCARI, Goa
26-03-2023	Production practices for quality chick production and hatchery management	Trainees	ICAR-CCARI, Goa



Transfer of Technology - Technology Dissemination by the Institute

List of training and lectures delivered by **Dr. Mathala Juliet Gupta** under Pradhan Mantri Formalisation of Micro food processing Enterprises (PMFME) scheme

Date	Title	Audience	Venue
14/2/2023	Plant Layout, design and Maintenance	District Resource Persons of PMFME Scheme	ICAR-CCARI, Goa
21/02/2023 to 28/02/2023	PM FME Overview, Food Domains, & Value Addition	Seed Capital SHG beneficiaries of PMFME Scheme	ICAR-CCARI, Goa
2/03/2023 to 14/03/2023	PM FME Overview, Food Domains, & Value Addition	Seed Capital SHG beneficiaries of PMFME Scheme	ICAR-CCARI, Goa
18/05/2023	ODOP Products, Processing, Value Addition – Advantages and PMFME Overview	Participants of PMFME Awareness Camp	Rani Laxmibai Hall, Valpoi
24/05/2023 to 26/05/2023	PM FME Overview, Food Domains, & Value Addition	Seed Capital SHG beneficiaries of PMFME Scheme	ICAR-CCARI, Goa
19/6/2023 to 20/06/2023	PM FME Overview, Food Domains, & Value Addition	Direct Credit Linked Beneficiaries of PMFME Scheme	ICAR-CCARI, Goa
9/10/2023 to 11/10/2023	PM FME Overview, Food Domains, & Value Addition and Hands-on experience in PHT lab & VCO Unit	Direct Credit Linked Beneficiaries of PMFME Scheme	ICAR-CCARI, Goa
13/10/2023	ODOP Products, Processing, Value Addition - Advantages	Participants of PMFME Awareness Camp	ZAO Office Training Hall, Pernem
19/10/2023	ODOP Products, Processing, Value Addition - Advantages	PMFME Awareness Camp attendants of Bardez, Goa	ZAO Office Training Hall, Mapusa
27/10/2023	ODOP Products, Processing, Value Addition - Advantages	PMFME Awareness Camp attendants of Tiswadi, Goa	Sal Training Hall, KVK North Goa
01/11/2023	PMFME Overview and brief mention of other government of India Schemes supporting food processing enterprises and use of Hime-based Equipment	Seed Capital SHG beneficiaries of PMFME Scheme from Bicholim North Goa	ICAR-CCARI, Goa
02/11/2023 to 03/11/2023	Plant Layout, design and Maintenance	District Resource Persons of PMFME Scheme Goa	ICAR-CCARI, Goa
27/11/2023 to 05/12/2023	PM FME Overview, Food Domains, & Value Addition	Seed Capital SHG beneficiaries of PMFME Scheme from North Goa & South Goa districts	Sal Training Hall, KVK North Goa



Technology dissemination by the Institute

Adoption and dissemination of Artificial Insemination of farm animals in farmers' field

A total of 435 piglets were born through 96 numbers of AI and 63 numbers of farrowings with success rate of 72%. Average litter size at birth and at weaning were 7.1 and 6.3, respectively. Moreover, farmers were trained to perform AI and also received technical advice on scientific practices. Institute has also distributed superior quality pig germplasm to farming community. Institute has also standardized the technique of AI in indigenous Konkan Kanyal goats. Adoption of controlled breeding technology has boosted goat production with overall conception rate of 65%. There was an increase of 20% in submission rate and 26% increase in kidding rate as compared to conventional mating system.



Artificial Insemination in Goat

Demonstration of pheromone traps & sticky traps for the management of insect pests



A demonstration on use of pheromone traps and sticky traps for the management of insect pests was conducted at Old Vaddem, Sanguem, Goa on 28 April 2023. Dr. Maruthadurai, Senior Scientist delivered a talk on the use of pheromone traps for coconut insect pests, sticky traps and spinosad for sucking insect pests in vegetable pest management. A total of 100 yellow and blue sticky traps, 50 pheromone traps and spinosad were distributed to 30 ST farmer beneficiaries.

Field day and cyclone relief animal health camp in Bhuj, Gujarat

ICAR-CCARI, Goa, in collaboration with KVK, ICAR-CAZRI, Bhuj, organized field day and cyclone relief animal health camp at Kukma and Adesar villages of Bhuj, Gujarat during 13-14 July 2023 as an activity under SCSP. During the field day, veterinary medicates and vitamin-mineral supplements were given to farmers. The program was coordinated by Dr. Shirish Narnaware and Dr. Amiya R. Sahu, veterinary scientists from ICAR-CCARI, Goa, along with Dr. Manish Kanwat, Principal Scientist & Head KVK, ICAR-CAZRI, Bhuj. The programme was attended by 118 farmers, and other stakeholders.





Field day cum animal health camps and farmer's interaction meet

The institute organized a field day cum animal health and infertility camp and farmer's Interaction Meet at Sindhudurg, Maharashtra on 8 September 2023. A team of scientists from the Institute interacted with total 46 farmers and Gram panchayat officials during a meeting convened at Ghonsari Gram panchayat. Veterinary medicines and extension folders on scientific livestock farming were also distributed during the programme. Six dairy farms in the region were also inspected for clinico-gynaecological examinations and disease diagnosis. Dr. Shirish D. Narnaware, Dr. Gokuldas P.P. and Dr. Amiya R. Sahu coordinated the programme. The Institute also organized a field day and farmer interaction Meet under SCSP in the Kadamakkudy Islands, Ernakulam, Kerala on 12 October, 2023. A team of scientists from the Institute interacted with the farmers at Pizhala island, Ernakulam. Scientist team of CCARI provided much-needed guidance on scientific practices in rice cultivation, horticulture, livestock, poultry and fish farming. Veterinary medicines and extension folders on scientific livestock farming were also distributed during the programme, which was attended by 20 farmers from SC community.



Field day and farmer interaction meet under SCSP in the Kadamakkudy Islands, Ernakulam, Kerala

Field day cum awareness programme organized at Usgaon, Goa

A Field day cum awareness programme under One Health Approach was organised for officials and staffs of Dwarkapuri Goseva Ashram, Kasayle, Tisk-Usgaon on 22 July 2023. Dr. Parveen Kumar, Director, ICAR-CCARI along with team of scientists, interacted with the staff and guidance was also provided on cultivation of high yielding fodder varieties and feeding management of cattle and buffalo. Animals were examined and blood and other biological samples were also collected from selected animals for disease diagnosis and assessing the health status of the herd.



Field day cum awareness programme organized at Tisk, Usgaon, Goa

Field day cum farmers interaction meet at Venkitangu, Kerala

ICAR-CCARI, Goa and KUFOS, Kochi jointly organized a field day cum farmers interaction meet for the farmers and fishermen in Venkitangu panchayat near Chettuva estuary, Kerala on 15 October 2023. A team of scientists interacted with 20 fishermen and farmers. The purpose of the interaction was to understand the issues faced by the farmers and interventions required in feed formulation for different livestock, disease management of dairy animals and implementing sustainable fish culture activities such as cage culture and pen culture in an integrated way with ducks/poultry in the panchayat.



Field day at Mulki estuary and Ankola of Coastal Karnataka

ICAR-CCARI, Goa organized a field day cum monitoring of the farm activities in an integrated farm at Mulki, Mangaluru, Karnataka during 16-17 December, 2023. Total of 10 farmers in all engaged in a variety of operations, including mussel-oyster-crab farming, Assel poultry farming and fish farming in cages and ponds. This demonstration farm serves as a model for about 500 farmers/fishermen in the coastal region. About 250 students/researchers visit the farm on annual basis.



Field day at Mulki estuary and Ankola, Karnataka

Participation in exhibitions / programmes



Science Film Festival 2023, Panaji, Goa,



Goa Krishi Mahotsav, Ponda, Goa,



Vision Goa – A Mega Exhibition, Panaji, Goa



XVI Agricultural Science Congress & ASC Expo-2023.

Memorandum of Understanding/ Agreement Signed

A Memorandum of Agreement (MoA) was signed on 9 March, 2023 between ICAR-Central Coastal Agricultural Research Institute (ICAR-CCARI), Goa and National Innovation Foundation (NIF), Gandhinagar, Gujarat to foster collaboration in carrying out advanced research. The MoU will have a synergistic impact and the collaborations will be fruitful for carrying out advanced research in areas of validation and value addition of outstanding indigenous practices.



MoU signed with DST-NIF, Gandhinagar



ICAR - STC

Scheduled Tribe Component

Under the ICAR STC program, the institute has undertaken various agricultural initiatives aimed at benefiting farmers. These includes providing regular training sessions that focus on enhancing agricultural practices for field and horticultural crops, as well as training in fish and livestock processing techniques. Additionally, the program involves the distribution of essential inputs such as seeds, fertilizers and organic materials to support farmers in their agricultural activities. Furthermore, the institute organized frontline demonstrations and farmers' field days to showcase and popularize innovative agricultural technologies among farmers. This hands-on approach helped farmers learn and adopt modern farming techniques, leading to improved yields and income generation. Overall, about 1350 farmers have directly benefited from the ICAR STC gaining access to valuable training, inputs, and knowledge that contribute to their success and livelihood improvement. A community-based "Small Scale Dairy Processing Unit" was established for the tribal farmers of Vaniyampara, Thrissur with the budgetary allocation of Rs. 9.91 lakhs under financial support from STC in collaboration with Kerala Veterinary and Animal Sciences University, Wayanad, Kerala. Three capacity training programs in value-added milk products were conducted and a training manual was published. An exclusive tribal women SHG-Micro Enterprise group "SAMSUDDHA" for marketing dairy products were registered under the Kudumbashree-poverty eradication and women empowerment programme implemented by the State Poverty Eradication Mission (SPEM) of the Government of Kerala.

for marketing dairy products were registered under the Kudumbashree-poverty eradication and women empowerment programme implemented by the State Poverty Eradication Mission (SPEM) of the Government of Kerala.



Distribution of vegetable seeds & grass cutting machine to women STC farmers



Registration Certificates for SHG-ME farmers group issued by Govt. of Kerala



Tribal women SHG-Micro Enterprise group "SAMSUDDHA" registered at Thrissur, Kerala

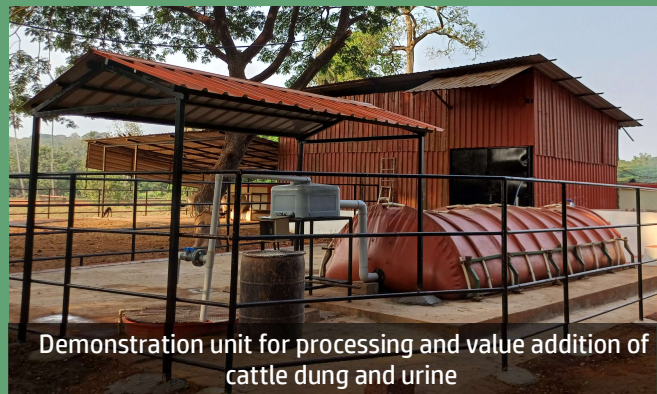


ICAR - SCSP

Scheduled Castes Sub Plan

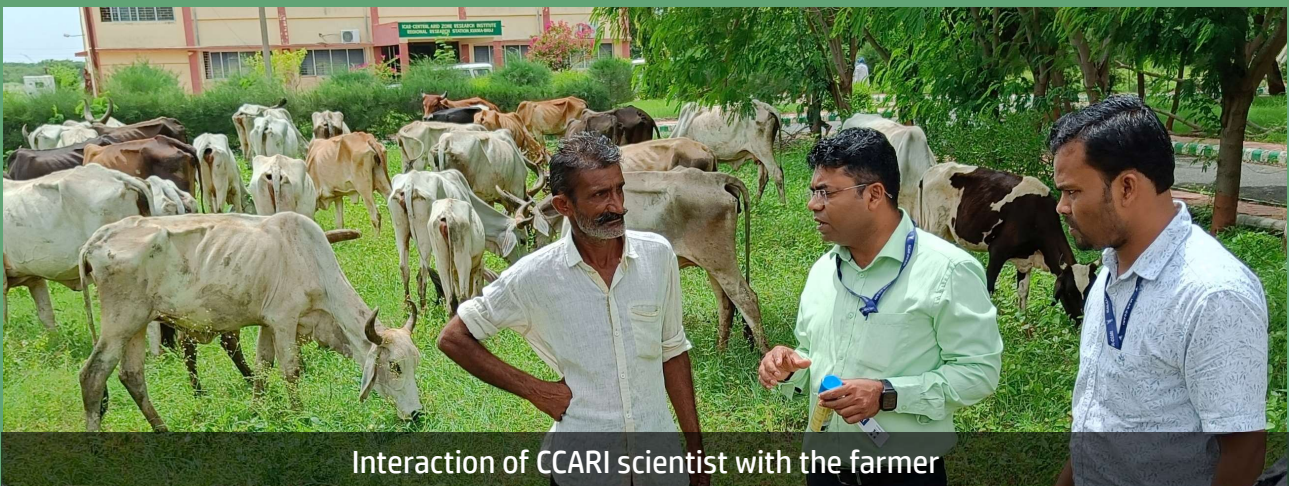
ICAR-Central Coastal Agricultural Research Institute (ICAR-CCARI), Old Goa, Goa is involved in fishermen Welfare projects under Scheduled Caste Sub Plan (SCSP) funded by Indian Council of Agricultural Research (ICAR), from Govt. of India, to make a change in the livelihood of coastal farmers/fishermen. The institute organized different activities under the SCSP during 2023 that benefitted about 800 farmers/fishermen from the coastal region.

A demonstration unit for processing and value addition of cattle dung and urine was established for capacity building of SC farmers. Sixty farmers were provided training on the demonstration unit for biogas and production of phosphate rice organic manure (PROM) productions and its use. Further, the SC beneficiary farmers will be provided the PROM to improve crop productivity and income.



Demonstration unit for processing and value addition of cattle dung and urine

Particulars	Qty	Number of beneficiaries
Trainings (capacity building / skill Develop etc.) (1-10 days) (number)	15	100
Awareness-Heath camps visits etc. / vet. Services / testing samples / field visits (no.)	7	50
Inputs- Seeds (Field crop / horti. crops) (kg)	100	30
Nursery plants (number)	400	30
Poultry chicks / duckling etc. (number)	1100	85
Fish (number)	2000	50
Equipment (small, medium, and large) (number)	100	100
Animal medicates / supplements / supplements (kg)	20 kg	20
Promotion of agri-entrepreneurships / market linkage (number)	30	150
Distribution of literature (number)	400	200
Testing samples of soil, plant water, feed, fodder, and livestock	20	20
Promotion of IFS, IOFS, Natural Farming. Nutri-garden. Kitchen garden, orchards etc.	3	3
Creation of market linkages	5	50



Interaction of CCARI scientist with the farmer



IYoM 2023

International Year of Millets



ICAR – CCARI, Goa organized a workshop on 'Millets for nutritional security and prosperity in the coastal region' on 8 June 2023 as an activity in the International Year of Millets-2023. Dr. Parveen Kumar, Director, ICAR-CCARI delivered a lecture on 'Shree Anna: Role of millets in global nutritional security, climate adaptations, health and prosperity'. Shri Dilip Balkrishna Sawaikar and Smt. Ranjana Dilip Sawaikar, Marcel, Tiswadi were felicitated and declared as 'BRAND AMBASSADORS' of ICAR-CCARI for the State of Goa for promotion of millets in Goa.

ICAR-CCARI, Goa and Goa Science Centre, Miramar, Goa jointly organized one-day workshop on "Shree Anna: Role of millets in global nutritional security, climate adaptation, health and prosperity" on 14 August 2023 at Goa Science Centre, Miramar as an activity during the International year of Millets-2023. Dr. Parveen Kumar, Director, ICAR-CCARI, Goa enlightened the audience about importance of millets in achieving nutritional and health security. He briefed the audience about the journey of millets from Siridhanya to Sree Anna. The workshop was attended by 250 participants mainly homemakers, teachers and school children from different parts of Goa.



Shri Dilip and Smt. Ranjana Sawaikar declared as 'BRAND AMBASSADORS' for promotion of millets in Goa

18 events with 6 trainings, 3 workshops, 3 lectures, 2 exhibitions and disseminated knowledge on millets to over 10,240 stakeholders



One-day workshop on "Shree Anna: Role of millets at Goa Science Centre, Miramar, Goa



Awareness program on millets for central and state government organizations

The institute organized an awareness programme on millet for central and state government organizations in Goa on 12 September 2023. The multi-institutional congregation included 60 delegates from CSIR-NIO, FCI, Police Department, ETDC, ESIC, Kendriya Vidyalaya, Census of India, LIC, NSSO, and ICAR-CCARI, Goa.

Training cum workshop on nutritional recipes of millets

The institute organized a training cum workshop on 'Nutritional recipes of Millets for women' to create awareness about nutritional value of millet and to impart skill in making various millet recipes on 14 July 2023. Mrs. Anjana Gupta gave detailed information on importance of millets in daily diet, demonstrated preparation of millet based foods. A total of 25 trainees attended the programme.



Smt. Anjana Gupta demonstrating healthy recipes from millets to the trainees



Ragi Laddo



Ragi Moduk



Little Millet Sira



Education & Human Resource Development



©Vishwajeet Prajapati 2023 | Drone Demonstration at CCARI



Education

R. Ramesh

- Mr. Gangaraj, M. Scientist (Plant Pathology) from ICAR-IIVR, Varanasi completed three months (25-08-2023 to 24-11-2023) Professional Attachment Training on “Bacterial wilt disease in vegetable crops and study on its pathogen”.
- Ms. R. Sheneka, Ph.D. Scholar from Tamil Nadu Agricultural University, Coimbatore completed two weeks (26-10-2023 to 10-11-2023) Experimental Skill Learning Programme on “Isolation and characterization of *Ralstonia solanacearum*”.
- Subject expert in interviewing the selection of Assistant Professor (Plant Pathology) to the College of Agriculture, Govt. of Goa on 30-09-2023

R. Solomon Rajkumar

- Academic Mentor for Ms. Mahima Madan IAS Probationer (2021 AGMUT) for the dissertation on 'Women Empowerment through Micro-Food Processing: An Empirical Study of Self-Help Groups of North Goa' for fulfilling the academic requirements of Masters of Public Policy of Lal Bahadur Shastri National Academy of Administration (LBSNAA), Mussoorie, Uttarakhand.
- Guest faculty at GIPARD, Goa for induction training of Goa Civil Services (Jr. Scale Officers)
- External Examiner to evaluate Master's student thesis (MVSc in Livestock Products Technology) at the College of Veterinary and Animal Sciences, Pookode, Wayanad, Kerala.
- Member of the committee constituted by the Directorate of Higher Education, Govt. of Goa for granting advanced increments for the faculty of Goa College of Agriculture.

Sripad Bhat

- External Examiner to evaluate Master's student thesis entitled 'Economic implications of farmer producer companies on production and marketing of vegetables in rural and urban districts of Karnataka' of UAS, Bengaluru and communicated the report on 27-01-2023.

Ganesh V. Chaudhari

- External examiner for Viva-Voce, of course ELM HORT 4811 (Module: Vegetable), for final semester B.Sc. Agri. Students, from Goa College of Agriculture, Govt. of Goa, on May 6th 2023.

Bappa Das

- Mentor for three months of professional attachment training (PAT) training programme of Ms Sonam, Scientist (Agricultural Meteorology), ICAR-National Institute of Abiotic Stress Management, Baramati
- Guided Nishtha Digambar Sawant, M.Sc. (Geoinformatics) of Parvatibai Chowgule College of Arts and Science (Autonomous), Margao, Goa for M.Sc. thesis entitled Crop Suitability Analysis for the Coastal Region of India.



IAS probationer during her dissertation work at ICAR-CCARI



Director and Scientists of ICAR-CCARI with Goa Civil Services Officer trainees at GIPARD



Human Resource Development

Participation of scientist in training and capacity building programmes

Date	Name	Programme	Venue
16-02-2022 to 18-02-2022-	Dr. Shirish Narnaware	Quality management system (QMS) as per ISO9001:2015	Virtual platform by ICAR-NINFET, Kolkata
27-02-2023 to 01-03-2023	Dr. Sujeet Desai	Competency Enhancement Programme for Effective Implementation of Training Functions by HRD Nodal Officers of ICAR	ICAR-NAARM, Hyderabad.
17-03-2023	Dr. Shripad Bhat	Hortnet & exports of Agriculture Produce by APEDA	Krishi Bhavan, Goa
10-08-2023	Dr. Shripad Bhat	Research beyond Academia: Strategies for real-world impact"	Virtual platform by Taylor & Francis
04-09-2023 to 15-09-2023	Dr. Shripad Bhat	Data Science in Agriculture	Virtual platform by ICAR-IASRI, New Delhi
26-09-2023 to 10-10-2023	Dr. Uthappa AR	Global online certificate course on Demystifying environment data and maps for communication in the 21st century	Virtual platform by Anil Agarwal Environment Training Institute, Centre for Science and Environment, New Delhi
09-10-2023 to 13-10-2023	Dr. Ganesh V. Chaudhari	Design Thinking in Agricultural Research and Education.	Virtual platform by ICAR-NAARM, Hyderabad

Participation in Conference / Seminar / Symposia / Workshop / Meetings

Date	Name	Programme	Venue
24-01-2023 to 25-01-2023	Dr. Sujeet Desai	International Conference on Water Management and Climate Change	WALMI, Dharwad
27-01-2023	Dr. Shirish Narnaware	National Workshop on Lumpy Skin Disease in India: Current Scenario and Future Challenges	Virtual platform by ICAR-NIVEDI, Bengaluru
27-01-2023 to 28-01-2023	Dr. Matha J Gupta	Industry problems – academia solutions conclave -2023	ICAR-IARI, New Delhi
06-02-2023 to 10-02-2023	Dr. Bappa Das	Shanghai Cooperation Organisation (SCO) Young Scientist Conclave (YSC)	Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru



Education and Human Resource Development

16-02-2023 to 17-02-2023	Dr. Mathala J Gupta Dr. R Solomon Rajkumar	National-level workshop on 'What makes a Tech Incubator Successful' jointly hosted by Startup India	IIT Madras Incubation Cell (IITMIC), Chennai
03-03-2023	Dr. Shirish Narnaware Gokuldas PP	Workshop on Genome editing in farm animals for improved productivity and health	ICAR - National Dairy Research Institute, Karnal
26-04-2023	Dr. Bappa Das	Climate Change Interventions and Funding Opportunities in Goa	Hotel Taj Vivanta, Miramar, Goa
03-06-2023 to 05-06-2023	Dr. Ganesh Chaudhari	41 st Annual Group Meeting of AICRP-Vegetable Crops	Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar, Kashmir
21-06-2023	Dr. R Ramesh	AMAAS QRT Review meeting	ICAR- NRC Grapes, Pune
23-06-2023 to 24-06-2023	Dr. Maruthadurai R	National Symposium on Floriculture nurtures pollinators: Flower Crops for healthy pollinators and value-added bee products	Online
06-07-2023 to 07-07-2023	Dr. Susitha Rajkumar	Annual Review Meeting of National Animal Disease Epidemiology Network (NADEN) 2023	ICAR-NIVEDI, Bengaluru
28-07-2023	Dr. Gokuldas PP	Interface Meet on Advances in Animal Health and Production	Virtual Platform by ICAR-IVRI, Bareilly
01-08-2023	Dr. Bappa Das	Y20 event on "Climate Change and Disaster Risk Reduction"	BITS Pilani, K K Birla Goa Campus, Goa
17-08-2023 to 18-08-2023	Dr. R Solomon Rajkumar	Joint stakeholders meeting of Zoological Survey of India	GSBB, Goa
22-08-2023 to 23-08-2023	Dr. Uthappa AR	National seminar on Abiotic stress management for sustainable millet based production systems	ICAR-NIASM, Baramati, Maharashtra
04-09-2023 to 06-09-2023	Dr. Parveen Kumar	G20 Technical Workshop on "Climate Resilient Agriculture"	Hotel Novotel, Hyderabad
11-09-2023 to 12-09-2023	Dr. Maruthadurai R	National Conference on Generative AI in Practice for Empowering Agricultural Research Productivity	Online
13-09-2023 to 15-09-2023	Dr. Amiya R. Sahu Dr. Nibedita Nayak	National Symposium on "Innovative poultry production strategies for nutritional, socio-economic and environmental security"	FVSc &AH, SKUAST-K, Kashmir
13-09-2023 to 15-09-2023	Dr. V Arunachalam	32 nd Annual Group Meeting of AICRP on palms	Kahikuchi, Assam, India
21-09-2023 to 22-09-2023	Dr. Mathala J Gupta Dr. R Solomon Rajkumar	Sensitization workshop for PI and CoPIs of ICAR-ABI	NASC, New Delhi
02-10-2023 to 03-10-2023	Dr. Mathala J Gupta	International Symposium on Automation in Agriculture in Asia	MGM, Aurangabad,



Education & Human Resource Development

05-10-2023 to 06-10-2023	Dr. Ganesh V Chaudhari	National Conference on Spices, Aromatic and Medicinal Plants for Economic Prosperity and Ecological Sustainability-2023	ICAR-CIARI, Port Blair (Virtual)
10-10-2023 to 13-10-2023	Dr. V Arunachalam Dr. Manohara K K Dr. Shirish Narnaware Dr. R. Solomon Rajkumar Dr. Gokuldas PP Dr. Sreekanth G B Dr. Parmesha V Dr. Amiya R. Sahu Dr. Nibedita Nayak	XVI Agricultural Science Congress 2023 and ASC Expo 2023	ICAR-CMFRI, Kochi, Kerala,
16.10.2023 to 18.10.2023	Dr. R Solomon Rajkumar	VI convention of the Association of Meat Scientists and Technologists and National Seminar on "One Health – A New Paradigm to Augment Livestock Productivity and Food Security"	Madras Veterinary College (TANUVAS), Chennai
17-10-2023 to 18-10-2023	Dr. R. Ramesh	AMAAS Annual Review Meeting	ICAR- NBAIM, Mau
17-10-2023 to 19-10-2023	Dr. Ganesh V Chaudhari	International Seminar on Exotic and Underutilized Horticultural Crops: Priorities and Emerging Trends	ICAR-IIHR, Bengaluru
06-11-2023 to 07-11-2023	Dr. Mathala J Gupta	International Symposium on Engineering Interventions for making Millets a global food	UAS Raichur
06-11-2023 to 08-11-2023	Dr. Parveen Kumar	10 th Indian Horticulture Congress -2023	AAU, Khanapara
06-11-2023 to 08-11-2023	Dr. Parmesha V	Review Workshop of Research Activities and Strengthening Future Research Program under the NICRA Program	NASC, New Delhi
7-11-2023 to 10-11-2023	Dr. Sujeet Desai	International Conferences on Sustainable Natural Resource Management under Global Climate Change	Virtual mode by NASC, New Delhi
8-11-2023 to 10-11-2023	Dr. Amiya R. Sahu	XII European Symposium on Poultry Genetics 2023	Hannover, Germany
15-11-2023 to 18-11-2023	Dr. Maruthadurai R	International Conference on Plant Health Management	Hyderabad

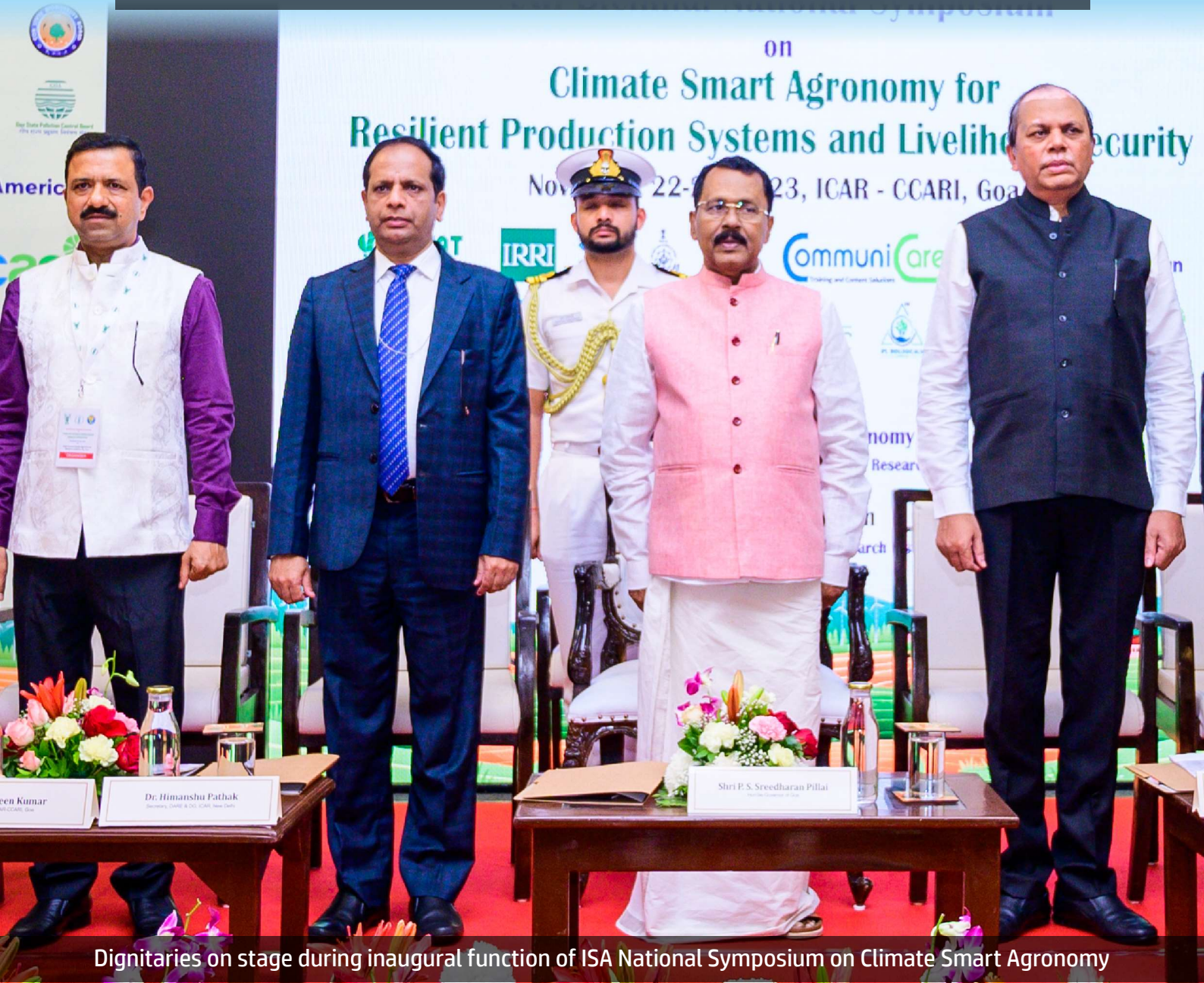


Education and Human Resource Development

22-11-2023 to 24-11-2023	Dr. V Arunachalam Dr. Mathala J Gupta Dr. Shirish Narnaware Dr. R Solomon Rajkumar Dr. Maruthadurai R Dr. Gokuldas PP Dr. Susitha Rajkumar Dr. Ganesh V Chaudhari Dr. Sripad Bhat Dr. Parmesha V Dr. Amiya R Sahu Dr. Nibedita Nayak Shri Vinod Ubrahande Shri Sidharth Marathe Shri Rahul Kulkarni	XXII Biennial National Symposium on “Climate-smart agronomy for resilient production systems and livelihood security”	ICAR-CCARI, Old Goa
25-11-2023	Dr. Bappa Das	Workshop on Mapping of Saline Soils in Agricultural Areas: A Roadmap for Egypt	CIMMYT-India office, NASC Complex, New Delhi
27-11-2023 to 28-11-2023	Dr. R Solomon Rajkumar Dr. Uthappa A R	Collaborative project meeting with the delegation of Cornell University, USA for the potential research collaboration	CTARA, IIT Bombay
02-12-2023 to 04-12-2023	Dr. Susitha Rajkumar	International Conference on Feeding the Future through Sustainable Eco-friendly Innovations in Rangeland, Forages and Animal Sciences	UAS, Bengaluru
11-12-2023 to 13-12-2023	Dr. R Ramesh	VIROCON – 2023 Advancements in Global Virus Research Towards One Health	ICAR- NRC Banana Tiruchirappalli-
02-12-2023 to 04-12-2023	Dr. Uthappa A R	International conference on Feeding the future through sustainable eco-friendly innovations in rangeland, forages and animal sciences	University of Agricultural Sciences, Bangalore
20-12-2023 to 21-12-2023	Dr. Bappa Das	International Conclave on “Futuristic Farming”	Four Points by Sheraton Hotel, Pune, Maharashtra



Glimpses of Institute Activities



Dignitaries on stage during inaugural function of ISA National Symposium on Climate Smart Agronomy



Events Organized



National Symposium on “Climate Smart Agronomy for Resilient Production Systems and Livelihood Security”

ICAR-CCARI, Goa and the Indian Society of Agronomy organized three days National Symposium on “Climate Smart Agronomy for Resilient Production Systems and Livelihood Security” from 22-24 November, 2023. During the symposium a special session on Revitalizing Goan Agriculture was also conducted. About 550 delegates from India as well as SAARC countries participated in the symposium.



Symposia on “Coastal Agriculture: Livelihood and Sustainability” during XVI Agricultural Science Congress & ASC Expo-2023

ICAR-CCARI, organized a Symposia on “Coastal Agriculture: Livelihood and Sustainability” during XVI Agricultural Science Congress & ASC Expo during 10-13 October 2023 at Kochi, Kerala. Dr. Suresh Kumar Chaudhari (Hon'ble DDG (NRM), ICAR) chaired the symposia, about 300 delegates participated in the symposia including progressive farmers.



ICAR-CCARI, Goa represented in G20 Technical Workshop on 'Climate Resilient Agriculture'

ICAR-CCARI, Goa represented in G20 Technical Workshop on "Climate Resilient Agriculture" during 4-6 September 2023 at Hyderabad. The theme of the event "*Vasudhaika Kutumbam*" signifies that the whole world is a family. During the prestigious event, Dr. Parveen Kumar, Director, ICAR-CCARI, presented on 'Climate, Resilient Coastal Agriculture: Research Needs and Innovations'.



Two days Young Agri-entrepreneur's conclave

ICAR-CCARI Goa organized a two days "Young Agri-entrepreneurs Conclave 2023" from 31 January to 1 February, 2023 at the Institute. The conclave was inaugurated by Smt. Swetika Sachan IAS, Director of Industries, Trade, and Commerce, Govt. of Goa. The conclave was conceptualized to identify the best agri start-up ideas from the ignited young minds (below 40 years) to nurture them through incubation support from CCARI.



34th Foundation Day

The Institute celebrated its 34th Foundation Day on 1 April, 2023. Dr. Suresh Kumar Chaudhari, Hon'ble Deputy Director General (NRM), ICAR, New Delhi graced the occasion as Chief Guest



Glimpses of Institute Activities - Events Organized



International Womens' Day



World Intellectual Property Day



International Day of Yoga - 2023



International Labour Day



World Food Day



World Coconut Day



National Farmers Day



National Sports Day



World Soil Day



World Ayurveda Day



Touch & feel of agriculture for specially abled (blind) students



Specially abled (deaf and speech-impaired) students



Distinguished Visitors



- a. Shri Parshottam Rupala, Hon'ble Minister of Fisheries, Animal Husbandry and Dairying, Govt. Of India along with Dr. Himanshu Pathak, Secretary DARE & DG, ICAR visited the ICAR-CCARI exhibition stall during XVI Agricultural Science Congress & ASC Expo during 10-13, October, 2023 at Kochi, Kerala.
- b. Shri Rohan Khaunte, Hon'ble Minister for Tourism, IT, Printing and Stationery, Govt. of Goa visited ICAR-CCARI on 30 June, 2023.
- c. Dr. Himanshu Pathak, Hon'ble Secretary, DARE and Director General, ICAR along with Dr. S. K. Chaudhari, DDG (NRM), ICAR and Dr. Rajbir Singh, ADG (AAF&CC), ICAR, New Delhi visited ICAR-CCARI, Goa on 22 November 2023
- d. Dr. Suresh Kumar Chaudhari, Hon'ble Deputy Director General (NRM), ICAR, New Delhi visited ICAR-CCARI, Goa and graced the 34th Foundation Day on 1, April 2023.
- e. Dr. A. Velmurugan, Assistant Director General, ADG (Soil and Water Management) and Director, ICAR-Indian Institute of Water Management, Bhubaneswar visited ICAR-CCARI, Goa on 17 April 2023
- f. Prof. Panjab Singh, Chancellor, RLBCAU, Jhansi, Ex-Secretary, DARE & DG, ICAR and Ex-VC, BHU, Varanasi visits ICAR-CCARI, Goa visited ICAR-CCARI, Goa on 24 November 2023



Glimpses of Institute Activities - Other Visitors

Other visitors

Date	Name of Visitor	Designation/ Institute/ Place
31-01-2023	Smt. Swetika Sachan IAS	Director, DITC, Govt. of Goa
01-02-2023	Dr. Milind R Bhirud	Chief General Manager, NABARD, Goa
01-04-2023		
08-02-2023	Shri Subhash A. Shirodkar	Hon. Minister for Cooperation, Govt. of Goa
28-02-2023	Shri Narendra Sawaikar	Chairman, Goa Bagayatdar Sahakari, Ponda
09-03-2023	Dr. Vipin Kumar	Director, NIF, Gandhinagar
01-04-2023	Shri Nevil Alphonso	Director of Agriculture, Govt. of Goa
31-05-2023		
08-06-2023		
01-04-2023	Shri Pradip Sarmokadam,	Member Secretary, GSBB, Govt. of Goa
08-06-2023		
01-04-2023	Dr. Jagannath V. Dixit	Professor, Department of Community Medicines, BJ Medical College, Pune,
17-04-2023	Dr. Arjamadutta Sarangi	Director, ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar
01-05-2023	Shri Chandra Shekhar	IAS (Retd.), Hisar, Haaryana
01-05-2023	Prof. N. P. Singh	Ex- Director, ICAR - NIASM, Baramati
31-05-2023	Dr. Shamila Monteiro	Director of Fisheries, Govt. of Goa
30-06-2023	Shri Rohan Khaunte	Hon'ble Minister for Tourism, Govt. of Goa
04-07-2023	Dr. Nisha Rakhesh	Head, ISFE, Western Sydney University, Australia
20-07-2023	Dr. A. K. Sikka	Country Representative-India, IWMI, Sri Lanka
17-08-2023	Dr. Neelam Patel	Senior Advisor, NITI Aayog, New Delhi
02-11-2023	Shri Tejaswi S Naik IAS	PS to Hon'ble Minister for Agriculture, Government of India
23-11-2023	Dr. V.S. Korikanthimath	Former Director, ICAR - CCARI, Goa

Over 5500 Students and with more than 300 faculties / Officers from various institutions from 14 states have visited ICAR - CCARI during last year.



Director and staff of CCARI visited Raj Bhavan of Goa to brief the activities of the Institute to Hon. Shri P. S. Sreedharan Pillai, Governor of Goa



Committees & Meetings

Research Advisory Committee

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

1.	Dr. Tapas Bhattacharya Ex-Vice Chancellor (Dr BSKKV) Dapoli, Maharashtra	Chairman
2.	Dr. MA Shankar Ex-Director of Research, UAS, Bengaluru, Karnataka	Member
3.	Dr. V. L. Deopurkar Ex-Director of Research, MAFSU Nagpur, Maharashtra	Member
4.	Dr. M. R. Dinesh Ex-Director, ICAR-IIHR Bengaluru, Karnataka	Member
5.	Dr. Baban Ingole Visiting Scientist ESSO-National Centre for Polar & Ocean Research, Goa	Member
6.	Dr. Anupam Mishra Hon'ble Vice-Chancellor CAU, Imphal (Manipur)	Member
7.	Dr. A. Velmurugan Assistant Director General (SWM) ICAR, New Delhi	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 18-19 April, 2023 in hybrid mode. The Committee chairman and members appreciated the work done during the last two years and urged the scientists to focus on site-specific technological interventions for the higher productivity of crops, livestock and fisheries in the coastal region of the country.

The approved recommendations of the RAC are as follows:

1. Crop suitability rating for coastal regions should be made quantitative rather than qualitative for integration in coastal agricultural information systems.
2. Development and assessment of multiple stress tolerant rice varieties for coastal ecosystems.
3. Work on poly-embryonic rootstock research for mango needs to be initiated.
4. Development of functional value-added products from kokum, jackfruit, cashew apple and ready-to-eat high-energy/protein food.
5. The Goya pig variety is recommended for release at the institute level for the west coastal region.
6. Development of site-specific technological interventions involving coastal aquaculture systems including fishing technologies for enhancing fish productivity.
7. The varieties developed and released by the SVRC should be taken up for upscaling and popularizing among the coastal districts of India.
8. Further, in view of the disaster proneness of the coastal areas, the institute should work on technologies for post-disaster mitigation in agriculture and strengthen the coastal information system by including relevant climatic parameters





Institute Research Council Meeting

The 34th Annual Institute Research Council meeting of the Institute was held during 8- 10 May, 2023. The meeting was chaired by Dr. Parveen Kumar, Director of the Institute along with Dr. M.R. Dinesh, Ex-Director, ICAR-IIHR, Bengaluru who was invited as an external expert to review the projects in the Horticulture and Crop Science Section. The IRC reviewed the progress made under various research projects for the year 2022-23 and finalized the technical programmes of the ongoing research projects for the year 2023-24. The details of IRC are as follows: -

Dr. Parveen Kumar Director, ICAR - CCARI	Chairman
All Project Leaders ICAR - CCARI	Members
Dr. Uthappa A. R. Scientist (Agroforestry) ICAR - CCARI	Member Secretary



Institute Management Committee

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

Dr. Parveen Kumar	Director, ICAR – CCARI, Old Goa	Chairman
Dr. Nevil Alfanso	Director of Agriculture, Govt. of Goa	Member
Dr. B N Sawant,	Associate Director of Research RFRS (Dr. BSKKV), Vengurla, Maharashtra	Member
Dr. P C Haldvanekar	Associate Dean, College of Horticulture (Dr. BSKKV) Dapoli, Maharashtra	Member
Dr. Jagdish Rane	Principal Scientist & Head (I/C) School of Drought Stress Management ICAR-NIASM, Baramati, Maharashtra	Member
Dr. Jayashree Loka	Principal Scientist & I/c. Karwar Research Centre of CMFRI, Karwar, Karnataka	Member
Dr. Ravi Bhat	Principal Scientist & Head (I/C) Division of Crop Production ICAR-CPCRI, Kasargod, Kerala	Member
Dr. Kiran N Bhilegaonkar	Principal Scientist & Head (I/C) IVRI Regional Station, Pune, Maharashtra	Member
Dr. A. Velmurugan	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



Interface meeting with Goa *Bagayatdar Sahkari Vikri Kharedi Society*

ICAR-CCARI, Goa organized a one-day meeting for discussion on 'Challenges faced in Horticulture/Agriculture in Goa owing to constant climate changes with a specific focus on cashew cultivation' for the Goa Bagayatdar Sahkari Vikri Kharedi Society (GBSVKS), Goa. on 28 February 2023. The meeting was attended by Adv. Shri Narendra Keshav Sawaikar Chairman of GBSVKS, Dr. Parveen Kumar, Director, ICAR-CCARI, Goa, Managing Director and Board of Directors of GBSVKS, Director and staff of ICAR-CCARI, Old Goa and KVK, North Goa.



Interface meeting with Development Departments of Goa State

ICAR-CCARI, organized interface meeting with officers of line departments of Government of Goa, on 31st May 2023 to discuss various researchable issues pertaining to agriculture and allied sectors. 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.



Brainstorming meeting on the formulation of an Agro Eco-Tourism (AET) policy for the state of Goa



ICAR-CCARI, Goa conducted a brainstorming meeting on the formulation of the Agro-Eco-Tourism (AET) policy for the state of Goa on 30 June, 2023 at the Institute. Shri Rohan Khaunte, Hon'ble Minister for Tourism, Govt. of Goa chaired the meeting. Dr. R. Solomon Rajkumar, Senior Scientist and Coordinator of the agro-eco-tourism centre presented the draft policy prepared by ICAR-CCARI for the promotion and regulation of Agro-eco-tourism (AET) in the state of Goa.



संस्थान के राजभाषा प्रकोष्ठ की गतिविधियां

‘ग’क्षेत्र में स्थित हमारे संस्थान की राजभाषा गतिविधियां सराहनीय हैं।

सितंबर १-१४ को संस्थान ने उत्साहपूर्वक पखवाड़ा मनाया। इस साल प्रकोष्ठ ने ४ बैठके एवं ४ कार्यशाला का आयोजन किया।

हिन्दी पखवाड़ा-2023

हिन्दी पखवाड़ा उद्घाटन समारोह

संस्थान में हिन्दी पखवाड़े का उद्घाटन १ सितंबर २०२३ को संपन्न हुआ। संस्थान के माननीय निदेशक महोदय डॉ. प्रवीण कुमार एवं मुख्य अतिथि डॉ. नरेन्द्र प्रताप सिंह, एमेरिटस वैज्ञानिक एवं पूर्व निदेशक, भा०कृ० अनु०प०- केन्द्रीय तटीय कृषि अनुसंधान संस्थान गोवा एवं डॉ. मतला गुप्ता, राजभाषा अधिकारी एवं प्रधान वैज्ञानिक द्वारा कार्यक्रम का उद्घाटन दीप प्रज्वलन से किया गया। निदेशक महोदय ने मुख्य अतिथि को पुष्पगुच्छ एवं स्मृति भेट देकर सम्मानित किया।

सभा को संबोधित करते हुए निदेशक महोदय ने हिन्दी पखवाड़ा एवं हिन्दी के महत्व पर प्रकाश डाले तथा संस्थान के सभी कर्मचारियों को पखवाड़े में होने वाली गतिविधियों में बड़-

चढ़ कर भाग लेने के लिए प्रोत्साहित किया। मुख्य अतिथि महोदय ने हिन्दी भाषा के विषय में अपने मौलिक विचार सभा में रखे तथा प्रशासनिक कार्यों में हिन्दी के प्रयोग पर प्रकाश डाले तथा संस्थान के राजभाषा कार्यान्वयन की सराहना की। संस्थान की राजभाषा अधिकारी डॉ. मतला जूलिएट गुप्ता ने सभा में उपस्थित सभी को संस्थान में राजभाषा कार्यान्वयन के प्रगतियों का हिन्दी पखवाड़े के कार्यक्रम का विवरण देते हुए आयोजित की जाने वाले विविध प्रतियोगिता के बारे में अवगत कराया। उन्होंने सबको प्रतियोगिताओं में उत्साह से भाग लेने के लिए अनुग्रह किया।

पखवाड़े में आयोजित किये गए विभिन्न कार्यक्रम निम्नलिखित है:

क्र.सं.	प्रतियोगिता का नाम	दिनांक
1	हिन्दी पखवाड़े का उद्घाटन समारोह एवं हिन्दी काव्य पाठ प्रतियोगिता	01.09.2023
2	हिन्दी अनुवाद एवं सुलेख प्रतियोगिता (सभी कर्मचारियों तथा संविदा कर्मचारियों के लिए)	04.09.2023
3	हिन्दी अंताक्षरी प्रतियोगिता प्रथम चरण (सभी कर्मचारियों तथा संविदा कर्मचारियों के लिए)	05.09.2023
4	कंप्यूटर पर युनिकोड में टंकण (सभी कर्मचारियों तथा संविदा कर्मचारियों के लिए)	11.09.2023
5	उत्तर गोअ नगर राजभाषा कार्यान्वयन समिति के सदस्यों के लिए श्री अन्न पर आधारित सामान्य ज्ञान प्रश्नोत्तरी प्रतियोगिता	12.09.2023
6	बच्चों के लिए विभिन्न प्रतियोगिताएं: प्रतिभा दर्शन, चित्रकला (राजभाषा का महत्व)	13.09.2023
7	हिन्दी अंताक्षरी का अंतिम चरण एवं हिन्दी पखवाड़े का समापन समारोह और पुरस्कार वितरण	14.09.2023



तदुपरांत संस्थान के कर्मचारियों के लिए हिन्दी काव्य पाठन प्रतियोगिता का आयोजन किया गया। संस्थान के सभी वर्ग के कर्मचारियों ने इस प्रतियोगिता में उत्साहपूर्वक भाग लिया। श्री शशि विश्वकर्मा, वरिष्ठ तकनीकी अधिकारी (मृदा विज्ञान) एवं सह राजभाषा अधिकारी ने कार्यक्रम का संचालन एवं आभार प्रस्ताव प्रस्तुत किया।

हिन्दी पखवाड़े के दौरान दिनांक १२ सितंबर, २०२३ को नगर राजभाषा कार्यान्वयन समिति संस्थानों के लिए श्री अन्न पर आधारित सामान्य ज्ञान प्रश्नोत्तरी प्रतियोगिता का आयोजन किया गया था। इस प्रतियोगिता में कुल १० संस्थानों (जनगणना कार्यालय, गोवा, राष्ट्रीय नमूना सवेक्षण कार्यालय, गोवा, केन्द्रीय तटीय कृषि अनुसंधान संस्थान, गोवा, राष्ट्रीय समुद्र विज्ञान संस्थान, गोवा, अंतर राज्य पुलिस बेतार केंद्र पणजी, गोवा, केन्द्रीय विद्यालय बाम्बोलीम, गोवा, भारतीय खाद्य निगम, गोवा, कर्मचारी राज्य बीमा निगम, गोवा, भारतीय जीवन बीमा निगम, गोवा) से २० प्रतिभागियों ने भाग लिया था। प्रतिभागियों का २ का एक गण बनाकर टीम बनाया गया। इस प्रतियोगिता का संचालन डॉ गोपाल महाजन वरिष्ठ वैज्ञानिक (मृदा विज्ञान) एवं श्री विनोद उबरहांडे सहायक मुख्य तकनीकी अधिकारी (प्रक्षेत्र



अधीक्षक) ने किया। कार्यक्रम के दौरान संस्थान के निदेशक महोदय डॉ प्रवीण कुमार जी ने श्री अन्न की महत्तापर प्रकाश डाला। प्रतियोगिता के विजेताओं को पुरस्कार दिया गया। श्री शशि विश्वकर्मा, वरिष्ठ तकनीकी अधिकारी ने प्रतियोगिता से कार्यक्रम का समन्वयन किया।



प्रतिभादर्शन प्रतियोगिता



कंप्यूटर पर यूनिकोड में टाइपिंग प्रतियोगिता



चित्रकला स्पर्धा



सुलेख प्रतियोगिता



संस्थान के राजभाषा प्रकोष्ठ की गतिविधियां

हिन्दी पखवाड़े का समापन समारोह

भा०कृ०अनु०प० – केन्द्रीय तटीय कृषि अनुसंधान संस्थान, गोवा में 01 सितम्बर से 14 सितम्बर 2023 के दौरान हिन्दी पखवाड़े का आयोजन उत्साहपूर्वक किया गया। इसके दौरान विभिन्न प्रतियोगिताओं का आयोजन किया गया जैसे हिन्दी काव्य पाठ प्रतियोगिता, सुलेख प्रतियोगिता, कम्प्यूटर पर यूनिकोड में टाइपिंग, श्री अन्न पर आधारित सामान्य ज्ञान प्रश्नोत्तरी और अंताक्षरी प्रतियोगिता। इसके अलावा बच्चों के लिए भी विभिन्न प्रतियोगिताओं का आयोजन किया गया था। सभी वर्ग के कर्मचारियों ने उत्साहपूर्वक भाग लिया। इन कार्यक्रमों में १५ वैज्ञानिकों ४५ कर्मचारियों एवं २० बच्चों ने भाग लिया। इस पखवाड़े के दौरान १४ सितम्बर २०२३ को पखवाड़े का पुरस्कार वितरण एवं समापन कार्यक्रम संस्थान के निदेशक डॉ प्रवीण कुमार जी के अध्यक्षता में सम्पन्न हुआ। समापन कार्यक्रम में डॉ. आर. बी. सिंगन दुबेजी मुख्य अतिथि के रूप में प्रस्तुत रहे। मुक्या अतिथि एवं निदेशक महोदय के हाथों से विजेताओं को

पुरस्कृत किया गया। निदेशक, डॉ. प्रवीण कुमार जी ने सुनियोजित रूप से हिन्दी पखवाड़ा को सम्पन्न करने के लिए डॉ मतला जूलियट गुप्ता, राजभाषा अधिकारी को सराहा एवं इस कार्यक्रम के आयोजकों, प्रतिभागियों एवं निर्णायकों को पखवाड़े की सफलता पर बधाई दिया। अंत में श्रीमति श्रेया चैतन्य बर्वे ने पखवाड़ा कार्यक्रम के बारे में प्रतिवेदन एवं धन्यवाद प्रस्तावना प्रस्तुत किया।

**भा०कृ०अनु०प० – केन्द्रीय तटीय कृषि अनुसंधान संस्थान, गोवा में राजभाषा कार्यशाला****कार्यशाला I : “राजभाषा हिन्दी का सरकारी कामकाज में कैसे उपयोग बढ़ाए”**

भाकृअनुप - केन्द्रीय तटीय कृषि अनुसंधान संस्थान में दिनांक ०३.०२.२०२३ को हिन्दी कार्यशाला का आयोजन किया गया। इस कार्यशाला के वक्ता सुश्री ममता वेल्लेकर, गोवा विश्वविद्यालय की हिन्दी सहायक प्राध्यापक थी।

इस संस्थान की सह-राजभाषा अधिकारी श्रीमति श्रेया बर्वे ने कार्यशाला में उपस्थित सभी का स्वागत किया। माननीय निदेशक महोदय डॉ. प्रवीण कुमार ने इस कार्यशाला की मुख्य वक्ता को पुष्पगुच्छ एवं स्मृति चिन्ह देकर स्वागत किया। सुश्री ममता वेल्लेकरजी ने अपने संबोधन में कहा की भाषा के बिना मनुष्य अधूरा है और अपने इतिहास तथा परंपरा से वंचित है। मानव इतिहास में भाषा का अत्यंत महत्वपूर्ण स्थान रहा है, जो मानव सभ्यता के विकास, सामाजिक चेतना, पारंपरिक ज्ञान का संचार आदि में महत्वपूर्ण भूमिका निभाती है। भाषा के माध्यम से इंसान अपने विचारों को दूसरे व्यक्ति तक पहुंचाकर, अपने इतिहास को संरक्षित कर पाया है। भाषा को नियमित इस्तेमाल न करने पर भाषा विलुप्त हो जाने की संभावना बन सकती है।

हिन्दी भाषा पर प्रकाश डालते हुए उन्होंने कहा की, हिन्दी विश्व में तीसरी सबसे ज्यादा बोले जाने वाली भाषा है। हिन्दी भारतवर्ष की राजभाषा होने के साथ ही ग्यारह राज्यों और तीन केंद्र शासित क्षेत्रों की भी प्रमुख राजभाषा है। उन्होंने सबको सचेत किया कि कृत्रिम बुद्धिमत्ता एवं इलेक्ट्रॉनिक मीडिया ने भाषा की संवेदनशीलता एवं बारीकियों को धीरे धीरे विलुप्त कर रहा है। अतः भाषा के नींव से जुड़े रहने के लिए हमें एवं हमारी आने वाली पीढ़ियों को जागरूक रहने की आवश्यकता है।

कार्यशाला II : “प्रचलित हिन्दी भाषा संबंधित ई-टूल्स”

भाकृअनुप – केन्द्रीय तटीय कृषि अनुसंधान संस्थान गोवा के प्रशासनिक कार्यों में राजभाषा के उपयोग को सरल करने एवं कार्यालय में राजभाषा को बढ़ावा देने के लिए दिनांक २३.०६.२०२३ को सायं ४.३० बजे बैठक कक्ष में “ प्रचलित हिन्दी भाषा संबंधित ई – टूल्स ” विषय पर कार्यशाला का आयोजन संस्थान की राजभाषा अधिकारी एवं प्रधान वैज्ञानिक डॉ मतला जूलियट गुप्ता द्वारा किया गया।

कार्यशाला को डॉ. मतला गुप्ताजी ने स्वागत भाषण से शुरू किया



तदुपरांत संस्थान के निदेशक, डॉ प्रवीण कुमारजी ने अपने सभापति भाषण में कार्यशाला के प्रतिभागियों को राजभाषा के अधिकाधिक उपयोग हेतु प्रोत्साहित किया। कार्यशाला में राजभाषा के सरल उपयोग हेतु प्रतिभागियों को विभिन्न ई-टूल्स जैसे गूगल ट्रांसलेट, ऑनलाइन हिंदी डिक्शनरी, ई-सरल हिंदी व्याकरण आदि की जानकारी दी गई, साथ ही हिन्दी में कंप्यूटर पर सरलता से काम करने के लिए फोनेटिक या इंस्क्रिप्ट कीबोर्ड का प्रयोग करने के बारे में बताया गया तथा कंप्यूटर के माध्यम से यूनिकोड के फॉन्ट को सक्रिय करके हिंदी में टाइपिंग करने का आसान सुझाव बताया गया ताकि हिन्दी का अधिकाधिक प्रयोग किया जाए। कार्यशाला में हिन्दी उपयोग हेतु कुछ प्रमुख एपस की जानकारी भी दी गयी जैसे की हिन्दी व्याकरण, शब्दकोश इंग्लिश हिन्दी डिक्शनरी, डॉपस, हैलो टॉक, मेमरीस, मॉनडली इत्यादि।

कार्यशाला III :“प्रशासनिक बैठकों में राजभाषा का प्रयोग”

भाकृअनुप – केन्द्रीय तटीय कृषि अनुसंधान संस्थान गोवा के प्रशासनिक कार्यों में राजभाषा के उपयोग को सरल करने एवं कार्यालय में राजभाषा को बढ़ावा देने के लिए दिनांक 09.08.2023 को सायं 4.30 बजे बैठक कक्ष में “ प्रशासनिक बैठकों में राजभाषा का प्रयोग ” विषय पर कार्यशाला का आयोजन संस्थान के सह राजभाषा अधिकारी एवं वरिष्ठ तकनीकी अधिकारी श्री शशि विश्वकर्मा द्वारा किया गया।

कार्यशाला को श्री शशि विश्वकर्मा ने स्वागत भाषण से शुरू किया तदुपरांत संस्थान के निदेशक, डॉ प्रवीण कुमारजी ने अपने सभापति भाषण में कार्यशाला के प्रतिभागियों को राजभाषा के अधिकाधिक उपयोग हेतु प्रोत्साहित किया। कार्यशाला में राजभाषा के सरल उपयोग हेतु प्रतिभागियों से बातचीत कर उनके दिन-प्रति-दिन किए जाने वाले कार्यों में उपयोग आने वाले

अंग्रेजी प्रशासनिक शब्दों का हिन्दी में अनुवाद करके एवं उनका वाक्यों में प्रयोग करने का अभ्यास कराया गया ताकि हर एक कर्मचारियों को प्रशासनिक कार्यों में हिन्दी का उपयोग करने में कठिनाई महसूस न हो। उसके बाद प्रशासनिक शब्दों की अंताक्षरी खेली गयी जिसमें हर एक कर्मचारी को हिन्दी का प्रशासनिक शब्द लेना था और उस शब्द के अंतिम अक्षर से दूसरे कर्मचारी को दूसरा शब्द लेना था। इस प्रकार शब्दों का आदान प्रदान कर रोमांचक तरीके से हिन्दी का अधिकाधिक प्रयोग के लिए प्रशासनिक एवं तकनीकी कर्मचारियों को प्रोत्साहित किया गया।

कार्यशाला IV :“अनुशासनिक मामलों में राजभाषा का उपयोग: एक सरल अभ्यास”

भाकृअनुप – केन्द्रीय तटीय कृषि अनुसंधान संस्थान गोवा के प्रशासनिक कार्यों में राजभाषा के उपयोग को सरल करने एवं कार्यालय में राजभाषा को बढ़ावा देने के लिए दिनांक 01.11.2023 को सायं 4.00 बजे बैठक कक्ष में “अनुशासनिक मामलों में राजभाषा का उपयोग एक सरल अभ्यास” विषय पर संस्थान की राजभाषा अधिकारी डॉ मतला गुप्ता द्वारा कार्यशाला का आयोजन किया गया।

कार्यशाला में तालिका के मदद से शब्दों का उपयोग वाक्यों में कैसे करे इसपर विस्तार पूर्वक चर्चा की गयी तथा हर एक अधिकारी/कर्मचारी को कार्यालयीन शब्दों को वाक्यों में प्रयोग करने का अभ्यास करवाया गया था। इस प्रकार अनुशासनिक शब्दों का आदान प्रदान कर हिन्दी का अधिकाधिक प्रयोग के लिए प्रशासनिक एवं तकनीकी कर्मचारियों को प्रोत्साहित किया गया।

इन कार्यशालायों में संस्थान के 6 7 तकनीकी एवं प्रशासनिक कर्मचारियों ने भाग लेकर लाभ उठाया।





Mission Swachhata - 365

Taking a step ahead than the scheduled Swachh Bharat Abhiyan activities like 'Swachhata Hi Sewa', Special Campaign 3.0 for Institutionalizing Swachhata and minimizing Pendency in Government Offices, Swachhata Pakhwada, the Institute launched "Mission Swachhata - 365" to keep the campus and surrounding clean and green round the year. The activities planned in this mission were cleaning the office premises, rooms, laboratories and all other units of the institute free from all obsolete/unserviceable items and spreading the awareness of the mission.

Fifty Swachhata campaigns were conducted including: Swachhata Pakhwada (15 days), Swachhata Hi Sewa (15 days) and Special Campaign 3.0 (1 month)

- Activities conducted includes pledge, rallies, competitions, drives, awareness programs, weeding of files, scrap disposal, tree plantation, landscaping, virtual events, social media outreach
- Reused and value addition of 10 q of old iron / wood worth more than ₹3.0 lakhs in ongoing works costing more than ₹5.0 lakhs
- Disposed 2000 kg scrap of old and unusable items
- Generated revenue of ₹78,600/-
- Reallocated IT resources of more than ₹5.0 lakh (computers, printers, IT equipment)



Weeding out files



Awareness among school students



Awareness about waste management



Scraping of unusable items



Mission LiFE

The Institute organized various programmes under Mission LiFE : Mission Lifestyle for Environment, to encourage sustainable life styles. The mission was focused on various themes like reduce waste, reduce e-waste, adopt healthy life styles, adopt sustainable food systems, say no to single use plastic, save water and save energy. As per the Govt. of India guidelines diversified programmes like awareness on soil health, rain water harvesting, use of climate resilience seed, drone demonstrations, tree plantation drives, ideation Research hackathon on composting / biogas production were conducted during Mission LiFE campaign.



Awareness on rain water harvesting



Demonstration on vermicomposting to manage farm waste

Vigilance Awareness

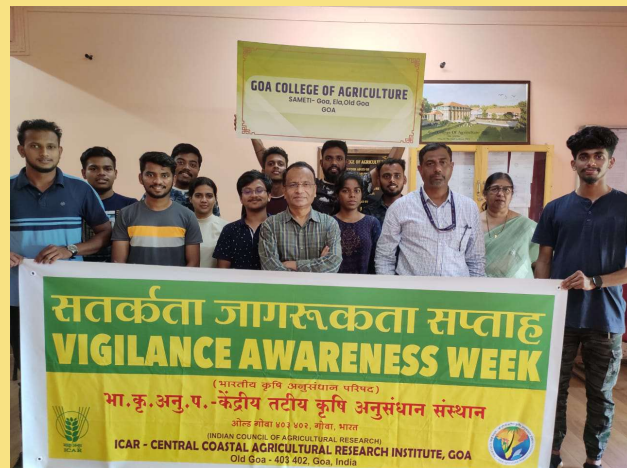
Organized Vigilance Awareness Campaign from 16-08-2023 to 15-11-2023 and Vigilance Awareness Week, 2023 (VAW) with the theme "Say no to corruption: commit to the Nation" from 30-10-2023 to 05-11-2023

Activities undertaken during the Vigilance Awareness Week, 2023 are:

- Administration of Integrity Pledge
- e-pledge by visiting the CVC's website (www.cvc.gov.in)
- Display of banners
- Distribution of Pamphlets to spread awareness and campaign about "Say no to corruption; commit to the Nation"
- Distribution of Posters to spread awareness about complaints under PIDPI (Public Interest Disclosure and Protection of Informers)
- Conducted sensitization programme for all the Employees, for the Vendors/Contractors on Vigilance Awareness
- Essay writing competition relating to anti-corruption for all the Employees and

Drawing Competition for the Children

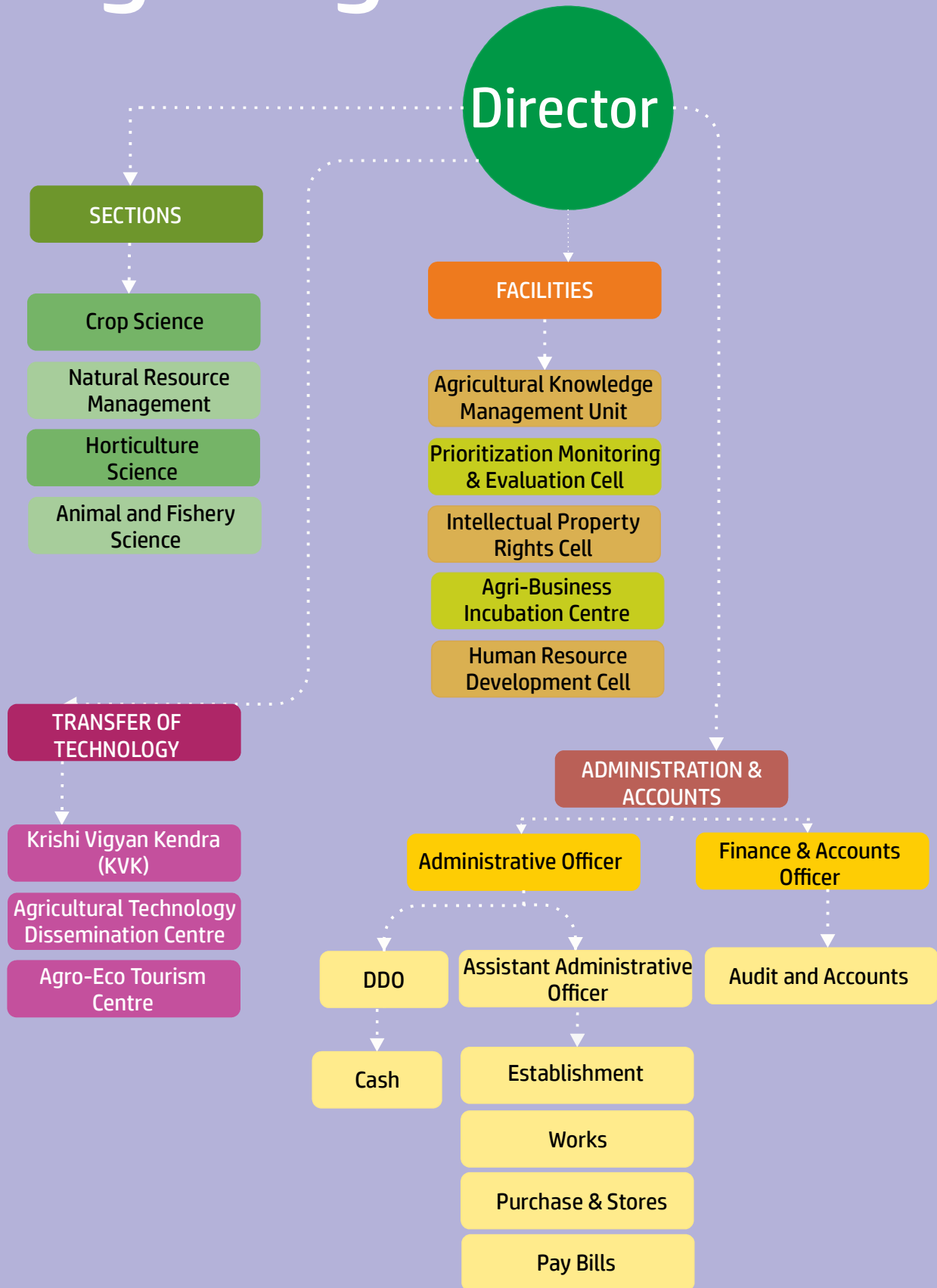
- Lecture on Vigilance Awareness was given to the students of Goa College of Agriculture, Old Goa
- Awareness programme against corruption at the Old Goa Panchayat and Karmali Village Panchayat involving Villagers and Gram Sabha Members



Vigilance awareness programme organized at Goa College of Agriculture



Organogram





Personnel

Institute

No.	Name	Designation	Additional Charge
Research Management			
1.	Dr. Parveen Kumar	Director	
Scientific Staff			
2.	Dr. A. Raizada	Principal Scientist (Agro-forestry)	Section I/C (NRM)
3.	Dr. V. Arunachlam	Principal Scientist (Horticulture)	Section I/C (Horticulture Science)
4.	Dr. A. R. Desai (Until 31-03-2023)	Principal Scientist (Horticulture)	
5.	Dr. R. Ramesh (Until 13-12-2023)	Principal Scientist (Plant Pathology)	
6.	Dr. Manohara KK	Senior Scientist (Genetics & Plant Breeding)	Section I/C (Crop Science)
7.	Dr. Mathala Juliet Gupta	Principal Scientist (Agricultural Structures and Process Engineering)	AGNI-ABI
8.	Dr. Shirish D. Narnaware	Senior Scientist (Veterinary Pathology)	Section I/C Animal and Fishery Science
9.	Dr. R. Solomon Rajkumar	Senior Scientist (Livestock Products Technology)	Nodal Officer (Liaisoning / RKVY), Member Secretary (RAC)
10.	Dr. R. Maruthadurai	Senior Scientist (Agricultural Entomology)	Library Coordinator
11.	Dr. Gokuldas PP	Senior Scientist (Animal Reproduction)	Nodal Officer (KRISHI Portal)
12.	Dr. Gopal R Mahajan	Senior Scientist (Soil Science)	Nodal Officer AKMU Nodal Officer (Mission Swachhata 365)
13.	Dr. Shripad Bhat	Senior Scientist (Agricultural Economics)	Coordinator (PME/ IPR / PIMS)
14.	Dr. Susitha Rajkumar	Senior Scientist (Veterinary Pathology)	Nodal Officer (Seminars) & Member Secretary (IAEC & IBSC)
15.	Dr. Sreekanth GB	Senior Scientist (Fisheries Resource Management)	Nodal Officer (SCSP)
16.	Dr. Uthappa AR	Scientist (Agroforestry)	Nodal Officer HRD (Education) & Member Secretary (IRC)
17.	Dr. Chaudhari G. Vasudeo	Scientist (Vegetable Science)	
18.	Shri Trivesh S Mayekar	Scientist (Fish genetics and Breeding)	
19.	Dr. Paramesha V	Scientist (Agronomy)	Nodal Officer (STC)
20.	Dr. Bappa Das	Scientist (Agricultural Meteorology)	
21.	Dr. Sujeet Desai	Scientist (Land and Water Management Engineering)	Nodal Officer (HRD & Estate)
22.	Dr. Amiya Ranjan Sahu	Scientist (Animal Genetics and Breeding)	
23.	Dr. Nibedita Nayak	Scientist (Poultry Science)	



Organogram & Personnel

Technical Staff

1.	Smt. Madina Sollapuri	Assistant Chief Technical Officer (Estate)	
2.	Shri Vinod Ubarhande	Farm Superintendent	Nodal Officer (Swachhata / PRO)
3.	Shri Rahul Kulkarni	Asst. Chief Technical Officer (Agronomy)	PRO
4.	Shri Sidharth K. Marathe	Asst. Chief Technical Officer (PME Cell)	
5.	Smt. Pranjali Wadekar	Senior Technical Officer (AKMU)	
6.	Shri Yoganand Gaude	Technical Officer (Electrical)	
7.	Shri Suresh M Gomes	Technical Officer (Tractor Driver)	
8.	Shri Omar De Souza	Sr. Technical Assistant	
9.	Shri Prakash Parwar	Sr. Technician	
10.	Shri Gokuldas Gawas	Sr. Technician	
11.	Shri Datta Velip	Sr. Technician	
12.	Shri Laxman Naik	Sr. Technician	
13.	Shri Payak J Padkar	Technician	

Administrative & Accounts Staff

1.	Smt. Montia Rita D'Silva	Administrative Officer	
2.	Smt. Anupama N.K.	Finance & Accounts Officer	
3.	Smt. Lizette Noronha	Private Secretary	
4.	Smt. Sneha Arlekar	Asst. Administrative Officer	Works
5.	Smt. Pratibha Sawant	Asst. Administrative Officer	Accounts
6.	Smt. Sohini Sawant	Asst. Administrative Officer	Establishment & Bills
7.	Smt. Tarika Ussapkar	Private Secretary	
8.	Smt. Shreya C. Barve	Personal Assistant	
9.	Shri Vinod Pagi	Assistant	
10.	Smt. Bushra Ansari	Personal Assistant	
11.	Smt. Chitra Kankonkar	UDC	
12.	Shri Vyas Hiren Kumar	UDC	
13.	Smt. Sujatha S. Kamble	LDC	
14.	Smt. Swati Khandeparkar	LDC	
15.	Smt. Kushmala Chalawadi	LDC	
16.	Smt. Sarita Shelko	LDC	

Skilled Supporting Staff

1.	Shri Subhash Melekar	11.	Smt. Partibha Folkar
2.	Shri Dhaku Kankonkar	12.	Shri Ravi S Kadam
3.	Shri Ashok Gadekar	13.	Shri Vilas P Gaonkar
4.	Shri Anil Khandeparkar	14.	Shri Prabhakar Goankar
5.	Smt. Maria S Dias	15.	Shri Sitaram Kuncolikar
6.	Shri Giri Madkaikar (Until 31-05-2023)	16.	Smt. Janika S Shirodkar
7.	Shri Umesh Marcelkar (Until 24-03-2023)	17.	Shri Shanu G Velip
8.	Smt. Prafulla Khandeparkar	18.	Shri Nitin J Naik
9.	Smt. Rekha U Naik (Until 31-07-2023)	19.	Shri Prallhad Zambaulikar
10.	Smt. Lalitha Naik	20.	Shri Jayesh Umesh Marshellkar (From 3-10-2023)

**Krishi Vigyan Kendra, North Goa**

No.	Name	Designation
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Scientific Staff

1.	Dr. Bommayasamy N. (From 6-10-2023)	Senior Scientist-cum-Head
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Technical Staff

1.	Shri H. R. C. Prabhu	Subject Matter Specialist T-9 (Plant Protection)
2.	Smt. Sunetra Talaulikar (Until 30-04-2023)	Subject Matter Specialist T-9 (Home Science)
3.	Dr. Sanjay Kumar Udharwar	Subject Matter Specialist T-7-8 (Animal Science)
4.	Dr. Monica Singh (Until 3-11-2023)	Subject Matter Specialist T-7-8 (Agricultural Extension)
5.	Shri Shashi Vishwakarma	Senior Technical Officer
6.	Shri Vishwajeet Prajapati	Technical Officer
7.	Shri Dilkush Velip	Technical Assistant (Driver)

Administrative Staff

1.	Shri Vishwas Sharma	Assistant
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Appointments/ Joining

No.	Name	Post	Date of Joining
1.	Dr. Bommayasamy N.	Senior Scientist-cum-Head KVK, North Goa	06-10-2023
2.	Shri Jayesh Umesh Marshelkar	Multi-Tasking Staff (MTS)	03-10-2023

Promoted / Transferred

No.	Name & Designation	Promoted / Transferred to	With effect from
1.	Dr. Monica Suresh Singh, SMS (Agricultural Extension)	West Garo Hills under ICAR-Research Complex for NEH Region, Umiam, Meghalaya as Senior Scientist-cum-Head KVK on selection	03-11-2023
2.	Dr. R. Ramesh Principal Scientist (Plant Pathology)	ICAR-Sugarcane Breeding Institute, Coimbatore	13-12-2023

Superannuation

No.	Name & Designation	Date of Superannuation
1.	Dr. A. R. Desai Principal Scientist (Fruit Science)	31-03-2023
2.	Smt. Sunetra M. Talaulikar Subject Matter Specialist (Home Science)	30-04-2023
3.	Shri Giri Tanu Madkaikar Skilled Support Staff	31-05-2023
4.	Smt. Rekha Naik Skilled Support Staff	31-07-2023

Clearance of Probationary Period and Confirmation

No.	Name & Designation	Date of Probation clearance	Date of Confirmation
1.	Miss Kushmala I.Chalawadi, LDC	03-10-2020	03-10-2022
2.	Smt. Sarita Kedo Shelko, LDC	21-11-2020	21-11-2022

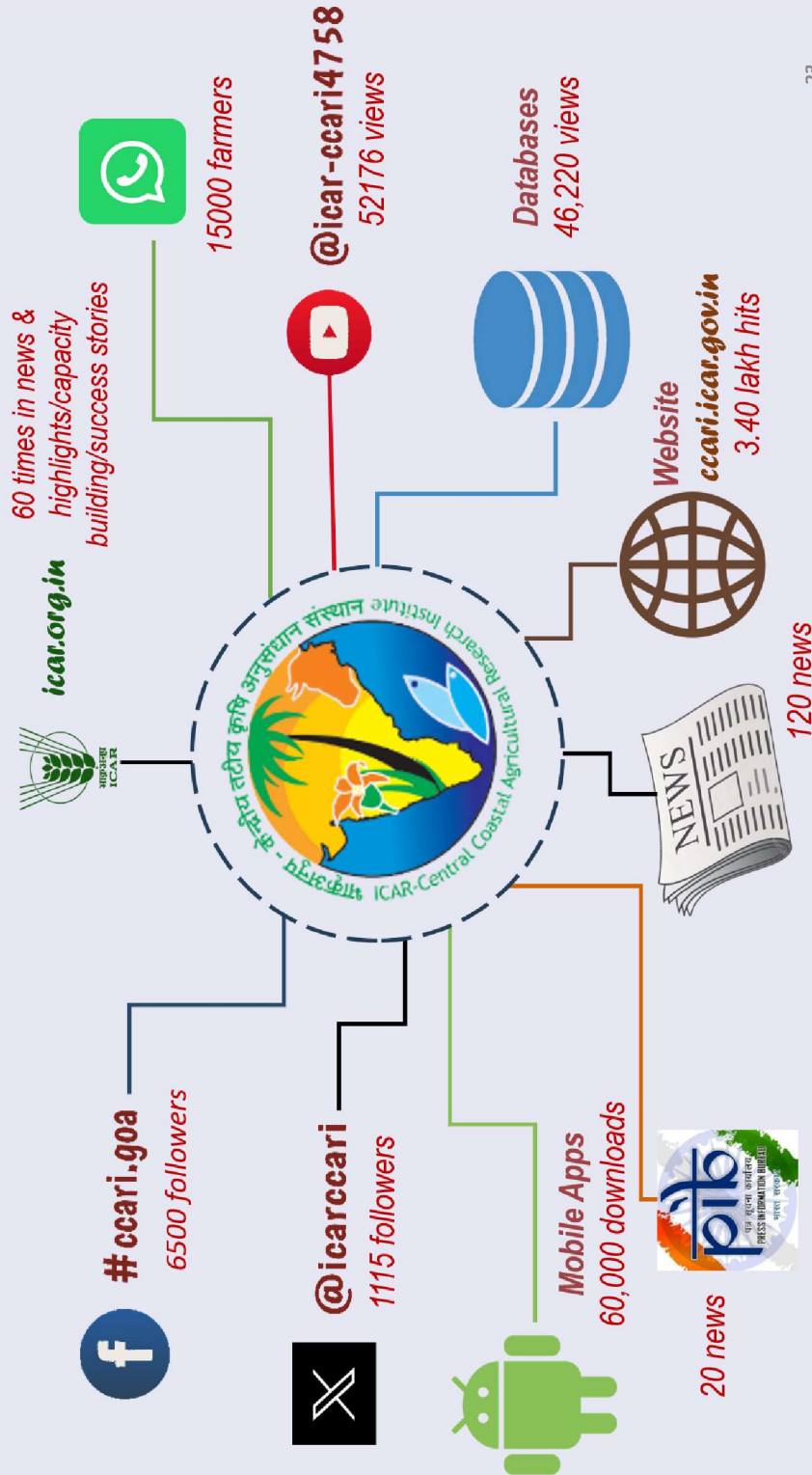
Sad Demise

No.	Name & Designation	Date of Demise
1.	Late Umesh Marcelkar, Skilled Support Staff	24-03-2023



ICAR - CCARI in Media

Institute's Presence in Mass & Social Media





ICAR - CCARI in Print Media

Soil erosion losses for key Goa crops less than or close to national average: ICAR

Times News Network
Panaji: A day after TOI reported that severe soil erosion is likely in parts of Goa, ICAR-CCARI on Wednesday said soil erosion losses in cashew, mango and coconut cropping systems were less than or close to the national average. ICAR-CCARI cited several studies carried out in Goa over 15 years.

"Soil erosion losses in Goa vary from moderate to extremely severe classes. The national average soil loss in India is 16.59 t/ha year," said director of ICAR-CCARI Parveen Kumar. The permissible soil loss limit for India is 11.21 t/ha/year.

Kumar said that soil erosion losses in cashew, mango and coconut cropping systems were estimated to be 21.4 t/ha/year, 12.6 t/ha/year and 20.1 t/ha/year, "without any conservation practices".

The institute said that for cashew crops, conservation measures reduced the runoff by 44.5%, soil loss by 47%, and NPK (nitrogen, phosphorus, and potassium) loss by 62.3%.

"Cashew interfall, which starts during November-December covers the soil surface and acts as a physical barrier to runoff and reduces soil erosion losses," said Kumar. "Further, the leaf litter helps to improve soil moisture retention and ground-water recharge."

As for mangoes, conservation measures reduced soil loss by 83% and runoff by 53% over control. This recommended measure, on average, reduced the NPK loss by 86%. As for coconuts, they conserve, circular trenching reduced soil loss and runoff by 76% and 34%, respectively and the NPK loss by 73.2%.

"The cultivation of crops like cashew, mango and coconut reduces soil erosion," said Kumar. "However, the adoption of soil and water technologies developed by ICAR-CCARI further helps to reduce erosion loss and improves soil health."

A prickly start to jackfruit's commercial exploitation

Times News Network
Panaji: A prickly start to jackfruit's commercial exploitation is being witnessed in Goa, as the state government and ICAR-CCARI are working together to promote its cultivation and processing. The institute has developed several technologies to improve jackfruit production and quality, including the use of bio-fertilizers and integrated nutrient management systems. The adoption of these technologies is expected to increase jackfruit yields and reduce the risk of soil erosion and nutrient loss. The institute is also working on developing new jackfruit varieties that are more resistant to pests and diseases. The state government is providing financial support for jackfruit cultivation and processing, and is also working on creating a market for jackfruit products. The institute is also conducting research on the nutritional value of jackfruit and its potential uses in food and medicine. The institute is also working on developing a value chain for jackfruit, from cultivation to processing and marketing. The institute is also working on creating a network of jackfruit growers and processors, and is also working on creating a market for jackfruit products. The institute is also working on creating a network of jackfruit growers and processors, and is also working on creating a market for jackfruit products.

At Barcem, 50 tribal women learn about value-added millets

Times News Network
Panaji: A hands-on training programme to prepare various value-added products of millets such as 'ragi idli', 'jowar idli', 'little millet upma' and 'finger millet baati' was held for 50 women of the tribal farming community of Barcem, Quepem.

The programme was organised at the ICAR-CCARI (Indian Council of Agricultural Research: Central Coastal Agricultural Research Institute).

The women belonged to 10 self-help groups (SHGs). Under the scheduled tribe component, the beneficiary farm women were also given the required utensils and accessories such as idli cookers, kadais, frying spoons, measuring cups and hand gloves.

Experts from the institute guided the beneficiaries and trainees on how initiatives can be taken up to form SHG-based cultivation and market value additions to millets. The experts urged the beneficiaries to utilize the given inputs to maximize value additions to millets produced by themselves.

Collaborative efforts of the SHGs and the institute were discussed to promote cultivation, processing and marketing of millets by the beneficiaries as part of community farming. Another training programme was held for 20 students of Goa College of Home Science, Panaji.

Dr Parveen Kumar, director, ICAR-CCARI, Goa, highlighted the objectives of celebrating the International Year of Millets, 2023, and the importance of millets as climate-smart crops which require very low inputs. Dr Mahesh Pal, the principal of Goa College of Home Science, called for initiating more collaborations with ICAR-CCARI and ICAR-KVK, North Goa, for human resource development.

'CCARI-Goa has developed salt-tolerant varieties of rice'

Varieties include Goa Dhan 1, Goa Dhan 2, Goa Dhan 3, Goa Dhan 4

Special Correspondent Panaji

Union Minister for Agriculture and Farmers Welfare Narendra Singh Tomar on Monday said that the Central Coastal Agricultural Research Institute (CCARI-Goa) has developed salt-tolerant varieties of rice namely Goa Dhan 1, Goa Dhan 2, Goa Dhan 3 and Goa Dhan 4 for salt-affected soils of Goa.

"The CCARI has also developed Goa Bio 2, CCARI Bio 3, CCARI Bio 4 for improving the biological activity of different types of soils to promote the plant growth and improve the plant health," he added.

Replying to the related question from the Rajya Sabha member Laxmidhata on Monday, Tomar said that a



Narendra Singh Tomar, Union Minister for Agriculture and Farmers Welfare

package of practices of integrated nutrient management involving Goa Bio-1, a talk-based bio-fertilisation, and crop establishment methods to improve paddy productivity on the salt-affected soils, has been standardised and disseminated. It has also standardised different soil and water conservation measures namely continuous contour trenches with siltcatchers, trenches with Vetiveria Zizanioides for cashew crop, continuous contour trenching with vegetative barriers (Vetiveria Zizanioides) in mango and circular trenching in coconut to reduce erosion losses and degradation.

The reply of the Union Minister for Agriculture and

Farmers Welfare further informed that the central government is implementing a national project on management of Soil Health and Fertility (Soil Health Card/Soil Health Management), now merged as Soil Health and Fertility component of Rashtriya Krishi Vikas Yojana (RKVY) through the state government.

"The main objective of the scheme is to assist states in promoting integrated Nutrient Management (INM) through judicious use of chemical fertilisers including secondary and micro nutrients in conjunction with organic manures and bio-fertilisers for improving soil health and its productivity," the reply noted.

मॅंगो मॅन डॉ. ए.आर. देसाई

कृषी जलियमयुक्त संशोधन जगावळीत

करी पेशे देवेंद्र अर्जुन आपले ज्ञान करी काढतात. कृषी क्षेत्रात काम करीत असतानाच त्यांनी 'मॅंगो मॅन' या पुस्तकाचे लेखन केले. या पुस्तकात त्यांनी मॅंगो पेशेची महत्त्वाची बाबी सांगितली आहे. या पुस्तकाचे लेखन करीत असतानाच त्यांनी 'मॅंगो मॅन' या पुस्तकाचे लेखन केले. या पुस्तकात त्यांनी मॅंगो पेशेची महत्त्वाची बाबी सांगितली आहे.

Goa farms to expand 'barefoot luxury' space for tourists

Bindiya.Chari@timesgroup.com

Panaji: As the Goa government promotes eco and hinterland tourism, various novel concepts are being explored, and one discussed recently was agro-eco-tourism (AET). At last week's Goa Tourism Board (GTB) meeting, a representative of Indian Council of Agriculture Research (ICAR)-Central Coastal Agricultural Research Institute, Ella, told the GTB that farming and linked processes have the potential to be introduced as experiential travel.

A GTB member said that while visits to spice farms have been popular for a while, a bigger opportunity awaits in the segment.

AET, it was stated, will help Goa create its own model of 'barefoot luxury' (slower pace of travel in a lush setting) by harnessing its rich biodiversity, well-endowed agricultural traditions, and cultural heritage.

"The ICAR's suggestion of organising farm tours is wonderful. A segment of tourists will be enthused about farm tours," said the board member. "Men and women sowing in the rain is a beautiful sight. I am sure many will like to step into a paddy field to know how it feels."

Dr R Soloman Rajkumar, a senior scientist at ICAR, played the idea of AET before the

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with travel. The linkage of the mutual needs of farmers and tourists has the potential to create synergies at different levels.

Biodiversity conservation, harvest festivals, heritage foods, farm stays, and visits to livestock farms are among the primary activities listed by ICAR.

The board member said since Goa is nestled amid the biodiversity hotspot of the Western Ghats, it can be a great AET site, and pique the interest of youth, thus diversifying the tourism market and ensuring year-round income to farmers.

This activity will indirectly enhance the value of farm produce. More importantly, a farmer will be able to become an entrepreneur. Experiential tours, the board member said, will not just give tourists an opportunity to connect more closely to nature but also give them a chance to understand the culture and heritage of the region.

The board member said that over the past two years, a few have been organising trips to paddy fields in monsoons, focused on gaining likes and views for social media feeds.

While farming has been on the decline in Goa for over a decade, some Goans have come back to their roots over the past few years to resume farming.

खी नाईक : सूचना, हरकती मागविणे सुरु; जानेवारी 2024 पर्यंत होईल पूर्ण

राज्याचे कृषी धोरण बनविण्याला गती

पानजी, ता. ११ (खास प्रतिनिधी) : राज्यतील सर्व उपकरणा कृषी क्षेत्राला प्रोत्साहन देणारे आणि शेतकऱ्यांना विविध सेवा देणारे कृषी धोरण बनवण्याचे काम सुरु झाले असे माहिती सूचना, हरकती मागविण्यात आल्या आहेत. जानेवारी २०२४ पर्यंत हे धोरण तयार होईल, अशी माहिती कृषीमंत्री खी नाईक यांनी सोमवारी (ता. ११) दिली. राज्य सरकारचे कृषी धोरण तयार करण्यासाठी खास महत्त्वाचे आलेख्य समितीची बैठक, समितीचे अध्यक्ष आणि कृषीमंत्री खी नाईक यांच्या अध्यक्षतेखाली पार पडली. यावेळी कृषी संचालक नरेंद्र आलमोन्सो, डॉ. नंदकुमार कार, आचार्य विनायक सरदेसाई, आचार्यदासे यांच्या उपस्थितीत, फारद कार्ब, मांडवीकर कांढीकर, प्रोफेसर ज्योती, माजी संचालक महेश्वर धेंडुरकर, खासदार, कृषी महाविद्यालयचे आचार्य श्रीराम जांभेकर यांच्यासह अनेक मान्यवर उपस्थित होते. यावेळी विविध मुद्द्यांवर चर्चा झाली.



पानजी: सरकारचे कृषी धोरण तयार करण्यासाठी खास महत्त्वाचे आलेख्य समितीची बैठक, समितीचे अध्यक्ष आणि कृषीमंत्री खी नाईक यांच्या अध्यक्षतेखाली पार पडली.

कृषी भांडेकार' आणणार
राज्य सरकारचे मान्य केंद्रेतून कृषी भांडेकार काढण्याची आमसभेबाबतची हरकत तयार व्हावी यासाठी महसुस विभागाला दिशेनामा घेऊन त्याबाबतची सर्व केंद्रे जाऊन गोवा राज्याबाबत कृषी धोरण तयार करण्याबाबतची धोरणाच्या संदर्भात तयारीचा आदेश आला यासाठी प्रयत्न केले जातील, असे खी नाईक म्हणाले.

सरकारचे हे धोरण शेतकऱ्यांसाठी महत्त्वाचे आणि उपयुक्त असे बनवले जाईल. धोरण बनवण्याबाबत २५ ते ३० प्रश्ने त्याबाबतची हरकत आणू या. क्षेत्राच्या संदर्भात काम करण्याबाबत ५ उपसमितीच्या स्थापना करण्या जातील. उपसमितीची स्थापना करताना हरकती आणून इतर सर्व मागण्यांकडे लक्ष देईल, असे खी नाईक म्हणाले.

संस्थापनाची पत्रव्यवस्था

आठुडियावाणी विद्यालयाचे सुसोपकरणे 'सुसोपण' वळवणु

वसंतगणेश मठ
वसंतगणेश मठ, आठुडियावाणी वी.के.एम.ए.ए. विद्यालयाचे सुसोपकरणे 'सुसोपण' वळवणु. या उपक्रमात विद्यार्थ्यांनी विद्यालयाच्या सुसोपकरणाचे वळवणु करून देण्याचे काम केले आहे. या उपक्रमात विद्यार्थ्यांनी विद्यालयाच्या सुसोपकरणाचे वळवणु करून देण्याचे काम केले आहे. या उपक्रमात विद्यार्थ्यांनी विद्यालयाच्या सुसोपकरणाचे वळवणु करून देण्याचे काम केले आहे.



Annual Accounts 2023-24

up to 31-03-2024

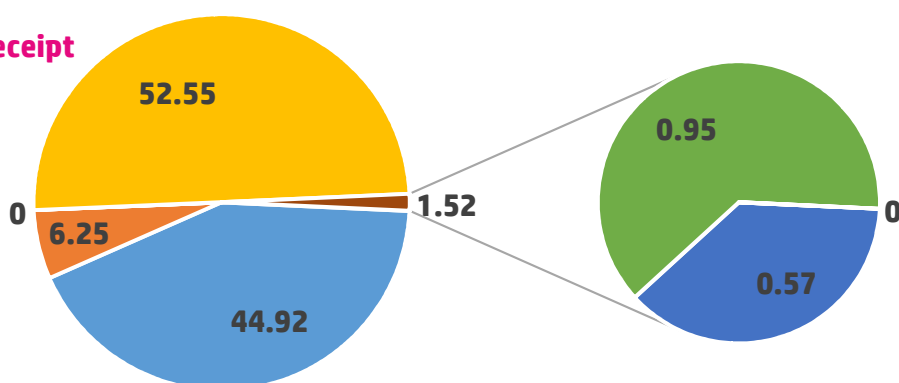
Details of Institute Govt. Grant expenditure for the year 2023-24 (in ₹ lakh)

No.	Head	RE 2023-24	Expenditure	% of Utilization
I	Grants for Creation of Capital Assests			
1	Works			
A.	Land			
B.	Building			
i.	Office building	2.89	2.89	100
ii.	Residential building	0	0	0
iii.	Minor Works	7.43	7.43	100
2	Equipment	21.15	21.15	100
3	Information Technology	16.72	16.72	100
4	Library Books and Journals	1	1	100
5	Vehicles & Vessels	0	0	0
6	Livestock	3	3	100
7	Furniture & fixtures	4.26	4.26	100
8	Others	0	0	0
	Total – CAPITAL (Grants for creation of Capital Assests)	56.45	56.45	100
II	Grant-in-aid Salary			
1	Establishment Expenses (Salaries)			
i.	Establishment Charges	1232.84	1232.8	100
ii.	Wages	0	0	0
iii.	Overtime Allowance	0	0	0
	Total - Establishment Expenses (Grant in Aid - Salaries)	1232.84	1232.8	100
III	Grant in Aid - General (Revenue)			
1	Pension & Other Retirement Benefits	215.49	215.49	100
2	T.A.			
A.	Domestic TA / Transfer TA	13.5	13.5	100
B.	Foreign TA	0	0	0
	Total – Traveling Allowance	13.5	13.5	100
3	Research & Operatinal Expenses			
A.	Research Expenses	105.69	105.69	100
B.	Operational Expenses	212.37	212.37	100
	Total - Research & Operational Expenses	318.06	318.06	100
4	Administrative Expenses			
A.	Infrastructure	102.64	102.64	100
B.	Communication	1.52	1.52	100



C.	Repair & Maintenance			
i.	Equipment, Vehicles & Others	17.73	17.73	100
ii.	Office building	19.98	19.98	100
iii.	Residential building	14.98	14.98	100
iv.	Minor Works	10.09	10.09	100
D.	Others (excluding TA)	46.86	46.86	100
	Total - Administrative Expenses	213.79	213.79	100
5	Miscellaneous Expenses			
A.	HRD	1.78	1.78	100
B.	Other Items (Fellowships, Scholarships etc.)	0	0	0
C.	Publicity & Exhibitions	0	0	0
D.	Guest House – Maintenance	14.51	14.51	100
E.	Other Miscellaneous	0	0	0
	Total - Miscellaneous Expenses	16.28	16.28	100
6	Loans and Advances	0.00	0.00	0
IV	TSP			
A.	Grants in Aid Capital	8	8	100
B.	Grants in Aid General	12	12	100
	Total - TSP	20	20	100
V	SCSP			
A.	Grants in Aid Capital	14.75	14.75	100
B.	Grants in Aid General	20	20	100
	Total - SCSP	34.75	34.75	100
	Grand Total	2121.16	2121.2	100

Revenue Receipt



- Income from Sales / Services
- Income from Royalty, Publication etc.
- STD Interest
- CPWD / Grants Refund

- Fees / Subscription
 - Other Income
 - Recoveries on Loans & Advances
- Total : ₹ 105.24 lakh**

Projects	Opening Balance as on 01.04.2023	Remittance Received	Expenditure	Amount Lapsed during the year	Refund	Closing Balance
ICAR Schemes Projects	34.36	361.09	371.07	0	0.98	23.39
Non-Scheme General 1270 (Additional Fund above RE)	0	110.88	110.88	0	0	0
Deposit Schemes (External Funded) Projects	29.42	112.27	80.01	14.47	4.72	42.5





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Malabari Goats a prolific goat breed of coastal region (Kerala) | ©R. Solomon Rajkumar 2023

