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भाकृअनुप – केंद्रीय तटीय कृषि अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद)
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(Indian Council of Agricultural Research)

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हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch

In this issue

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Director's Desk

Traditional farming system of Goa

Presently in Goa, the essential agricultural commodities like rice, vegetables, flowers, milk, eggs, meat, etc. are imported from neighboring states. Goa has immense potential for the cultivation of flowers, fruits, spices, meat products, fish products, etc. it needs to be harnessed with the integration of allied enterprises such as dairy, piggery, poultry, and fishery in combination with field and horticultural crops. An integrated farming system (IFS) is an agricultural system that integrates crop production, livestock, and other locally suited farm enterprises. The concept of IFS is more feasible for small and marginal farm holdings as it serves as a tool for linking allied agri-enterprises with crop production besides offering scope for environmental safety and conservation of agro-biodiversity. The Kulagar is a traditional farming system of Goa including the cultivation of horticultural crops on the hilly slope by terrace system. In Goa, the majority of the Kulagar systems are found in Ponda, Sattari, Bicholim, and Sanguem and also in some parts of Canacona and Quepem. The main objective of IFS is to meet the food and nutritional requirement of the farm family and to generate year-round income. The majority of the Kulagar farmers included complimentary enterprises such as dairy, poultry, goatery, etc to increase farm profitability. The residue generated in the system is recycled through mulching and composting. Natural wells act as a source of irrigation in the Kulagar system and through technological interventions drip/sprinkler system of irrigation became popular. Currently, labor shortage, increased cost of inputs, lower production, choice of low-yielding forage crops, and rearing of nondescript/local breeds of cows are the issues confronting the Kulagar farmers. To revive the full potential of the Kulagar system, agronomic management practices, pest management, and livestock management need to be considered. Scientific Kulagar farming will increase crop and livestock production leading to regular and enhanced income for farmers. The major problem which is affecting the farmers of this region is poor affordability to buy inputs, lack of knowledge on management practices, lower yield due to planting of low yielding local varieties/landraces, old and senile plantations, fruit rot problem in arecanut, crop-wildlife conflict by the monkey, wild boar, bear, etc. Due to these constraints, many of the farms are neglected and poorly managed, thereby reducing ecosystem services provided by the system. Policy planning to manage the wild animal-crop conflict, assured price for the agroforestry products, subsidy for mechanization, and organic certification to get a premium price for the products, are some of the incentives to encourage the farmers for better management of the Kulagar system.

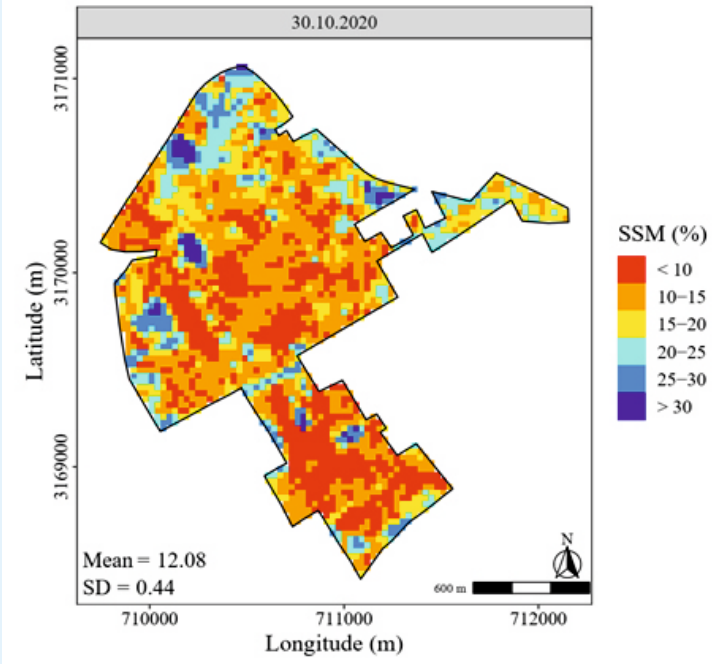
Chakurkar
DIRECTOR

RESEARCH HIGHLIGHTS

Soil moisture mapping using satellite remote sensing and machine learning model

(Bappa Das, Debashis Chakraborty)

Real-time soil moisture mapping is vital for many applications, including agricultural decision making. However, the considerable spatio-temporal variability renders mapping of surface soil moisture (SSM) using field-based observations unviable. Satellite remote sensing can offer SSM on a regular basis. In the current study, SSM was mapped at 30 m spatial resolution using microwave (Sentinel-1, 10 m), optical (Sentinel-2, 20 m), and digital elevation (Shuttle Radar Topography Mission, 30 m) data. Georeferenced SSM data were obtained on 30th October 2020 from ICAR-Indian Agricultural Research Institute (150 places) agricultural lands in New Delhi. Optical data and digital elevation model (DEM) was used to compute various vegetation indices and DEM derived variables. For SSM digital mapping, 52 covariates were calculated. The field-collected soil moisture data and remote sensing variables were used to calibrate and validate the random forest machine learning model. R2 and RMSE were 0.93 and 3.5% during calibration while during validation these were 0.52 and 6.05%, respectively. The most important covariate was the backscatter coefficient in VV polarisation from Sentinel-1, followed by convergence index and plan curvature from DEM data. The mapped surface soil moisture ranged from 4.5 to 33.2%.



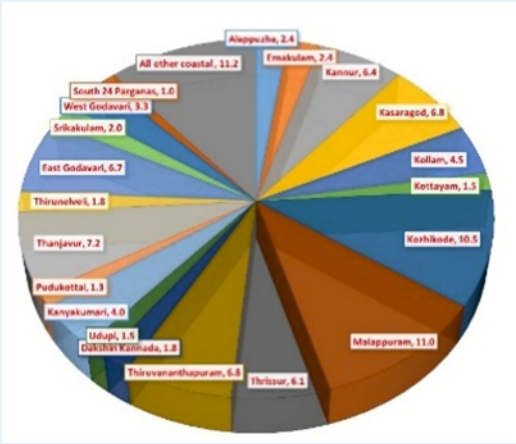
Surface soil moisture map using RF model

The economic significance of coconut crop in major coastal districts

(V Arunachalam)

Coconut palm forms the major economic perennial plant species in the coastal agroecosystem. It is crucial to work out the economic significance of the crop to plan policy matters including investment in research and development efforts. The contribution /share of a commodity or a sector to national Gross Domestic Product (GDP) is important. Hence, secondary data sets of the area under cultivation, production, productivity, price, and value of the output of coconut during the past 17 years were compiled for each of the 59 selected coastal districts of mainland India. Total geographical area, population figures of each coastal district, along with GDP of all the coastal state/UT of the country were also collected. Based on these, % area to total geographical area, % contribution of the crop in the district to total GDP of the state / country were worked out. Annual growth rate and compound growth rate were worked out for

the area, production, value of output for each district. The salient findings of the study indicate that the coconut alone in these 59 Indian mainland coastal districts contributed to the tune of 0.073% of the country's GDP. A pie chart showing each district's share of the economic significance of coconut to country GDP indicates the role of 20 major districts of coconut-based economy. Hence investment in coconut research and development for these 20 coastal districts also needs specific attention to boost the economy. Necessary measures need to be undertaken to protect the livelihoods of coastal inhabitants by protecting the coconut-based economy by climate-smart strategies and other crises debilitating the coconut crop.



Coastal Districts - Coconut - 0.07003 % GDP

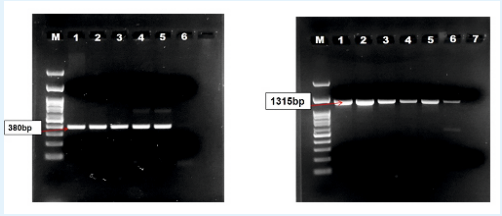
Phenotypic and molecular screening of Coagulase negative Staphylococci associated with subclinical mastitis in cattle for biofilm production

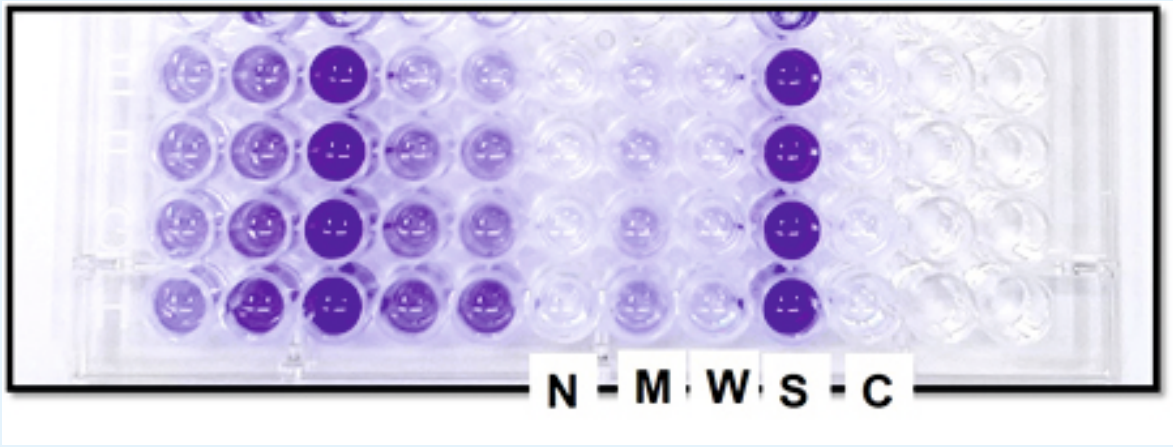
(Susitha Rajkumar)

Bovine subclinical mastitis is a highly prevalent economically important disease. Coagulase-negative *Staphylococci* (CNS), are a group of multiple Staphylococcus species which are less pathogenic but are the highest isolated pathogens from bovine clinical and subclinical mastitis.

It is important to detect biofilm-producing CNS isolates because cells in biofilms differ from those of their free-floating counterparts due to possession of different genotypic and phenotypic characteristics which facilitates the colonization and persistence of the bacteria in the glandular mammary tissue as well as on other inert materials in the farm. Also, biofilms can decrease the bacteria's susceptibility to antibiotics and disinfectants. Hence the CNS strains isolated from subclinical mastitis were screened phenotypically for the ability to form biofilms and for the presence of biofilm-associated genes. The biofilm production was screened using Crystal Violet assay and tested strains were classified into 3 categories based on the optical density (OD) measured at 630 nm which showed 53.73%, 25.46%, and 12.73% of the CNS isolates as strong (S), moderate (M), and weak (W) biofilm producers, respectively. The isolates were screened for biofilm-associated genes *Ica* A and *Ica* D which showed 30% and 28.57% of isolates were positive for *Ica* A and *Ica* D. Among the most prevalent CNS species, *Staphylococcus epidermidis* 80 and 30% of the isolates harbored *Ica* A and *Ica* D genes, respectively. Among the seven *S. haemolyticus* isolates even though only 1 isolate carried *Ica* D gene and none carried *Ica* A gene, phenotypically 28.57% and 71.42% isolates were medium and strong biofilm producers. Among the strong biofilm producers, 33.3 and 26.66% carried *Ica* A and *Ica* D genes, whereas 40% didn't carry either of these genes. The present study shows a very high percentage of strong and medium biofilm-producing isolates among the CNS from subclinical mastitis which indicates the need for strong control measures

against this CNS. Also, no significant relationship was observed between phenotypic biofilm production and the presence of *Ica* A and *Ica* D genes in this study.



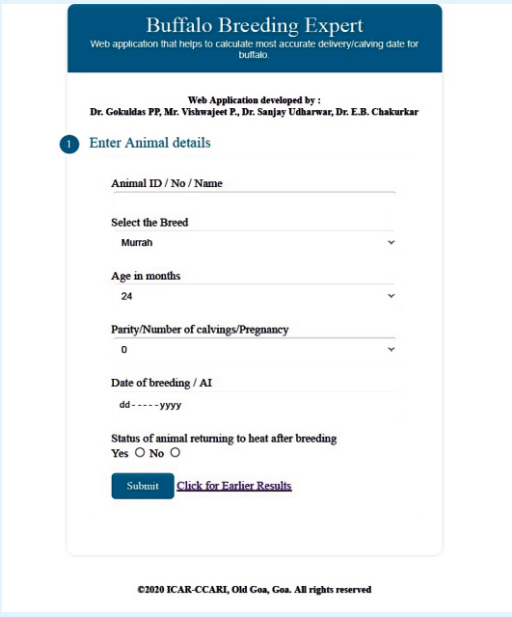


PCR amplification of Ica A (1315bp) and IcaD (380bp)

Web application on buffalo breeding management

(Gokuldas PP, Vishwajeet Prajapati, Sanjay Udharwar and Chakurkar EB)

As a step towards creating more opportunities for smart dairy farming utilizing the Internet of things (IoT) and data-driven techniques, a web application namely Buffalo Breeding Expert was developed that can assist farmers and agri-entrepreneurs in calculating calving dates with high degree of accuracy as well as ideal weaning date for different breeds of buffaloes reared under coastal climate. Different factors influencing gestation period like breed, age, parity of the animal, the season of breeding were factored to predict a reliable calving date for buffaloes. Based on the input data on breeding, the application can help farmers to effortlessly plan calving and weaning care management in buffaloes. The application also provides an expert system on scientific buffalo farming. The expert system consisted of comprehensive information on good management practices like breeding, feeding, reproductive, health management for scientific buffalo farming. The expert system also provides useful information on indigenous breeds, breed characteristics of buffaloes reared in the coastal ecosystem.



Internship Training Programme on Veterinary Science for BVSc students organized

ICAR-CCARI organized Internship Training Programme for BVSc. Undergraduate students of Mumbai Veterinary College, Maharashtra Animal & Fishery Sciences University (MAFSU), Mumbai towards capacity building of Veterinary Scholars in the areas of veterinary science and advanced scientific livestock production practices. The program was organized from January to April, 2021. A total of 36 veterinary scholars from Mumbai Veterinary College participated in the program which was organized in four batches during the period. Dr. Shivasharanappa N., Dr. Susitha Rajkumar, Dr. Gokuldas PP, and Dr. Amiya Sahu acted as training coordinators for the program. Program comprised of lectures, field visits, hands-on sessions on various veterinary practices. The students were given practical exposure to the different managemental activities in the dairy cattle, buffalo, goat, piggery, poultry, and rabbit units. Students were demonstrated concentrate feed formulation and feed mixing for different livestock units and animal health management and treatment procedures like vaccination and deworming. Managemental activities like breeding in rabbits and sexing in bunnies, artificial insemination in pigs, cattle, castration, and microchip tagging were also demonstrated. This was followed by evaluation and feedback sessions.

EVENTS

Training programme on ornamental fish culture

ICAR-CCARI, Goa in collaboration with the Directorate of Fisheries, Govt. of Goa has organized a one-day training and demonstration programme on ornamental fish culture on 13th January 2021 at the Institute. A total of 22 participants attended the training programme. Various aspects like international and national status of ornamental fish trade, ornamental fish brood stock development, ornamental fish breeding, larval rearing and grow out culture, live feed culture, designing an ornamental fish farm, disease treatment were explained and demonstrated to the trainees. In addition, training on identification of different exotic/indigenous ornamental fish species of commercial importance, aquarium tank fabrication, food and feeding, health management of ornamental fishes, breeding, water quality management, culture and seed production, the economics of ornamental fish culture, technological know-how and scope of ornamental fish business development and entrepreneurship opportunities were also described. This training was conducted by Mr. Trivesh Mayekar, Scientist (FGB), and Dr. Sreekanth GB, Scientist (FRM), Animal and Fisheries Science section of ICAR-CCARI, Goa.

Republic Day celebrated

The Institute celebrated 72nd Republic day on 26th of January, 2021 at 9.30 am in the campus. Dr EB Chakurkar, Director (Acting) hoisted the flag and addressed the scientists, administrative and supportive staff. In his republic day address, the Director appreciated the good work done by the various sections. He also felicitated the meritorious students of wards of the staff.

Farmers-Scientists Interaction on "Advances in Production and Processing of Turmeric and Ginger"

A Farmers-Scientists interaction on "Advances in Production and Processing of Turmeric and Ginger" was jointly organized by Agriculture Technology Management Agency (ATMA-North Goa) and ICAR-CCARI, Goa on 16th February 2021 at ICAR-CCARI, Goa. Forty nine farmers participated in this field demonstration-oriented training programme. In this programme, farmers were imparted practical training and demonstration on various aspects of organic and inorganic cultivation of turmeric and ginger in Goa, crop management practices, and appropriate harvesting stage. During the practical classes, Dr. AR Desai appraised the farmers about different improved varieties of turmeric and ginger, land preparation, different planting methods, pro tray nursery raising and its advantages, harvesting and various primary processing of turmeric steps including cooking, drying, polishing, and pulverizing. Scientists, Technical Officers – Shri. Rahul Kulkarni, Mrs. Pranjali Wadekar, Shri Omar, Shri Yoganand Gaude, and others, coordinated the overall programme.

Training program for Skilled Support Staff organized at ICAR-CCARI, Goa

ICAR-CCARI, Goa organized a three-day training program on "Skill up-gradation in good office practices cum general awareness for Skilled Support Staff" of the institute during 18th-20th February 2021 in which 22 participants benefitted. Dr. Sujeet Desai, HRD Nodal Officer, and Mr. Vinod Ubarhande, Farm Superintendent were the coordinators. The training program covered different topics related to skill full farm practices, livestock management, discipline, and office decorum, which included presentations, field visits, practical demonstrations, and interactive sessions carried out by the scientists, technical and administrative staff of the institute, and other resource persons. During the valedictory function, the Skilled Support Staff gave feedback about the program and, the certificates were distributed to the participants by Dr. EB Chakurkar, Director and Shri. Somanth, SAO, ICAR-CCARI, Goa.

Training programme on "Scientific pig farming" under Tribal Sub Plan (TSP) of AICRP on Pig

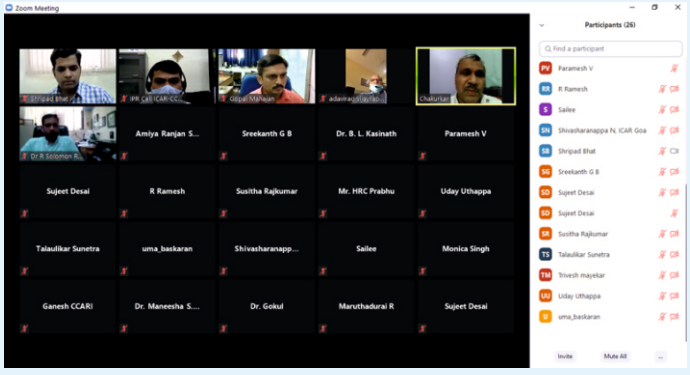
A two-day training programme on "Scientific pig farming" was conducted under the Tribal Sub Plan (TSP) of AICRP on Pig, at the Institute from 26th -27th February, 2021. A total of seven participants from the Palghar district (Maharashtra) have attended the training. Dr. E.B. Chakurkar (Director) has given the introductory remarks. Dr. Amiya Ranjan Sahu, Dr. Shivasharanappa, N., and Dr. Gokuldas P.P. have delivered lectures as well as practical sessions on different aspects of scientific pig farming, its importance, breeds, managemental practices, diseases, prevention measures and vaccination in pigs, breeding and its significance, advanced techniques in pig reproduction, etc. The piglets and feed materials were also distributed to the farmers free of cost. There was an interactive session by the scientists with the farmer trainees. In the end, certificates were distributed to the participants by Dr E.B. Chakurkar (Director) and Dr Amiya Ranjan Sahu (P.I, AICRP on Pig) along with other staff members of the institute.

Training and agricultural inputs distribution under SCSP scheme to the farmers of Maharashtra

On 9th March 2021 under Schedule Caste Sub-Plan (SCSP) scheme a training and agricultural inputs distribution programme for the beneficiary farmers of Ganvale village of Kudal taluka, Sindhadurga, Maharashtra was organized. The fertilizer and sprayers were distributed to the paddy, coconut, cashew growers. Dr. Paramesha, V, Scientist Agronomy highlighted the importance of integrated nutrient management in the rice and coconut cropping system. The recommended package of practices of nutrient application to rice, coconut, and cashew was elaborated. Furthermore, he highlighted the importance of the new technologies and their adoption for improving crop productivity and income. He distributed the agricultural inputs such as fertilizers, sprayers, and micronutrients to the beneficiaries. He also briefed about the scientific agronomic practices for improved yields and explained the importance of vermicompost in the farming system.

Webinar on "Importance of Intellectual Property Rights in Agricultural Research"

The ITMU/IPR Cell, ICAR - CCARI, Goa organized a Webinar on "Importance of Intellectual Property Rights in Agricultural Research" on 26th April 2021, on the occasion of World Intellectual Property Day. Dr. EB Chakurkar, Director (A), ICAR - CCARI, Goa, highlighted the importance of Intellectual Property Rights (IPRs) in agriculture and shared his experience in securing the patent and registering animal breeds. Ms. Uma Baskaran, IPR Attorney and Senior Consultant, Krishna and Saurastri Associates LLP, Mumbai, discussed the patentability of agricultural inventions, criteria, and restrictions on patentability and also interacted with scientists. Dr. Shripad Bhat, Scientist, and ITMU/IPR Cell Coordinator apprised the participants about the role of ITMU in IP management in the ICAR system. This Webinar was aimed to create awareness about IPR issues in agricultural research and impart knowledge on the patentability of agricultural inventions. A total of 26 participants attended the Webinar virtually.



Popularisation of coconut climbing device among Schedule Tribe beneficiaries

Management of coconut palm by regular spraying, crown cleaning operations and timely harvest is a manual climbing skilled operation. Manual climbing is a drudgery process and is an occupational hazard in the coconut palm. Although the coconut climbing device is available to ease the operation, the rate of adoption of the device was poor in Goa. With the help of climbing devices, the livelihoods of tribal people of the villages will receive a boost. Using the devices, the farmers can reduce their drudgery and also harvest coconuts at regular intervals, carry out timely intercultural operations to improve the productivity of coconut palm. The activity also brings confidence among the farmers in using the device and neighboring farmers get motivated to use the device. Hence a series of demonstration training was conducted to popularise the device among farmers, farmworkers especially padeli (coconut climbing person) covering about 72 tribal beneficiaries under the Institute Scheduled Tribe Component (STC) Program.

People belonging to the Scheduled Tribe community from Canacona Taluka, South Goa District were given demonstration on 12.02.2021. About 19 beneficiaries of Shrishtal panchayat were given training in their village in the morning and during the afternoon session, 30 beneficiaries from Cotigao and Gaodongrim villages received the training at Gaodongrim village. Coconut climbing devices were distributed to all 49 beneficiaries. On 17.02.2021, in the morning about 6 beneficiaries from Rivona village of Sanguem Taluka, and in the afternoon session 12 beneficiaries from Morpirla village of Quepem Taluka received the training and coconut climbing devices were distributed to all. On 07.04.2021, the demonstration of the devices and distribution was done at the Institute, in which 4 beneficiaries of the Scheduled Tribe community from Goa Velha village and 1 from Chimbel village, Tiswadi Taluk, North Goa District got benefitted. Dr. V Arunachalam, Principal Scientist (Horticulture), organized the event and arranged the coconut climbing devices under STC with the help of local panchayats and local people.

ITMU / IPR Cell Activities

Patent Filing:

- A patent was granted (Patent No. 355114) by the Indian Patent Office for the patent application (PA# 3037/MUM/2015 dated August 11, 2015) entitled "Extender for preservation of boar semen" on January 1, 2021.
- First Examination Reports (FERs) have been issued by Indian Patent Office for the patent application (PA# 201621012414) entitled "Process for preparing nutmeg taffy and resultant food product thereof" on January 12, 2021 and for the patent application (PA# 201621012413) entitled "Process for preparing cashew apple crunch and resultant food product thereof" on March 24, 2021.
- Power of Attorneys for two cases ("Process for preparing nutmeg taffy and resultant food product thereof" and "Process for preparing cashew apple crunch and resultant food product thereof") have been provided to the Institute IPR Attorney - M/S Krishna & Saurastri Associates LLP, Mumbai on April 23, 2021.

Commercialization of Technologies:

- Facilitated signing of Memorandum of Agreement (MoA) for commercialization of technology- 'Process for manufacturing of Nutmeg Pericarp Taffy' between ICAR-CCARI, Goa & Goa State Biodiversity Board, Goa on February 19, 2021, with a license fee of ₹ 3,54,000 (₹ 3,00,000 + 18% GST) under the non-exclusive licensing agreement valid for five years.
- Material Transfer Agreement (MTA) signed:
- Facilitated in signing of Material Transfer Agreement (MTA) for transfer of seed material and promotion of cultivation of Curcuma longa (var. CIM-Pitamber) with CSIR-CIMAP, Lucknow, on April 19, 2021.

Administration

Study Leave :

- Dr. Bappa Das, Scientist (Agricultural Meteorology) of this Institute has been granted Study Leave for a period of 12 months from 12-10-2020 to 11-10-2021 for availing the ICAR Post-doctoral Research Fellowship for 2020-21 at ICAR-IARI, New Delhi.
- Dr. Sanjaykumar Vithalrao Udharwar, Subject Matter Specialist (Animal Science), North Goa KVK, has been granted Study leave for a period of 1 year (i.e. 12 months) from 31-12-2020 to 30-12-2021 for attending the course work at Kerala Veterinary and Animal Sciences University, Wayanad, Kerala for pursuing Ph.D. in Veterinary Surgery and Radiology for the year 2020-21.

Transferred from ICAR-CCARI:

- Dr. Eaknath Bhanudasrao Chakurkar, Principal Scientist (Animal Reproduction)/Director (Acting) was relieved of his duties at ICAR-CCARI, Goa on 28-04-2021, consequent upon his selection to the post of Director, ICAR-Central Island Agricultural Research Institute, Port Blair.

Transferred to ICAR-CCARI :

- Dr. Chaudhari Ganesh Vasudeo, Scientist (Vegetable Science) of ICAR-VPKAS, Almora joined duty at ICAR-Central Coastal Agricultural Research Institute, Goa on 15-02-2021.

Promotion:

Sl. No.	Name/designation of the Scientists	Promoted to the higher grade	Effective date of placement/ promotion
1	Dr. Mathala J. Gupta, Sr. Scientist (Agril. Structures & Process Engineering)	Placed in PB- Rs. Rs.37400 -67000 + RGP Rs.9000/ -	14-04-2014
2	Dr. B.L. Kasinath, Senior Scientist (Soil Science) and Head KVK	Principal Scientist in the Pay Level 14 under CAS	07-09-2018
3	Dr. Shripad Bhatt, Scientist (Agri. Economics)	Pay Matrix Level -11	15-09-2016
4	Smt. Pranjali N. Wadekar, Technical Officer (T-5)(Computer)	Senior Technical Officer (T-6) (Computer) in Pay Level 10	24-12-2018
5	Shri Uthappa A.R., Scientist (Agroforestry)	Pay Matrix Level -11	01-01-2019
6	Shri Vinod A. Ubarhande, Senior Technical Officer (Farm Superintendent)	Assistant Chief Technical Officer (T - 7/8) (Farm Superintendent)	24-11-2019
7	Shri Rahul M. Kulkarni, Senior Technical Officer (Agronomy)	Assistant Chief Technical Officer (T - 7/8) (T-7/8)(Agronomy)	01-01-2020
8	Shri Somnath, Administrative Officer	Senior Administrative Officer	27-01-2021 (Afternoon)

Lectures delivered:

Date	Name of Scientist	Title	Venue
19-02-2021	Dr. Gokuldas PP Scientist	Scientific dairy farming	ICAR -CCARI, Goa
27-02-2021	Dr. Gokuldas PP Scientist	Modern techniques in pig reproduction and practical demonstration on A.I in pigs	ICAR -CCARI, Goa

Conference/Symposia/Workshop/Training attended:

Date	Name of the scientist	Programme	Venue
16-19 March 2021	V Arunachalam	Delivered a invited talk **Advances in the banana production technologies for the coastal ecosystems** on 17.03.2021 ISCA Webinar - International Symposium on Coastal Agriculture: Transforming Coastal Zone for Sustainable Food and Income Security	Virtual platform organised by Indian Society of Coastal Agricultural Research
16-19 March 2021	Susitha Rajkumar	ISCA Webinar, International Symposium on Coastal Agriculture, Transforming Coastal Zone for Sustainable Food and Income Security organized by The Indian Society of Coastal Agricultural Research (ISCAR)	Virtual platform organised by Indian Society of Coastal Agricultural Research
16-19 March 2021	Bappa Das	ISCA Webinar, International Symposium on Coastal Agriculture, Transforming Coastal Zone for Sustainable Food and Income Security organized by The Indian Society of Coastal Agricultural Research (ISCAR)	Virtual platform organised by Indian Society of Coastal Agricultural Research