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(Indian Council of Agricultural Research)
Port Blair – 744 105, Andaman & Nicobar Islands, India



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प्रस्तावना

भाकृअनुप-केंद्रीय द्वीपीय कृषि अनुसंधान संस्थान, पोर्ट ब्लेयर देश का एक विशिष्ट संस्थान है, जो द्वीपीय क्षेत्र के कृषि एवं उससे जुड़े विषयों पर शोध कार्य करता है। संस्थान का मुख्य परिसर, पोर्ट ब्लेयर, अंडमान एवं निकोबार द्वीप समूह में स्थित है और इसका एक क्षेत्रीय केंद्र मिनिर्कोय, लक्षद्वीप में अवस्थित है। वर्ष 1978 में अपनी स्थापना के बाद से, संस्थान ने कृषि उत्पादकता एवं उत्पादन में महत्वपूर्ण और उल्लेखनीय योगदान दिया है और अनुसंधान, विकास, विस्तार एवं क्षमता निर्माण कार्यक्रमों के माध्यम से कृषि जिनसे की मांग एवं आपूर्ति के बीच के भारी अंतर को कम किया है।

संस्थान की वार्षिक रिपोर्ट-2021 को प्रस्तुत करते हुए मुझे अति प्रसन्नता हो रही है जिसमें संस्थान के अनुसंधान, विकास, विस्तार, क्षमता निर्माण कार्यक्रम और अन्य महत्वपूर्ण गतिविधियों को प्रदर्शित किया गया है। कोविड-19 के बावजूद, भाकृअनुप-सीआईएआरआई की टीम ने इस द्वीपीय पारितंत्र में कृषि क्षेत्र की प्रगति के लिए सराहनीय कार्य किया है।

संस्थान की मुख्य उपलब्धियों में छोटी सुपारी, नारियल, खट्टा नींबू, पुमेलो, केला, लौंग, मिर्च, भिंडी, डायोस्कोरिया, ग्रेटर याम (रतालू), कोलोकेशिया, आर्किड एवं मैकरंगा के अद्वितीय परिग्रहणों की पहचान की गई और उनके विशिष्ट गुणों का लक्षणवर्णन किया गया तथा आगे के मूल्यांकन एवं अध्ययन के लिए संरक्षित किया गया है। फसल सुधार कार्यक्रम में उपयोग की संभावना के रूप में उच्च उपज वाले नारियल की पहचान की गई। द्वीप हरिता और द्वीप सोना, नारियल की बौनी किस्मों को कोमल नारियल के उद्देश्य से अविश्रुत किया गया। संभावित फार्मास्युटिकल मूल्यों के साथ गार्सिनिया धानी खारियेंसिस को हाइड्रोक्सि साइट्रिक एसिड के नए स्रोत के रूप में पाया गया। अद्वितीय गुच्छों (क्लस्टर) वाले नौनी एक्सेसन (परिग्रहण) का डीयूएस लक्षण वर्णन किया गया और पंजीकरण के लिए उसे भाकृअनुप-एनबीपीजीआर को प्रस्तुत किया गया। मैकरंगा निकोबारिका और एम. इंडिका की ताजी पत्तियों से खाने की (डाइनिंग) प्लेट बनाने के लिए उपयुक्त पाया गया। भाकृअनुप-एनबीपीजीआर, नई दिल्ली की प्लांट जर्मप्लाज्म रजिस्ट्रेशन कमेटी (पीजीआरसी), द्वारा बैक्टिरियल विल्ट प्रतिरोधी 'सीएआरआई बैंगन 2' को पंजीकृत किया गया। चावल अनुसंधान कार्यक्रम के तहत मध्यम अवधि की चावल वंशावलियों - एएनआर 59 एवं एएनआर 60 को सर्वोत्तम उपजशील किस्म के रूप में पहचाना गया।

समेकित कृषि प्रणाली, द्वीपीय कृषि की रीढ़ है। हमारे संस्थान ने पहाड़ी ऊपरभूमि के साथ-साथ निचली भूमि के लिए मॉडल विकसित किए हैं। पिछले दस वर्षों के आंकड़ों में औसत कृषि आय में 143 प्रतिशत की वृद्धि प्रदर्शित की तथा 2.32 लाख/हेक्टेयर/वर्ष की शुद्ध आय प्राप्त हुई और 325 मानव दिवस/हेक्टेयर/वर्ष का रोजगार सृजित हुआ। चावल की फसल में नैनो यूरिया के पर्णय छिड़काव (फोलियर स्प्रे) के मूल्यांकन में चावल की उपज में वृद्धि तथा उर्वरकों के अनुप्रयोग में नाइट्रोजन की बचत दर्ज की गई। हमारे वैज्ञानिकों ने समुद्री शैवाल (सी वीड) पर अनुसंधान कार्य को प्रारंभ किया है और कैल्शियम एल्गिनेट, जो एंजाइमों के प्रग्रहण हेतु उपयोग में लाया जाने वाला तथा प्लांट टिशू कल्चर में कृत्रिम बीज बनाने में प्रयुक्त किया जाने वाला एक उपयोगी सबस्ट्रेट को तैयार कर इसके निर्माण का मानकीकरण किया तथा इसे तैयार करने की नूतन प्रक्रिया को भारतीय पेटेंट के लिए प्रस्तुत किया।

स्वदेशी पशुओं एवं कुक्कुट जननद्रव्य के माइटोकॉन्ड्रियल लक्षण वर्णन पर उल्लेखनीय कार्य किया गया है। निकोबारी सुअर की मातृ धरोहर को निकोबार द्वीप के निवासियों के साथ पहले से वर्णित पांच भौगोलिक उद्गम स्थानों से जोड़ा गया है। भारत के एक स्थानिक पौधे, टेबर्नामोंटानाकिस्पा के जलीय अर्क को मुंह द्वारा दिए जाने वाले संपूरक (ओरल सप्लीमेंट) को कुक्कुट में वृद्धिकारक और इम्युनोमोड्यूलेटर के रूप में पाया गया। सुअर में प्रोबायोटिक संपूरण द्वारा सुअर के शिशुओं (पिगलेट) में दूध छुड़ाने के तनाव को कम किया गया जिसका मूल्यांकन उनकी वृद्धि प्रदर्शन, प्रतिरक्षात्मक खोज एवं लिपिड प्रोफाइल द्वारा किया गया।

सूक्ष्मजीवरोधी प्रतिरोधिता पर किए गए अध्ययनों में एंटीबायोटिक दवाओं की तीसरी और चौथी पीढ़ी के विरुद्ध बहुऔषधि प्रतिरोधिता की बढ़ती प्रवृत्ति देखी गई। जीवाण्विक और वायरल रोगों की सीरो-निगरानी द्वारा पशुधन एवं कुक्कुट की बीमारी के स्तर को दर्ज किया गया तथा पशुओं को समय पर कृमिरहित (डीवर्मिंग) करके परजीवियों को कम किया गया। दक्षिण, उत्तर तथा मध्य अंडमान एवं निकोबार जिलों के विभिन्न इलाकों में मिनी इन्क्यूबेटर्स की स्थापना से जलवायु स्मार्ट देसी कुक्कुट पक्षियों के उत्पादन एवं आपूर्ति को बढ़ाया गया जो किसानों की आय को दोगुना करने के लिए एक अनुकरणीय मॉडल है।

द्वीप कार्प स्टार्टर और वृद्धि आहार (ग्रोवर फीड) की योजना बनाकर उसे तैयार एवं विकसित किया गया। क्रेब को मांसल बनाना (क्रेब फैटेनिंग) और बायोप्लोक यूनिट के लिए इंडोर वर्टिकल री-सर्कुलेटरी मॉडल को वैज्ञानिकों द्वारा प्रकल्पित एवं विकसित किया गया जिसके बेहतर परिणाम मिले हैं। मीठे पानी की सजावटी मछली फैंसी गम्पी के प्रजनन और लार्वा पालन की तकनीक का पहली बार मानकीकरण किया गया।

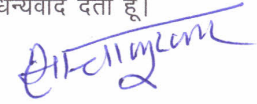
अवतरण केंद्र (लैंडिंग सेंटर) से यथासमय व्यावसायिक रूप से महत्वपूर्ण समुद्री मछलियों के प्रगहण पर डेटा एकत्र करने के लिए एक फिश कैच मोबाइल ऐप विकसित किया गया है। किसान का खेती के प्रति दृष्टिकोण, कृषि में ग्रामीण युवाओं की भागीदारी की आकांक्षा, ऐसे क्रियाकलाप जिसमें ग्रामीण युवा सहभागिता के इच्छुक हों, सामाजिक-सांस्कृतिक घटकों, ऐसी चुनौतियां जो कृषि भागीदारी में युवाओं की संभावना को प्रभावित करते हैं की पहचान हेतु क्रॉस-सेक्शनल स्टडी डिजाइन का मूल्यांकन किया गया।

इस संस्थान के अंतर्गत संस्थापित कृषि विज्ञान केंद्रों (केवीके) ने प्रौद्योगिकी को किसानों के खेतों तक पहुंचाने में महत्वपूर्ण भूमिका निभाई है। इस अवधि के दौरान 1193 किसानों को शामिल करते हुए कुल 42 प्रशिक्षण, 17 ऑएफटी एवं 25 अग्र पंक्ति के प्रदर्शनों (एफएलडी) को आयोजित किया गया। इसके अलावा, संस्थान ने किसानों के हितार्थ टीएसपी सहित अनेक क्षमता निर्माण कार्यक्रमों का भी आयोजन किया। इस अवधि के दौरान कुल मिलाकर 45 प्रशिक्षण/जागरूकता, 23 खेत दिवसों एवं प्रदर्शनों को आयोजित किया गया जिससे 2641 किसान/हितधारक लाभान्वित हुए। संस्थान द्वारा विकसित प्रौद्योगिकियों के व्यापक प्रसार के लिए डेली टेलीग्राम अखबार में एक किसानों का स्तंभ शुरू किया गया और इस अवधि के दौरान 86 प्रौद्योगिकियों को प्रकाशित किया गया। आजादी का अमृत महोत्सव नामक नई पहल के तहत, संस्थान द्वारा 9 वेबिनार, 27 प्रशिक्षण कार्यक्रमों/गोष्ठियों का आयोजन किया गया जिसमें 1544 किसान/हितधारक लाभान्वित हुए। हमारे संस्थान ने पौधों की 57,766 कटिंग/पौध तैयार करके गुणवत्ता वाले बीज एवं रोपण सामग्री के उत्पादन में उल्लेखनीय काम किया है जिन्हें संस्थान के मुख्य परिसर तथा केवीके, सिपीघाट में एक नए बिक्री काउंटर से किसानों/हितधारकों को बेचा गया।

संस्थान द्वारा पहली बार दो तकनीकों अर्थात् सीआईएआरआई-हैनग्रीस एवं द्वीप माइक्रो का व्यावसायीकरण किया गया है। अन्य प्रौद्योगिकियां जैसे द्वीपटिक्योर, द्वीप कार्प वृद्धि अहार, वर्टिकल फार्मिंग संरचना आदि को विकसित करने का कार्य प्रगति पर है तथा आने वाले वर्षों में इनके व्यावसायीकरण की संभावनाएं हैं।

अनुसंधान एवं शैक्षणिक संपर्कों को सुदृढ़ करने के लिए संस्थान ने आचार्य एन जी रंगा कृषि विश्वविद्यालय, हैदराबाद, केरल कृषि विश्वविद्यालय तथा तमिलनाडु पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय के साथ समझौता करार (एमओयू) पर हस्ताक्षर किए हैं।

विभिन्न प्रकार की अनुसंधान, विकास एवं प्रसार गतिविधियों को आगे बढ़ाने में विगत वर्ष प्रभाग (एसएमडी) के साथ-साथ भारतीय कृषि अनुसंधान परिषद से हमारे संस्थान को पर्याप्त सहायता एवं मार्गदर्शन मिलता रहा है। मैं, सचिव, डेयर एवं भाकृअनुप के महानिदेशक, डॉ. टी. महापात्र का उनके द्वारा दिए गए मार्गदर्शन एवं निरंतर समर्थन के लिए हृदय से आभार व्यक्त करता हूँ। साथ ही मैं, डॉ. ए. के. सिंह, उप महानिदेशक (बागवानी विज्ञान), भाकृअनुप को उनकी बहुमूल्य सलाह और पर्यवेक्षण के लिए आभार व्यक्त करता हूँ। मैं, डॉ. बी. के. पांडे, तथा डॉ. विक्रमादित्य पांडे, एडीजी (बागवानी विज्ञान) का उनके द्वारा दी गई सहायता तथा समर्थन के लिए उन्हें धन्यवाद देता हूँ। मैं, संस्थान के अधिदेश और उद्देश्य को पूरा करने में दिए गए महत्वपूर्ण योगदान और उपलब्धियों के लिए सभी स्टाफ सदस्यों को बधाई एवं धन्यवाद देता हूँ।



(एकनाथ बी. चाकुरकर)

निदेशक

भाकृअनुप-सीआईएआरआई

दिनांक : 23 जून, 2022



PREFACE

ICAR-Central Island Agricultural Research Institute, Port Blair is a unique Institute in the country which addresses the agricultural and allied issues of Island region. The institute has its main campus at Port Blair, A & N Islands and a Regional Station at Minicoy, Lakshadweep. Since its inception in 1978, the institute has contributed significantly and immensely towards the agricultural productivity, production and reduced the huge gap between demand and supply of agricultural commodities through research, development, extension and capacity building programmes.

I am happy to present the Annual Report-2021 of our institute, showcasing the research, development, extension, capacity building programme and other important activities of the institute. Despite COVID-19, Team ICAR-CIARI has done commendable work for the progress of agricultural sector in this Island ecosystem.

To mention a few are unique accessions of dwarf arecanut, coconut, acid lime, pummelo, banana, clove, chilli, bhendi, dioscorea, greater yam, colocasia, orchid and macaranga have been identified and characterized for their unique traits and are being conserved for further evaluation and studies. High yielding coconut accessions have been identified as potential for utilization in crop improvement programme. Dweep Haritha and Dweep Sona, dwarf coconut varieties have been coined for tender coconut purpose. *Garcinia dhanikhariensis* was found as the novel source of hydroxycitric acid with potential pharmaceutical values. DUS characterization of unique cluster bearing noni accession has been done and submitted to ICAR-NBPGR for registration. Fresh leaves of *Macaranga nicobarica* and *M. indica* has been identified as suitable for making dining plates. Bacterial wilt resistant 'CARI Brinjal 2' has been registered by Plant Germplasm Registration Committee (PGRC), ICAR-NBPGR, New Delhi. In the rice research programme, medium duration lines *viz.* ANR 59 and ANR 60 were identified as best yielder.

Integrated farming system is the backbone of the island agriculture. Our institute has developed models for the hilly upland as well as low land. The last ten years data showed 143 percent increase in the average farm income with net income of 2.32 lakhs/ha/year and employment generation of 325 mandays/ha/year. Evaluation of nano urea as foliar spray in rice recorded increase in rice yield and saving of nitrogen over fertilizer application. Our scientists have initiated seaweed research and developed and standardized extraction of calcium alginate, a useful substrate used for entrapment of enzymes and forming artificial seeds in plant tissue culture and the novel procedure has been submitted for Indian patent.

Pioneer work has been done on mitochondrial characterization of indigenous animal and poultry germplasm. Maternal inheritance of Nicobari pig has been correlated with peopling of Nicobari in Nicobar Island from five geographical provenances described ever before. Aqueous extract of *Tabernaemontana crispera*, an endemic plant of India was found as growth enhancer and immunomodulator of poultry as oral supplement. Probiotic supplementation in pig reduced weaning stress in piglets which was assessed through growth performance, immunological mining and lipid profile. Antimicrobial resistance studies showed increasing trend of multi drug resistance against third and fourth generation of antibiotics. Through sero-surveillance of bacterial and viral diseases, disease status of livestock and poultry has been brought into record and timely deworming of animals brought down the parasitosis. Establishment of mini-incubators in different pockets of South,

Andaman and Nicobar districts upscaled the production and supply of climate smart Desi poultry birds which is a role model for doubling the farmers' income.

Dweep carp starter and grower feed has been planned, formulated and developed. Indoor vertical-re-circulatory model for crab fattening and bioflocunit has been designed and developed by our scientists with promising outcome. For the first time, technology on breeding and larval rearing of freshwater ornamental fancy guppy fish has been standardized. A fish catch mobile app has been developed to collect the real time commercially important marine fish catch data from landing centre. Cross sectional study design was evaluated to identify, attitude towards farming by farmer, aspiration of rural youth participation in agriculture, kind of activities rural youth wish to participate, socio-cultural factors, challenges that influence the likelihood of youth in agriculture participation.

KVKs under the institute have played a significant role in transfer of technology to the farmer's field. During the period, a total of 42 training, 17 OFTs and 25 FLDs involving 1193 farmers were conducted. In addition, our institute has also conducted different capacity building programmes including TSP for the benefit of the farmers. A total of 45 training/awareness, 23 field day and demonstration were conducted benefitting 2641 farmers/stakeholders. For wide dissemination of the technologies developed by our institute, a farmer corner has been started in the Daily Telegram newspaper and during the period, 86 technologies have been published. Under the new initiative of Azadi ka Amrut Mahotsav, we conducted 9 webinars, 27 training programmes/ghoshties wherein 1544 farmers/stakeholders were benefitted. Our institute has done remarkable work in the production of quality seed and planting materials by producing 57766 cutting/seedlings and are being sold to the farmers/stakeholders through a new Sale Counter at main campus and at KVK, Sippighat.

For the first time, our institute has commercialized two technologies viz. CIARI-Hangreens and Dweep Micro. Other technologies viz. Dweeptickure, Dweep carp grower feed, vertical farming structure etc. are under pipeline and expected to be commercialized in the coming year.

To strengthen the research and academic linkages, our institute have established MoUs with Acharya N G Ranga Agricultural University, Hyderabad, Kerala Agricultural University and Tamil Nadu University of Veterinary and Animal Science.

Our institute has substantial support from the SMD as well as from the Council in pursuing various research, development and extension activities. I am thankful to the Dr. T. Mohapatra, Secretary, DARE and Director General, ICAR for his valuable guidance and constant support. I also convey my sincere gratitude to Dr. A.K. Singh, Deputy Director General (Hort. Sci.), ICAR for his valuable advice and supervision. I thank Dr. B.K. Pandey, ADG (Hort. Sci.) & Dr Vikramaditya Pandey, ADG (Hort.Sci) for their help and support. I congratulate and thank all the staff members for their significant contribution and achievements made to fulfil the mandate and objective of the Institute

(Eaknath B. Chakurkar)
Director ICAR-CIARI

Dated: 23rd June 2022

कार्यकारी सारांश

बागवानी एवं वानिकी विज्ञान

- नारियल के परिग्रहणों जैसे रेनेल टॉल, कटचल टॉल, ऑक चुंग टॉल, ताहिती टॉल, तमालू टाल एवं पाओ पाओ टॉल को फलों की उपज, गूदे (कर्नेल) के वजन और विशुद्ध नारियल तेल की उच्च पुनर्प्राप्ति को देखते हुए फसल सुधार में उनके उपयोग की सक्षमता के रूप में पहचाना गया है।
- 35 नारियल परिग्रहणों के फ़ैटी एसिड संरचना में विभिन्न परिग्रहणों के बीच अंतर पाया गया। लॉरिक अम्ल के अनुपात को 49 से 62: के बीच, मिरिस्टिक अम्ल का अनुपात 17 से 27: और पाल्मिटिक अम्ल के अनुपात को 5.7 से 11.2: के बीच पाया गया, जिससे विशिष्ट फ़ैटी एसिड अंश हेतु नारियल के विभिन्न प्रकारों के चयन की गुंजाइश को बताता है।
- अंडमान ऑर्डिनरी टॉल की संरक्षित समिति (पॉपुलेशन) ने पत्तियों की रूपाकृति, पुष्पक्रम तथा फल विशेषताओं में महत्वपूर्ण अंतर प्रदर्शित किया तथा फसल सुधार के लिए 37 ताड़ वृक्षों के एक वर्ग का चयन किया गया।
- संस्थान अनुसंधान समिति द्वारा अप्रैल, 2021 के दौरान अंडमान ग्रीन ड्वार्फ एवं अंडमान येलो ड्वार्फ से चयनित बौनी किस्मों को जारी करने के प्रस्तावों को अनुमोदित किया गया था। इन चयनों को क्रमशः द्वीप हरिता तथा द्वीप सोना का नाम दिया गया जिन्हें द्वीपीय परितंत्र में कोमल नारियल हेतु उपयुक्त एवं संभावित उच्च उपजशील किस्म के रूप में चिह्नित किया गया।
- भाकृअनुप-सीआईएआरआई (अन्नपूर्णा, ओंकार, सूर्या और चंदन) द्वारा पूर्व में जारी की गई बौनी किस्मों के आण्विक फिंगर प्रिंटिंग के निष्कर्षों को भाकृअनुप-सीपीआरआई, कासरगोड में संचालित कार्य के आधार पर जारी प्रस्तावों में शामिल करने के लिए संकलित किया गया।
- बौने सुपारी की किस्म एएडी-1 के लक्षणवर्णन में इसके पौध (सीडलिंग) की ऊंचाई की वृद्धि दर को प्रगतिशील पाया गया तथा 11 महीनों में समृद्ध एवं मंगला सुपारी की पौध (सीडलिंग) की तुलना में उल्लेखनीय रूप से कम पाया गया।
- खट्टे नींबू (एसिड लाइम) की दो किस्मों एवं तीन स्थानीय परिग्रहणों को एकत्र करके उनके मूल्यांकन हेतु संरक्षित किया गया। पुमेलो के पांच उत्कृष्ट मातृ वृक्षों की पहचान करके उनका लक्षणवर्णन किया गया।
- फसल सुधार में उपयोग के लिए स्थानीय केले की उच्च उपजशील किस्म की पहचान की गई जिसके गूदे का स्वाद रेड बनाना की तरह होता है किंतु परिपक्व अवस्था में इसका छिलका पीले रंग का होता है।
- अमरूद में किए गए छंटाई अध्ययनों में टिप प्रूनिंग (अग्र भाग की छंटाई) विधि से छंटाई करने पर पुरुआती फलों के गठन तथा प्रति पौधा अधिक संख्या में फल (31 प्रति पौधा) पाए गए जबकि बिना छंटाई वाले पौधों में कोई फल नहीं लगा।
- वाणिज्यिक किस्मों के केले के किस्मगत मूल्यांकन में यह देखा गया कि मई-जून महीने को केले के वृक्षारोपण हेतु सबसे अच्छा मौसम पाया गया तथा इस मौसम में लगाए गए मोनथांड केले से अधिक पैदावार प्राप्त हुई और इस क्रम में तत्पश्चात पूवन एवं नेय पूवन किस्म को पाया गया।
- गार्सिनिया धानीखेरियासिस को औद्योगिक रूप से कीमती हाइड्रॉक्सि साइट्रिक अम्ल का नया स्रोत पाया गया। साइनाइडिन को इसके फलों के छिलके में मौजूद प्रमुख एंथोसायनिडिन पाया गया।
- मैंगो जिंजर (करकुमा मैंगो) से तैयार पाकशाला पेस्ट को परिवेशी वातावरण एवं प्रशीतित भंडारण दशाओं में तीन महीने तक भंडारित करने पर स्व-स्थिर (शेल्फ स्टेबल) उत्पाद के रूप में पाया गया।
- भाकृअनुप-सीआईएआरआई के सिपीघाट फार्म में संरक्षित लौंग की पौध संततियों (सीडलिंग प्रोजिनीज) में से वांछनीय गुणों जैसे अगेती पुष्प, नियमित फलन, ठोस कलिकाएं तथा उच्च लौंग उपज के आधार पर प्लस ट्री के एक वर्ग का चयन किया गया। वर्ष 2007 में लगाए गए प्लस पेड़ों की औसत उपज 1.8 किग्रा से लेकर 3.85 किग्रा/वृक्ष/वर्ष (औसत 2.5 किग्रा) थी। छह पेड़ों वाले नियमित फलत युक्त प्लस पेड़ों के चयन को सीआईएआरआई क्लोव -1 नाम दिया गया और किस्मगत सुधार में इनके आगे के उपयोग के लिए इनकी पहचान की गई।
- अंडमान एवं निकोबार द्वीप समूह से संरक्षित मिर्च परिग्रहणों के मूल्यांकन से पता चला कि कैप्सिकम फ्रुटसेंस के 04 एवं कैप्सिकम एन्म के 03 प्रकारों (टाइप्स) को फल उपज, कीट एवं व्याधियों के प्रति सहनशीलता के लिए बेहतर पाया गया। सी. फ्रूटसेन्स के 04 परिग्रहणों में से सीएफ-3 परिग्रहण को फल के आकार, आकर्षक रंग, फल उपज तथा कीट व व्याधि रहित होने के मामले में सबसे अच्छा पाया गया।
- भिंडी की एक जंगली किस्म मारावेंडाई (एबेलमॉस्कस कैलेई) का संग्रह किया गया जिसे बारहमासी किस्म बताया जाता है।
- लिटिल अंडमान द्वीप से डायोस्कोरिया एलाटा के दो विविधतापूर्ण परिग्रहणों को एकत्र किया गया तथा संस्थान के फील्ड जीन बैंक में विभिन्न कंद फसलों के कुल 123 परिग्रहणों का रखरखाव किया जा रहा है। द्वीपीय दशाओं में ग्रेटर याम (रतालू) के अधिकांश परिग्रहणों में वायवीय कंदों का उत्पादन देखा गया जो जननद्रव्य के संरक्षण एवं बहुगुणन में उपयोगी हो सकते हैं। कोलोकेशिया की किस्म, मेगा तारो -2 किस्म को जारी किया गया तथा दिनांक 7 अप्रैल 2021 को भारत के राजपत्र में अधिसूचित किया गया।
- आदिवासी क्षेत्रों में कंद आधारित कृषि प्रणाली को लाभ एवं रोजगार बढ़ाने के लिए उपयुक्त पाया गया। इन हस्तक्षेपों (इंटरवेंशन) से पूर्व, दुहेट की कुल आय 70,000 रुपये दर्ज की गई तथा लाभ:लागत अनुपात 1.22 था। कंद फसल आधारित कृषि प्रणाली अपनाते के बाद, दुहेट की कुल आय 2.26 के बी : सी अनुपात सहित बढ़कर 1,91,350 रुपये तक पहुंच गई। कंद फसल आधारित खेती प्रणाली में रोजगार सृजन 460 दिन/हे० था जबकि किसानों की पारंपरिक प्रणाली में यह मात्र 240 दिन/हे० था।
- कॉयरपिथ : मृदा : एफवाईएम को 1:2:1 अनुपात में रूटिंग मीडिया संयोजन में गमलों में लगाए गए स्टार जैस्मीन (जैस्मीनम नाइटिडम) में पर्णय पेटियोल प्रवर्धन का मानकीकरण किया गया। जैस्मीनम सेम्बक के खुली दशाओं में रखे गए पौधों में पत्तियों को हटाने + 45 सेमी ऊंचाई पर तने की छंटाई वाले उपचार में अगेती पुष्प एवं अधिक संख्या में फूल देखे गए। जैस्मीनम नाइटिडम में 1 मीटर ग 1 मीटर की दूरी पर तथा एयर लेयर द्वारा तैयार किए गए पौधों में बेहतर बढ़वार देखी गई।
- आर्किड की दो स्वदेशी प्रजातियों - यूलोफिया स्पेक्टैबिलिस एवं पेरिस्टाइलिस ग्रैसिलिस का संग्रह, लक्षणवर्णन एवं संरक्षण किया गया।
- ट्यूबरोज (रजनीगंधा) के किस्मगत विकास में, बीआरएच-19 को फूलों की विशेषताओं के मामले में सबसे अच्छा परिग्रहण पाया गया।
- तीन अलग-अलग साइटोकिनिन के परीक्षण में बीएपी केएन एवं 2,4-डी, बीएपी को 3 मिग्रा/लीटर पर टैरोकार्पस डल्बर्गियोइड्स में इन विट्रो प्रवर्धन को सबसे अधिक प्रभावी पाया गया।
- तीन-वर्षीय बहुउद्देशीय वृक्ष प्रजातियों (एमपीटीएस) में, अधिकतम हरा चारा (106 किग्रा/पेड़) और कुल वाई बायोमास 16.2 किग्रा/पेड़ को कैलोफाइलमिनोफिलम में दर्ज किया गया और तत्पश्चात इसे टैरोकार्पस

डल्वरिगोइड्स में पाया गया।

- गुच्छों में फलत वाले नोनी परिग्रहण (आईसी संख्या 0641086) की विशिष्टता, एकरूपता एवं स्थिरता (डीयूएस) संबंधी लक्षणवर्णन के कार्य को पूरा किया गया।
- मेकारंगा निकोबारिका और मैकारंगा इंडिका को उनके वांछित पत्ती क्षेत्र, ताजा भार, नई पत्तियों के रंग प्रतिधारण के आधार पर ताजी पत्तियों के भोजन में उपयोग हेतु पहचान कर प्रलेखित किया गया।

खाद्यान्न फसलों का सुधार एवं सुरक्षा

- पादप जननद्रव्य पंजीकरण समिति (पीजीआरसी), भाकृ अनुप-एनबीपीजीआर, नई दिल्ली द्वारा एक बैक्टीरियल विल्ट प्रतिरोधी बैंगन वंशावली 'सीएआरआई बैंगन 2' (परिग्रहण सं० आईसी 0640704 एवं पादप जननद्रव्य पंजीकरण सं० आईएनजीआर 21153) को पंजीकृत किया गया।
- बारानी (रेनफेड) निचली भूमि की दशाओं में 15 मध्यम अवधि वाले उत्कृष्ट चावल वंशालियों के मूल्यांकन में, चेक किस्म सीएआरआई ६ पान 6 (3.61) की तुलना में एएनआर 60 (4.35) एवं एनआर 59 (3.98) से अपेक्षाकृत अधिक अनाज उपज (टन/हे०) प्राप्त हुई।
- अनाज एवं पुआल उपज के लिए चावल की 13 किस्मों के फसल सूचकांक अध्ययन (हार्वेस्ट इंडेक्स स्टडी) में एएनआर 47 (57.8%), सीएआरआई धान 7 (51.4%) और एएनआर 40 (46.31%) में उच्चतम फसल सूचकांक (:) पाया गया। इसके अतिरिक्त, सीएआरआई धान 4 तथा सीएआरआई धान 5 को अनाज (दाना) एवं पुआल की उपज हेतु उपयुक्त किस्म पाया गया।
- लवणता सहिष्णु चावल की किस्म- सीएआरआई धान 5 ग बीएलबी प्रतिरोधी वंशावली, आईआरबीबी 60 से 41 बीएलबी प्रतिरोधी बैक-क्रॉस अंतर्जात वंशालियों (बीआईएल) को विकसित किया गया।
- दलहनों के उपज मूल्यांकन स्थल परीक्षणों में, मूंग एवं उड़द की चैक किस्मों की तुलना में आईसी 282083 (4.31) तथा आईसी 343939 (4.24) जीनरूपों से उच्च बीज उपज (ग्राम/पौधा) प्राप्त हुई।
- नियंत्रित दशाओं के तहत विभिन्न सिंचाई स्तरों में मूंग एवं उड़द के जीनरूपों के प्रदर्शन पर किए गए अध्ययनों में बिना किसी सिंचाई स्तर के क्रमशः एएनएम-11-63 (1.5) एवं सीओ-8 (2.2) जीनोटाइप में अधिक बीज उपज दर्ज की गई।

प्राकृतिक संसाधन प्रबंधन

- अंडमान द्वीप समूह के उच्च पर्वतीय भूभागों में कृषि उत्पादन एवं उत्पादकता में वृद्धि हेतु समेकित खेती प्रणाली (आईएफएस) पर एक दीर्घकालिक अध्ययन (2011-2021) किया गया जिससे इस दौरान औसत कृषि आय में 143% की वृद्धि के साथ 2.32 लाख/हे०/वर्ष की वृद्धि आय और 325 मानव दिवस/हे०/वर्ष के रोजगार सृजन का पता चला।
- भिंडी की फसल में प्लास्टिक पलवार का उपयोग करने पर पौधे की अधिकतम ऊंचाई; अगेती पुष्पन; फलों की अधिकतम लंबाई (15 सेमी), फलों की संख्या (15.5), फलों का वजन (20 ग्राम) दर्ज किया गया जिसके फलस्वरूप उपसतही सिंचाई एवं हाइड्रोजेल अनुप्रयोग की तुलना में अधिक उपज (311 ग्राम/पौधा जो 9.95 टन/हे० के बराबर) प्राप्त हुई।
- चावल में नैनो यूरिया के पर्णिय छिड़काव से चावल की दाना उपज में 14.4 - 16.7% की वृद्धि दर्ज की गई और 100% आरडीएफ अनुप्रयोग

के सापेक्ष 35: उर्वरक नाइट्रोजन की बचत हुई।

- लोबिया में कंट्रोल (15.4 ग्राम/पौधा) की तुलना में समुद्री तैवाल (सरगासुम वाइटी) के 25: जलीय अर्क के प्रयोग से अनाज की उपज (21.3 ग्राम/पौधा) में उल्लेखनीय वृद्धि दर्ज की गई।
- भूरे समुद्री तैवाल (सरगासुम वाइटी) से समुद्री तैवाल तरल उर्वरक (एसडब्ल्यूएलएफ) और कैल्शियम एल्गिनेट के दोहरे निष्कर्षण के लिए निष्कर्षण प्रक्रिया का मानकीकरण किया गया।
- चावल के भूसे (आरएस), गाय के गोबर (सीडी), समुद्री खरपतवार (एसडब्ल्यू) और मछली के अपशिष्ट (एफडब्ल्यू) की वर्मीकम्पोस्टिंग द्वारा विभिन्न संयोजनों में ह्यूमिक सबस्टेंस (मिश्रित पदार्थ) निष्कर्षित किए गए और फूरियर ट्रांसफॉर्म इंफ्रारेड (एफटीआईआर) स्पेक्ट्रोस्कोपी का उपयोग करके उनका विश्लेषण किया गया। परिणामों से पता चला कि चावल के भूसे और गाय के गोबर को 1 : 1 के अनुपात में प्रयुक्त करने पर 65 - 70 दिनों में खाद की अधिकतम पुनर्प्राप्ति (64.8%) दर्ज की गई और इसके बाद इसे आरएस + सीडी + एसडब्ल्यू + एफडब्ल्यू को 5 : 3 : 1 : 1 के अनुपात में प्रयुक्त करने पर दर्ज किया गया। विभिन्न उपचारों में ह्यूमिक अम्ल की रिकवरी दर में कोई महत्वपूर्ण अंतर नहीं पाया गया और इसे 2.04 से 3.1: के बीच पाया गया।
- प्रतिवेदित अवधि के दौरान बहु-विषयी सलाहकार टीम की सहायता से कृषि उत्पादन के सभी पहलुओं को सम्मिलित करते हुए कुल 102 एग्रोमेट बुलेटिन जारी किए गए। वर्षा के आवृत्ति वितरण (फ्रीक्वेंसी डिस्ट्रीब्यूशन) के विश्लेषण में न्यून्य वर्षा (रेनलैस) वाले दिनों में वृद्धि देखी गई तथा मध्यम वर्षा श्रेणी में कमी के साथ अत्यधिक वर्षा की घटनाओं में वृद्धि पाई गई।
- संपूर्ण द्वीपसमूह से विभिन्न भूमि उपयोग के सतही (0-15 सेमी) और उपसतही (15-30 सेमी) मिट्टी के नमूने एकत्र किए गए और मिट्टी की ढगति (डाइनेमिक्स) के आकलन हेतु विभिन्न आइसोटोपों जैसे $\delta^{13}C$, $\delta^{15}N$ और δ^2H का विश्लेषण किया गया।
- जल संसाधन मंत्रालय, भारत सरकार द्वारा जल सुरक्षा की गई जल सेक्टर पर राज्य विशिष्ट कार्य योजना (एसएसएपी) तैयार की गई। अध्ययन से पता चला है कि बारिश (प्रेसिपिटेशन) ही ताजे पानी (24,747 एमसीएम) का एकमात्र स्रोत है, जिसका 75% समुद्र में अपवाह (रनऑफ) के रूप में चला जाता है। उपयोग में लाया जाने वाला कुल जल (संचित वर्षा जल, मृदा नमी और सतही जल संसाधन) लगभग 4,961 एमसीएम (वर्षा का 20%) होता है।

पशु विज्ञान

- टीएलआर 3 के दो लक्षित क्षेत्रों के परिवर्धन हेतु प्राइमरों को डिजाइन किया गया जिसमें गैर-समानार्थी एसएनपी का पूर्वानुमान किया गया था और बहुरूपता (पॉलिमॉर्फिज्म) के लिए इनका आगे मूल्यांकन किया गया। हालांकि, निकोबारी मुर्गी की टीएलआर 3 मोनोमॉर्फिक पाई गई।
- निकोबारी सुअर की मातृ विरासत का निकोबारीज के प्रवास से सहसंबंध देखा गया। निकोबारी सुअर के जातिवृत्तीय संकेतों (फाईलोजेनेटिक सिग्नल) और भौगोलिक उत्पत्ति के माध्यम से भारत के पूर्वोत्तर भागों, फिलीपींस और वियतनाम के लोगों के साथ निकोबारीज का एक नया संबंध स्थापित किया गया। यह निष्कर्ष निकाला गया कि निकोबारीज का प्रवास आज से लगभग 4,000 वर्ष पहले प्रवासन के पश्चिमी मार्ग (डब्ल्यूआरएम) से हुआ था।
- अंडमान की स्थानीय बकरी के प्रजनन क्षमता से संबंधित एसएनपी की पहचान करने के प्रयास में, उच्च प्रजनन क्षमता के विशिष्ट 18 एसएनपी (5 नए एसएनपी और 14 एसएनपी सहित) और खराब प्रजनन क्षमता हेतु विशिष्ट 3 नए एसएनपी की पहचान की गई।
- हर्बल काढा तैयार करने के पश्चात के बाद टेबर्नामोंटाना किस्पा के

जलीय अर्क की प्रभावकारिता पर एक जैविक प्रयोग किया गया। गैर उपचार (कंट्रोल) वर्ग की तुलना में एंटीबायोटिक और टी.क्रिस्पा से संपूरित वर्ग दोनों में ही रीर का वजन बेहतर पाया गया जो इसके वृद्धि वर्धक गुणों को इंगित करता है।

- अखिल भारतीय बकरी सुधार समन्वित अनुसंधान परियोजना के तहत चयनित प्रजनन (सेलेक्टिव ब्रीडिंग) के माध्यम से अंडमानी बकरियों की उत्पादकता बढ़ाने और उन्नत वैज्ञानिक प्रबंधन प्रथाओं जैसे कृमिनाशकों (डीवर्मर) का विवेकपूर्ण उपयोग, कृमिनाशकों के प्रतिरोध की संभाव्यता को कम करने के लिए फामाचा जांच प्रणाली का उपयोग, रोग की मानिटरिंग एवं निगरानी तथा स्वास्थ्य एवं जागरूकता शिविरों का संचालन जैसे वैज्ञानिक प्रबंधन के माध्यम से एक कार्यक्रम शुरू किया गया।
- दूध छुड़ाए गए सुअर के शिशुओं (वीन्ड पिगलेट) में प्रोबायोटिक्स संपूरण देने पर उनकी बढ़वार तथा लिपिड प्रोफाइल में सुधार दिखाया। इसके अलावा, एक यौगिक प्रोबायोटिक्स के संपूरण ने एंटीऑक्सिडेंट स्थिति में सुधार किया और प्रतिरक्षात्मक शक्ति को बढ़ाया। इसलिए, प्रोबायोटिक्स को संपूरक आहार के रूप में देने पर दूध छुड़ाने के तनाव को कम करता है और सुअर के शिशुओं की बढ़वार में सुधार लाता है; इसलिए दूध छुड़ाए गए सुअर के शिशुओं में तनाव से लड़ने के लिए इसकी संस्तुति की जाती है।
- साल्मोनेला की 60 प्रजातियों, 80 ई. कोलाई और 83 क्लेबसिएला प्रजाति के वियोजकों (आइसोलेट्स) को समलक्षणी (फेनोटाइपिक) और जीनरूपी लक्षणों के आधार पर पृथक करके उनकी पुष्टि की गई। सभी बैक्टीरियल वियोजकों को टेट्रासाइक्लिन, ऑक्सीटेट्रासाइक्लिन, जेटामाइसिन, एरिथ्रोमाइसिन तथा एमोक्सिक्लेव के विरुद्ध प्रतिरोधी पाया गया। बहु-औषधि प्रतिरोधी वियोजक क्लेबसिएला प्रजातियों में अधिक (19.2%) और इसके बाद ई. कोलाई (18.6%) और साल्मोनेला प्रजातियों (12.5%) में पाए गए।
- ई. कोलाई (43.36%) को सबसे आम विस्तारित स्पेक्ट्रम लैक्टामेस (ईएसबीएल) उत्पादक और तत्पश्चात क्लेबसिएला (30.94%) और साल्मोनेला प्रजातियों (27.48%) को पाया गया। इसके विपरीत, उच्च β B लैक्टामेज उत्पादक की सर्वाधिक प्रतिशतता साल्मोनेला प्रजातियों (36.28%) और उसके बाद क्लेबसिएला प्रजातियों (32.04%) और ई. कोलाई (18.58%) में पाई गई। साथ ही, कुल 10.82% वियोजकों ने ईएसबीएल और उच्च β B लैक्टामेज एंजाइमों के सह-अस्तित्व को प्रदर्शित किया।
- द्वीप के लगभग सभी भागों में परजीवी रोगों की बहुत अधिक व्यापकता देखी गई। सूचित किए गए परजीवी संक्रमण में फैसियोलियासिस (32.44%), एस्कारियासिस (31.9%) और एम्फीस्टोमियासिस (15.07%) को पाया गया। बकरियों में इनकी व्यापकता (45.25%) अधिक पाई गई, जबकि उसके बाद इसे क्रमशः गोपशुओं में (39.71%), सुअर (8.3%) और भैंस में (6.66%) में पाया गया।
- ब्रुसेला एबॉर्टस एंटीबॉडीज (रोग प्रतिकारक) की उपस्थिति के लिए जांचे गए 728 गोजातीय सीरा नमूनों में से किसी भी नमूने को पॉजिटिव (सकारात्मक) नहीं पाया गया। समीक्षाधीन अवधि के दौरान, दक्षिण अंडमान के दो गांवों की बकरियों में 15.5% प्रकोप दर से संक्रामक एक्टीमा (ओआरएफ) के 34 मामले सूचित किए गए।

मत्स्य विज्ञान

- कार्प अहार जैसे द्वीप-कार्प वृद्धि अहार तथा द्वीप-कार्प स्टार्टर अहार विकसित किए गए।

- क्रैब फैंटनिंग (क्रेब को मोटा बनाना) तथा इनडोर बायोप्लोक यूनिट के लिए एक वर्टिकल रीसर्क्युलेटरी मॉडल को प्रकल्पित एवं विकसित किया गया।
- मीठे पानी की सजावटी फैंसी गम्पी मत्स्य किस्मों के लार्वा पालन के लिए प्रौद्योगिकी का मानकीकरण किया गया।
- मीठे पानी की सजावटी सियामीज फाइटिंग फिश का सफलतापूर्वक प्रजनन एवं लार्वा पालन किया गया।
- मत्स्य अचार, मत्स्य वेफर और मत्स्य पिज्जा जैसे मूल्य वर्धित मत्स्य उत्पादों और मत्स्य अहार (फिश मील) जैसे उप-उत्पादों को तैयार कर उनका मानकीकरण किया गया।

सामाजिक विज्ञान

- अवतरण केंद्रों (लैंडिंग सेंटर) से वाणिज्यिक रूप से महत्वपूर्ण समुद्री मछलियों को पकड़ने के संबंध में वास्तविक समय पर आंकड़ों को एकत्र करने के लिए ए एंड एन फिश कैच मोबाइल ऐप विकसित किया गया है। प्रयोक्ता प्रमाणीकरण लॉगिन पृष्ठ को पंजीकृत प्रयोक्ताओं को साइट पर लॉगिन करने और कैच डेटा को अपडेट करने की अनुमति देने के लिए विकसित किया गया है। गूगल प्ले स्टोर पर इस ऐप को पब्लिश किया गया है, उसमें लैंडिंग सेंटर पर उतारी गई प्रजाति-वार और गियर-वार दैनिक मत्स्य प्रगहण (कैच) को संग्रह करने की क्षमता है।
- जलवायु परिवर्तन के बारे में किसानों की अवधारणा की पुष्टि करते समय पता चला कि आयु, शिक्षा, खेती का अनुभव, परिवार का आकार, लिंग, सिंचाई की उपलब्धता, भूमि जोत का आकार, समुदाय आदि जलवायु परिवर्तन के बारे में किसानों की अवधारणा को प्रभावित करते हैं। लॉजिस्टिक रिग्रेशन से पता चला कि खेती का अनुभव, पुरुष और आदिवासी होना, जलवायु परिवर्तन के बारे में उनकी धारणा को काफी प्रभावित करता है, जिसका तात्पर्य है कि किसान जितना अधिक अनुभवी होता है, जलवायु परिवर्तन के बारे में उतना ही अधिक उसका ज्ञान होता है। इसी तरह, महिला किसानों की तुलना में पुरुष कृषक बदलते जलवायु के बारे में अधिक समझते हैं। आदिवासी किसानों को गैर-आदिवासी किसानों की तुलना में जलवायु परिवर्तन के बारे में अधिक जानकारी है।
- गर्मी के महीनों में डाइक से सिंचित सब्जी की खेती की देशी अनुकूलन योजना, भूमि उपयोग दक्षता को बढ़ाती है, खाई में पानी को वापीकरण से बचाती है तथा खाई में मत्स्य पालन के लिए परिवेशी वातावरण प्रदान करके फसलों की सिंचाई जरूरतों को कम करती है।
- किसानों का खेती के प्रति दृष्टिकोण, कृषि में ग्रामीण युवाओं की भागीदारी की महत्वाकांक्षा, ग्रामीण युवाओं का कृषि गतिविधियों के प्रति रुझान, सामाजिक-सांस्कृतिक घटक, कृषि भागीदारी में युवाओं की संभावना को प्रभावित करने वाली चुनौतियों की पहचान के लिए प्रतिनिध्यात्मक (क्रॉस-सेक्शनल) अध्ययन का मूल्यांकन किया गया। किसानों और युवाओं को शामिल करते हुए इस सर्वेक्षण के लिए 48 गांवों को मिलाकर कुल 3 तहसीलों की पहचान की गई।

कृषि विज्ञान केंद्र

- दक्षिण अंडमान, उत्तर तथा मध्य अंडमान एवं निकोबार जिले के कृषि विज्ञान केंद्र (केवीके) द्वारा कुल 42 प्रशिक्षणों, 17 ओएफटी और 25 एफएलडी का संचालन किया गया, जिसमें 1,193 किसानों ने लाभ उठाया।

EXECUTIVE SUMMARY

Horticulture & Forestry

- Coconut accessions *viz.* Rennel Tall, Katchal Tall, Auck Chung Tall, Tahiti Tall, Tamaloo Tall and Pao Pao Tall have been identified as potential for utilization in crop improvement considering fruit yield, kernel weight, and higher recovery of Virgin Coconut Oil.
- Fatty acid profiling of the 35 coconut accessions revealed the variation among the accessions. The lauric acid proportion ranged from 49 to 62%, the myristic acid proportion ranged from 17 to 27% and palmitic acid ranged from 5.7 to 11.2% highlighting the scope for selection of coconut types for specific fatty acid content.
- Conserved population of Andaman Ordinary Tall showed significant variation for leaf morphology, inflorescence traits and fruit, a group of 37 palms were selected for crop improvement.
- Proposals for release of dwarf varieties selected from Andaman Green Dwarf and Andaman Yellow Dwarf were approved by Institute Research Committee during April 2021. The selections were named as Dweep Haritha and Dweep Sona respectively which are identified as potential high yielders suitable for tender coconut purpose under Island conditions.
- Results of molecular fingerprinting of earlier released dwarf varieties from ICAR-CIARI (Annapurna, Omkar, Surya and Chandan) were compiled for inclusion in the release proposals based on the work conducted at ICAR-CPCRI, Kasaragod.
- Characterization of a dwarf arecanut AAD-1 revealed the progressive in terms seedling height growth rate of AAD-1 seedlings was significantly lower compared to Samrudhi and Mangala arecanut seedlings at 11 months.
- Two varieties and three local accessions of acid lime were collected and conserved for evaluation. Five elite mother trees of pummelo were identified and characterized.
- A high yielding table purpose local banana cultivar is identified for crop improvement which has a similar pulp taste of Red banana, but with yellow coloured peel at ripe stage.
- In pruning studies in guava, early fruit set and more number of fruits (31 per plant) per plant were observed in tip pruning method with no fruit set observed in without pruning.
- In the varietal evaluation of banana with commercial varieties it was observed that May-June was the best season for planting banana with more yields in Monthand followed by Poovan and Ney Poovan.
- *Garcinia dhanikhariensis* was found to be a novel source of pharmaceutically valuable hydroxycitric acid. Cyanidin was the major anthocyanidin present in its fruit rind.
- Culinary paste prepared from mango ginger (*Curcuma mangga*) was found to be a shelf stable product, when stored at ambient and refrigerated storage conditions for three months.
- Among the seedling progenies of clove, conserved at Sippighat farm of ICAR-CIARI, a group of plus trees were selected based on desirable traits *viz.*, early flowering, regular bearing, bold buds and higher clove yield. The average yield of 2007 planted plus trees ranged from 1.8kg to 3.85kg buds per tree per year (average 2.5kg). The regular bearing plus trees selection comprising of six trees is named as CIARI Clove-1 and identified for further exploitation in varietal improvement
- Evaluation of conserved Chilli accessions collections from Andaman and Nicobar Islands revealed four *Capsicum frutescens* and three *Capsicum annum* types as better for fruit yield, tolerance to pest and diseases. Among the four *C. frutescens*, the accession Cf-3 was found to be best in terms of fruit size, attractive colour, fruit yield and free from pest and diseases.
- One wild relative of Bendi, called Maravendai (*Abelmoschus caillei*) was collected which is reportedly perennial in nature.
- Two diverse accessions of *Dioscorea alata* were collected from Little Andaman Island and a total of 123 accessions of different tuber crops are being maintained in the field gene bank. Production of aerial tubers in most Greater Yam accessions was noticed under Island conditions which could be useful in conservation and germplasm multiplication efforts. *Colocasia* variety, Mega Taro-2 was released and notified in the Gazette of India dated 7th April 2021.
- The tuber-based farming systems were found to increase the profits and employment in tribal areas. Prior to interventions, the net income of the tuber was recorded as Rs70,000 with B: C ratio of 1.22. After intervention of tuber crops-based farming system, the net income of the tuber increased to Rs1, 91,350 with the B: C ratio of 2.26. The employment generation in the tuber

- crops-based farming system was 460-man days/ha as compared to 240man days/ha in their traditional system.
- Leaf petiole propagation in standardized in star jasmine (*Jasminum nitidum*) in rooting media composition of coirpith: soil: FYM in 1:2:1 ratio in protrays. Early flowering and more number of flowers were observed in the treatment leaf removal + 45 cm height stem pruning in plants maintained in open condition in *Jasminum sambac*. In *Jasminum nitidum*, spacing of 1m x 1m and plants raised by air layers showed better growth.
- Two indigenous orchid species viz. *Eulophia spectabilis* and *Peristylis gracilis* were collected, characterized and conserved
- In the varietal evolution of tuberose, BRH-19 was found to the best accession in terms of floral characteristics.
- Among the three different cytokinins tested, BAP KN and 2,4-D, BAP at 3 mg/L was found to be most effective for *in vitro* propagation efforts in *Pterocarpus dalbergioides*.
- Among the three-year-old multipurpose tree species, the highest total green biomass (106 kg/tree) and total y biomass 16.2 kg/tree) was recorded in *Calophylluminophyllum* followed by *Pterocarpus dalbergioides*.
- Distinctness, Uniformity and Stability (DUS) characterization for the the cluster bearing Noni accession (IC number 0641086) was completed.
- Identified and documented *Macaranga nicobarica* and *Macaranga indica* as suitable for using their fresh leaves as dining plate based on their desirable leaf area, fresh weight, colour retention of fresh leaves
- In yield evaluation location trials of pulses, high seed yield (g plant⁻¹) obtained for genotype IC282083 (4.31) and IC343939 (4.24) over the check varieties of green gram and black gram, respectively.
- Study on performance of green gram and black gram genotypes in different irrigation level under controlled condition recorded the high seed yield in genotype ANM-11-63 (1.5) and Co-8 (2.2), respectively with no irrigation level.

Natural Resource Management

Field Crops Improvement & Protection

- A bacterial wilt resistant brinjal line 'CARI Brinjal 2' (Accession No. IC0640704 and Plant Germplasm Registration No. INGR21153) has been registered by Plant Germplasm Registration Committee (PGRC), ICAR-NBPGR, New Delhi.
- Among 15 medium duration elite rice lines evaluated under rainfed lowland conditions, the highest grain yield (t/ha) was recorded (4.35) for ANR 60 and ANR 59 (3.98) compared to check CARI Dhan 6 (3.61).
- Thirteen rice varieties subjected to grain and straw yield with harvest index study revealed highest harvest index (%) for ANR 47 (57.8%), CARI Dhan 7 (51.4 %) and ANR 40 (46.31%). Further, CARI Dhan 4 and CARI Dhan 5 found suitable for grain and straw yield.
- Forty-one BLB resistant back-cross inbred lines (BILs) have been developed from the salt tolerant rice variety, CARI Dhan 5 x BLB resistant line, IRBB 60.
- A long-term study (2011-2021) on IFS for enhancing farm production and productivity in hilly uplands of Andaman Islands indicated 143% increase in average farm income with the net income of Rs.2.32 lakh ha⁻¹ yr⁻¹ and employment generation of 325-man day's ha⁻¹ yr⁻¹
- Plastic mulching in okra recorded maximum plant height and helped to attain early flowering with maximum fruit length (15 cm), no. of fruits (15.5), fruit weight (20 g) resulting in higher yield (311 g plant⁻¹ equivalent of 9.95 tha⁻¹) when compared to subsurface irrigation and hyogel application.
- Application of nano urea as foliar spray to rice recorded 14.4- 16.7 % increase in rice grain yield and saving of 35% fertilizer nitrogen over 100% RDF application.
- Application of 25% aqueous extract of seaweed (*Sargassum wightii*) recorded significant increase in grain yield (21.3 g plant⁻¹) compared to control (15.4 g plant⁻¹) in cowpea.
- The extraction process for dual extraction of seaweed liquid fertilizer (SWLF) and calcium alginate from brown seaweed (*Sargassum wightii*) was standardized.
- Humic substances were extracted by vermicomposting of rice straw (RS), cow dung (CD), sea weed (SW) and fish wastes (FW) mixed in different combinations and analysed using fourier transform infrared (FTIR) spectroscopy. The results indicated that rice straw and cow dung in 1:1 ratio recorded the highest compost recovery (64.8%) in 65 – 70 days followed by RS + CD + SW + FW in 5:3:1:1. No significant differences in recovery rate of humic acid were observed between the treatments which varied from 2.04 to 3.1%.
- A total of 102 agromet bulletins were issued covering all aspects of agriculture production with the help of multidisciplinary advisory team during the year. Analysis of frequency distribution of rainfall showed increase in rainless days and incidences of very high rainfall with decrease in moderate rainfall category.
- Surface (0-15cm) and subsurface (15-30cm) soil samples were collected from different land uses across

the islands and analyzed for different C isotopes viz., C¹², C¹³ and C¹⁴ to assess the soil C dynamics.

- The state specific action plan (SSAP) on water sector launched by MoWR, GOI was prepared. The study showed that precipitation is the only source of fresh water (24747 MCM), of which, 75 % goes as runoff into the sea. The total utilizable water (harvested rain water, soil moisture and surface water resource) is around 4961 MCM (20% of precipitation).

Animal Science

- Primers were designed to amplify two target regions of TLR3 having predicted non-synonymous SNPs and further assessed for polymorphism. However, TLR3 of Nicobari fowl was found to be monomorphic.
- Maternal inheritance of Nicobari pig correlated with the migration of *Nicobarese*. A novel connection of *Nicobarese* with people of Northeastern parts of India, Philippines and Vietnam was established through phylogenetic signal and geographical provenance of Nicobari pig. It was concluded that, migration of *Nicobarese* happened during Western route of migration (WRM) ~ 4000 years before present.
- In an attempt to identify SNPs related to fecundity of Andaman local goat, 18 SNPs specific to higher fecundity (including 5 novel SNPs and 14 SNPs) and 3 novel SNPs specific to poor fecundity were identified.
- Biological experiment was carried out on efficacy of aqueous extract of *Tabernamontana crispa* after preparation of herbal decoction. Both antibiotic and *T. crispa* supplemented group have better body weight compared to control group which indicated growth promoting property.
- Scientific management practices like judicious use of dewormer, use of FAMACHA test system to reduce the probability of anthelmintic resistance, disease monitoring and surveillance and conducting health and awareness camps has been implemented for improving the productivity in goat.
- Probiotics supplementation improved growth performance and lipid profiles in weaned piglets. Moreover, supplementation of a compound probiotics improved antioxidant status and boosted immunity. Therefore, supplementation of probiotics minimizes the weaning stress and improves the growth performance of the piglets; therefore, may be recommended to weaned piglets to fight against stress.
- *E. coli* (43.36%) was the most common extended spectrum β lactamases (ESBL) producer followed by *Klebsiella* spp. (30.94%) and *Salmonella* spp.

(27.48%). On the contrary, the highest percent of Amp C β lactamase producer was *Salmonella* spp. (36.28%) followed by *Klebsiella* spp. (32.04%) and *E. coli* (18.58%). Further, a total of 10.82% isolates exhibited co-existence of ESBL and Amp C β lactamase enzymes. Prevalence of parasitic diseases is observed to be very high in almost all parts of the Islands. Parasitic infection reported were fascioliasis (32.44%), ascariasis (31.9%) and amphistomiasis (15.07%). Prevalence was found to be to more in goat (45.25%) followed by cattle (39.71%), pig (8.3%) and in buffalo (6.66%), respectively.

Out of 728 bovine sera samples screened for presence of *Brucella abortus* antibodies, none of the sample was found positive. During the reporting period, 34 cases of contagious ecthyma (Orf) with attack rate of 15.5% were reported from the goats of two villages of South Andaman.

Fisheries Science

- Carp feeds such as Dweep-Carp Grower Feed and Dweep-Carp Starter Feed were developed.
- A vertical recirculatory model for crab fattening and indoor biofloc unit was designed and developed.
- Technology for larval rearing of freshwater ornamental fancy guppy varieties was standardized.
- Breeding and larval rearing of freshwater ornamental Siamese fighting fish was achieved successfully.
- Value added fishery products like fish pickle, fish wafer and fish pizza and by-products like fish meal were prepared and standardized.

Social Science

- A&N Fish catch mobile app has been developed to collect the real time commercially important marine fish catch data from landing centre. User authentication login page has been developed to allow registered users to login to the site and update the catch data. The app which has been published in Google Play store has the ability to collect species-wise and gear-wise daily landed at landing centre.
- Validation of farmers' perception about climate change revealed that age, education, farming experience, family size, gender, access to irrigation, landholding size, community, etc. influence the farmers' perception about climate change. Logistic regression revealed that farming experience, being a male and being a tribal have significantly influenced the farmers' perception about climate change inferring that, more the farmer is experienced more is his knowledge about the changing climate. Similarly, male farmers perceive more about the

changing climate than the female farmers. Tribal farmers have more knowledge about the changing climate than the non-tribal farmers.

- The indigenous adaptation strategy of dyke vegetable cultivation during summer months increases the land use efficiency, saves water in the trench from evaporation, provides ambient environment for the fishes in the trench, and reduces the irrigation requirement of crops.
- Cross sectional study design was evaluated to identify, attitude towards farming by farmer, aspiration of rural youth participation in agriculture, kind of activities

rural youth wish to participate, socio- cultural factors, challenges that influence the likelihood of youth in agriculture participation. A total of 3 tehsils comprising of 48 villages have been identified for the survey with farmers and youth

Krishi Vigyan Kenas

- A total of 42 training, 17 OFT and 25 FLDs were conducted by KVKs of South Andaman, North & Middle Andaman and Nicobar district, wherein 1193 No of farmers have been benefitted



3. INTRODUCTION

ICAR - Central Island Agricultural Research Institute (CIARI)

ICAR -Central Island Agricultural Research Institute (CIARI) formerly Central Agricultural Research Institute (CARI) was established on 23rd June 1978 by merging different Regional Research Stations of the ICAR Institutes at Port Blair viz., Central Marine Fisheries Research Institute, Indian Veterinary Research Institute, Indian Agricultural Research Institute, and Central Plantation Crops Research Institute. During October 1989, the Regional station of CPCRI located at Minicoy, Lakshadweep Islands was merged to this Institute to serve as a Regional Station of CARI. This Lakshadweep centre was later transferred to CPCRI in late 1994 and then again brought back under CIARI from April 2017 as Regional Station.

ICAR- CIARI is conducting research work for the farming community of these Islands. The Institute has five research divisions viz., Horticulture and Forestry, Animal Science, Fisheries Science, Natural Resource Management and Field Crops improvement & Protection and a Section of Social Science.

The main research-cum-residential complex located at Garacharma, 9 Km away from Port Blair houses the Director's Office, Administrative Block and a Central Laboratory Building besides research farm. The Institute has four research farms. (i) Garacharma farm of 62 ha. area, where works on field crops, horticulture, animal sciences and fresh water fisheries are carried out. (ii) Sippighat farm having an area of 32 ha. where research work on horticulture is carried out. (iii) Bloomsdale Farm which has flat lands of 3.5 ha. and this is used for research works of natural resource management and field crops divisions. (iv) Marine Hill Research Laboratory has a sea front hatchery facility and a fisheries informatics lab.

An Out Reach Centre of the Institute funded by NABARD established at Diglipur was operational from 15th July, 2009 to till the establishment of a new KVK in North & Middle Andaman during 2012. The Institute has three KVKs, one at Port Blair established in 1993, another at Nicobar established in 2010 and the latest one at Nimbudera established in 2012. The KVK at Kilton Island in Lakshadweep was transferred to this Institute in 2016, and later shifted under the administrative control of ICAR-CMFRI, Kochi during 2018.

3.1 Mission

To provide decent livelihood to farm youth from agriculture in a fragile Island ecosystem on sustainable basis.

3.2 Vision

The Institute envisages developing agri horticulture, livestock and fisheries sector in a sustainable way through technological innovation in the changing climatic scenario to ensure decent livelihood in the fragile Island ecosystem.

3.3 Mandate

- To provide a research base to improve the productivity of agri-horticulture, livestock and fisheries of Andaman & Nicobar and Lakshadweep group of Islands through basic, applied and adaptive research
- Conservation, characterization and sustainable utilization of natural resources and harnessing through post harvest and value addition
- To standardize technologies for health coverage and bio security of plant, animal and fishery resources
- To standardize techniques for capture and culture fisheries including coastal aquaculture
- Vulnerability studies of Island ecosystem and adaptive strategies to develop climate resilient agriculture
- Transfer of technology, capacity building, policy support and market intelligence to stake holders

3.4 Thrust Areas

Broad research programmes are as under:

- Conservation and utilization of Island biodiversity
- Enhancing the productivity of agriculture, livestock, and fisheries sector
- Management of biotic and abiotic stress
- Frontier research for knowledge and increased productivity
- Post-harvest technology and value addition
- Water resource development and utilization

3.5 Organisational Set up

Administration of the institute rests with the Director, who receives support from both research divisions and administration. The Research Advisory Committee (RAC), Institute Management Committee (IMC) and Institute Research Council (IRC) reviews and monitor the research programmes and facilitates to identify new research thrust areas for the Institute.

3.6 Staff Position

Sl. No.	Category	Sanctioned	Filled
1	Scientist	44	33
2	Technical	43	27
3	Administrative	25	21
4	Supporting	66	64
Total		179	145

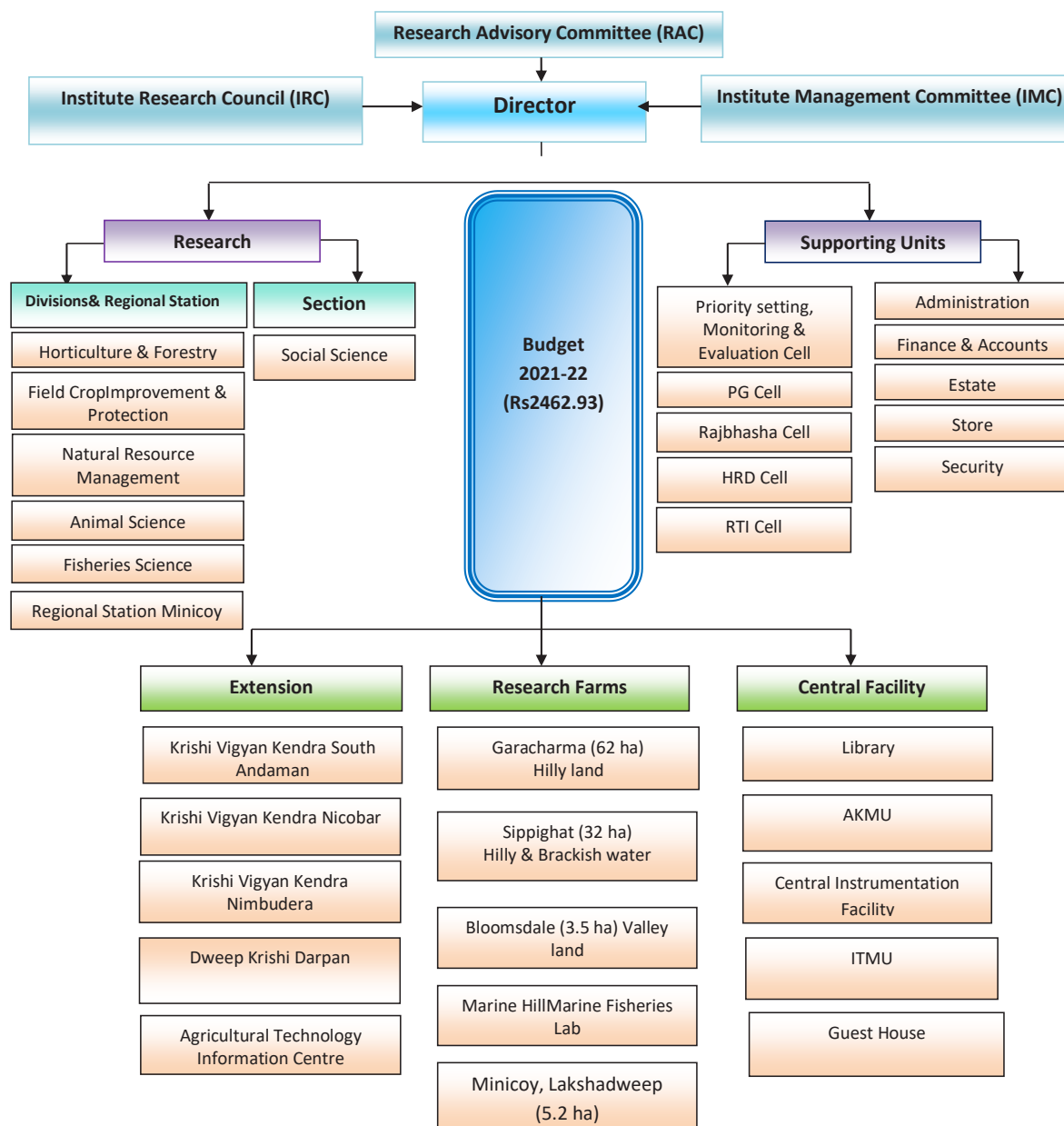
3.7 Budget 2021-22 (Rs. in lakhs)

Head	Sanction	Expenditure
Grant in aid – Capital	66.50	66.38
Grant in aid – Salary	1824.94	1824.59
Grant in aid – General	571.49	570.98
Total	2462.93	2461.95

Revenue (Rs in lakhs)

Target	Achieved
27.00	47.16

Organogram



RESEARCH ACHIEVEMENTS

DIVISION OF HORTICULTURE & FORESTRY



Plantation and spice crops

Coconut genetic resources management

The first-generation palms of thirty conserved coconut accessions at World Coconut Germplasm Centre (WCGC), which includes 24 accessions collected from Pacific Ocean Islands (*viz.*, Solomon Islands, Fiji, Papua New Guinea, French Polynesia, American Tonga and Samoa) and six accessions from Nicobar Islands were continued to be conserved in the field gene bank at Sipighat farm of the Institute.



Plate 1:- Selected palm of Acc 21/65 from WCGC with better mother palm and desirable traits

The selected palms of identified accessions are being utilized for pollination programme aimed at germplasm multiplication and crop improvement. Six accessions *viz.*, Rennel Tall, Katchal Tall, Auck Chung Tall, Tahiti Tall, Tamaloo Tall and Pao Pao Tall were identified for further utilization in crop improvement considering the desirable traits such as higher fruit yield, kernel weight, higher recovery of Virgin Coconut Oil and desirable palm features. Further, superior palms were identified for seed nut production for germplasm multiplication and use in crop improvement programme from Acc. 21 (7 palms); Acc. 11 (2 palms); Acc. 9 (3 palms); Acc. 2 (2 palms); Acc. 1 (2 palms); Acc. 24 (2 palms); Acc. 14 (3 palms); Acc. 26 (1 palm); Acc. 5 (1 palm) and Acc. 18 (2 palms). Plate 1 shows one of the selected palms Acc. 21/65.

Fatty acid profiling of 35 coconut accessions including thirty WCGC accessions, Andaman local tall and dwarf



Plate 2:- Fruit diversity in Kurmadera population of coconut

accessions revealed variations for fatty acid composition in the virgin coconut oil (VCO) derived through fermentation method. Lauric acid ranged from 49 to 62%, myristic acid ranged from 17 to 27%, while palmitic acid ranged from 5.7 to 11.2% leaving the scope for selection of coconut types for specific fatty acid content.

An exploration was undertaken in Kurmadera coconut population, which comprised of well-aged palms of Andaman coconut population. Wide variability was noticed for husk, kernel, shell, fruit and yield characteristics. High wind tolerance and bunch retention on the crown after maturity was also observed in the collections.

Intra-population analysis in coconut

Observations on mother palm traits of selected Niu Leka Green Dwarf continued for development of homogenous population. Data on fruit component revealed kernel weight ranged from 380 g to 590 g among the studied Niu Leka palms. Palm morphology and flowering observations continued in the Niu Leka Dwarf with orange-coloured fruits, which was identified as unique genetic stock from Niu Leka Green dwarf population. Observation and seed nut collection in the palm 5/39 continued, which showed 470 ml of tender nut water from orange coloured 7 months old fruits.

The conserved population of Andaman Ordinary Tall at Sipighat farm of the Institute showed significant variation for leaf morphology, inflorescence traits and fruit production. Based on the performance of desirable and typical traits of Andaman Ordinary Tall, a group of 37 palms (Numbers: 2, 3, 4, 5, 15, 17, 21, 22, 27, 29, 38, 39, 43, 46, 47, 49, 55, 67, 83, 90, 92, 107, 111, 127, 137, 157, 158, 163, 166, 167, 169, 183, 185, 186, 187, 188 and 255) were selected for further exploitation for crop improvement. The selected palms recorded an average number of 35 to 42 leaves on the crown, 18 to 21 bunches on crown with fruits/buttons, 9 to 18 nuts per bunch, oblong fruits, mixture of green and brown fruits, kernel weight over 400g per fruit. The average estimated annual fruit yield of the selection ranged between 110 to 152 with a mean of 126 fruits



Plate 3:- A high yielding palm of Andaman Ordinary Tall

under rain fed conditions of Andaman Islands. The average estimated copra out turn of the selection was recorded as 27.6 kg per palm year with copra content of 219 g per fruit.

Varietal Improvement

Proposals for release of dwarf varieties selected from Andaman Green dwarf and Andaman Yellow Dwarf were approved by Institute Research Committee (IRC) during April 2021 and were christened as Dweep Haritha and Dweep Sona respectively by IRC. These varieties (Plates 4 to 7) have been identified as potential high yielders suitable for tender coconut purpose under Island conditions. Matured fruit yield estimation was carried out in selected palms, which revealed the yield of 115 to 160 per palm per year. Seedling characterization was undertaken in selected varieties. The observations revealed robust and vigorous nature of Andaman Yellow Dwarf followed by Andaman Green Dwarf, whereas seedlings of CIARI Omkar were the thinnest and slow growing. Higher mean collar girth of 14.8 cm at one year age was recorded in CIARI Annapurna. The number of leaves and number of split leaves were better in Andaman Yellow Dwarf followed by CIARI Surya and Andaman Green Dwarf.

As a token of genetic characterization, SSR fingerprints of dwarf coconut varieties are completed and documented in collaboration with ICAR-CPCRI, Kasaragod. Results of molecular analysis for finger printing of CIARI Annapurna, CIARI Omkar, CIARI Surya and CIARI Chandan were compiled for inclusion in the release proposals based on the work conducted at ICAR-CPCRI, Kasaragod.



Plate 4:-Fruit bunch of *Dweep Haritha*



Plate 5:- Fruit bunch of *Dweep Sona*



Plate 6:-Fruit component in *Dweep Haritha*



Plate 7:-Fruit component in *Dweep Sona*

Coconut Hybrid Evaluation

Evaluations of coconut hybrids revealed that, CARI Annapurna x ADOT recorded maximum girth of stem (146 cm), longest leaf (344 cm) and higher number of leaflets on one side (104) in D x T cross while AOD x CARI Annapurna recorded maximum girth of stem (170 cm), longest leaf (438 cm) and a greater number of leaflets on one side (123) followed by AGD x AYD among the D x D crosses. The hybrid palms are under various stages of growth and development. Hybridization work has been initiated during the month of October 2021 in selected dwarf accession viz., 5, 8, 18, 22, AOD and AYD as female parents and Andaman Ordinary Tall as male parents and 555 female flowers were pollinated in six Dwarf x Tall crosses and the result is awaited.

Arecanut Genetic Resources



Plate 8:- Height increment differences at three leaf stage of AAD-1 and Samrudhi

Characterization of a dwarf arecanut AAD-1 was continued which was collected and conserved at ICAR- CIARI. Observations on seedling parameters revealed that more than 80% of the progenies of these dwarf type palms were uniform for seedling traits such as germination, seedling height, number of leaves and collar girth. The progressive growth rate of AAD-1 seedlings was compared with Samrudhi and Mangala arecanut seedlings. Significantly lower height increment was noticed in AAD-1 in 11 months, whereas number of leaves produced was non-significant indicating the dwarfness of AAD-1 at early seedling stage itself (Table 1). The AAD-1 seedlings showed 50 % lesser height in the initial stages of growth upto 3 to 4 leaf stage and also recorded higher collar girth and produced dark green leaves than Samrudhi and Mangala (Plate 8). Preliminary observations on growth parameters recorded in the compact block of this dwarf arecanut along with the hybrids using Dwarf with local and the local tall have revealed marked differences in the leaf length, petiole length, leaf lamina and palm height. The hybrid seedlings have exhibited vigorous growth over the dwarf parent. About 200 seed nuts were sown in poly bags nursery for seedling production to establish a new block of dwarf arecanut at the Institute.

Table 1. Seedling traits of arecanut accession

Traits/ accession/ Days of observation	AAD-1				Samurdhi				Mangla			
	150	210	270	330	150	210	270	330	150	210	270	330
Plant height (cm)	33.8	41.4	47.8	57.2	50.1	56.3	62.8	70.5	52.2	59.1	66.3	75.6
Girth (cm)	3.67	4.01	4.32	4.76	3.28	3.54	3.85	4.11	3.64	3.98	4.32	4.68
No.of leaves	3.2	4.1	3.6	4.2	3	4.1	3.8	3.6	3.1	4.7	4.1	3.8
Leaf length (cm)	15.4	22.1	28.1	32.2	22.6	27.4	29.7	32.2	22.5	27.1	30.8	33.8
Leaf width (cm)	9.09	10.3	12	13.6	10.6	11.7	12.3	13	12.3	12.7	13.6	14.2

Arecanut product diversification

The traditional methods of drying and dehusking of arecanut by the farmers and traders of arecanut in A& N Islands have been documented. The harvested arecanut fruits with their husk are kept in gunny bags for about 5-7 days and allowed for fermentation. During this period, the water from husk oozes out and the fruits turn into dark coloured. Afterwards the fruits are spread in thin layers for 7 to 10 days under open sun depending upon the intensity of sunlight either in cement concrete floors on open areas or on roof top with or without tarpaulin for complete drying. Intermittent stirring is done periodically every day for uniform drying. The dried arecanut are then husked manually with the help of dao (a bent knife of varying sizes) and hammer. As per the estimates of the farmers and entrepreneurs, an unskilled worker can husk arecanut fruits

to produce about 15 kg challi in 7 hours per day while the skilled worker can husk the fruits to produce about 40-50 kg challi per day. Usually the workers are paid @ Rs 15/- kg of dehusked chali. The whole husked nuts are then packed and sent for market.

Performance evaluation of improved varieties of cinnamon as intercrop

A study was initiated to identify suitable varieties of cinnamon for large scale cultivation in the arecanut plantations. Five improved varieties were evaluated for growth parameters (Table 3) and chlorophyll content. Variety Konkani Tejpatta showed lowest growth characteristics such as plant height (47.4 cm), collar thickness (12.4 mm) and canopy spread (54.0 cm and 38.2 cm). Yercaud- 1 and local check showed superior growth characters. Further, highest accumulation of total chlorophylls (1195.8 mcg/g) were observed in the variety Yercaud- 1.

Table 2:-Plant growth in different varieties of cinnamon grown as intercrop in arecanut plantation

Variety	Plant height (cm)	Collar thickness (mm)	Canopy spread (cm)		No. of branches
Konkan Tejpatta	47.4 ± 3.12	12.4 ± 1.40	54.0 ± 7.92	38.2 ± 7.05	5.0 ± 1.00
Konkan Tej	79.7 ± 7.41	21.7 ± 0.33	68.3 ± 7.40	71.2 ± 4.33	11.0 ± 0.58
Yercaud-1	102.2 ± 10.57	29.3 ± 1.83	114.7 ± 5.99	107.4 ± 5.09	8.3 ± 1.45
IISR- Navasree	69.6 ± 10.97	17.3 ± 4.09	81.0 ± 12.63	57.5 ± 5.78	5.3 ± 0.88
IISR- Nityasree	60.4 ± 14.48	19.7 ± 4.37	55.1 ± 10.45	57.5 ± 9.33	4.7 ± 0.88
Local	115.7 ± 20.36	24.7 ± 4.67	106.2 ± 28.15	96.9 ± 24.57	12.0 ± 3.06

Table 3:-Chlorophyll content in different varieties of cinnamon grown as intercrop in arecanut plantation

Variety	Chl. a (mcg/g)	Chl. b (mcg/g)	Total chl. (mcg/g)
Konkan Tejpatta	805.9 ± 27.93	182.9 ± 41.24	988.8 ± 67.97
Konkan Tej	896.5 ± 47.24	201.8 ± 10.47	1098.2 ± 36.93
Yercaud-1	964.7 ± 36.06	231.1 ± 46.76	1195.8 ± 80.14
IISR- Navasree	817.6 ± 37.54	157.7 ± 47.49	975.3 ± 84.02
IISR- Nityasree	857.0 ± 42.40	147.0 ± 7.27	1004.0 ± 48.69
Local	791.7 ± 19.31	194.3 ± 31.44	985.9 ± 46.00

Effect of substrates and foliar nutrition on culantro in Dweep ProDhaniya system

Studies on effect of substrates and foliar nutrition on growth, yield and quality of culantro grown under Dweep ProDhaniya system were conducted. Superior herb yield

and photosynthetic pigment accumulation were observed, when vermicompost and soil (1:1, v/v) was used as a substrate. Treatment combination with vermicompost and soil (1:2, v/v) as substrate exhibited higher content of ascorbic acid and total carotenoids. Foliar application of

urea (0.1%) at fortnightly interval supported plant growth, yield and quality parameters.

Culantro as a profitable intercrop in arecanut plantations

Herbal spices-based cropping system models were evaluated in Arecanut 'Samrudhi' plantations under South Andaman condition. Of the crops studied, incorporation of culantro in the interspaces could give higher net returns than arecanut sole crop. The B:C ratio of this treatment was found to be 3.19 and hence, it was recommended for island condition.

Collection and characterization of Cinnamon (*Cinnamomum verum*)

True cinnamon is highly suitable crop for commercial scale cultivation in the islands. However, the existing populations are of seedling origin thereby causing variability in the produce. In order to tap the natural diversity of this spice, 24 collections were shortlisted based on colour of new flush for further evaluation. The collections were studied for various bark characteristics. Significant variations were observed in the studied collections for fresh peel thickness (0.79- 1.44 mm), dry peel thickness (0.40-0.97 mm), fresh bark weight per m stem length (81.0- 243.7 g), dry bark weight per m stem length (31.4- 115.9 g) and drying percentage (36.1-48.6%). Ease of peeling the bark is of utmost importance in cinnamon and hence, this character was also considered for scoring. Of the studied collections, nine were easy to peel type, while one was difficult to peel type.

Collection and characterization of Tejpat (*Cinnamomum tamala*)

Indian Bay Leaf or tejpat is a popular crop among the island farmers. In general, no improved varieties are available for cultivation in this crop. In order to explore the possibility of identifying superior collections of this spice, surveys were conducted and eight collections from South Andaman Island and one collection from North Andaman were identified for further evaluation. Air layering has been done to multiply these collections for further elaborative studies.

Biochemical characterization of Woody pepper

Woody pepper is a novel spice identified for cultivation in the Andaman Islands. Biochemical studies were conducted in the stem of this spice to know its chemical composition. Piperine content was estimated using liquid chromatography in thick and thin samples dried using two methods. Results revealed that, piperine content was higher in thicker sized stems than the thinner ones. Further,

piperine content was higher in vacuum ied samples than the oven dried samples. Phenolic profiling of samples collected from North Andaman was carried out through Liquid Chromatography – Mass Spectroscopy. Results revealed presence of 18 phenolic compounds, of which dominant was ferulic acid. The compound was found to be present at higher concentrations in thicker stems than the thin stems studied. Further, the concentration of ferulic acid was higher in oven ied samples than the vacuum ied samples.

Collection and conservation of *Piper* species

Bay Islands hold rich diversity for the genus *Piper*. Natural population of many *Piper* species have been noticed in the islands and some of these species are commonly being used for variety of purposes. In order to collect the natural diversity of *Piper* species from the islands, explorations were carried out. Planting material of five collections of *Piper sarmentosum* from North and Middle Andaman Islands and one from South Andaman were collected. Rooted cuttings of an accession of woody pepper from Nimbudera and unrooted cuttings from one accession from Sitanagar, Diglipur were also collected for further studies

Identification of plus trees of Clove



Plate 10:-Leaf traits of CIARI Clove-1 compared with unselected tree and Harvested bold buds from the plus tree

From the seedling progenies of clove conserved at Sippighat farm, superior trees were selected based on desirable traits viz. early flowering, regular bearing, bold buds and higher clove yield. Characterization of the group of selected trees revealed broader and darker green leaves, medium canopy

volume, higher number of branches, higher number of leaves, more flowers, regular flowering, when compared with the general population. The average yield of identified trees (2007 planted) ranged from 1.8 kg to 3.85 kg dry buds per tree per year (average 2.5kg) under rainfed conditions. The regular bearing superior trees selection comprising of six trees has been named as CIARI Clove-1 and identified for further exploitation in varietal improvement.

Establishment of mother block of cinnamon

The seedlings of cinnamon were raised from identified elite mother plants at Sippighat farm and mother block of cinnamon was established at experimental field of Garacharma farm.

Biochemical analysis of Tisal (*Zanthoxylum rhetsa*) collections

Biochemical studies were carried out in tisal (*Zanthoxylum rhetsa*), which is a minor spice traditionally used in Goa, under a collaborative project. Essential oil content in the dried peel of tisal varied between 6.0 and 8.4% among seven collections, while oleoresin content varied from 8.86 to 12.22%. Phenolic acid profiling using LC-MS revealed dominance of Ferulic acid in the dehydrated fruit peel, which is the economic part of the plant.

Fruit crops

Collection and characterization of Banana variety Korangi

Korangi is a popular local banana grown in Andaman group of Islands. It has dark yellow colour pulp which is rich in carotenoids. To identify superior genotypes of this banana variety, field surveys were undertaken in the North and Middle Andaman Islands. Three collections from Middle Andaman and one from North Andaman were carried out and suckers of these collections were brought to the institute.

Augmentation and characterization of germplasm of fruit crops

Two improved varieties viz. Pusa Abhinav and Kagzi Kalan were collected from ICAR-IARI, New Delhi, while three local accessions of acid lime were collected from different parts of the Island and conserved. Five local pummelo accessions were identified and characterized under *in-situ* condition. Of these, two accessions were seedless while pulp colour varied from light pink to dark pink. The total soluble solids content was high (9.2 °Brix) in pear-shaped fruit accession collected from North and Middle Andaman and had good aroma. Fruit weight ranged from 0.66kg to 1.20 kg in different accessions. The rind thickness varied among the accessions with number of segments ranging

from 11 to 13 in each fruit. Seed germination studies were conducted; however, no germination was observed.



Plate 12:- Pummelo accessions collected from Andaman Islands

Genetic diversity analysis of *Musa* germplasm using molecular marker

Dendrogram and phylogenetic signalling of 27 *Musa* genotypes including cultivars of mainland India and the wild relatives of Andaman and Nicobar Islands by UPGMA using Jaccard's similarity of co-efficient was generated from 8 SSR marker by UPGMA using Jaccard's similarity of co-efficient. Two major clusters, Cluster I and II were obtained with 16 and 11 *Musa* genotypes at Jaccard's similarity co-efficient of 0.13, respectively. Cluster I was further divided into sub-clusters, Ia and Ib at Jaccard's similarity co-efficient of 0.2 with 6 [Khatta Champa - KC (NB1); Cheena Kela - CK (CQ); Wild banana - WB (NVC); Nenan Cheena kela - CK (NB); Grand Nain] and 10 [Red banana; Khatta champa; Monthan; Cheena kela - CK (C); *Musa balbisiana* - MIA (1C); Korangi (C); Ornamental banana [OB (Oxz); Ney poovan; *Musa balbisiana* - MIA (2C); Elakki] *Musa* genotypes, respectively. Cluster II was further divided into sub-clusters, IIa and IIb at Jaccard's similarity co-efficient of 0.27 with 7 [Robusta; Wild banana - WB (*Musa balbisiana*); Wild banana - WB (*Musa indandamanensis*.); Korangi (A); Wild banana - WB (SG2); Poovan; Virupakshi] and 4 [*Musa indandamanensis* - MIA (3A); Ornamental banana - OB (Rx2); Katta champa - KC (NB2); Wild banana - WB (SG1)] *Musa* genotypes, respectively.



Plate 13:- Varietal evaluation of banana – field view

Observational trial on evaluation of banana varieties

Five varieties viz., Grand Naine, Poovan, Ney Poovan, Monthan and Red Banana were evaluated at different seasons of planting viz. March, May and July. Among all the varieties, early fruiting was observed in varieties Ney Poovan (294.3 days) and Poovan (301.8 days). Maximum bunch weight was recorded in the variety Monthan (15.23 kg). Fruiting was delayed in the variety Red Banana and significantly higher yield was recorded in May planting.

Evaluation of new varieties of banana



Plate 14:- Field view of Dwarf Cavendish

Four new banana varieties released from ICAR-NRCB, Trichy viz. Kaveri Saba, Kaveri Kalki, Kaveri Haritha and Udayam were procured and evaluated for their growth and yield performance. Among the four varieties, early fruiting was observed in Kaveri Haritha. The bunch weight ranged from 12 to 14 kg with 5- 6 hands per bunch. Weight of third hand ranged from 2.0 to 2.5 kg with 10-12 fingers per bunch. Further, the varieties were evaluated in zero input management system and cooking characteristics were also found to be good.

Identification of a high yielding banana accession



Plate 15:- High yield banana accession

A local banana accession (JDSB-2009-1) which was collected during 2009 and evaluated at experimental farm for past three years was found to be high yielding than the other local and commercial varieties grown in the Island. This collection is found to be suitable as a table variety due to its taste similar to red banana. The ripe fruits have

yellow peel but the pulp traits are similar to Red Banana cultivar. The collection seems to be a mutant of Red banana. The biochemical analysis of the ripe fruits showed high TSS(22.4 °B) and also was rich in flavonoids(62.92 mg/100g). The bunch weight varied from 19.2 Kg to 21.8 Kg with 6-7 hands per bunch. The number of fingers ranged from 16 to 18 per bunch. Finger weight ranged from 165 to 190 g.

Susceptibility of *Musa sabuana* (syn. *M. indandamanensis*) to BBTV

Musa sabuana, an endemic wild banana found distributed in the islands is known to bear fruits with high carotenoids content and fertile seeds. A plant of this species was observed to have morphological symptoms resembling that of Banana Bunchy Top Virus(BBTV), which was further confirmed by simplex PCR using BBTV specific sense and antisense primers.

Biochemical characterization of Andaman Kokum (*Garcinia dhanikhariensis*)

Biochemical analysis of peel of Andaman Kokum was carried out using Liquid Chromatography- Mass Spectroscopy. Results suggested potential of this endemic species as a novel natural colourant. Cyanidin was identified as the dominant anthocyanin. Phenolic acid profiling of its two distinct collections revealed variations in terms of presence of phenolic compounds. *P*-Coumaric acid and Gentisic acid were found to be the dominant constituents. Further, peel was also found to be a novel source of pharmaceutically valuable hydroxycitric acid.

Collection and conservation of Andaman Kokum (*Garcinia dhanikhariensis*)

During the period, four new collections of endemic *Garcinia dhanikhariensis* were identified from South Andaman Island and fruit physicochemical evaluation was carried out. The existing *Garcinia* conservation block of the institute was enriched with four species during the rainy season. Plants have been established well.

Postharvest studies in hog plum and Malabar tamarind

Physicochemical changes occurring in fruits of hog plum (*Spondias dulcis*) during different phenological stages were studied. While TSS, pH and ascorbic acid content of fruits increased with advancement in maturity from green mature to yellow ripe stage, moisture content showed a declining trend. Post-harvest treatment of Malabar tamarind (*Garcinia gummi-gutta*) fruits with calcium chloride significantly improved the shelf life over untreated control at ambient condition of storage.

Fruit set through Hand pollination in dragon fruit

Four genotypes of two different *Hylocereus* species (*H. costaricensis* and *H. undatus*) were observed for effect of artificial pollination with same genotype/ cross combinations among four genotypes on fruit setting and yield. Fruit setting from artificial hand pollination with cross combinations, same genotype and by natural pollination ranged from 86.7 to 100.0, 63.0 to 75.0 and 19.4 to 32.5, respectively. Hand pollination done in different cross combinations showed significantly higher average fruit setting (94.2%) compared to hand pollination with same genotype (68.3) and by natural pollination (24.2). Low fruit setting and yield were observed from natural pollination. Suitable timing of artificial hand pollination for better fruit setting and yield was 8.30 pm to 9.30 pm on same day of anthesis under South Andaman conditions. Maximum fruit size (13.5 cm length, 30.5 cm breadth and 678.4 g weight) was observed in the cross combination DGF 2 (Pink pulp) × DGF 5 (white pulp with pink tinge). Thus from this study this may be concluded that, artificial pollination will help in increased fruit set and yield in dragon fruit. Hence, it is advisable to grow mixed genotypes of dragon fruit with hand pollination in different cross combinations for commercial production.



Plate 16:- Fruit set in hand pollination

Pruning studies in Guava

Pruning studies were conducted in guava 'Lalit' (two-year-old trees) with three treatments viz. control (No pruning), tip pruning and pruning to half the length of branches



Plate 17 :- Pruning techniques in guava

during the month of October, 2021. Early fruit set and greater number of fruits (31 per plant) were observed in tip pruning method with no fruit set in control.

Germplasm collection and characterization in Passion fruit

One better performing passion fruit accession (IC-0641086) is conserved at ICAR-CIARI Garacharma research farm having violet peel with medium sized fruits (Plate 18). The fruit morphological observations revealed that, the average single fruit weight was 60 gm, percentage of seed was 27.25 and fruit juice recovery percentage was 36.



Plate 18:- Cross section of passion fruit accession

Vegetable and Tuber Crops

Collection, conservation and characterization of vegetable and tuber crops

Identification of better performing vegetable lines

Evaluation and seed production was undertaken in 12 accessions of okra received from ICAR-NBPGR. The accessions were evaluated for growth, development, and yield. The accession EC-930080 performed better followed by EC-901970 and IC-506207 in terms of growth, shorter internodes, and fruit production. From the varietal evaluation, the hybrid, Arka Nikitha was found to be better for plant height, number of leaves in 90 days duration, fruit length and fruit yield over Arka Anamika. The average fruit yield per plant ranged from 300 to 520 g in Arka Anamika whereas Arka Nikitha recorded 650 to 900g. The fruit length was shorter with more fruit diameter, fruit colour was darker green in Arka Nikitha than Arka Anamika (Plate:-19). The yellow vein mosaic disease incidence was 20% and 45% in Arka Nikitha and Arka Anamika, respectively at 90 days of sowing. One wild relative of Bhendi, called *Maravendai* (*Abelmoschus caillei*) was collected and established which is reportedly perennial in nature. The plants flowered in about 7 months after sowing at a height of over 2.1 m and further result is awaited.

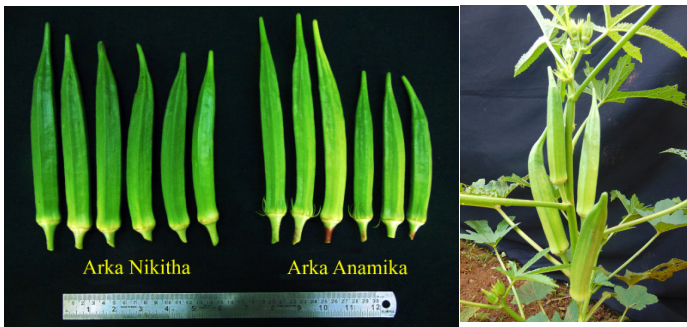


Plate 19:-*Arka Nikitha* and *Arka Anamika* performance

Seeds were extracted from 30 local collections of brinjal and stored for further use in evaluation. These accessions exhibited wide variations for traits such as fruit weight, fruit size, plant height, plant spread, days to 50% flowering and susceptibility to shoot borer.

Seven Chilli accessions (four *Capsicum frutescens* and three *C. annuum* types) collected from Andaman and Nicobar Islands were studied for fruit yield and tolerance to pests and diseases. The yield of chilli among the four identified accessions of *C. frutescens* ranged from 600g to 900g per plant in 210 days duration under organic system of pot cultivation. The range among the *C. annuum* types was from 720 to 870g per plant. The accession Cf-3 (originated from Car Nicobar) was found to be superior for fruit size, attractive colour, fruit yield and freedom from pests and diseases. The accession, Cf-2 (from Niocbar) recorded very small fruits with only two or three seeds per fruit. The *C. frutescens* type plants were observed to be free from anthracnose disease infection and thrips infestation upto 150 days of duration



Plate 20:- *C. annuum* and *C. frutescens* types selected

Seedlings of Bread nut and air layers of Bread fruit plants were field planted for further conservation and evaluation. The fruit developmental stages of Bread fruit were observed to standardise the maturity index. Preliminary observations indicated time taken from fruit set to full ripening to be about 90 to 130 days. Fruit yield was positively related to the age of trees canopy size and number of branches in Bread fruit trees and number of leaves which was revealed from the observations taken from adult trees available at farmers' gardens. An attempt was made to use the sliced bread fruit for preparation of Bread fruit flour.

Seed production and Evaluation of leafy vegetables

Leafy vegetable viz. palak (*Arka Anupama*), coriander (*Arka Isha*), radish (*Arka Nishant*) and Amaranthus (*Arka Arunima*) were evaluated to study the growth and yield performance under poly house (Plate 21). The average green biomass yield (per m²) of 1.30 kg, 0.78 kg, 1.20 kg and 2.25 kg were recorded from palak, coriander, radish and amaranthus respectively. Further, the green biomass yield of *Hibiscus sabdariffa* (khatta bhaji) (3.75 kg/m²) and *Corchorus olitorius* (pat baji) (1.12 kg/m²) were recorded in open field condition. Seed production was taken up in seven Amaranthus accessions comprising five local collections and two released varieties of CIARI, one *Corchorus olitorius* accession and CIARI Broad Dhaniya-1. Seventeen trees of Mitha Baaji which are conserved at Sippighat farm was identified for further exploration and promotion as perennial leafy vegetable, unique from Andaman. Efforts are on to multiply the genetic material through seeds and cuttings. *Cissus repens* a traditional leafy vegetable accession (AJ 66) was identified and seed/cuttings were collected for its multiplication and further evaluation. One meter length of the vine recorded 85 g of green leaves and 21 g of leaf dry weight. Mean number of leaves per meter length was 19, mean width of leaf (2.8 cm) and mean length of leaf (3.7 cm) was recorded. Better rooting percentage was observed in vine cuttings treated with 200 ppm IBA.



Plate 21:- Leafy Vegetables under poly house cultivation

Morphology and biochemical diversity of *Drynaria quercifolia* (L.) J.Sm.

Collections of *D. quercifolia* rhizomes from nine different host plant (habitat) showed significant differences for morphological characters. Superior rhizome length (127.27 cm), fresh weight of rhizome (2290.00 g) and dry weight of rhizome (917.24 g) was recorded in the collection from coconut followed by *Crypteronia paniculata* host (129.00 cm, 1906.00 g and 743.81 g, respectively). The lowest values (89.67 cm, 289.70 g and 94.01 g respectively) were recorded in the fern collected from *Rhizophora mucronata* as a host plant. Biochemical variability among the collected rhizomes and skin showed significant differences.

The highest phenolic content (91.13 mg/100g and 92.87 mg/100g, respectively), flavonoids (96.70 mg/100g and 78.43 mg/100g, respectively) in rhizome and skin were obtained in the rhizomes collected from *Crypteronia paniculata* host plant. The highest tannin (192.00 mg/100 g and 219 mg/100 g, respectively), saponin (192.50 mg/100g and 183.27 mg/100g, respectively) and reducing sugar (384 mg/100g and 379.67 mg/100g, respectively) were observed in the fern collected from *Mangifera indica* host plant. The highest carbohydrate (2045.33 mg/100g; 1910.87 mg/100g respectively) and protein (3.57; 3.70% respectively) was recorded in the fern collected from *Rhizophora mucronata* as a host plant. *Drynaria quercifolia* accession was submitted to the ICAR-NBPGR, New Delhi and IC number (IC 0641112) was obtained.

Vegetable Evaluation trials under All India Coordinated Research Project

Brinjal:

Brinjal (long) AVT-I trial consisting of nine entries were evaluated in which highest yield (189.47 q/ha) was recorded in 2019/BRLVAR-5 followed by 2019/BRLVAR-2 (147.10 q/ha). Of the eleven entries evaluated under brinjal long AVT-II trial, the highest yield of 171.80 q/ha was recorded in 2018/BRLVAR-4. In brinjal long IET trial, the highest yield of 203.20 q/ha was observed in 2020/BRLVAR-3 of the twelve entries evaluated. In brinjal round AVT-I trial, a total of thirteen entries were evaluated of which 2019/BRRVAR-15 recorded the highest yield of 193.45 q/ha. In brinjal round IET trial, a total of nine entries were evaluated of which 2020/BRRVAR-4 recorded the highest yield of 217.20 q/ha. Of the six entries evaluated under Brinjal Hybrid (Long) AVT-I trial, the highest yield of 236.94 q/ha was recorded in 2019/BRLHYB-6. In Brinjal Hybrid (Long) AVT-II trial, 2018/BRLHYB-6 recorded the highest yield of 233.89 q/ha. In Brinjal Hybrid long IET trial, 183.34 q/ha yield was observed in 2020/BRLHYB-3. In brinjal hybrid round AVT I trial, entry 2019/BRRHYB-6 recorded the highest yield (212.27 q/ha) was recorded in. In Brinjal Hybrid Round AVT-II trial, of the nine entries evaluated, highest yield (206.50 q/ha) was observed in 2018/BRRVAR-8. In Brinjal Hybrid Round IET trial, 2020/BRRHYB-3 recorded the highest yield (237.37 q/ha).

Tomato:

During the reporting period, Tomato Determinate AVT-I, Tomato Determinate- AVT-II, Tomato (indeterminate) AVT II, Tomato (TOLCV) Hybrid AVT - I Tomato Hybrid Determinate- IET, Tomato ToCLV hybrid IET, Tomato hybrid Determinate- AVT-I, Tomato hybrid Determinate-IET, and Cherry Tomato – AVT-I trials were undertaken.

Yield attributing parameters and bacterial wilt (BW) incidence (%) were recorded. Among the trials, Tomato ToCLV Hybrid IET performed well with fruit yield of 220q/ha in 2020/TOLCV HYBRES-5 entry. In the cherry tomato AVT –II trial, the highest yield of 130q/ha was recorded in the entry 2018/TOCVAR-5.

Garden Pea:

Trials were conducted for Garden pea viz. Pea (Early) – AVT I, Garden Pea (Mid) – AVT- I Peas (Mid Season) Powdery Mildew AVT I. Garden Pea (Mid) – AVT- I performed well under Island condition. The highest pod yield of 14.25 q/ha was recorded in 019/PMVAR-6.

Tuber crops

ICAR-CIARI is one of the voluntary centres of AICRP on Tuber crops contributing significantly to the conservation and utilization of tuber wealth of Islands. The Centre has been adjudged as the Best Centre for the Year 2020. Two collections of sweet potato from Great Nicobar and a local collection of *Colocasia* were conserved in the field gene bank. Yield of tubers in the Nicobari collections of sweet potato ranged from 700g to 1800g per vine under rainfed conditions. Cuttings of sweet potato varieties, Bhu Sona and Bhu Krishna, received from ICAR-CTCRI are under evaluation at four locations in South and N&M Andaman.

Aerial tubers of two diverse accessions of *Dioscorea alata* were collected from Little Andaman Island. A total of 123 accessions of different tuber crops are being maintained in the field gene bank.

Twenty-nine conserved accessions of Greater Yam including the farmers' varieties of Nicobar Greater yam were catalogued for morphological traits of leaves, stem and tubers. The results revealed wide genetic variability available within greater yam collections for leaf traits, growth, morphology, tuber colour, texture and production of aerial tubers. The observations on the production of aerial tubers in most accessions at Port Blair conditions could be useful in conservation efforts and multiplying



Plate 22:- Catalogue of Achin Pink Greater Yam accession of Nicobar

the germplasm in a faster manner. Six farmers' varieties of Greater yam were submitted to PPV & FR Authority to facilitate registration as farmers' varieties. The tuber samples of the six accessions were also deposited with ICAR-CRCRI (RS), Bhubaneswar for conservation. Yam bean was found to flower profusely and seed production is yet to be recorded.

Notification of *Colocasia* variety- Megha Taro-2 for Andaman and Nicobar Islands



Plate 23:-Megha Taro-2 performance at Port Blair

Based on the varietal evaluation from 2012-19 under AICRP on tuber crops, the entry TTr 12-8 (Megha Taro-2) was recommended for release in A&N Islands during the 19th Annual Group Meeting of AICRP (TC) held at ICAR-CTCRI, Thiruvananthapuram. Accordingly, *Colocasia* variety, Megha Taro-2 (Plate 23) has been released and notified in the Gazette of India dated 7th April 2021. It is a selection from the local collection of Arunachal Pradesh. The variety is high yielding with an average yield of 18.81 t/ha, recording 26.95% higher yield over check variety Muktakeshi. The variety is low in calcium oxalate (20-24 mg/100g), high in dry matter (27-30%) and rich in starch content (20-23%). It is suitable for leaf, petiole, corm and cormel purposes and is moderately resistant to leaf blight. It has a long keeping quality (more than 30 days).

Success of tuber-based farming system in tribal areas

Community level tuber crops-based farming system was demonstrated at farmers' field at Harminder Bay, Little Andaman during 2021 in 0.3 ha model involving tuber crops, vegetables, fruits and spices integrated with piggery. Farmers were distributed with planting materials of tuber crops (elephant foot yam, *Colocasia* and sweet potato), ginger and piglets. Regular trainings and field visits were organized to upgrade the farming skills of tribal farmers. Prior to interventions, the net income of the *tuhet* was Rs. 70,000/- with B:C ratio of 1.22. After intervention, the net income of the *tuhet* increased to Rs. 1,91,350/- with B:C ratio of 2.26. The employment generation in the tuber crops-based farming system was 460-man days/ha as compared to 240-man days/ha in their traditional system.

Floriculture and ornamental crops

Collection and evaluation of fillers

Ferns viz. *Asplenium falcatum*, *Davallia denticulata* and *Asparagus springeri* were found suitable as filler material in bouquets and flower arrangements. These species have been conserved. Seed germination studies were conducted in *A. springeri* and sand as substrate showed highest germination (92.6%).



Plate 24-*Asplenium falcatum* and *Davalia denticulata*

Survey, collection and evaluation of native ornamentals for commercial cultivation

Seeds of seven palms *Pinanga andamanensis*, *Rhopaloblaste augusta*, *Bentinckia nicobarica*, *Areca triana*, *Licuala Peltata*, *Caryota mitis* and *Licuala spinosa* were collected and seedlings were raised. Seedlings of six species were submitted to IIFR (NAGS center) for further registration process.

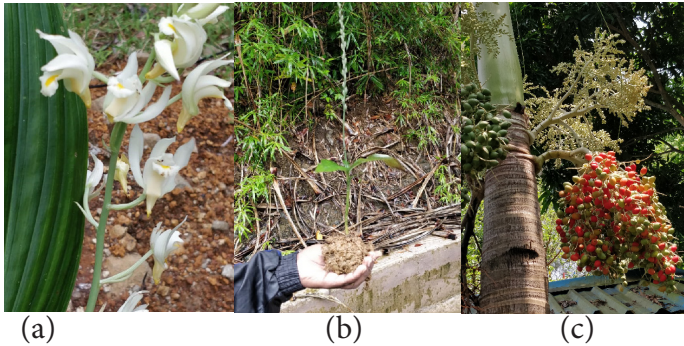
Collection and conservation of two new orchid species

A new orchid species *Eulophia spectabilis* was collected from the forests of South Andaman and conserved. It is a terrestrial orchid growing up to a height of 30-65 cm. The pseudobulb grows beneath the ground and is sub globose in shape. Leaves are oblong to lanceolate and 2-3 in numbers. Light yellow flowers were borne on racemose inflorescence, which bore up to 15 flowers. The inflorescence was originated from the base of the leaves. Flowering season was observed to be July-October. This orchid was highly suitable for exploitation as cut flower. Another orchid species, *Peristylus gracilis* was collected and conserved during the period. It is a terrestrial, perennial, deciduous, sympodial herb. The tubers were fleshy, while stems are upright and unbranched. Flowers were small, often crowded with green coloured florets that lasted for few days. Flowering was observed during August to November

Collection and conservation of potential ornamental species

Four exotic palms viz. Foxtail palm (*Wodyetia furcata*), *Prichardia grandis*, Royal palm and *Veitchia merrilli*

found in Andaman Islands were collected and conserved. *Zingiber spectabilis*, a cut flower species, was also collected and conserved.



a- <i>Eulophia spectabilis</i>	b- <i>Peristylus gracilis</i>
c- <i>Prichardia grandis</i>	

Plate 25:- ornamental species

Collection, conservation and in-situ characterization of *Pinanga andamanensis*

Endemic ornamental palm *Pinanga andamanensis* is widely distributed at Mt. Harriet, South Andaman. This endangered palm was characterized by solitary slender stem, opposite leaflets with brownish pink fruits. Flowering was initiated in October-November and fruit matured during March-May. In each rachis, about 1,200 seeds were distributed in opposite direction. The pulp seems to be consumed by Civet and seeds are excreted



Plate 26:- *Pinanga andamanensis*

Leaf petiole propagation in star jasmine (*Jasminum nitidum*)

Star jasmine or shiny jasmine (*Jasminum nitidum*) is an introduced species in the Island and is a potential loose flower, which blooms round the year in Island condition, The flowers are very attractive, mild fragrant and produced in clusters. Propagation by stem cuttings showed highest success (92-95%). However, an alternate propagation method through leaf petioles was standardized in protrays with coirpith: soil: FYM in 1:2:1 ratio as media. The survival rate was 62% and the time taken for rooting was 42.8 days but shooting was observed only after 214.5 days after planting. Though the time taken for production of

saplings was long, compared to stem, thus this method can be utilized when there is scarcity of mother plants. The leaves which were pruned can be used for its multiplication.

A report on occurrence of polyembryony in Ruaksha (*Elaeocarpus ganitrus*)

During the seed regeneration of five carpelled Ruaksha (*Elaeocarpus ganitrus*), polyembryony was observed in few seeds during seedling emergence. This occurrence of polyembryony is the first report in the species *Elaeocarpus ganitrus*. The number of seedlings germinated per seed ranged from 1 to 5. The polyembryonic seedlings from each seed were found to be equally vigorous.



Plate 27:- Occurrence of polyembryony in Ruaksh (*Elaeocarpus ganitrus*)

Evaluation of *Rosa indica* in different growing environment

Rosa indicais evaluated for their growth and flowering in different growing environments like open field and polyhouse. Observations recorded six months after planting showed that the growth is slow in open field when compared to polyhouse condition. Early flowering was initiated in polyhouse with 15.7 flowers per month per plant whereas in open only 9.2 flowers were produced per plant.

Evaluation of Anthurium in different growing environment

Anthurium cultivar Tropical Red was evaluated under polyhouse in container and terrestrial planting. Observations recorded on growth and flowering showed more sucker production (5.2 per plant) in terrestrial planting and early flowering (42.7 days after planting) in container production. More number of flowers produced under container production as there was less frequency in flowering of about 27.3 days.

Flower regulation for off season flowering in *Jasminum sambac*

Four pruning treatments viz. leaf removal, leaf removal + 45 cm height stem pruning, pruning of stems of 45 cm height along and no pruning as control were studied in *Jasminum sambac* plants maintained in pots in both open

and polyhouse condition. The results showed that early flowering and more number of flowers were observed in the treatment leaf removal+ 45 cm height stem pruning in plants maintained in open condition.



Plate 28:- *J. sambac* under open condition

Standardization of suitable spacing and propagation method for *Jasminum nitidum*

In a spacing trial in *Jasminum nitidum*, of the five treatments studied, highest plant growth and flowering was observed at the spacing of 1m × 1m in the first year after planting. The plants raised by stem cuttings and air layers were evaluated at field level, which suggested that plants raised by air layers had superior growth and establishment.



Plate 29:- Air layered *Jasminium nitidum* 1mx1m spacing

Regeneration studies in native ornamental palms

Seed germination studies were done in three indigenous palms (*Pinanga andamanensis*, *Licuala spinosa* and *Caryota mitis*) and exotic palms (Royal palm, fox tail palm and *Veitchia merrillii*) using different treatments. The highest germination (72.3% to 85.8 %) was recorded in the treatment involving four days soaking of seeds in cowdung slurry in all three species.

Evaluation

Testing of new genotypes of *chrysanthemum* (for loose/cut flower/pot culture)

The planting material of *Chrysanthemum* were received from centers like NBRI Lucknow, Punjab and ICAR-IIHR, Bengaluru. However, due to long transportation time many varieties did not survive. Only two varieties received DFR C 2 and Himani survived, and flowering is initiated in pot culture conditions.

Testing of interspecific ornamental banana hybrids

Thirteen germplasm of ornamental banana were received from ICAR-NRCB, Tiruchirapalli and the rhizomes were planted in the experimental field during September, 2021. Early Flowering was observed in Accession no 8 (73 days after planting)



Plate 30:- Experimental field view of ornamental banana evaluation

Testing of new genotypes of tuberose

Varieties received from BCKV, Kalyani (03 nos.), ICAR-DFR, Pune (01 no.) and MPUAT, Udaipur (04 nos.) were evaluated in pots for growth and flowering. Accession BRH-19 was found to be superior in floral characteristics like early flowering (42.67 days after planting), maximum flowering duration (33.63 days), rachis length (57.67 cm), number of florets per spike (51.33) and number of spikes per clump (3.33). Maximum spike length was observed in Arka Prajwal (97.33 cm). Maximum length of floret was recorded in MPUAT accession. Maximum diameter of floret was recorded in Shayai Vaman (5.03 cm). Maximum weight of 100 florets was recorded in BRH 17 (188.33 g).

Horticulture based sustainable roof top production model



Plate 32:- Roof top production model

Sustainable roof top production models were established in three Public sector units and 5 households at different places of South Andaman with vegetables (major component), flowers, fruits, medicinal plants and spices. Under this project, organic vegetables were being produced by the beneficiaries for daily family requirement of households. The project was also established in Department of

Defence, Bichgunj, Andaman College and Chinmaya Mission to popularize the technology among students and public. Regular technical guidance was imparted to the beneficiaries about package of practices and organic management of pests and diseases.

Entrepreneurship development

Speciality flowers model production units were established at two places of South Andaman viz. Andaman and Nicobar Co-operative Union (ANCOU) premise, Teylerabad and at an entrepreneurs' field at Beodnabad. Planting material of 12 speciality flowers were planted in the premises of ANCOU. This cut flower model unit established has been maintained by SHG members and produce has been utilized for making value added products and further commercialization. Support structures have been established for *Arachnis* orchid cultivation in the beneficiary's field, while planting has been taken up at ICAR-CIARI.



Plate 33:- Speciality flowers demonstration block established at various part of South Andaman district

Medicinal and Aromatic Plants

Collection, characterization and conservation of *Pandanus* species

Twenty-two *Pandanus lerum* accessions were collected from Car Nicobar and Great Nicobar Islands and morphological observations were recorded (Plate 34) Fruit weight ranged from 7 kg to 22 kg, and number of lobes on fruit ranged from 40 to 84. Thirteen each of *P. tectorius* and



Plate 34:-*Pandanus lerum* fruit variability (Collection from Great Nicobar)

P. odorifer accessions were also collected from Andaman and Nicobar Islands. The average fruit weight of *P. odorifer* ranged from 1.75 kg to 3.75 kg with reddish orange colour, while mean fruit weight of 0.3 kg to 1.8 kg with yellowish orange colour were recorded in *P. tectorius*. Pandanus seed oil was extracted, which revealed 54 % oil in *P. lerum*, 39 % in *P. odorifer* and 35 % in *P. tectorius*.

Cluster bearing noni germplasm



Plate 35:- Cluster fruit bearing noni accession

Month-wise fruit yield was recorded from cluster bearing noni accession identified from noni plantation maintained at Garacharma Farm (Plate 35). Mean fruit yield of 2.86 kg/tree/month and mean single fruit weight of 297 g was recorded from the tree. Seed (10.77%), pulp (91.90%) and fruit pulp recovery (69.96%) were recorded. The cluster bearing accession was submitted to ICAR-NBPGR, New Delhi and obtained IC number (IC0641086). The germplasm was characterized using DUS descriptors.

Yield performance of reference varieties of noni

Yield and fruit characters of eleven-year-old trees were recorded in the four reference varieties to assess their month-wise fruit yield potential and influence of weather on fruit yield. The highest yield of 25.72 kg/plant was recorded in CIARI Dweep Sampada variety, which was on par with CIARI Dweep Samridhi (25.36 kg), followed by CIARI Dweep Sanjivini (24.73 kg/plant). In all four varieties, highest fruit yield per plant was recorded in the month of April and CIARI Dweep Sampada recorded the highest fruit yield (2.90 kg/tree) during November.

Effect of pruning on growth of noni trees

An experiment was conducted to know the impact of different pruning levels (pruning above 15 cm, 30 cm, 60 cm and 200 cm) on growth and yield of noni trees 10-year age. The tree pruned above 200 cm recorded less number of days taken for shoot initiation (33 days) followed by 60 cm above pruned trees (75 days) and the highest days taken for shoot initiation was observed in the tree pruned above 15 cm (86 days).

Registration of noni germplasm

Registration proforma of two noni germplasm (TRA-1 and HD-6) were prepared and submitted to ICAR-NBPGR, New Delhi for their specific traits. Seeds were also deposited in the National Active Germplasm Site.

Flowering and fruiting in honeybee repellent plant

An accession of honeybee repellent plant (*Amomum aculeatum*), which was collected and conserved at the Institute has flowered and fruited during this year. The flower and fruit characteristics were documented for further exploitation of the plant. The fruit rind of the plant is dark purple, pulp was creamy white and tasted sweet. Fruits were measured 15 to 32 mm long and 12 to 22 mm wide. The number of seeds per fruit ranged from 12 to 18, black in colour



Plate 36:- *Amomum aculeatum* in flowering

Agro-Forestry – Crops and management systems

Enriching coconut plantations

Growth observations recorded on multipurpose trees planted in coconut garden showed more height (5.60 m) in *Sesbania grandiflora*, while the highest diameter at Breast Height level (7.5 cm) was recorded in *Calophyllum inophyllum*. The first flowering and fruiting was observed from the Andaman Green Dwarf coconuts planted in between *Sesbania grandiflora*, *Leuceana leucocephala* and *Bauhinia* spp. Based on the observations, species were identified to enrich the coconut plantations for green biomass production (*Denolobium umbellatum*), for soil nutrient enrichment (*Sesbania grandiflora*, *Leucaena leucocephala*), as a wind break (*Calophyllum inophyllum*) and for staking (*Bauhinia* spp., *Casuarina equisetifolia*).

Total biomass estimation of the Multi - purpose trees under coconut plantation

Destructive sampling was done in the multipurpose tree species (MPT's) planted as an intercrop in coconut plantation. The three years old MPT's highest total green biomass of 106 kg was recorded in *Calophyllum inophyllum*

followed by *Pterocarpus dalbergioides* (9.30 kg) and least green biomass was recorded in *Sageraea elliptica* (1.5 kg). The dry biomass of the MPT's were recorded after two months. The highest total dry biomass was recorded in *Calophyllum inophyllum* (16.2 kg) followed by *Pterocarpus dalbergioides* (5.88 kg) and least y biomass was recorded in *Sageraea elliptica* (0.58 kg).

Potential of *Macaranga* leaves as an alternative to plastic plates

This study has been undertaken among *M. nicobarica* (IC-626370), *M. tanarius* and *M. indica* to identify the species best suited for commercial plate making. Leaf characteristics with their production pattern were recorded in six branches of each species. The leaves of *M. nicobarica* turned from pale green to dark green, while that of *M. indica* and *M. tanarius* turned from pale green to shaded green on maturity. The number of leaf scar per meter stem was 12 in *M. nicobarica* and *M. tanarius*; and 13 in *M. indica*. It took 30 days for a leaf to mature in *M. nicobarica* and *M. indica* while the leaves of *M. tanarius* matured in 27 days. Leaf length (96.13 cm), leaf width (74.21 cm), mid rib length (75.76 cm), leaf area (5059 cm²), petiole length (55.57 cm), petiole diameter (2.4 cm), leaf fresh weight (158.5 g), and leaf dry weight (93.85 g) were significantly highest in *M. nicobarica* followed by *M. indica* (35.57 cm, 33 cm, 27.07 cm, 954.57 cm², 27.31 cm, 0.54 cm, 96.53 g and 42.63 g, respectively) and *M. tanarius* (24.66 cm, 21.17 cm, 21.51 cm, 511.4 cm², 12.37cm, 0.33 cm, 44.09 g and 21.42 g, respectively). Owing to their desirable leaf area and colour, fresh leaves of *M. nicobarica* and *M. indica* were found suitable for making plates on commercial scale.

DNA bar-coding and phylogeography of Andaman padauk

DNA from leaf samples were extracted using commercial extraction kit from the seedlings of 51 accessions collected from various places of Andaman Islands. From the 51 identified plus trees, a total of 30 samples were used. Amplified products were purified and sequenced in both directions by Sanger dideoxy fingerprinting. Polymorphism analysis indicated 9 polymorphic/variable sites for *rbcl*, 10 variable sites for internal transcribed spacer (ITS) sequence and 5 variable sites for *matK* (Fig 1) Among the three markers, highest proportion of variable sites was detected for ITS and lowest was for *matK*. For phylogenetic relationship of Andaman padauk with padauk species distributed throughout the world, representative sequences of *rbcl*, *matK* and ITS sequence. Other *Pterocarpus* species were retrieved from public database. Phylogenetic analysis revealed that, Andaman padauk is related to *Pterocarpus*

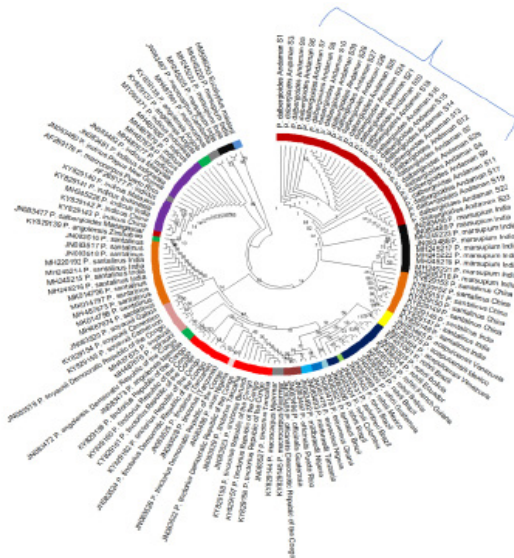


Fig1-Phylogenetic and phylogeographic relationship of *Pterocarpus dalbergioides* with different *Pterocarpus* species across the world.

indicus (Indonesia), *Pterocarpus indicus* (China), *Pterocarpus santalinus* (India), *Pterocarpus marsupium* (India) and *Pterocarpus soyauxii* (Cameroon).

Root Nodule Bacterial Population of *Pterocarpus dalbergioides*

Eight pure isolates were obtained from root nodules of *Pterocarpus dalbergioides*. Colonies showing different morphological characteristics on the plates were selected for further characterization (Plate:-37). Out of these eight isolates

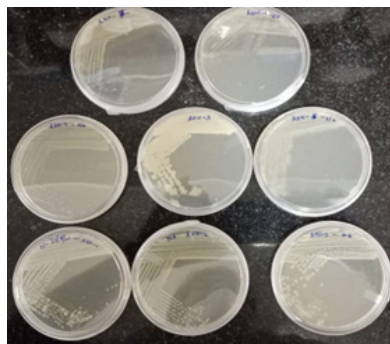


Plate 37 :- Morphological characteristics of bacterial strains

APRN 2 (OK465134), 5(OK465394), 7(OK465396) and 8 ((OK465133) exhibited high similarity with 16S rRNA gene of *Enterobacter kobei*, *Bacillus* sp., *Erwinia* sp. and *Serratia marcescens*, respectively.

Long term evaluation in Andaman Padauk

Andaman Padauk seedlings produced from various accessions were planted in the main field for long term

growth and establishment study. Around 650 number seedlings in an area of 6000 m² were planted with the spacing of 3m × 3m. The initial observations on growth of seedlings revealed that, there was no significant difference in height and collar diameter among the accessions; however, the highest value of 160.8 cm height was recorded in Pembroke Bay accession and the highest value of 1.98 cm collar diameter was recorded in Kalapahad-28 accession. The highest number of branches (5.6) was recorded in Katchal accession followed by Rangat-II accession (4.8).

Mangrove community zonation and vegetation mapping

Based on the field survey conducted in South Andaman area, mangrove community zonation mapping with different classes were made. The major dominant mangrove patches were mapped for *Rhizophora* sp., *Nypa* sp., *Avicennia* sp., *Bruguiera* sp., *Avicennia - Bruguiera* patch, *Sonneratia* patch and mixed mangrove vegetation.

The complete output of mangrove vegetation mapping of the Hut Bay, Little Andaman was prepared with the use of IRS LISS IV imagery. It was observed that the entire Little Andaman mangrove forest patches populated with the mixed mangrove species. High density and abundance of mangrove species were recorded. Further, the Island recorded 29 mangrove species with thick and mixed mangrove patches.

Mangrove Photosynthesis

Gas exchange and chlorophyll fluorescence studies have revealed that often mangroves have low photosynthetic rates and typically became light saturated at 30 – 50 % of the full sunlight, when compared with tropical moist rainforest. Photosynthesis of selected mangrove species was documented at Sippighat, South Andaman. The major dominant mangrove species of fully exposed and partially exposed leaf was taken for the observation. It was recorded that *Avicennia marina* had higher level of photosynthesis (1.61 g C/m²/day) followed by *Excoecaria agallocha* (1.55 g C/m²/day) and lowest photosynthesis rate was recorded in *Rhizophora apiculata* (1.25 g C/m²/day) in fully exposed leaf.

DIVISION OF

FIELD CROP IMPROVEMENT & PROTECTION



Registration of *CARI Brinjal 2*

A bacterial wilt resistant brinjal line ‘CARI Brinjal 2’ (Accession No. IC0640704 and Plant Germplasm Registration No. INGR21153) has been registered by Plant Germplasm Registration Committee (PGRC) of Indian Council of Agricultural Research on September, 2021. Its’ plants are medium tall (77 to 90 cm), semi-spreading type with profuse branching habit. Leaves were smooth and medium sized with green and smooth stems, fruits were oblong, purple with medium compact clusters and pendent fruit position. Seeds were medium sized and light yellow. Days to 50% flowering was 70 to 76 days; resistant to bacterial wilt disease caused by *Ralstonia solanacearum*; Average number of fruits/ plant is 7.0 with fruit weight of 76.25 g. Fruit yield was up to 16.0 t/ha under rainfed conditions of Andaman and Nicobar Islands during *Rabi* season (plate 38). This line has been suitable for growing in rainfed conditions of tropical islands.



Plate 38: A bacterial wilt resistant brinjal line ‘CARI Brinjal 2’: a) Performance of plants at field and b) Germplasm registration certificate from PGRC, New Delhi

Evaluation and conservation of germplasm

A total of 85 genotypes/lines of rice were maintained and evaluated in field during *Kharif* 2021. The single line consisting 30 plants of each genotype were planted in the month of July and observations were recorded for plant height (cm), no. of tillers/plant, panicle length etc. A total of 126 genotypes/lines of pulses including CIARI varieties and checks (green gram - 68 lines; black gram - 58 lines) were maintained and evaluated in field during *Rabi* 2021 (Plate 39).



Plate 39:- Maintenance and evaluation of rice, green gram and black gram genotypes in field.

Evaluation of medium duration elite rice lines under rainfed lowland conditions

Total of 15 improved rice lines were evaluated under rainfed lowland conditions at Bloomsdale Research Farm, Port Blair during *Kharif* 2021. The experiment was conducted in RBD with CARI Dhan 6 as check and planting was done at the spacing of 20 × 15 cm in the month of July and no fertilizers/ organic manures were applied. The results revealed that all studied rice lines as medium duration and medium-statured (90 to 106 Days). The range of medium panicle length (cm) and tillers/plant varied from 21.80 to 26.30 and 4 to 8 with average of 24.80 and 6.36, respectively. The highest grain yield (t/ha) was recorded (4.35) for ANR 60 and ANR 59 (3.98), when compared with CARI Dhan 6 (3.61).

Evaluation of CARI rice varieties for grain and straw yield with harvest index

Thirteen rice varieties/improved lines were evaluated for grain and biological yield under rainfed conditions during *Kharif* 2021. The highest grain yield were recorded for ANR 40 (6.90 t/ha) followed by Gayatri (5.1.0 t/ha) and CARI Dhan 6 (4.96 t/ha), while high straw yield were recorded for CARI Dhan 8 (18.0 t/ha), CARI Dhan 9 (17.5 t/ha) and CARI Dhan 4 (12.5 t/ha) (Table 4). High harvest index (%) was recorded for ANR 47 (57.8%), CARI Dhan 7 (51.4 %) and ANR 40 (46.31%). The results revealed that CARI Dhan 4 and CARI Dhan 5 are good for grain and straw yield. Similarly, an improved line ANR 47 has high potentiality to convert biological yield into grain yield



Plate 40:- Performance of 15 medium duration elite rice lines under rainfed lowland conditions

Table 4: Performance of CARI rice varieties for grain yield, straw yield and harvest index

Varieties/ Characters	Plant height (cm)	No. of tiller/ m ²	Panicle length (cm)	Straw yield (t/ha)	Grain yield (t/ha)	Harvest index %
CARI Dhan 1	110	283	26	4.50	3.15	41.14
CARI Dhan 2	105	218	25	7.50	4.00	34.78
CARI Dhan 3	107	244	28	7.50	4.14	35.58
CARI Dhan 4	125	261	28	12.50	4.37	25.89
CARI Dhan 5	124	233	25	11.50	4.43	27.79
CARI Dhan 6	110	262	27	5.00	4.96	49.80
CARI Dhan 7	108	289	24	4.50	4.76	51.40
CARI Dhan 8	2015	345	29	18.00	3.71	17.91
CARI Dhan 9	210	368	27	17.50	3.50	16.28
ANR 40	120	220	29	8.00	6.90	46.31
ANR 47	102	187	23	3.70	4.92	57.08
CSR 36	117	260	24	9.06	4.53	33.32
Gayatri	116	327	23	8.50	5.10	37.52

Multi-parental advanced generation inter-cross (MAGIC) mapping populations of rice developed

A total of 212 multi-parental advanced generation inter-cross (MAGIC) mapping populations of rice (82 four-way crosses and 130 eight-way crosses) have been developed. Parents used in inter-cross were comprised by special characters *viz.* salt tolerant, drought tolerant, bacterial leaf blight resistance, grain quality and adoptability for island conditions. F₅ generation of four-way crosses and F₄ generation of eight-way crosses were evaluated in field during *Kharif*, 2021. High phenotypic variability was observed for days to 50% flowering, plant height, tillers/plant, panicle length, grain length and grain width (Table 5). The results revealed that high range of variation recorded in eight-way crosses compared to four-way crosses for all

the characters studied except grain width. All the derived lines found stable and no segregation was observed. These mapping populations of rice may be used directly for release as new variety or in further breeding programmes.



Plate 41:- Performance of MAGIC populations of rice in field

Table 5-. Range and mean for important traits of 4-way and 8-way cross progenies

Characters/ Cross progenies/ Range with mean	Four-way crosses			Eight way crosses		
	Mean	Range		Mean	Range	
		Min.	Max.		Min.	Max.
Days to flowering (50%)	94.61	82	111	93.9	78	124
Plant height (cm)	114.62	83.2	179.2	110.24	77.4	195.4
Tillers/plant	9.6	6.2	14.4	10.87	5.4	23.4
Panicle length (cm)	26.4	22.4	31	25.63	19.6	30.2
Grain length (mm)	8.85	7.54	11.4	9.34	5.64	11.21
Grain width (mm)	2.59	2.23	3.48	2.5	1.99	2.92

Bacterial leaf blight resistant back-cross inbred lines of rice developed

Forty-one back-cross inbred lines (BILs) have been developed from cross between the salt tolerant rice variety,

CARI Dhan 5 and BLB resistant line IRBB 60 (CARI Dhan 5 × IRBB 60). These lines were evaluated under lowland field conditions for yield and yield attributing characters during *Kharif* 2021 (Plate 42). Out of 41 lines evaluated,

14 lines were early (93-99 days), whereas recurrent parent-CARI Dhan 5 is late flowering (110-115 days) (Table 6). Plant height of 41 lines ranged from 99.7 to 134.8 cm, while most of the lines showed slightly less height in general compare to recurrent parent. Significantly high number of tillers/plants (10-14 nos.) were recorded for 17-1-69-34, 17-1-69-55, 17-1-69-60, 17-1-69-72, 17-1-69-159, 17-1-69-179 and 17-1-69-324 lines. Similarly, long panicle (30-31cm) were recorded for 17-1-69-55, 17-1-69-159, 17-1-69-204, 17-1-69-316, 17-1-69-334, 17-1-69-375 and 17-1-69-384 lines. For BLB resistance, lines were artificially inoculated by bacterial leaf blight pathogen and scoring done using 1-9 scale. All the BILs were found resistant for bacterial leaf blight except recurrent parent.



Plate 42:- Performance of back-cross inbred lines under field

Table 6. Performance of Back-cross Inbred Lines under field conditions

Lines	D/F (50 %)	PH (cm)	TP	PL	DH	TGW	GL (mm)	GW (mm)	Y (t/ha)	BLB
CIARI Dhan 5	110	130	8	28	145	26.5	8.2	3.0	5.7	5
17-1-69-9	107	106	9	24	145	21.6	7.8	2.6	5.4	1
17-1-69-34	107	121	11	28	145	27.0	8.8	3.0	3.6	3
17-1-69-43	114	118	7	28	145	26.7	8.6	3.0	5.4	1
17-1-69-55	114	104	10	30	145	28.9	8.5	3.0	5.0	1
17-1-69-60	116	121	11	28	145	28.9	8.5	3.2	3.5	3
17-1-69-72	116	126	10	28	145	27.6	8.6	3.0	4.7	1
17-1-69-159	114	122	11	29	145	28.5	8.4	3.1	3.3	1
17-1-69-179	97	106	10	27	136	27.8	8.6	2.9	3.8	1
17-1-69-181	97	100	8	26	136	26.2	8.7	2.8	5.2	1
17-1-69-204	114	116	6	31	145	27.2	9.0	3.0	3.2	1
17-1-69-215	114	126	9	30	145	28.4	9.2	2.8	3.1	1
17-1-69-316	112	121	7	28	145	29.2	8.8	3.1	3.7	1
17-1-69-324	119	117	14	28	145	28.2	8.8	3.0	3.6	1
17-1-69-334	119	122	8	29	145	28.3	8.2	3.0	4.0	3
17-1-69-337	119	118	8	27	145	28.9	9.0	3.0	3.1	1
17-1-69-346	119	123	8	28	145	25.8	9.2	3.0	3.1	3
17-1-69-375	119	130	7	29	145	28.2	8.9	3.0	3.6	1
17-1-69-384	116	126	7	30	145	27.6	8.5	3.0	3.1	1
17-1-69-392	116	125	7	28	145	29.0	8.9	3.0	3.3	1
46-3-95-640	97	107	7	27	136	24.2	8.6	3.0	4.4	1
46-3-95-647	97	102	9	26	136	25.5	8.5	2.8	3.8	1
46-8-95-648	97	102	9	25	136	23.8	9.2	2.7	5.7	1
46-3-95-652	97	106	6	27	136	24.3	8.7	2.7	5.7	1
46-3-95-655	110	122	8	25	145	27.0	8.7	2.7	3.9	1
46-3-95-659	97	125	6	24	136	25.7	8.7	2.7	5.3	1
46-3-95-683	110	123	7	25	145	24.7	8.4	2.8	2.4	1
46-3-95-694	97	125	9	27	136	24.1	8.5	2.7	6.0	1
46-3-95-717	110	125	7	27	145	23.1	8.1	2.8	3.4	1
46-5-149-1185	110	130	7	26	145	22.5	8.7	2.7	3.6	1
131-2-190-785	107	135	10	24	145	28.4	9.1	2.6	3.3	3
131-2-190-795	108	125	7	24	145	27.5	9.2	2.7	3.9	1
131-2-190-1190	97	113	8	26	136	22.7	8.2	2.5	3.8	1
131-2-190-1196	97	119	7	25	135	23.1	8.4	3.1	6.1	1

Lines	D/F (50 %)	PH (cm)	TP	PL	DH	TGW	GL (mm)	GW (mm)	Y (t/ha)	BLB
131-2-190-1197	107	121	7	26	145	28.7	8.2	3.0	3.0	1
134-2-175-1207	97	103	7	24	135	23.6	7.5	3.1	6.8	1
131-2-175-1205	110	132	8	27	145	24.9	8.7	3.1	3.4	3
131-2-175-1209	93	110	6	25	135	22.4	8.2	2.5	6.4	1
131-2-175-1223	99	124	8	24	135	21.0	8.2	2.6	5.9	1
131-2-175-1224	99	114	8	27	135	22.0	8.6	2.7	6.0	1
131-2-175-1208	97	114	6	25	135	22.2	8.7	2.7	6.9	1
131-2-175-1239	110	130	9	28	135	23.0	8.9	2.8	5.5	1
IRBB 60	97	103	10	25	135	22.0	8.4	2.4	3.6	3
Mean	106.6	117.9	8.3	26.6	140.9	25.8	8.6	2.8	4.4	1.4
Min.	93.0	99.7	5.8	23.2	135.0	21.0	7.5	2.3	2.4	1.0
Max.	119.0	134.8	13.8	30.8	145.0	29.2	10.3	3.2	6.9	5.0

Bilocation yield trial on pulses

Eighteen selected genotypes each of green gram and black gram along with four checks were evaluated during *Rabi* in RBD at Garacharma farm and Bloomsdale farm. Range of variation on important characters of these accessions over locations was presented in Table 7. In case of seed yield per plant (g), two genotypes [IC282083 (2.03) and IC398988 (1.89)] of green gram at Garacharma farm, whereas the

genotypes IC282083 (4.31), IC436542 (3.96) and ANM-11-63 (3.91) at Bloomsdale farm showed on par results with superior check CIARI Mung 3 (2.20 and 3.99, respectively). Two genotypes IC343939 and ANU-12-02 showed higher seed yield per plant in black gram at both Garacharma farm (4.24 and 3.30) and Bloomsdale farm (4.46 and 4.22) over superior check CIARI Urd 2 (2.94 and 4.16).

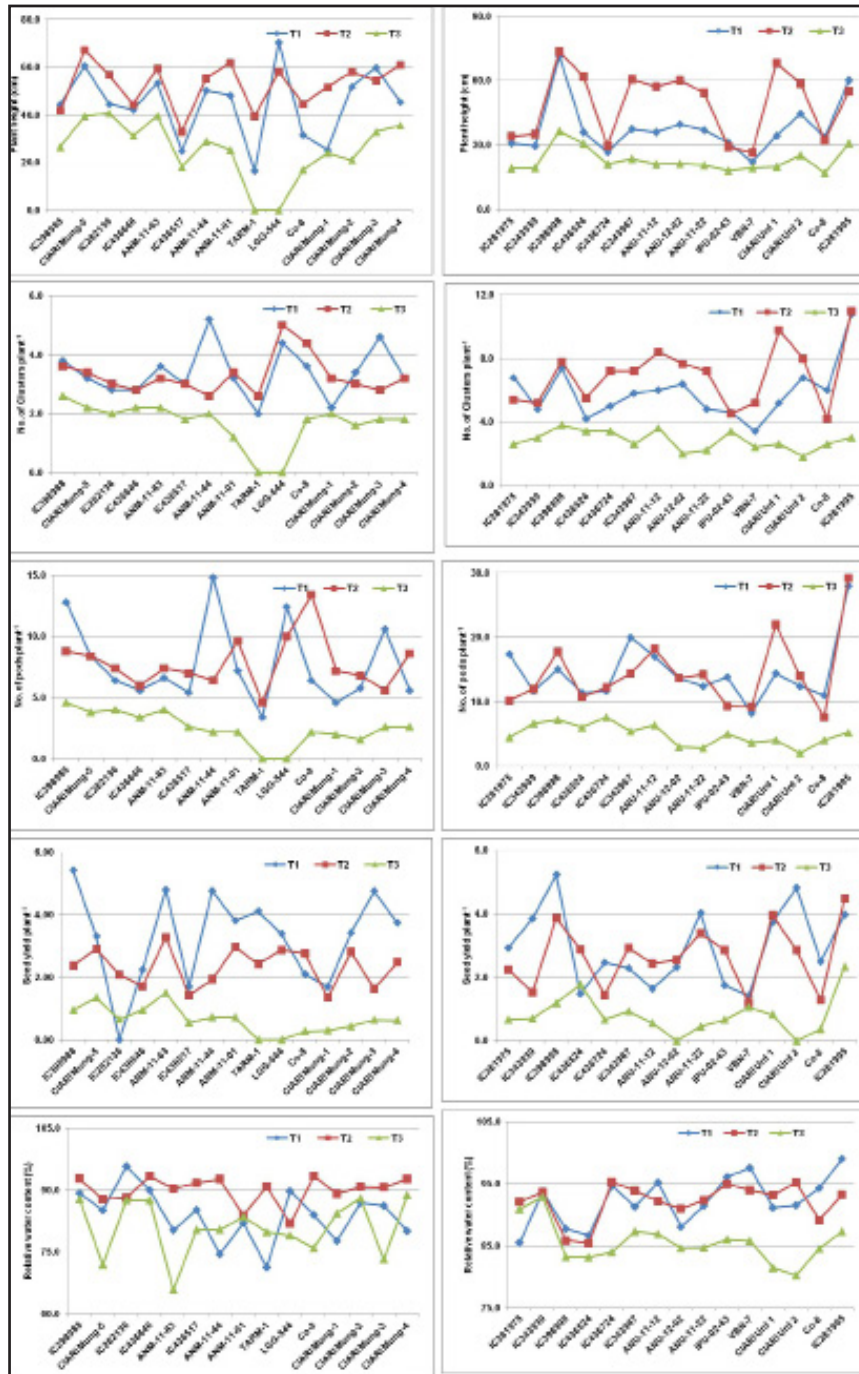
Table 7:-Variability in important characters of selected genotypes of green gram and black gram with 4 checks over locations at Garacharma farm (GF) and Bloomsdale farm (BF)

Characters		Min	Max	Mean	SE	SD	CV (%)
Green gram							
Plant height (cm)		23.50	46.90	35.09	1.70	7.95	22.66
Days to 50% flowering (nos.)		39.00	46.00	43.79	0.35	1.66	3.78
Days to 50% maturity (nos.)		63.00	68.80	66.20	0.32	1.51	2.29
No. of pods plant ⁻¹ (nos.)		5.10	11.10	7.62	0.37	1.76	23.08
No. of clusters plant ⁻¹ (nos.)		2.70	4.00	3.17	0.10	0.45	14.10
Pod length (cm)		6.20	9.40	7.60	0.20	0.94	12.31
No. of seeds pod (nos.)		9.40	12.00	10.97	0.14	0.64	5.80
Pod weight plant ⁻¹ (g)		2.20	3.90	3.05	0.09	0.42	13.73
Seed weight plant ⁻¹ (g)	GF	0.78	2.21	1.39	0.08	0.40	28.55
	BF	2.97	4.31	3.52	0.08	0.36	10.12
Black gram							
Plant height (cm)		17.60	29.50	22.95	0.75	3.51	15.30
Days to 50% flowering (nos.)		32.50	38.30	34.72	0.33	1.53	4.41
Days to 50% maturity (nos.)		61.00	65.50	63.66	0.21	0.99	1.56
No. of pods plant ⁻¹ (nos.)		7.90	16.40	11.34	0.46	2.14	18.91
No. of clusters plant ⁻¹ (nos.)		3.80	5.90	4.73	0.14	0.67	14.16
Pod length (cm)		4.10	5.20	4.60	0.07	0.31	6.73
No. of seeds pod ⁻¹ (nos.)		5.60	7.30	6.51	0.10	0.48	7.44
Pod weight plant ⁻¹ (g)		3.00	6.20	4.35	0.15	0.70	16.05
Seed weight plant ⁻¹ (g)	GF	1.63	4.24	2.49	0.11	0.53	21.49
	BF	3.04	4.46	3.74	0.08	0.38	10.25

Performance of pulses genotypes in different irrigation level under controlled condition

Fifteen genotypes each of green gram and black gram (including CIARI and other varieties) were evaluated for their performance under three levels of irrigation (T_1 - two irrigations; T_2 - one irrigation; T_3 - no irrigation) at the micro-plot facility. For ten yield and yield related characters observed, there was astic reduction in seed yield, plant height (cm), number of clusters per plant and number

of pods per plant in control than both irrigation treatments (Fig 2). In case of seed yield (g/ plant), two genotypes in green gram [ANM-11-63 (4.8, 3.3 and 1.5); CIARI Mung 5 (3.3, 2.9 and 1.4)] and three genotypes in Black gram [IC281995 (4.0, 4.5 and 2.3); IC398998 (5.2, 3.9 and 1.2); CIARI Urd 1 (3.7, 4.0 and 0.8)] yielded better than other genotypes across T_1 , T_2 and T_3 , respectively. In case of T_3 , high seed yield was obtained in green gram [ANM-11-63 (1.5)] and black gram [Co-8 (2.2)].



a



b



c

Fig 2:-Performance of pulses genotypes in different irrigation level

Plate 43:-Plate 51: Field view of seed production: a) Rice, b) Pulses and c) Brinjal.

Farming System Studies

Integrated Farming System

A long-term experiment (2011-2021) was conducted in 1 ha area for enhancing farm production and productivity through farming system approach in hilly uplands of Andaman Islands. The crop component consisted of spices (clove, nutmeg, black pepper), tapioca, sweet potato and pineapple grown as intercrops in coconut (0.9 ha). This was integrated with piggery (4 nos.) and poultry cum fishery (0.06 ha). Additionally, residue recycling, rainwater harvesting (lined pond of 100 m²) and *Azolla* cultivation were included.

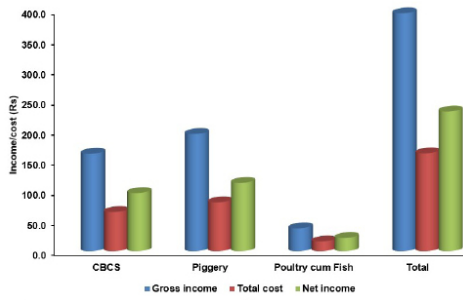


Fig 3:- Economics of coconut and piggy based IFS

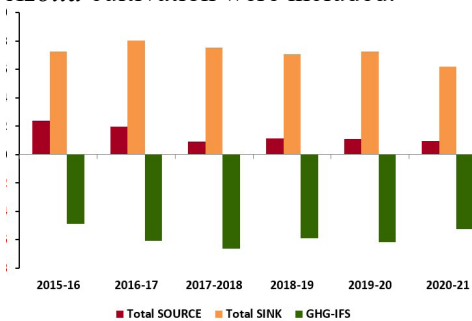


Fig:4 Temporal changes in GHG emission and C credit coconut based IFS

The study (Fig 1) indicated 143 % increase in average farm income with the net income of Rs. 2.32 lakh/ha/ year. Total farm productivity increased to 32 t/ha and generated an employment of

325 man days/ ha/ year. The cost analysis indicated that 73% of total cost was accounted by labour (45%) followed by recycled products (28%), while outside purchase accounted to only 27% in the form of livestock feed. The crop and enterprise diversification enhanced farm diversity (0.78) and sustainability (0.75). Total GHG emission (GHG Emission tool V1.1) from the system was 0.96 Mg CO₂ eq/ year/ ha with net C sequestration of 5.24 Mg CO₂- e /year/ ha. Temporal changes (2015-2021) indicated variations in net emission, while C sink showed gradual increase.

Organic Farming

The study on organic farming for sustaining the productivity of island cropping systems was continued during 2020-21 (Plate 44). Black pepper (100 nos.) and clove (25 nos.) were planted in the interspaces of coconut plantations to increase the cropping intensity beyond 100%. Recommended dose of nutrients (500 g N, 320 g P₂O₅ and 1200 g K₂O per palm

per year) was given through different combinations (T₁ to T₃) of organic sources viz. FYM, compost, green manure on N equivalent basis. Green manure (sunhemp and gliricidia) was applied in semi circular trenches made around the coconut trees as brown manuring. On an average, 70 kg organic waste per palm was generated which was recycled by composting and used to supply nutrients. The study showed 5% increase in coconut yield in treatments over control (60 nuts/ palm) and reduction in nut fall (8 – 11%) indicating positive effects of organic treatments.



Plate 44 (a). :- Overview of Plate 44 (b). Green manuring Organic farming experiment with sun hemp

Production Technology

Moisture Stress Management

The ongoing experiment on management of moisture stress in vegetable cropping system was continued. During post-monsoon season (Feb-May, 2021), effect of moisture stress management practices with horizontal (ip+plastic mulch, sub-surface ip and surface irrigation) and vertical treatments (hyogel, hyogel + K spray, hyogel + Ca spray, hyogel + K & Ca spray) on growth, yield attributes and yield of Okra (Arka Nikita) was studied (Plate 45). ip irrigation with plastic mulching treatment recorded maximum plant height and attained early flowering. It also recorded maximum fruit length (15 cm), no. of fruits (15.5) and fruit weight (20 g) which resulted in higher yield (9.95 t/ha) followed by sub-surface ip irrigation. Similarly, application of hyogel + K & Ca foliar spray recorded maximum fruit length (15.7 cm), no. of fruits (14.8), fruit weight (20.1 g), which resulted in higher fruit yield (9.56 t/ha) followed by



Plate 45 (a). :- Installation of ip system in field Plate 45 (a). :- Moisture stress studies in Okra

hyogel + K spray. During November 2021, experiment on moisture stress management was carried out using tomato (*Arka Samrat*) and brinjal (CIARI brinjal-2) as test crops (Plate 46). The initial results indicated mortality of tomato plants due to wilt both in surface irrigation and subsurface irrigation. However, minimum mortality of plants was observed in ip + mulch treatments. The establishment of seedlings was better in mulching + ip with hyogel + K & Ca foliar application.



Plate 46 (a) Moisture stress studies in tomato Plate 46 (b). Moisture stress studies in brinjal

Effect of Nano Urea

A field experiment was conducted to study the effect of IFFCO-Nano Urea (liquid) in reducing the application of conventional urea, increasing crop productivity and profitability of rice at three places viz. Bloomsdale Research Farm (NRM), Farmers field, Guptapara (KVK) and Nimbudera (KVK) (Plate 47). The results of Bloomsdale farm experiment showed increased root and shoot length (7% and 15%), root and shoot weight (5% and 16-20%) and total nitrogen content in Nano urea treatments than the conventional fertilizer application. Rice grain yield was significantly higher in IFFCO-Nano urea foliar spray treatments over control and 100% RDF application. The yield was higher by 16.7% and 14.4% over 100% RDF applied as fertilizer at farmers field and research farm, respectively. Among different treatments, N and P uptake by rice was significantly higher in 50% fertilizer N with two nano urea spray (0.4%) which was on par with 100% NPK application through inorganic fertilizer. This indicated better N use efficiency of nano liquid fertilizers.



Plate 47(a):-Nano Urea trial at Bloomsdale farm Plate 47(b):-Nano Urea trial at Guptapara

Participatory Evaluation

Climate Smart IFS

A participatory evaluation project on women empowerment through climate smart integrated farming systems comprising coconut/arecanut + spices, goat and back yard poultry were initiated in three farmers field at Chouldhari, Macca Pahad and Wandoor villages of South Andaman (Plate 48). The baseline information indicated that all the beneficiary farmers are marginal having less than 1 ha cultivated land and 1.5 lakh annual income. Arecanut is the dominant plantation crop followed by coconut with no intercrops. Black pepper, clove and nutmeg seedlings were introduced as intercrops in the existing plantations. Further, goat (5 Nos) and backyard poultry (50 chicks) were introduced after making livestockshed and integrated into crop component at each farmer's field. This increased the cropping intensity (>100%) and enterprise diversity. The evaluation work is in progress.



Plate 48:-Climate smart IFS demonstration at farmers field

Rainout Shelter

During the year high value vegetable cultivation and vermicompost production under rainout shelter for doubling farmer's income was continued in two progressive farmers field at Calicut and Beodnabad villages of South Andaman (Plate 49). Two rain out shelters having 72 m² area with misting system were constructed. Farmers were given vegetable seeds (amaranthus, coriander and palak), seedlings (capsicum, tomato, cucumber and brinjal), grow bags and growing media (cocopeat & saw dust)



Plate 49(a):-Rainout shelter at Beodnabad Plate 49(b):-Rainout shelter at Calicut

for growing high value leafy vegetables. During the year farmers have recycled about 2.5 ton of farm wastes using vermi bags. On an average the light intensity inside the rainout shelter during bright sunshine was 33,600 lux while 8680 lux was observed during cloudy weather condition. Soil moisture content was 21% higher inside the rainout shelter as compared to the open area indicating the better crop growing conditions. This enabled the farmers to go for year-round vegetable cultivation.

Development of Organic Products

Novel Bio-stimulants



Plate 50:- Seaweeds of South Andaman Coast

Agricultural growing practices have been evolving towards organic, sustainable and environmental viable systems. Thus, a study was undertaken to utilize the rich sea weed resources of the island by extracting and converting them to natural bio-stimulants for enhancing crop production. During the year, six species of seaweeds viz., *Caulerpa racemosa*, *Halimeda opuntia*, *Padina tetrastratica*, *Sargassum wightii*, *Gracilaria salicornia* and *Tricleocarpa fragilis* were collected from different locations of South Andaman coast (Plate 50). Characterization of chemical and biochemical properties was done and assessed their potential as organic nutrient source. The study indicated that seaweeds contain comparable quantity of macro nutrients especially N and K, higher amounts of Ca, Mg and trace elements like Fe than common green manure crops. Besides nutrients, seaweeds contained plant growth hormones (IAA) which varied from 15.61 $\mu\text{g g}^{-1}$ in *G. Salicorni* to 19.56 $\mu\text{g g}^{-1}$ in *P. tetrastratica*.

A field experiment was conducted to study the effect of aqueous extract of seaweed (*Sargassum wightii*) on growth, yield and quality parameters of grain cowpea. The extract was applied on cowpea at 30, 45 and 60 days after sowing

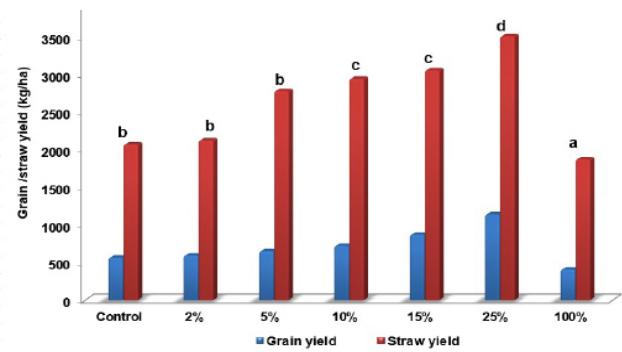


Fig 5:-Effect of seaweed extracts on biomass and grain yield of cowpea

at 5 concentrations viz., 0, 2, 10, 15, 25 and 100% (Fig 5) The study indicated significant increase in grain yield (21.3 g plant^{-1}) when compared to control (15.4 g plant^{-1}) at 25% concentration. However, at higher concentration (100%) grain yield was negatively impacted and decreased to 10.3 g plant^{-1} . During the reporting period an extraction process for dual extraction of seaweed liquid fertilizer (SWLF) and alginic acid from brown seaweed (*Sargassum wightii*) was standardized after characterization using FTIR spectroscopy.

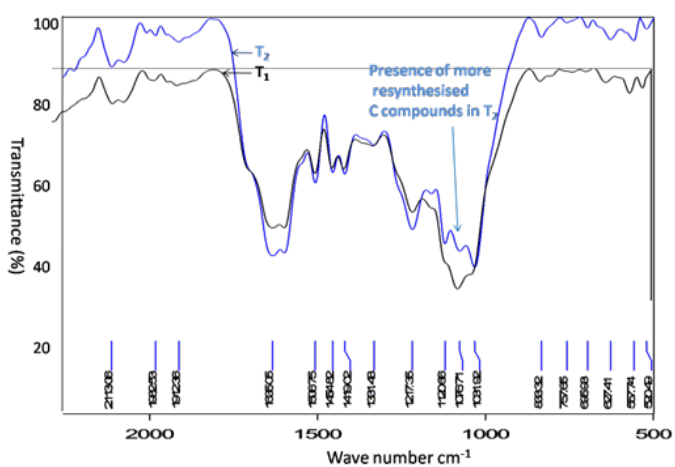
Valorization of Organic Wastes

A study was initiated to convert different agricultural wastes into valuable products by suitable processes for addressing abiotic stress viz., salinity, acidity and moisture stress. During the year assessment of agricultural residues in the Islands was carried out which showed the abundance of coconut husk followed by areca nut and rice straw. Off 56,000MT of coconut husk available, only 150 MT is used in coir industry, 25-30% is used for ying copra mainly and the remaining got wasted. On an average 4000 MT of animal wastes are available, of which poultry accounted more than 50%. An attempt was made to extract humic substances from vermicompost prepared from rice straw (RS), cow dung (CD), sea weed (SW) and fish wastes (FW) mixed in different combinations. The results indicated that rice straw and cow dung in 1:1 ratio recorded highest compost recovery (64.8%) in 65 – 70 days followed by RS + CD + SW + FW in 5:3:1:1 ratio. The nutrient composition of final compost is given in table 8.

Table 8. Physicochemical and nutrient composition of final compost

Treatment	pH	EC dS m ⁻¹	Ash (%)	OC (%)	Nutrient content (y wt.) %				
					N	P	K	Ca	Mg
T1	7.88	3.7	21	23.5	3.45	0.69	1.70	1.93	0.74
T2	6.80	3.5	20	21.5	4.09	1.59	1.75	1.61	0.68
T3	7.83	4.7	22	22.8	5.30	0.74	2.61	2.41	0.83
T4	7.31	2.4	16	27.6	3.64	0.73	1.05	1.46	0.53
T5	7.16	2.2	15	26.3	3.67	0.72	1.32	1.23	0.51

The humic substances *viz.*, humic acid (HA), fulvic acid and humin were separated from the final compost prepared using different feed stock materials (T1 – T5). There was no significant difference between the treatments in recovery rate of humic acid which varied from 2.04 to 3.1%. The infrared spectra (FTIR) of humic acid are shown in Fig 6. Major absorption bands are observed in the regions of 3800 cm^{-1} , 3200 cm^{-1} (H-bonded OH groups), 2900 cm^{-1} (aliphatic C compounds), 1920-2335 cm^{-1} (Aliphatic C-H), 1506 cm^{-1} (amides, amines), 1330 cm^{-1} (alkenes, alcohol, phenols) and 1078 cm^{-1} (C-O alcohols & aliphatic esters) in all the treatments. While absorption bands were observed at 2374, 1723, 1120, 757 cm^{-1} are specific to certain treatment indicating presence of different carbon compounds across the treatments. Further, more carbon compounds which are resynthesised or formed after break of original carbon compounds are observed between 1035 to 1713 cm^{-1} wave number.



Climate Change, Adaptation and Environment

Fig 6:-Fourier transforms infrared (FTIR) spectra of HA extracted from different treatments

Integrated Agromet Advisory Services

During the reporting period (Jan – Dec 2021) a total of 102 agromet bulletins were issued covering all aspects of agriculture production with the help of multidisciplinary advisory team. Under GKMS 11600 farmers were registered in mKISAN portal and agromet advisories were sent to them regularly in the form of SMS and most of them are linked through social media as well. Verification of forecasted and observed values of rainfall (skill score) revealed that forecasted and observed values of rainfall for pre-monsoon, monsoon and post-monsoon were matching to the tune of 78%, 72% and 74%, respectively for Andaman Islands and 62%, 56% and 71% respectively for Nicobar Islands. Analysis of frequency distribution of rainfall showed increase in rainless days, very high rainfall

and decrease in moderate rainfall category.

The analysis of monsoon performance (Jan – Dec 2021) indicated early onset of south west monsoon (21st May 2021) and 24% excess total rainfall over long-term average. The weekly rainfall performance over long-term average indicated 6 large excess rainfall (> +60%) incidence, 2 excess rainfall (+ 20 to + 59%) and 3 deficit rainfall (-20 to - 59%). This showed the changing pattern of rainfall distribution which is infused with both excess and deficit weekly rainfall. The feedback analysis indicated that timely advisories helped 60% of the respondents to minimize the production losses by supporting informed decision making in farm operations and support marketing of farm produces.

Carbon Footprints

A systematic study was initiated to study carbon (C) foot prints in different farming systems and its dynamics in different land uses of Andaman and Nicobar Islands. During the year, surface (0-15cm) and subsurface (15-30cm) soil samples were collected from different land uses across the islands and analyzed for different C isotopes *viz.*, C¹², C¹³ and C¹⁴ to assess the soil C dynamics. The ratio of C¹² to C¹³ expressed as δC^{13} (‰) was calculated.

State Specific Action Plan for Water

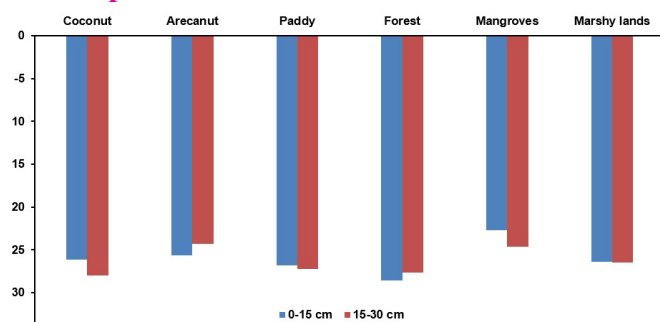


Fig 7:-Relative content of δC^{13} (‰) in different land uses

During the reporting period the state specific action plan (SSAP) on water sector launched by MoWR, GOI was prepared. It essentially consists of state specific present water situation, supply and demand in various sectors, identifications of key issues, their possible solutions and finally the preparation of detailed action plan on water sector. Majority of the data and other information were collected from secondary sources including state government departments and officials, published sources of Government of India, autonomous institutions and different reports of ICAR-CIARI, Port Blair.

The study showed that precipitation is the only source of fresh water (24747 MCM), of which, 75 % goes as runoff into the sea. The total utilizable water (harvested rain water, soil moisture and surface water resource) is

around 4961 MCM (20% of precipitation). Though surface storage capacity by dam, reservoir and ponds is 20 MCM (Dhanikari dam-5 MCM, Kalpong-15 MCM, others surface water -5 MCM), the utilizable water is only 10 MCM as the entire Kalpong dam water is used for power generation.

The total water consumption by farm sector is 323 MCM, of which 281 MCM is met through rainfall and 41.4 MCM is met through streams, nalla and ponds during y seasons. The water consumption by livestock and fisheries sector is 0.004 and 0.0012 MCM, respectively. The water consumption by establishments & institutions is more (2.17 MCM) than the industries & infrastructures (1.66 MCM) in the islands. Similarly, the domestic use of water in urban areas is double (6.54 MCM) the amount of water used in rural areas (3.44 MCM). The total water consumption/demand for non-agricultural purpose is 13.81 MCM, of which 10 MCM is supplied through PBMC/PWD from surface storages and remaining amount is met through shallow bore wells and private water suppliers.

Monitoring of Pesticide Residues

Monitoring of pesticide residues in agricultural commodities viz., vegetables, pulses, rice and fruits is important due to their ill effect on human health. During the year 420 samples covering vegetables, fruits, rice, green and black gram were collected from farm gate (345) and vendors (75)

in major markets of Andaman Islands and sent to Export Inspection Agency (EIA), Kolkata for determination of pesticide residues. Of the total vegetable samples gourds viz., snake gourd, bitter gourd, bottle gourd, ridge gourd, sponge gourd accounted 39% of the samples followed by cucumber, chilli, okra contributing 10% each. During sample collection it was observed that fruit fly is the major pest in gourds followed by aphids, red pumpkin beetle were observed in traces. In okra and brinjal, stem and fruit borer were the major pests noticed in many parts of the Island.

The analysis of the samples indicated that around 10% of samples recorded one or more pesticide residues of various compounds however, only 0.5% of the samples had pesticide residues above FSSAI MRL. While, major concern is the presence of off label pesticide residues in many of the samples indicating the use of pesticides which are not actually recommended for the specific crop. Besides, the use of herbicides such as Paraquat and Glyphosate are found to be common in the islands.

Molecular characterization

Molecular characterization of immune system genes of Nicobari fowl

Toll-like receptors (TLRs) are a class of pattern recognition receptors (PRRs) molecule of the innate immunity involved in sensing microbes. The current study involves characterization of TLR3 of Nicobari fowl which is involved in sensing dsRNA of pathogens. A total of 89 complete TLR3 coding sequences (2691bp) of 28 chicken breeds including Nicobari fowl from NCBI were used for polymorphism analysis by DnaSP software. The results indicated 42 polymorphic sites with 39 haplotypes. The polymorphic nucleotides 948, 949 and 950 were specific to Nicobari fowl and constitute codon 316 and 317. These polymorphic nucleotides cause non-synonymous substitution of amino acids from glutamine (Gln) to lysine (Lys) at position 316 and Lys to leucine (Leu) at position 317. Based on *in silico* observation, primers were designed to amplify two different regions of chTLR3 complete coding sequences for polymorphism study in Nicobari fowl. First target region was between nucleotide position 860-1038 yielding 179bp amplicon (forward primer- 5'CTGTGATAGAGGATGACTCA3' and reverse primer 5'TTCCTTCCAATGGTTACAC3') having non synonymous SNP(948, 949 & 950 positions), which has been characterized by single strand conformation polymorphism (SSCP) and no SSCP conformers were found after analysis of ten samples. Second target region between nucleotide position 1686-1852 yielding 167bp PCR product (forward primer- AAAGACTTGATTTAGGATCAAAA and reverse primer- CTTCAACTGAGGTTATTAGATT) consisting of non-synonymous SNP (nsSNP1781 C/T) was characterized by restriction fragment length polymorphism (RFLP) and SSCP analysis. SSCP analysis showed monomorphic pattern after screening of ten samples. RFLP analysis by digesting the specific product with *TspRI* restriction enzyme (RE) targeting non synonymous SNP at 1781 nucleotide position of coding sequence (SNP1781C>T) which results in change of amino acid from Ala to Val. RFLP was optimized and screening of 44 samples of Nicobari fowl showed absence of digested fragments (99bp and 68bp) which indicated absence of polymorphic allele.

Maternal lineage of Nicobari pig (*Sus scrofa nicobaricus*) and its correlation with migration of Nicobarese

Nicobari pig has maintained its genetic identity due to geographical isolation. Maternal lineage of Nicobari pig was investigated using mitochondrial D-loop and whole mitochondrial sequence information. DNA polymorphism

data showed seven haplotypes. D-loop sequence information and mitogenome analysis were able to earmark Nicobari pigs to Asian clade (Fig 8). The domestication process of pigs and its expansion pattern help to understand human migration pattern. Based on this hypothesis, this communication elucidates the probable origin of Nicobarese. Earlier studies indicated that, Nicobarese had genetic affinities to races distributed in China, Malaysia and Thailand. Our data on maternal inheritance of Nicobari pig correlates with the data on migration of Nicobarese. Moreover, we could establish a novel connection of Nicobarese with people of Northeastern parts of India, Philippines and Vietnam through phylogenetic signal and geographical provenance of Nicobari pig. We further concluded that, migration of Nicobarese happened during Western route of migration (WRM) ~ 4000 years before present. Therefore, we propose one wave hypothesis of peopling of Nicobar based on our study and existence of Austrorasiatic language, Mon-Khmer in these islands.

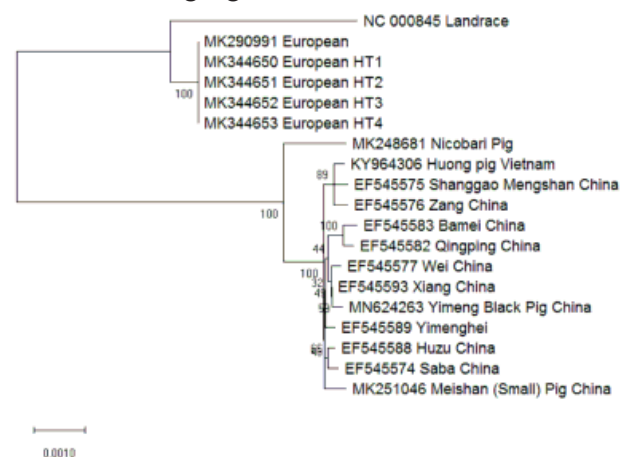


Fig 8:-Evolutionary relationship of Nicobari pig with Asian and European clades of pigs

Nutritional Management

Production technology of least cost balanced poultry feed with mini feed mill to augment income of rural poultry farmers in South Andaman

Capacity building programmes such as hands on training, demonstrations, field day and interaction meeting were conducted on mini feed mill for preparation of balanced feed, wherein 100 farmers were benefited. Preparation of balanced feed with locally available ingredients such as maize, groundnut cake, sunflower cake, coconut oil cake, rice bran, y fish, shell grit and vitamin mineral mixture was demonstrated to prepare the poultry feed. A total of 2.5 t of feed was prepared and 10 farmers are regularly using the unit as incubation facility. The feed cost was saved by 10% through own preparation of balanced feed using this mini feed mill.

Nutrient intake and digestibility of the Andaman local and Nicobari Pigs in intensive system of rearing

Feeding alone incurs more than 80% rearing cost of the pigs. Thus, one can maximize the profit out of the pig rearing venture by managing the ration and feeding of the animals. The climatic condition of the islands is generally hot and humid and the humidity remains more than 79% throughout the year. Thus, it becomes important to rule out the basic nutritional requirements of the indigenous pigs with emphasis to the climatic condition. Moreover, the energy requirement increases with increasing body weight, as basal metabolism and maintenance requirement are proportional to live weight & growth rate. For the purpose a feeding trial (phase feeding) has been initiated with week old piglets fed them with creep feed. After weaning, piglets were distributed into three groups viz. control (basal diet 18.5% CP and 3000 MJ/kg energy), treatment 1 (17.6% CP and energy 2850 MJ/kg feed) and treatment 2 (16.65% CP and energy 2850 MJ/kg feed). Now the pigs will be shifted to the next phase after conducting a digestibility trial.

Establishment of sustainable model village on fodder production at South Andaman

Seven fields of different altitude totalling about 10 acres of land were sown with Bajra Napier Hybrid (Co-4, Co-5, Co-6 and DHN-6), Guinea grass, maize, and cowpea apart from *Sesbania*, *Moringa* and *Leucaena* as fodder trees. The fields are prepared in bunds for Hybrid Napier (3,600 cuttings), Guinea grass and cowpea (multi-cut), whereas maize is sown in plain fields. *Moringa* stems were planted at sloppy terrain. Regularly the fodder fields are managed by weeding and irrigating.

Reproductive Management

Molecular and biochemical mining to search out fecundity of goats

Whole genome sequencing was carried out in Illumina NovaSeq6000 platform followed Genome wide association study (GWAS) revealed multiple putative SNPs having association with the fecundity in Andaman local goats. 18 SNPs specific to higher fecundity including 5 novel SNPs and 14 SNPs specific to poor fecundity group including 3 novel SNPs were identified.

Goat biochemical, hematological, mineral and hormonal profiles were analyzed for their association with fecundity, parity and nutritional status of Andaman Local goats. The findings of the present study indicate that parity influences MDA and RNS estimates. Moreover, better plan of nutrition in the form of concentrate feeding improves the total antioxidant status of the goats. Lack of variation in the

antioxidant profiles and stress markers between breeds may indicate a similar adaptive mechanism that may be acquired due to their prolonged inhabitation to these geographically isolated Islands wherein animal import is largely restricted due to biosecurity reasons.

Effect of melatonin on endocrinological profile in goat

Effect of exogenous slow-release subcutaneous melatonin (MT) on endocrinological, antioxidant profiles, sex behavioural score and scrotal and testicular biometrics in rainy and monsoon seasons was studied in indigenous goat bucks. MT (18 mg/50 kg B.Wt.) was administered as slow-release exogenous subcutaneous injection at monthly interval and was compared with control. Endocrinological profiles, antioxidant profiles, oxidative stress profile, sex behaviour scores were measured in both groups in different seasons. Scrotal circumference and testicular biometrics increased significantly ($p < 0.05$) in supplemented than unsupplemented group in different seasons and significantly higher in rainy than in summer season. FSH, LH and testosterone increased and cortisol and thyroxine decreased significantly in MT treated than in control group and significantly higher in rainy than in summer season. Sexual behaviour scores and antioxidants were higher and oxidative stress profile was significantly lower in MT treated than in control. Antioxidants were higher and oxidative profile was significantly lower in rainy than in summer season. Sexual behaviour profiles were significantly higher in rainy than in summer season. Therefore, this may be concluded that, MT supplementation and rainy season had significant beneficial effects on improvement of scrotal and testicular attributes, endocrinological and antioxidant profiles and minimization of oxidative stress in indigenous goat breeds of Andaman and Nicobar Islands.

Semen quality profiles, sexual behavioural score and artificial insemination in goat

Semen ejaculates were collected from Andaman local goat and Teressa goat with artificial vagina method for the first time. Semen quality parameters such as volume, concentration, pH, mass activity, individual motility, viability, acrosomal integrity, plasma membrane integrity and nuclear integrity were studied. Microbial load was studied and it was within the limit in the semen. Incubation study revealed that the liquid semen can be preserved for 4-5 days under refrigeration condition with sufficient motility for artificial insemination. Animals (five) were inseminated with liquid semen through trans-cervical insemination. These inseminated animals did not express estrus symptoms for 2 months indicated these animals

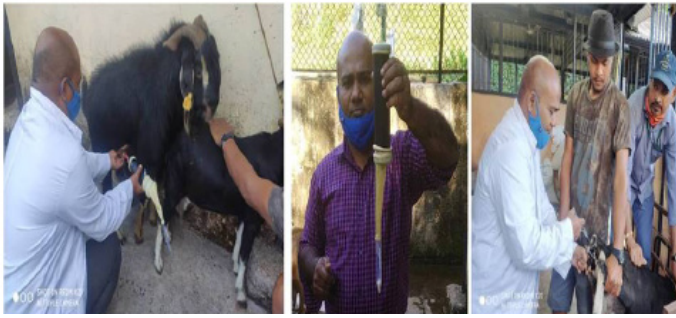


Plate 51:-Artificial Insemination in Andaman local goat became pregnant. Thus, the semen collection by artificial vagina method, preservation in liquid state, inseminated through trans-cervical method in Andaman local goat and Teresa goat in ICAR-CIARI, Port Blair for the first time (Plate 51).

Effect of melatonin on endocrinological profile in pig

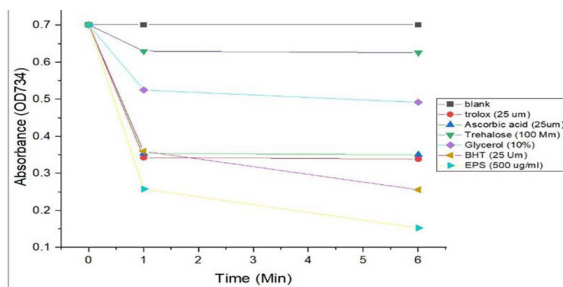


Fig 9:- ABTS antioxidant assay performed for various antioxidants

Effect of exogenous slow-release subcutaneous melatonin (MT) on endocrinological, antioxidant profiles and scrotal & testicular biometrics in rainy and monsoon seasons was studied in indigenous boars. MT (1 mg/ kg B.Wt.) was administered as slow-release exogenous subcutaneous injection at monthly interval and was compared with control. Endocrinological profiles, antioxidant profiles, oxidative stress profile and scrotal circumference (SC) and testicular biometrics measured in both groups in different seasons. SC and testicular biometrics were increased significantly in supplemented than unsupplemented group for different seasons and significantly higher in rainy than in y summer season. FSH, LH and testosterone increased and cortisol and thyroxine decreased significantly in MT treated than in control and significantly higher in rainy than in y summer season. Antioxidants were higher and oxidative profile was significantly lower in rainy than in y summer season. It may be concluded that MT supplementation and rainy season had significantly ($p < 0.05$) greater beneficial effects on improvement of scrotal and testicular attributes, endocrinological and antioxidant profiles and minimization of oxidative stress in indigenous pig breeds of Andaman and Nicobar Islands.

Reproductive traits and semen quality profiles in indigenous pigs

Reproductive traits such as age at first mating in male, age at first oestrus, oestrus cycle duration, litter size at farrowing and weaning and litter weight at birth and weaning were higher in intensive management than in extensive management at field level in Andaman local pig and Nicobari pigs. On the other hand, oestrus duration, age at first mating and first farrowing, gestation period, farrowing interval, stillbirth and mortality were higher in extensive management than in intensive management in both the breeds. Scrotal circumference and testicular volume & weight increased as age advanced and were higher in monsoon than y season. Andaman local pig showed medium to high level libido index (1.37). Semen quality profiles such as ejaculate volume, gel volume, gel free semen volume, seminal pH, sperm count, total sperm motility, progressive motility, semen microbial count and sperm morphometric profiles in Andaman local pigs were within the range of the porcine species. Seminal antioxidant and oxidative stress profiles and total antioxidant capacity were within the range of porcine species. Similarly, seminal biochemical profiles (total protein, total cholesterol, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, acid phosphatase and lactic acid dehydrogenase) and mineral elements (Na, K, Ca, Zn, P, Mg and Cl) were within the range of porcine species.

Cryobiology

Identification of key role players in bull semen freezability and to reduce the cryoinjury on bull spermatozoa

Proteome profiles of CS (Good freeze-group) and NCS (Poor freeze-group) semen was generated using LC/MS. A total of 1334 unique sperm proteins and 773 unique seminal plasma proteins were identified. Comparison between Good and Poor cryopreservable sperm proteomics showed tight packaging of DNA, DNA-Protein complexes in CS sperms, better PPI networking related with the sperm progressive motility (String Cluster CL:34961) (Fig. 14) and better expression of Profilins groups of proteins are could be the possible reasons/ key players of better freezability in sperm. It also showed that higher lipid, carbohydrate metabolisms and negative regulation of molecular function, higher transporter activity proteins which help for movement of ions, macromolecules in and out of cells in Poor cryopreservable sperms. Seminal plasma showed that enriched proteasome, peptidase activity, positive regulation of secretion and cell – cell adhesion proteins CS group while defence/antimicrobial

mechanisms and negative regulations of cell motility in NCS group.

Antioxidant properties of extracts of arctic bacteria showed better antioxidant activity compared commonly used trehalose and other antioxidants as indicated by steep reduction in the absorbance at 734 nM compared to blank. Similarly, the FRAP and TEAC ($\mu\text{g/ml}$) values of extract were 308 ± 9.08 and 0.003408175 compared to zero for trehalose and glycerol. Use of extracts of arctic bacteria improved the bull semen PTM % (55% vs 40%) compared to the control (Tris-EY-Citrate). Higher Livability% (73 % vs 66%), HOST% (52 vs 49%) was observed with the use of this extract. Trehalose showed a negative influence in our experiments (PTM % -10%, HOST-19%).

Antimicrobial Resistance

Prevalence and diversity of antimicrobial resistance in *Enterobacteriaceae*

The present study was undertaken to investigate the prevalence of multiug resistant *Enterobacteriaceae* with extended spectrum beta-lactamases (ESBLs) production in Andaman and Nicobar Islands. A total of 151 cloacal/ rectal swabs were collected from different breeds of poultry (49), goat (43), pig (35) and cattle (30) and were screened for identification and characterization of *Salmonella* spp., *E. coli* and *Klebsiella* spp. On the basis of colony characters, biochemical tests and amplification of the genus specific genes, a total of 60 isolates of *Salmonella* spp, 80 isolates of *E. coli* and 83 *Klebsiella* were confirmed. All the isolates were subjected to antibiotic sensitivity assay following standard methodology. Tetracycline, oxytetracycline, gentamicin, erythromycin, and amoxycylav were found to be resistant to all the isolates. High prevalence of antibiotic resistance was observed in the isolates from desi birds (49.73%), Vanraja (58.87%) and Nicobari fowl (50.86%) from North & Middle Andaman and Nicobar districts. The resistance percentage ranged from 21 to 74 %. The bacterial isolate showing resistance to more than 3 antibiotics was considered as multi ug resistant (M). Prevalence of M

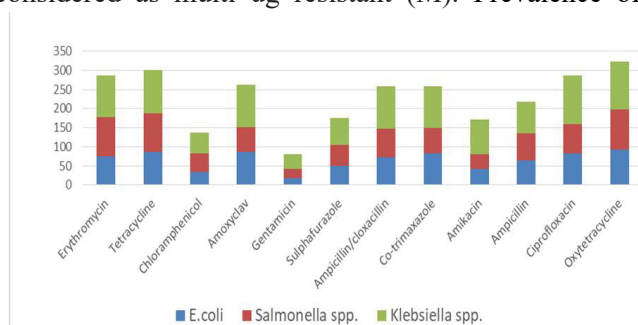


Fig 10- Antibiotic resistance pattern of *E. coli*, *Salmonella* spp. and *Klebsiella* spp. against a battery of broad spectrum antibiotics

was found to be very common as more than 51 % of the isolates showed multiug resistance to either 3 or more than 3 antibiotics. M isolates were recorded more in *Klebsiella* spp. (19.2%) followed by *E. coli* (18.6%) and *Salmonella* (12.5%).

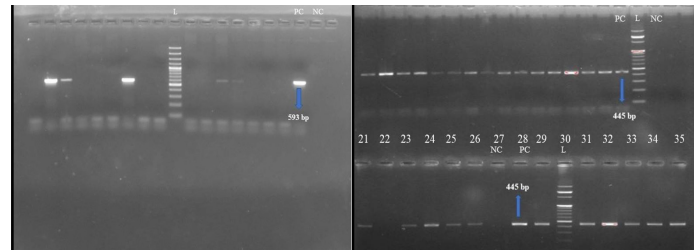


Fig 10 (a):-Amplification of bla_{CTX-M} gene in bacterial isolates. Lane No: 1-9, 11-17: Test samples; Lane No: 100 bp ladder; Lane No: 18: Positive control (PC); Lane No:19: Negative control (NC)

Fig 10 (b):- Amplification of bla_{TEM} gene in bacterial isolates. Lane No: 1-15, 21-26, 29, 31-35: Test samples; Lane No: 17 & 30- 100 bp ladder; Lane No: 16 & 28: Positive control (PC); Lane No: 18 & 27: Negative control (NC)

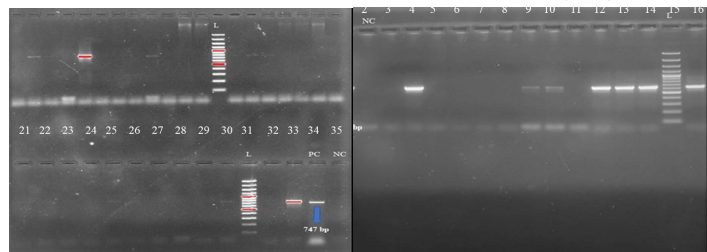


Fig 10 (c):-Amplification of bla_{SHV} gene in bacterial isolates. Lane No: 1-12, 14-30, 32, 33: Test samples; Lane No: 13 & 31: 100 bp ladder; Lane No: 34- Positive control (PC); Lane No: 35- Negative control (NC)

Fig 10 (d):-Gel photo showing the amplification of bla_{AmpC} gene in bacterial isolates. Lane No: 3-14,16: Testsamples; Lane No: 15- 100 bp ladder; Lane No: 1- Positive control; Lane No: 2- Negative control

Presence of extended spectrum beta lactamases (ESBL) was screened by performing inhibition zone test (IZT) followed by measuring and recording the diameter of zone of inhibition (ZOI) around the disk. Bacterial isolates isolated from broiler (48.39%) showed highest ESBL production followed by Vanraja (40.85%), layer (29.63%), Nicobari (28.16%) and desi (27.47%) birds. *E. coli* (43.36%) was found to be the most common ESBL producer followed by *Klebsiella* spp (30.94%) and *Salmonella* (27.48%). The isolates were also screened for the presence of AmpC β lactamase. Result revealed that 28.24% isolates were AmpC β lactamase producers, of which highest percentage was recorded in *Salmonella* spp. (36.28%) followed by

Klebsiella spp. (32.04%) and *E.coli* (18.58%). Production of ESBL enzymes in *Enterobacteriaceae* was found to be more than AmpC enzymes (33.38% and 28.24% respectively). A total of 10.82% of the isolates showed co-existence of ESBL-AmpC enzymes. Nucleotide sequencing of the selected PCR products showed the presence of SHV-11, TEM-1, CTX-M-15, SHV-228, SHV-27, SHV-11 genes. Overall antibiotic resistance was found to be more in goat (38.7 %) followed by pig (35 %) and cattle (27%). Erythromycin, ampicillin, ampicillin/cloxacillin and oxytetracycline were found to be more resistant than other antibiotics.

Monitoring and surveillance of important animal diseases

Monitoring and surveillance of Foot and mouth disease

During the reporting period, no clinical case of FMD was reported from A & N Islands. As a part of the routine surveillance and monitoring programme, a total of 608 cattle blood sera samples were screened for the presence of 3rAB3 antibodies by DIVA ELISA (differentiating infected from vaccinated) test. The result indicated that 33 samples (5.42%) showed presence of antibody against FMDV. The trend of the DIVA test (Fig 11) indicated that there was sharp decline in the number of samples showing positive to DIVA test which indicated that there was less chance of circulation of FMD virus in the population. Out of 193 goat sera samples screened for presence of 3rAB3 antibodies by DIVA ELISA, only one sample was found to be positive

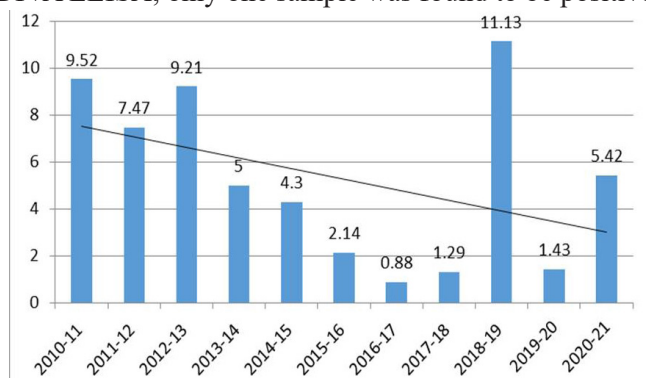


Fig 11. Trend of DIVA positivity in bovine sera samples

Sero-surveillance and monitoring of important livestock diseases of A & N Islands

A total of 19,517 parasitic cases were reported from different parts of the Islands. The main parasitic infections reported were fascioliasis (32.44%), ascariasis (31.9%) and amphistomiasis (15.07%). Prevalence of parasitic diseases was found to be more in goat (45.25%) followed by cattle (39.71%), pig (8.3%) and buffalo (6.66%). However, prevalence of parasitic cases per thousand animals was

more in buffalo (58.6) followed by pig (40.4), cattle (35.4) and goat (22.7). Occurrence of fascioliasis was common in buffalo and cattle, while cases of ascariasis and amphistomes were mainly reported from goat. The spatial distribution of parasitic cases per thousand of animal population was more in North & Middle Andaman (167.54) than in South Andaman (164.98) and least in Nicobar (55.96) district. The temporal distribution showed that the overall cases per thousand animals were high during September (20), February and April (12-15). The prevalence of parasitic diseases was reported to be very high in almost all parts of the Islands.

As a part of the routine sero-surveillance, a total of 193 goat sera samples from different parts of the A & N Islands were screened for the presence of *peste des petits ruminants* antibodies (PPRV) by rapid antibody test. None of the samples were found positive which indicated absence of PPR in these islands. Out of 728 bovine sera samples screened for presence of *Brucella abortus* antibodies by slide agglutination test, none of the samples were found positive. During the reporting period, 34 cases of contagious ecthyma (Orf) with attack rate of 15.5% were reported from the goats of two villages of South Andaman.

Active surveillance of immature *Paramphistomum cervi* in organized goat herd: An initial signature from A & N archipelago

A first recorded incidence of *Paramphistomum cervi* was reported from an organized goat farm situated in Mithakhari of South Andaman District during September, 2021. The animals were reared in semi-intensive system since they were regularly allowed to graze in the nearby water-logged marshy land since the climate was wet throughout this month and there was 21 cm rainfall over 23 days. From

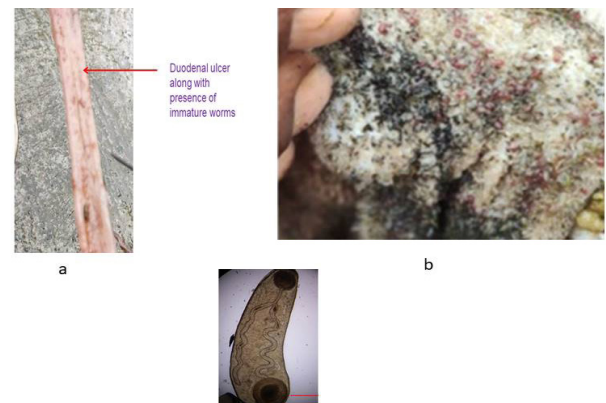


Plate:52. (a) Ulcerative lesion of duodenum of affected goat; (b) Numerous light red coloured worms in the rumen of infected goat; (c) Photomicrograph of pear-shaped *Paramphistomum cervi*, slightly concave ventrally and convex dorsally, with a large posterior sub terminal sucker (X40)

the middle of the month, the farmer reported mortality of the goats (average 2-3 per day) showing the symptoms of abdominal pain, bloat/distension of abdomen, abnormal accumulation of clear oedema fluid under the skin of the lower jaw (bottle jaw), profuse watery diarrhoea followed by death. Within 14 days, the mortality rate reached to 38.46%. After visiting the place of outbreak, post-mortem examination of the goats was done. Examination of abdomen revealed accumulation of colourless fluid in the peritoneal cavity and there was distension of gall bladder. After opening the intestine, in the duodenum region numerous immature flukes could be detected along with patches of haemorrhages as they were embedded in the mucosa and were reported to be plug feeders by awing pieces of mucosa in the suckers (Plate 52(a)). In the abomasum, there were ulcerative changes along with presence of few numbers of fluke. Ultimately, numerous worms were isolated from rumen of the affected animal (Plate 52(b)). On the basis of colour and microscopic examination, the worms were indistinguishable from *Paramphistomum cervi* (Plate 52(c)) since the light adult specimen was light red, which was pear-shaped, slightly concave ventrally and converse dorsally, with a large posterior sub terminal sucker.

Stress physiology and Production loss of agricultural animals

Economic impact of *Rhipicephalus microplus* infection

Parasitic diseases mainly caused due to ectoparasites- ticks are among the major concerns in agricultural animals. In A&N Islands, *Rhipicephalus microplus* is a major problem in large as well as small ruminants. A total of 22 infested animals with more than 20 adult ticks were selected for the study with average milk production of 4.5 L/ day. Production losses were calculated on the basis of 234 days' milk production. Milk production remained same in untreated animals. On the contrary, milk production in treated animals was 4.625 L per day. Therefore, this was observed that, milk production losses in each infested animal were 29.25 L.

Effect of transportation stress on physiological and immune responses in Andaman local pigs

During transportation, farm animals experience physiological and psychological stress. The effect of transportation stress was studied in Andaman local pig. Twelve pigs were transported from North and Middle Andaman to South Andaman via road in which two small sea channels have to be crossed in ferry with vehicle on board. Transportation triggered increase in serum levels of total protein and albumin. Elevated levels of aspartate

aminotransferase, alanine aminotransferase, alkaline phosphatase, lactate dehydrogenase and creatine kinase in transported pigs indicated muscular exercise or impaired liver function. Transportation induced dyslipidemia indicated by elevated levels of total cholesterol, low density lipoprotein cholesterol and triglycerides and a decreased level of high density lipoprotein cholesterol. High level of serum total nitric oxide and serum MDA as well as low antioxidant capacity in transported pigs indicated oxidative stress induction. Transportation resulted in activation of stress response and increased levels of serum cortisol and heat shock proteins were recorded in transported pigs. Moreover, increased concentration of pro-inflammatory cytokines (IL-2, IL-6, IL-12, IL-1 β and IFN- γ) and decreased concentration of anti-inflammatory cytokine IL-4 were detected in transported pigs.

Non-lectin mitogen and avian immune response

Mitogen induced immune response in Nicobari fowl

After inoculation of lipopolysaccharide in Nicobari fowl in two different phenotypically fowls, there was no significant difference in biomolecules related to immunity between short and long shank fowls (Table-9).

Table 9:-Profile of immunoregulatory biomolecules in mitogen induced polymorphic Nicobari fowl

Interleukin - IL6 (pg/ml, mean \pm SD)		
	Short Shank	Long Shank
24h	308.97 \pm 27.50	355.10 \pm 49.17
1 week	292.47 \pm 24.97	326.42 \pm 45.13
Interferon gamma-IFNG (pg/ml, mean \pm SD)		
	Short Shank	Long Shank
24h	636.62 \pm 125.09	658.82 \pm 83.97
1 week	662.61 \pm 99.98	607.20 \pm 61.28
Major Histo- compatibility complex- MHC (ng/ml, mean \pm SD)		
	Short Shank	Long Shank
24h	2.19 \pm 0.09	3.65 \pm 0.71
1 week	1.99 \pm 0.08	1.99 \pm 0.14

Effect of medicinal plants on immunity following mitogen stimulation

Efficacy of herbal formulation with composition of *Tabernamontana crispera* (10 g), *Psidium guajava* (5 g) and *Leea indica* (2.5 g) on innate immune homeostasis, resistance to invading pathogens and improved immune function was studied. Decoction was prepared @ 4.5 mg crude concentrate in 3 ml aqueous extract. Experimental birds (n=36) were grouped into three. In one group, decoction was given to birds @ 3 ml per bird twice a week.

One group was kept as a negative control with only water. Another group was as positive control and supplemented with oxytetracycline in water. On 22nd day, all the birds were injected with lippolisaccharide of *E. coli* @ 100 mg per kg body weight. Lower serum level of IL -6 and higher serum level of IFN γ and MHC with herbal decoction indicated that herbal additive supplemented twice in a week enhanced anti-inflammatory effect, improved immunity and maintained innate immune homeostasis (Table-9).

Table-9. Cytokine assay with supplementation of aqueous extract

	Control	Herbal	Antibiotics
Interleukin - IL6 (pg/ml, mean \pm SD)			
24h	355.10 \pm 49.17	298.9 \pm 40.32	324.36 \pm 76.10
1 week	326.42 \pm 45.13	279.78 \pm 34.42	290.35 \pm 25.70
Interferon Gamma - IFNG (pg/ml, mean \pm SD)			
24h	627.82 \pm 98.805B	753.93 \pm 146.73A	658.82 \pm 83.97B
1 week	507.20 \pm 61.28B	771.91 \pm 66.83A	640.27 \pm 79.63B
Major Histo-compatibility complex- MHC (ng/ml, mean \pm SD)			
24h	2.22 \pm 0.180B	3.650 \pm 0.70A	2.29 \pm 0.073AB
1 week	1.995 \pm 0.140	2.091 \pm 0.077	2.074 \pm 0.0558

Medicinal plants in animal care

Influence of medicinal plants supplementation on production and immunity in poultry

Biological experiment was carried out on efficacy of aqueous extract of *Tabernamontana crispa*. Experimental birds (18 numbers) were divided into three groups. First group was given only water without any additives. Antibiotic (oxytetracycline) was added in the water of second group. Third group was given aqueous extract of of *T. crispa* @ 5 ml per bird twice a week. Results revealed that, both antibiotic and *T. crispa* supplemented group had better body weight compared to control group. *T. crispa* supplemented group had the highest body weight, which indicated growth promoting property. Humoral immunity against goat RBCs indicated that the humoral response was sustained till 14th, 21st day post injection in both stages in *T.crispa* supplementation due to its immunity enhancing property. Lower values of thiobarbituric acid reactive substances (TBARS) with supplementation of antibiotics and *T.crispa* indicated reduction in stress and better antioxidant properties and as compared to antibiotics, *T.crispa* had significantly higher antioxidant property. The higher serum growth promoting hormone (0.3 to 0.4 ng/ml) in *T. crispa* supplemented group was well correlated with better growth performance during starter phase. *T. crispa* supplementation reduced total intestinal and caecal bacterial count (Table 10).

Table 10. Growth performance pre-starter (0-4 weeks) and starter (4-8 weeks)

Age in weeks	Body weight (g)		
	Control	Antibiotic	T. crispa
0 day	33.8 \pm 1.08	33.2 \pm 0.86	33 \pm 1.14
4th week	196.4 \pm 2.68	202.7 \pm 1.62	224.1 \pm 1.36
8th week	419.4 \pm 3.96	437.8 \pm 2.28	456 \pm 2.75

Maintenance, propagation and improvement of germplasm

Establishment and Promotion of quail farming; an emerging field of entrepreneurship in A&N Islands

Quail production performance with respect to body weight gain and feed and water requirements were evaluated in the Islands. (Fig 12). Body weights of 180-190 g were achieved at age of 35-42 days. At peak stage, 1 kg of feed is used for production of 24 eggs [FCR (12 eggs) =0.52]

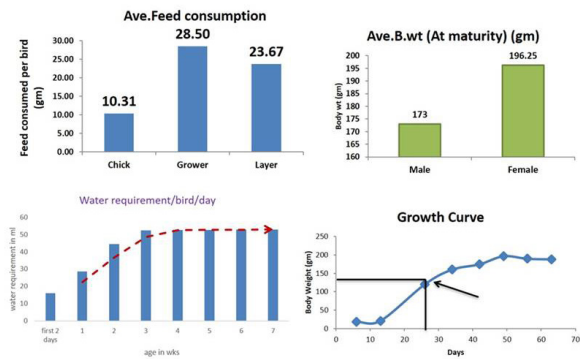


Fig 12:- Production performance and feed and water requirements of quail in A & N Islands

Enhancing the productivity of Andaman goat

Under the All India Coordinated Research Project on Goat Improvement, programme on enhancing the productivity of Andaman goats through selective breeding and implementation of advanced scientific management practices has been initiated (Plate 53). During the period, 3,382, 2,127 and 1,486 goats have been registered under



Plate 53. Andaman local goat (Male)

adopted clusters of Port Blair, Baratang and Nimbudera, respectively. A total of 383 farmers have been registered in 55 villages. The overall least square means of body weights (kg) at birth, 3, 6, 9 and 12 months of age were 1.39 ± 0.09 , 5.79 ± 0.07 , 9.67 ± 0.11 , 12.11 ± 0.18 and 15.91 ± 0.13 , respectively. The tugging percentage was found to be 81% and kidding rate of 1.49 was recorded in the present stock. Weight at first kidding (16.47 ± 0.14) and kidding percentage of 149.13 was recorded from the present stock. The percentage of singles, twins and triplets were 58%, 39% and 3.0 %, respectively. In the Nimbudera cluster, the percentage of triplets has increased. During the period, 1,108 kids were born with overall population growth of 71.8%. Body weight at 6 and 9 months showed high heritability and better genetic correlation with other parameters (R^2 values of 0.675 and 0.795 respectively). Hence, considering both the heritability and correlation, it may be suitable to select Andaman Local goat by 6 months body weights. A total of 96 male kids were selected on the basis of 6 months body weight over the population average. The selection differential of 1.10 kg body weight with selection intensity of 1.09 was recorded, which indicated that higher the selection intensity genetic improvement will be more. A total of 2,940 goats were provided with mineral mixture/ deworming/ treatment for different illness. Overall mortality during the period was 4.8%, mainly due to diarrhoea, weakness and bloat. Timely deworming has been advised and practiced. Clinical cases of amphistomiasis and contagious ecthyma has been reported. Use of FAMACHA has been advised and demonstrated in the adopted clusters. The new born kids are also given more care by providing the vitamin tonic and sufficient milk of the does. The weaning weight of the goat kids were increased to 23.09 % over the last five years. A total of 6 training/awareness programmes/field day were conducted during the period, of which 159 farmers (68 males and 103 females) were benefitted. The economics of the present flock has been calculated. The net income per animal per year was increased from Rs. 2,937/- (2017) to Rs. 4,731/- (2021) with 61.08 % increase in the income.

Mitigation of livestock and poultry ailments

Humpsore treatment by Trimodel therapy

Twenty-four cattle (18 affected and 6 unaffected) were selected and divided into Gr 1: positive control (infected without treatment; $n = 6$), Gr 2: treatment group (infected with treatment with ivermectin; $n = 6$), Gr 3: treatment group (infected with treatment with tri-model therapy including ivermectin, diethylcarbamazine citrate, and an herbal ointment, $n = 6$), and Gr 4: negative control (non-infected

animals; $n = 6$). In Gr 2 and Gr 3, treatment to the ailing animals was given for 30 days. Lesion was significantly reduced in day 15 of post-treatment and completely healed on day 30 of post-treatment in Gr 3. Tri-model therapy recorded significant improvement in the surface area of the sore as compared to ivermectin administration alone. Liver functional intracellular enzymes such as Aspartate aminotransferase (AST), Alanine aminotransferase (AST) and lactate dehydrogenase (LDH) were significantly reduced in Gr 3 than in untreated control group at day 14, 21 and 28. Gr 3 treated humpsore affected cows had significantly higher TRBC, Hb, ESR, and PCV and significantly lower TWBC than in untreated control cows. Similarly neutrophil, lymphocyte, monocyte, eosinophil and platelet were significantly lower in tri-model therapy treated than in untreated control cows. Endocrinological profiles such as cortisol and prolactin were decreased and thyroid hormones were increased significantly in tri-model therapy treated cows than in untreated cows. Biochemical profiles revealed that total protein, albumin, globulin, glucose and total cholesterol were significantly ($p < 0.05$) higher in tri-model therapy treated than in untreated humpsore affected cows. Success rate of tri-model therapy is more than 90%. Milk yield has been increased in 75-80% of tri-model therapy treated animals with 25-30% of milk production. Induction of heat or bring to heat was achieved in 50-55% of tri-model therapy treated animals. Similarly, nuisance due to fly and micro or microfilaria has been reduced significantly in tri-model therapy treated cows than those treated with ivermectin alone or untreated control groups. Therefore, tri-model therapy has the potential to cure humpsore.

Probiotics supplementation as a remedy for weaning stress in piglets

Weaning in piglet is extremely stressful event and it is associated with nutritional, psychological, oxidative and immunological stresses. In-feed antibiotics or zinc oxide have long been used as therapeutic agents and growth promoters to prevent the loss associated with weaning stress. The use of antibiotics or zinc oxide is not recommended due to increasing occurrence of antibiotic resistance or environmental heavy metal contamination. The effect of a multi-strain probiotic compound containing *Bacillus coagulans*, *Enterococcus faecalis*, *Clostridium butyricum* and *Bacillus mesentericus* on growth performance, diarrhea incidence, antioxidant status, lipid profile, stress and immunity in weaned piglets of Andaman local pig breed was investigated. A total of 24 piglets (28 d-old, initial body weight 6.77 ± 0.15 kg) were randomly divided into 3 groups; (i) weaned control group (WC) received basal diet,

(ii) weaned probiotic group (WB) received basal diet and probiotics and (iii) positive control (PC) group received basal diet with 2500 mg/kg ZnO. The experiment lasted for 28 days and parameters were recorded on day 0 and weekly interval thereafter. Probiotic supplementation improved growth performance and reduced diarrhea rate. WB and PC did not show any significant difference in respect of growth parameters and diarrhea rate. Probiotics supplementation improved lipid profile; significantly lower levels of total cholesterol and low-density lipoprotein cholesterol and higher level of high-density lipoprotein cholesterol in WB group as compared to those of the control group (WC) were recorded. Probiotic supplementation stimulated antioxidant defense system by increasing total antioxidant capacity and decreasing lipid peroxidation. Probiotic supplementation down-regulated the stress biomarkers like serum cortisol and serum heat shock proteins. WB group showed higher serum levels of IgG and IgM throughout the study period and higher IgA at day 28 as compared to WC. In comparison with PC, higher serum levels of all the immunoglobulin isoforms were detected in WB group at day 28. These data suggest that supplementation of the probiotic minimizes the weaning stress, thereby improves the growth performance, lipid profile, antioxidant status and systemic as well as mucosal immunity of weaned piglets.

Herbal intervention to ameliorate ocular infection of poultry and goat

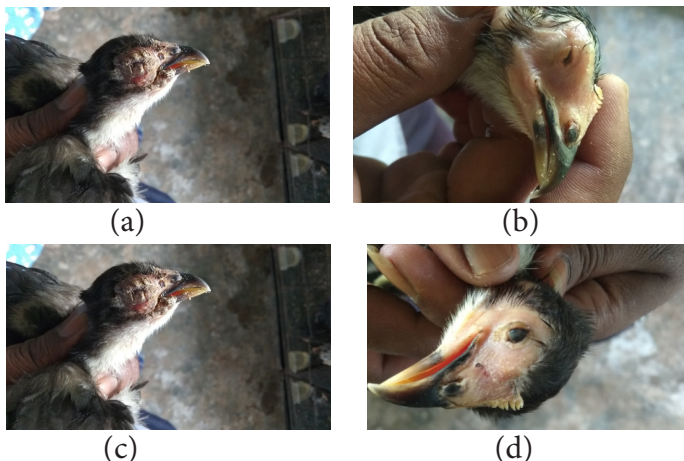


Plate 54:- Various stages of ocular infection of Nicobar fowl. a. Swollen eye with big mass of pus plug, b, c Mucus formation on sclera & Recovered bird 4 days after treatment

Oil based herbal comprising of *Glycosmis pentaphylla*, *Spondias pinnata*, coconut oil and castor oil were applied topically in ailing poultry and goat. Four days of after treatment with in-house herbal preparation, ocular lesion disappeared. Same result was also obtained when infected bird and goat was treated with conventional commercially available eye op.

Biotech Kisan Hub

BIOTECK KISAN HUB was established with the infrastructure facility to conduct training cum demonstration and to facilitate exposures visits of farmers to the main hub. Mass awareness has been created on concepts/activities/technologies such as application of FAMACHA for detection of anemia in goat, establishing multiplier flock, community-based vaccination for rural poultry, Mini incubator and Mini Feed mill for balanced rural poultry feed through trainings, establishment of field demonstration units through Mahila Biotech Kisan fellowships. During the period a total of **1542 farmers** have been benefitted both directly and indirectly through training, demonstrations and availing hatching facilities from field demonstration units of mini-incubators. Community based vaccination for rural poultry was established and routinely followed by farmers in adopted villages. A total of **600 birds** are covered per month under community-based vaccination. Nucleus flock concept with superior bucks has been successfully established by two entrepreneurs which is in turn alleviating unavailability of good breeding bucks in the field. By implementation of strategic planning with use of mini-incubator technology for production and selling of desi chicks has **doubled the monthly income from Rs.3000 to Rs.6000**. By adopting scientific goat farming technology net economic gain has been increased from Rs 22,310/- to Rs. 31, 110/- with flock size of 5 does and 1 buck. The benefits accrued on various skills on mini-incubator, scientific rural poultry and goat farming increased by **38%**. **Four popular articles** in local newspaper and **four DD programmes** on mini-incubators and scientific goat farming has been published and recorded. The project has motivated farmers and unemployed youths to make mini-incubators using card board and thermo coal boxes and the home made mini incubators is getting flared up in these Islands. Field demonstration units is indirectly acting as desi egg cooperative centre wherein village farmers sell their desi eggs which made their marketing at doorstep and has doubled the egg production of desi poultry farming as hens are not engaged for brooding and thereby farmers income has doubled across the village.



Plate 55 : Demonstration of Mini incubator at farmers field

DIVISION OF FISHERIES SCIENCE



Coastal Fisheries Information Hub

Car Nicobar Island, the headquarter of Nicobar district in Andaman and Nicobar archipelago is a small flat Island inhabited majorly by the Nicobari traditional communities who are one among the six aboriginal tribal communities in the archipelago (Fig 13).

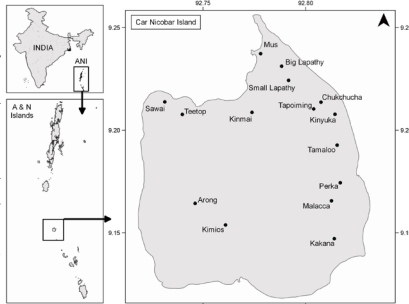


Fig 13: Location of the study area, Car Nicobar Island

Subsistence and small-scale fishing in the coastal waters of the Island is one of the important livelihood activities of the traditional communities. The fishermen mostly engaged in fishing in their traditional fishing craft namely Hodi and their indigenous traditional practices were well documented. The project aimed to build a network of coastal fisheries information activities which could benefit the tribal fishing communities in their day-to-day fishing practices. A preliminary information of the livelihood loss due to the pandemic related restrictions were studied from the tribal fishers of Car Nicobar. The respondents belonged to the villages of Car Nicobar such as Sawai, Teetop, Mus, Big Lapathy, Small Lapathy, Tapoiming, Chukchucha, Kinyuka, Tamaloo, Perka, Malacca, and Arong. Among the group of fishers interviewed (N=95) the monthly fish catches were declined by 30% and the average monthly income were also reduced by 33% in post pandemic conditions. Operational issues in fishing such as fuel shortage, limitations in fishing inputs, manpower issues, storage facilities, demand and transportation were highlighted by the respondents. The respondents also outlined the need for subsidies, compensatory packages, awareness, advisories, insurance schemes, and infrastructure upgradation as the suggestions for future to strengthen the coastal fishing sector of Car Nicobar. The study also identified the women fish vendors engaged in sale of marine fishes in Car Nicobar which forms an important source of information on the role of women vendors in fish marketing systems of Car Nicobar. A conceptual framework highlighting roles and responsibilities to engage the stakeholders such Government organizations, research departments, traditional community and the extension functionaries were also developed. The critical need to link the science-policy-practice interface was also stressed for sustainable fishery and participatory outcomes in the coastal fishing activities of Car Nicobar Island.

Aquatic animal disease surveillance and health management practices

Passive and active surveillance were conducted on freshwater and marine fish and shellfishes of Andaman and Nicobar Islands. Baseline data has been collected from a total of 65 freshwater fish farms and necessary advice were provided to improve their farming practices. In order to analyze the perception of stakeholders on fish health management in Andaman and Nicobar Islands, responses were collected and compiled from a total of 305 freshwater fish farmers by using the semi-structured questionnaire. Incidences of bacterial infections due to *Citrobacter* sp. in *Channa striata*, abdominal psyllid due to *Aeromonas* sp. in *Barbonymus gonionotus* and koi carp were recorded. Occurrence of the parasites such as monogenea of the genus *Microcotyle* was recovered from little tuna, *Euthynnus affinis* and digenetic trematode, *Hexangium cf. sigani* was recorded from *Siganus argenteus*. The newly described parasitic isopod, *Renocila bijui* was recorded from a new host in *Acanthurus mata*. A raphidascarididae nematode worm of the genus *Hysterothylacium* was isolated from the snapper fish, *Nemipterus peronii*. Crustacean parasites like *Argulus foliaceus* and *Lernae cyprinacea* were also recorded from the aquarium specimens of Goldfishes. Besides, *Piscino odinium* sp., a parasitic dinoflagellate was recorded from *Betta splendens* and *Camallanus* species was recorded from *Channa royi* and *Channa striata*. A case of morbidity and mortality was recorded from the mud crab, *Scylla serrata* due to severe infestation of the barnacle, *Octolasmis warwickii*. Under the capacity building programmes, a webinar and two awareness programmes were conducted on aquatic animal health management in which a total of 73 stakeholders have benefitted.

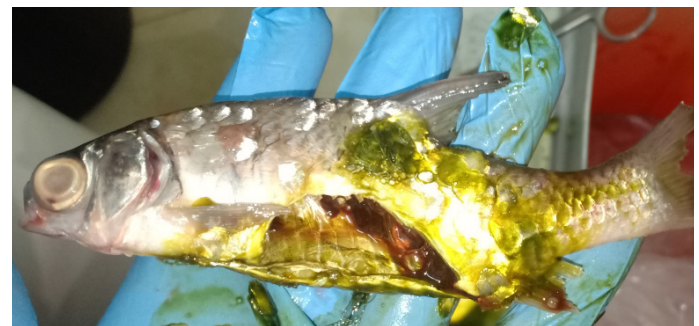


Plate 56:-Abdominal dropsy in Javanese barb (*Barbonymus gonionotus*)

Prevalence of parasites infecting commercial marine and freshwater fishes of the Andaman Islands

A total of 456 fish specimens comprising of 256 freshwater and 200 marine fishes were screened for finfish parasites.

The list of parasite species documented in the surveys are reported in Table 14. Some of the significant groups of parasite belonging to families like *Philometridae*, *Cymothoidae*, *Bomolochidae*, *Camallanida*, *Microscaphidiidae*, *Pennellidae*, *Oodiniaceae* and *Ichthyophthiriidae* were recorded from the marine and freshwater fishes. In the freshwater fishes, outbreak of whitespot disease and *Piscinoodinium* sp. in *Betta splendens* larvae were recorded in different occasions

(Plate 56). The protozoan parasite *Ichthyophthirius multifiliis* was isolated by wet mount. A prevalence of 100 and mortality of 67% with a mean intensity of 28–32 *I. multifiliis* per *Betta* larvae was recorded. The mortality rate (56%) due to *Piscinoodinium* sp. was recorded in 1 month advance *Betta splendens* fry. The incidence of parasites in the nurse rearing phase of *Betta splendens* possess threat to its associated hatchery operations, if necessary, management practices are not taken.

Table 11. List of parasites recovered from the respective marine and freshwater fish host.

Parasite species	Family	Host	Site of infestation	Status
Marine fishes				
<i>Philometra</i> sp.	Philometridae	<i>Rastrelliger brachysoma</i>	Intestine	First record
<i>Renocilabiju</i>	Cymothoidae	<i>Acanthurus mata</i>	Body surface	New host record
<i>Cymothoa frontalis</i>	-do-	<i>Paraexocoetus mento</i>	Gill	New record
<i>Lerneanicus</i> sp.	Pennellidae	<i>Atherone</i> sp	Nostril	-do-
<i>Bomolochus decapteri</i>	Bomolochidae	<i>Ariomma melanum</i>	Gill	-do-
<i>Hexangium</i> cf. <i>sigani</i>	Microscaphidiidae	<i>Signanus argenteus</i>	Intestine	-do-
<i>Camallanus</i> sp.	Camallanida	<i>Epinephalus areolatus</i>	-do-	-do-
Freshwater fishes				
<i>Piscinoodinium</i> sp.	Oodiniaceae	<i>Betta splendens</i>	Body surfaces	-do-
<i>Ichthyophthirius multifiliis</i>	Ichthyophthiriidae	<i>Betta splendens</i>	-do-	-do-

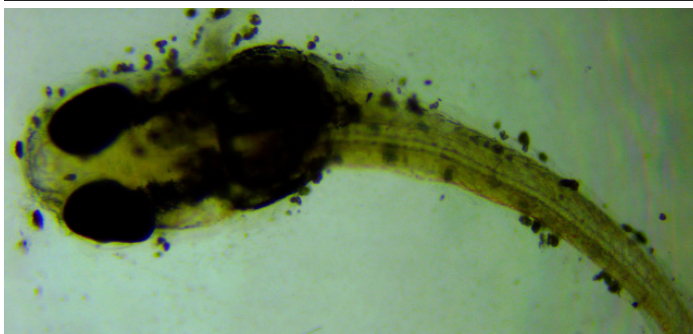


Plate 57:- White spot and dinoflagellate infection in freshwater fighting fishes

Feed based aquaculture practices to augment fish production

In order to encourage the feed-based aquaculture practices, Dweep-Carp Starter Feed has been formulated with 30-35% of crude protein and 6-8% of crude lipid content by using the locally available feed ingredients and evaluated on rohu fishes in farmer’s field at Lal Pahad, South Andaman (Plate 58). The results revealed that better growth and production parameters were recorded for the carp starter feed fed fishes than the control feed



Plate 58:- Dweep Carp starter feed formulated and evaluated in the farmer field

fed fishes. A total of 890 kg of feed comprising of carp grower feed, carp starter feed and control feeds were produced from the fish feed mill for demonstration and sale purposes. Terms and conditions were finalized in order to extend the pilot scale fish feed mill of ICAR-CIARI as an incubation facility to the interested stakeholders to equip themselves on entrepreneurship development in fish feed production. Besides, a webinar and an awareness programme were conducted on fish nutrition and feeding management in Island aquaculture in which a total of 64 stakeholders have participated. Further, the developed fish feeds were displayed at the Exhibition on Agricultural Technologies held at ICAR-CIARI in which a total of 68 participants comprising of farmers and school students have participated and the importance of fish feed in Island aquaculture was explained to the stakeholders.

Exploring the post-harvestutilisation and market potential for value added products from commercial fish landings of Andaman

flesh characteristics, nutritional profiling and the existing utilization pattern in the islands. Of the 25 candidate species, proximate analyses of 11 species were completed as shown

Twenty-five low value species have been identified from our studieswhich has potential for value addition, based on the

in Table 15. These underutilized species were used for value addition studies.

Table 12: Proximate analysis of 11 commercially important low value species from the island.

S.No	Species	Moisture (%)	Protein (%)	Ash (%)	Fat(%)
1.	<i>Leognathus</i> sp (<i>Chanda</i>)	78.80±0.02	17.85±0.34	0.20±0.35	3.10±0.05
2.	<i>Stolephorus</i> sp (<i>Maya</i>)	79.64±0.05	18.07±1.10	0.28±0.40	1.08±0.04
3.	<i>Sardinella fimbriata</i> (<i>Tarni</i>)	71.39±0.08	17.41±0.18	0.21±0.08	5.54±0.21
4.	<i>Rastrelliger</i> sp (<i>Bangdi</i>)	72.85±0.14	18.18±0.16	0.32±0.20	4.12±0.05
5.	<i>Nemipterus</i> sp (<i>Rani</i>)	76.31±0.20	18.14±0.07	0.59±0.25	1.78±0.24
6.	<i>Lactarius lactarius</i> (<i>Parava</i>)	72.30±0.30	16.13±0.20	0.11±0.34	2.0±0.23
7.	<i>Gerres</i> sp (<i>Potti</i>)	68.02±0.05	17.89±1.28	0.23±0.08	0.08±0.23
8.	<i>Alepesd jedaba</i> (<i>Topi</i>)	75.36±0.07	18.87±0.10	0.29±0.50	1.03±0.12
9.	<i>Pomodasys</i> sp (<i>Cocko</i>)	73.21±0.19	17.28±0.23	1.33±0.08	0.08±0.30
10.	<i>Upeneus</i> sp (<i>Daadi/goat fish</i>)	71.21±0.63	17.63±0.32	0.95±0.07	0.04±0.02
11.	<i>Euthynnus affinis</i> <i>Little tuna</i>	69.2±0.2	19.82±0.54	0.85±0.92	0.02±0.03

Seafood quality and safety assessment studies in commercial fish landing of Andaman Islands

General hygienic practices in the markets and landing centres were observed during the survey in which more than half of the respondents (58%) did not use ice for chilling of fish, and most of the vendors (42.6%) did not use the ice during transport of fish. To evaluate the microbiological quality of the seafood against pathogens of public health significance, total plate count (TPC) and most probable number (MPN) were done. 16 commercially important

species, collected from 3 different markets were chosen for the study. (Table 13). MPN were also within the limits for the sampled species. 20 isolates of *E. coli* were confirmed from the different selective plates. Biochemical parameters of the species were also checked to assess the freshness and it was found that most of the parameters were within the acceptable levels except for the free fatty acids which was higher in certain fishes and crossed the maximum accepted level of 2 % oleic acid (Table 13).

Table-13. Total plate count of the commercially important species

Data expressed as mean ± S.D (n=2)

Location	Species	TPC (10 ⁷ CFU/ g)
BathuBasthi	<i>Dussumieria acuta</i>	0.28±0.57
	<i>Stolephorus indicus</i>	0.45±0.00
	<i>Rastrelliger kanagurta</i>	1.25±1.15
	<i>Atule mate</i>	0.79±0.57
	<i>Lutjanus gibbus</i>	1.19±0.57
Mohanpura	<i>Stolephorus indicus</i>	0.41±0.57
	<i>Nemipterus peronii</i>	0.52±1.15
	<i>Rastrelliger kanagurta</i>	1.32±0.57
	<i>Carangoides oblogus</i>	0.97±0.00
	<i>Penaeus vannamei</i>	0.85±0.57
	<i>Scylla serrata</i>	1.08±1.15
Junglighat	<i>Nemipterus peronii</i>	0.19±1.7
	<i>Herklotsichthys quadrimaculatus</i>	0.08±0.57
	<i>Atule mate</i>	0.70±0.57
	<i>Sepiella inermis</i>	1.56±0.57
	<i>Stolephorus indicus</i>	0.73±1.15

Table:14-Biochemical parameters of the commercially important catch.

 Data expressed as mean \pm S.D (n=2)

Location	Sample	Biochemical quality parameters				
		PV	FFA	TBARS	TVBN	pH
Mohanpura	<i>Stolephorus indicus</i>	2.58 \pm 0.005	0.9 \pm 0.005	0.05 \pm 0.006	3.15 \pm 0.012	7.11 \pm 0.003
	<i>Nemipterus peronii</i>	2.59 \pm 0.006	0.8 \pm 0.028	1.49 \pm 0.006	3.15 \pm 0.006	6.89 \pm 0.017
	<i>Rastrelliger kanagurta</i>	2.59 \pm 0.01	2.4 \pm 0.100	2.08 \pm 0.000	6.65 \pm 0.000	6.36 \pm 0.000
	<i>Carangoides oblogus</i>	3.58 \pm 0.005	1.6 \pm 0.200	1.07 \pm 0.006	4.9 \pm 0.029	6.84 \pm 0.009
	<i>Penaeus vannamei</i>	3.59 \pm 0.095	1.6 \pm 0.080	0.17 \pm 0.006	4.9 \pm 0.058	7.47 \pm 0.033
	<i>Scylla serrata</i>	2.59 \pm 0.005	1.6 \pm 0.710	1.07 \pm 0.000	6.65 \pm 0.012	7.78 \pm 0.012
Junglighat	<i>Nemipterus peronii</i>	3.58 \pm 0.005	0.8 \pm 0.057	1.53 \pm 0.017	3.15 \pm 0.006	6.83 \pm 0.006
	<i>Herklotsichthys quadrimaculatus</i>	3.59 \pm 0.005	2.2 \pm 0.057	1.84 \pm 0.023	4.9 \pm 0.017	6.53 \pm 0.003
	<i>Atule mate</i>	1.59 \pm 0.005	1.7 \pm 0.057	0.45 \pm 0.000	1.4 \pm 0.029	6.45 \pm 0.029
	<i>Sepiella inermis</i>	3.59 \pm 0.00	1.3 \pm 0.057	0.47 \pm 0.006	3.15 \pm 0.006	7.58 \pm 0.000
	<i>Stolephorus indicus</i>	2.59 \pm 0.025	0.9 \pm 0.057	0.04 \pm 0.003	3.15 \pm 0.012	7.14 \pm 0.009

Promoting livelihood and entrepreneurship through value added fishery products-An initiative aimed for women empowerment

Value added products has gained less attention in the Islands till date due to less awareness and lack of organized markets focussing the value-added fishery products. Identifying the potential for value addition, value added products such as Fish pickle, Fish pizza and fish wafers were prepared from candidate low valued fishes such as little tuna, mackerel, and pink perch. These products were subjected to sensory and quality evaluation for further popularization. The sensory scores of the products were within acceptable range and got an overall acceptability of more than 7. For the developed products, storage studies were undertaken and the present analysis indicates that fish pickle is having a shelf life of five months with all the biochemical parameters like TVBN, TBARS, PV and FFA falling within the acceptable range and the product also remained microbiologically stable up to 5 months at normal room temperature (Table 17). The treated pickle (T1-sodium benzoate treatment) was found to have better score and acceptability than the control (T0-without preservative). Fish pizza was prepared from mackerel and the species received good reception and overall acceptability from 7 to 9 during the 3 days of refrigerated storage study. The product remained stable up to 3 days under the refrigerated condition with all biochemical, microbiological and sensory parameters within the acceptable range during the storage period. Fish wafers were prepared from pink perch. The product received good sensory score during the past 21 days of the storage periods and all the quality parameters are found to be within the acceptable limits. A total of 61 beneficiaries has been benefitted through the different training and awareness programmes conducted.

Table:-15 Biochemical and microbiological characteristics of the fish pickle prepared.T0: Control, T1: Sodium benzoate treated-1st month storage

Parameter	T0	T1
Moisture (%)	31.53 \pm 0.01	30.66 \pm 0.02
Fat (%)	26.3 \pm 0.04	26.7 \pm 0.05
TVBN (mg N/100 gm)	18.37 \pm 0.02	18.37 \pm 0.02
PV (meq O ₂ /Kg)	0.054 \pm 0.003	Nil
FFA (% oleic acid)	0.008	0.008
pH	3.99 \pm 0.04	3.93 \pm 0.05
TTA (% acetic acid)	0.37 \pm 0.02	0.37 \pm 0.03
Total Plate count (log cfu/g)	2.84 \pm 0.07	2.97 \pm 0.08

 Data expressed as mean \pm S.D (n=2)

Sustainable utilization of fish wastes for by-product development – an initiative for entrepreneurship development in the Islands.

The concept of waste to wealth has been gaining rapid attention across the world leading to development of various byproducts which are of commercial use. The fish-based wastes and associated studies are very limited leading to loss of various wastes generated in the markets which has the potential to be developed as products. Waste disposal is also a concern in the fish markets since these wastes are discarded haphazardly at different places leading to environmental issues. Hence, the study aimed to gather information on the type of wastes generated in the fish markets and the way to sustainably utilize the wastes by converting them into products. The major wastes in the markets include skin, scales, fins, viscera, and bones etc which are discarded on daily basis in the markets. Various byproducts such as fish meal, fishsilage, fish oil, etc were tried in our studies from the wastes collected in the local markets. Fish meal was prepared from the fish offal, and

discarded poor quality fishes. The overall yield of the fish meal was 32.4% with a moisture content of 9%, and fat content of 15%. Fish oil has been prepared from *Pangasius sp.* with a total yield of 12.4%. Storage studies of fish meal is taken up for the past three months and further studies will be undertaken for developing fish meal into a commercial product. Various sensitization programmes were organized to sensitize the fisher-folk regarding the potential of fishery wastes in processing and by-product development. All together 27 beneficiaries were benefitted from the programmes.

Development and demonstration of mud crab fattening to improve the livelihood of fishers at Andaman Islands

Mudcrab fattening is one of the potential culture activities for employment generation and entrepreneurship activities in the Islands. Considering the issues associated in the pond-based culture such as intensive management, feeding, surveillance etc, an indoor recirculatory vertical crab fattening unit was designed to undertake crab fattening activities under controlled conditions. A demonstration unit was fabricated which could accommodate 100 crabs with a water recirculatory system. The fattening activities were undertaken for a period of 45 days. Water crabs were procured from the local fishermen fishing in the estuarine areas and are conditioned to acclimatise



Plate 58:- Mud crabs of Grade A weighing above one kg weight

in the fattening unit. For further popularization an awareness programme was organized for the farmers from various villages of South Andaman to sensitize the need for promoting crab fattening practices for promoting livelihood, employment and harnessing the brackish water fishery resources. A mud crab fattened and kept for sale shown in (Plate 58)

Assessment of Elasmobranch Fisheries of Andaman Islands

Overall, 55 elasmobranch species belonging to 28 genera, under 13 families and six orders have been recorded from three different gear types (Long line, Gill net and Trawl net) from landing centres of Juglight, Wandoor, Guptapara, Burmanallah and Dignabad. Among all elasmobranchs, sting rays and sharks constituted 49% each (27 species) and shovel nose rays 2% (1 species). The sting ray gill nets locally known as “tirukkaivala” contributed maximum quantity of elasmobranch to the islands, followed by hook and line and trawl net. The majority of the catches from Islands are targeted by the skilled Thoothoor fishers of Tamil Nadu, as they employ large mesh sized bottom drift gill nets (for sting rays) and low numbered hooks (0 to 4) for shark fishing. The remaining catches were mostly by-catches of hooks & lines and trawl fishers. The monthly length frequency data of two shark species (*Loxodon macrorhinus* & *Paragaleus randalli*) and two sting ray species (*Himantura leopard* & *Neotrygon cf. caeruleo punctata*) were collected and the population demography were studied using FiSAT II software (Table 16). Operational performance of sting ray gill netters, shark long liners and trawlers were documented. The CCRF compliance evaluation done from 59 fishers, 12 fishery managers and officials and from three traders.

Table 16. Population dynamics of selected elasmobranch species in Andaman Islands

Parameter	<i>L. macrorhi</i> n=581	<i>Prandalli</i> n=645	<i>N. cf. caeruleo punctata</i> n=329	<i>H. leopard</i> n=394
L / DW (cm)	110.78	98.01	45.70	171.72
K [∞] (per year)	0.55	0.60	0.30	0.21
M (per year)	0.84	0.92	0.45	0.39
Z (per year)	1.93	2.04	0.74	1.38
F (per year)	1.09	1.12	0.29	0.99
T _{max} (year)	5.50	5.00	10.34	14.28
E	0.56	0.55	0.39	0.72
U (per year)	0.48	0.48	0.21	0.54

Biology and population dynamics of major perch fishes of Andaman Islands

The larger perch fishes belonging to families Serranidae (groupers), Lutjanidae (Snappers) and Lethrinidae (Emperors) are known as 'major perches'. A total of 104 species of major perches, belonging 21 genera were identified during the period. Family Lutjanidae (snappers) landing maximum diversity of 45 species belonging to nine genera (*Aphareus*, *Aprion*, *Etelis*, *Lipocheilus*, *Macolor*, *Pristipomoides*, *Lutjanus*, *Pinjalo* and *Paracaesio*) followed by Serranidae (43 species belonging to eight genera) and Lethrinidae (16 species; 4 genera). Monthly biological analyses (feeding and reproductive) of *Lutjanus decussatus* (checkered snapper) were done. A total of 544 specimens (284 male (16.5-29.1 cm); 224 female (17.2-29.8 cm) and 36 undifferentiated (15.7-23.5 cm) of *Lutjanus decussatus* were dissected to study the gonads and the reproductive stages. Upon examination of gonads it was understood that the fish is a batch spawner and the GSI values expressed in % (proportion of gonad weight to body weight) was peaked twice during July to October. The observations could be helpful in application of fishery input controls during the period of spawning. The food and feeding dynamics of the species also studied from gut contents of 544 specimens in which 276 stomachs were empty and 268 stomachs were found in different degrees of fullness. Each prey was identified to the lowest possible taxon and quantified based its numeric and gravimetric abundance. The diet composition, diet breadth and diet shift between the male, female and sexually undifferentiated fishes were analysed seasonally. The species was found to feed dominantly on crustaceans (QI of 6048.48 and % IRI of 92.56%) followed by teleost (QI of 296.60 and % IRI of 7.29%). The seasonal diversity indices, vacuity index, most preferred prey items and the Index of fullness of each sex were calculated. The findings of the present study will form baseline information on the feeding dynamics of the checkered snapper that would helpful for fishery managers for formulating management strategies. Further population studies revealed the parameters such as Length infinity at 310mm, K value of 0.69, total mortality value of 2.53 and fishing mortality of 1.15. The exploitation rate was found to be 0.45 which indicates that the fishing is optimal however, further increase in fishing pressure should not be encouraged for this species. The length weight relationship

of *Lutjanus decussatus* revealed that the species has b value less than 3 indicating negative allometric growth.

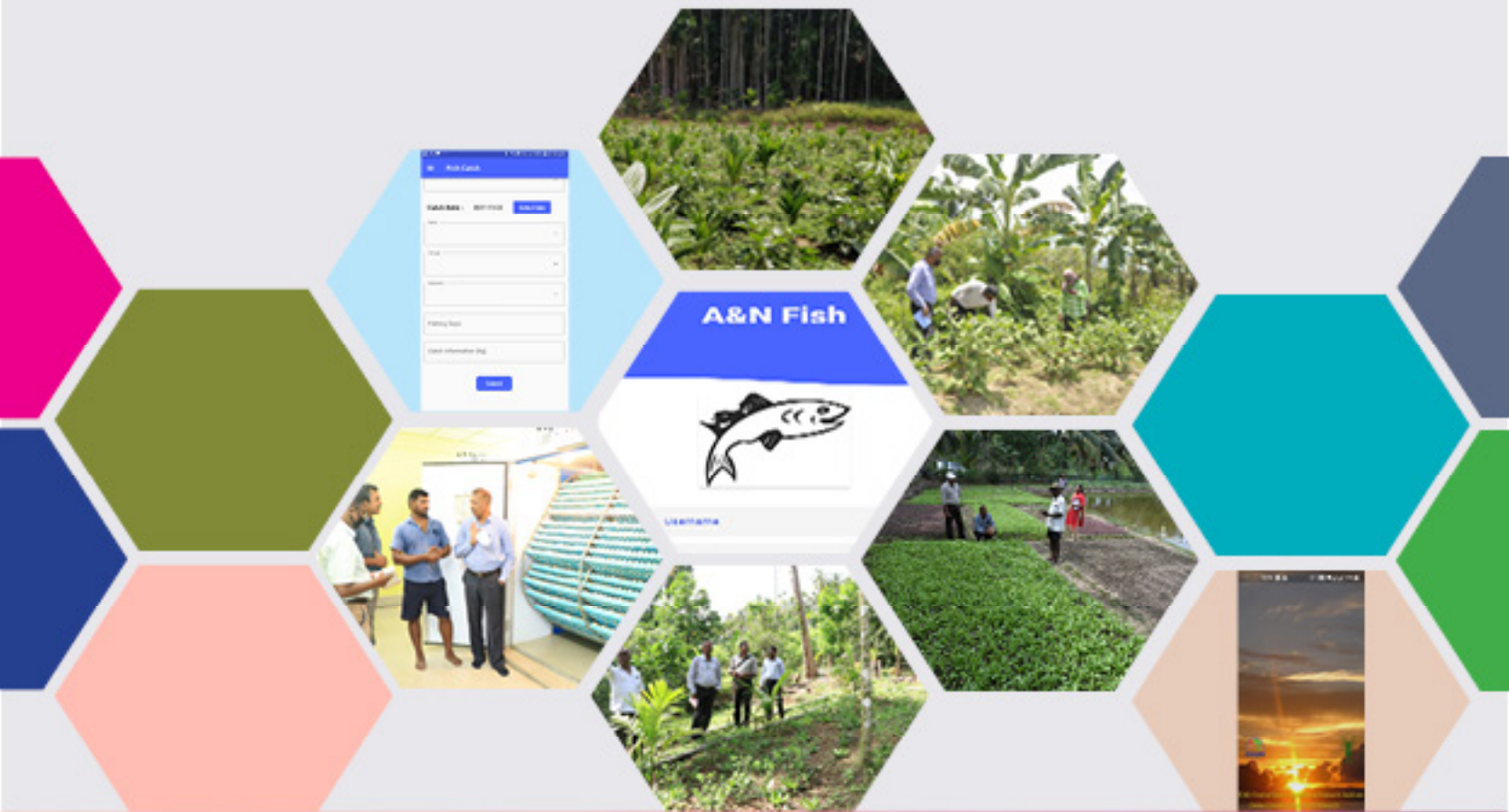
All India Network Project on Mariculture

Cultivation trials of seaweeds *Sargassum natans*, *Turbinaria ornata*, *Gracillarioides* in rafts were initiated in the outdoor facility in marine research laboratory as well as in sea-based conditions (Plate 59). Bamboo rafts of 3x3 m were made for sea conditions and raft made of PVC pipes for outdoor tanks. The rafts were further damaged due to the cyclonic weather conditions during December 2021. New rafts were constructed again for initiating seaweed culture in sea-based conditions. Fresh micro-algal stocks were procured and the new culture is maintained for three micro algal types (*Chlorella vulgaris*, *Nannochloropsis* sp and *Isochrysis* sp). The broodstocks of orange clown fish (*Amphiprion percula*), Nosestripe clown (*A. akallopsis*), Saddle clown (*A. ephippium*) & Spine cheek clown *Premnas biaculeatus* were maintained and larval development through various feed treatments studies were conducted. The clown fish *A. akallopsis* were successfully breed and the larvae were successfully reared. The hybrid seedling production of Clown fish *A. ephippium* X *A. frenatus* were attempted and a breeding pair were successfully made. The brood stocks of brackish water ornamental goby *Giuris margaritacea* raised in marine research laboratory and attempted an induced breeding trail during its breeding season



Plate 59:- Bamboo rafts seeded with seaweeds for open sea cultivation

SOCIAL SCIENCE SECTION



Transfer of technology, capacity building, policy support and market intelligence to stakeholders

Agricultural information sharing and knowledge generation through mobile app

A & N Fish catch mobile app has been developed to collect the real time important marine fish catch data from landing centre. User authentication login page has been developed to allow registered users to login to the site and update the

catch data. The app has the ability to collect species-wise and gear-wise daily catch landed at landing centre. Important fish categories landing in A & N Islands are pelagic (seer fishes, coastal tunas, barracudas, anchovies, sardines, wolf herrings, mackerels, carangids, ribbon fishes *etc.*), demersal (silver bellies, elasmobranchs, perches, pomfrets, threadfin breams, croakers, gerrids, goat fishes, grunts, ift fishes, lizard fishes, flat fishes, bulls eye, cephalopods, shrimps, crabs, lobsters *etc.*), oceanic fisheries (yellowfin tuna, skipjack tuna, bigeye tuna), and bill fishes (marlins, sail fishes, sword fish, wahoo, dolphin fishes, oceanic squids *etc.*). Major gears under usage are ring seine, gillnet, hand line, long line, and trawl net.

Images and main features of 35 commercially important fish species belonging to pelagic, demersal and oceanic groups are available in the app for identification. This mobile application has been developed based on 3 Tr Architecture. Apache web services are configured and most popular Open Source license database management system MySQL has been used in this application. The app has been integrated with web server and MySQL data base server to store and retrieve data in real time. A&N Fish App has been published in Google Play store and Institute's website. The App has been installed in boat owners' mobile phones and demonstrated its functionalities. The advantages of this app are to get near real-time data, which will be stored in centralised server. It allows us to save time and collect data quickly and efficiently, leading to fisheries management and policy decision.

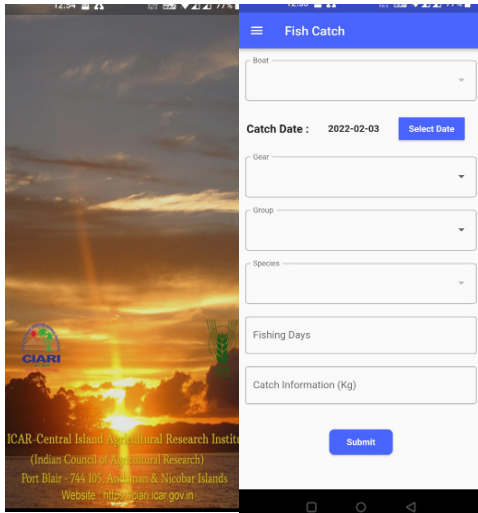


Plate 59:- A&N Fish catch mobile app interfacing

Vulnerability studies of Island ecosystem and adaptive strategies to develop climate resilient agriculture

Validation of farmers' perception about climate change

Socio-economic characteristics of tribal and non-tribal farm households

Majority of the 80 Nicobari tribal farmers from Car Nicobar and 120 non-tribal farmers across Andaman Islands were aged between 40 and 60 years (60%). Apart from that, 20% were aged between 20 and 40 years and 20% between 60 and 80 years among tribal farmers while 14% were aged between 20 and 40 years, 22% between 60 and 80 years and 4% beyond 80 years among non-tribal farmers.

Majority of tribal farmers (52%) have studied up to secondary followed by 25% primary, 16% senior secondary and 7% illiterate. On the other hand, 36% of non-tribal farmers were illiterate, the same proportion have studied up to secondary, 21% primary, 4% senior secondary and 3% attained graduation.

Since Nicobari tribals pursue *tuhet* system of community farming, most of the farmers do not own separate land for themselves. Hence 96% of sample tribal farmers own less than 0.5 ha, 2% between 1 and 2 ha; and 2% more than 4 ha. On the contrary, 3% of non-tribal farmers own less than 0.5 ha, 27% between 0.5 and 1 ha, 29% between 1 and 2 ha, 29% between 2 and 4 ha; and 6% above 4 ha.

Due to its unique physiography, farming in Andaman and Nicobar Islands is entirely rainfed. But, farmers in Andaman Islands earnestly pursue different water harvesting measures to store the rainwater for irrigation during summer months. Hence, apart from the 9% non-tribal farmers who were practicing rainfed farming, 22% have their own farm pond, 13% have dug ringwell, 6% have dug borewell, 16% utilize the canal and 34% utilize the Kalpong river in Diglipur.

Factors influencing the perception of farmers about climate change

Many factors *viz.* age, education, farming experience, family size, gender, access to irrigation, landholding size, community, *etc.* influence the farmers' perception about climate change. Logistic regression was run to identify the factors that significantly influence the farmers' perception about climate change which revealed that farming experience, being a male and being a tribal have significantly influenced the farmers' perception about climate change. That is, more the farmer is experienced; more is his knowledge about the changing climate.

Similarly, male farmers perceive more about the changing climate than the female farmers and tribal farmers have more knowledge about the changing climate than the non-tribal farmers.

Validating the perception of farmers with observational data

The long term temperature and rainfall data of Port Blair has been analysed to explore the occurrence of climate change as perceived by the non-tribal farmers of Andaman Islands.

Change in summer temperature from January to April

The trend of temperature parameters during the summer months i.e. January to April has revealed that, the maximum temperature increased significantly from 28.6°C to 30.2°C in January, from 29.3°C to 30.6°C in February, and from 31.9°C to 32.6°C in April and insignificantly from 30.4°C to 31.4°C in March. On the other hand, the minimum temperature has increased significantly during all the summer months from 21.7°C to 23.4°C in January, from 18.6°C to 23.6°C in February, from 20.6°C to 24.2°C in March and from 24.3°C to 25.3°C in April

Change in South-West Monsoon rainfall from June to September

The trend of South-West Monsoon rainfall from June to September has revealed that, rainfall increased significantly from 669 mm to 691 mm in June, from 389 mm to 584 mm in August and from 306 mm to 404 mm in September; and decreased significantly from 427 mm to 383 mm in July

Change in North-East Monsoon rainfall from October to December

The trend of North-East Monsoon rainfall from October to December has revealed that, rainfall increased significantly from 352 mm to 462 mm in October and from 277 mm to 303 mm in November; and decreased significantly from 281 mm to 163 mm in December.

Adaptation potential of dyke vegetable cultivation to overcome the impact of climate change on island agriculture

Despite located in high rainfall zone, the Islands suffer moisture stress and poor crop harvest due to the erratic

nature of rainfall and intermittent y spells during monsoon; and water shortage and crop failure during summer. A study has been undertaken in Ferrargunj Tehsil of South Andaman district where varieties of vegetables are intensively cultivated throughout the year for the Port Blair market. During summer months, farmers cultivate cucurbitaceous and other climbing crops on the dykes in such a way that their vines train on trellis constructed across the aimage trenches. The 2 to 5 m wide trenches running across the farm are the modified or elongated gullies formed due to heavy runoff during monsoon season. These trenches are covered by erecting trellis using nylon ropes length and breadth wise . These nylon ropes are bound on the wooden stumps fixed along the bank of the trench in zig-zag manner. Climbing vegetable crops viz. ridge gourd, bitter melon, bottle gourd, pumpkin, snake gourd, cucumber, broad bean, wing bean, cluster bean, long bean are planted on the edge of the dyke and allowed to climb on the trellis and spread above the trench. Farmers deliberately leave the dyke bare and not cultivate any crop till the water availability in the trench is enough to meet the water demand for those crops . Initially, the crops grown above the trench rely upon the residual moisture available in the dyke and later get irrigated from the water available in the trench.

This strategy increases the land use efficiency, saves water in the trench from evaporation, provides ambient environment for the fishes in the trench, and reduces the irrigation requirement of crops.

Policy support research for agriculture development in the Islands

Opportunities and challenges of sustaining agriculture in south Andaman district of Andaman & Nicobar Islands: a behavioural perspective

The current cross sectional study design aims to identify, attitude towards farming by farmer, aspiration of rural youth participation in agriculture, kind of activities rural youth wish to participate, socio- cultural factors, challenges that influence the likelihood of youth in agriculture participation Keeping the objectives in view, the study covering South Andaman with respondent's viz. farmers and youth representing 3 tehsils, 48 villages have been identified for the survey.

4.7 ICAR-CIARI Regional Station, Minicoy, Lakshadweep



Plate 60:- Glimpses of Minicoy

The ICAR-CIARI Regional Station at Minicoy, Lakshadweep, previously known as “ICAR Research Complex for Lakshadweep” was established in 1976 under the overall administrative control of ICAR, New Delhi. Consequently, after the formation of island zone, under the ICAR system, the station was merged with the Central Agricultural Research Institute (CARI), Port Blair, Andaman and Nicobar Islands in 1989. Later the station was brought under Central Plantation Crops Research Institute (CPCRI) in 1994 and again under the control of Central Island Agricultural Research Institute (ICAR-CIARI) since 1st April 2017.

Minicoy, locally known as *Maliku* is the second largest island in Lakshadweep, following Anoth and lies exactly West of Vizhinjam Port (Thiruvananthapuram) and at a distance of about 400 km from Kochi (8° 17' N and 73° 04'E). It is connected by ships from Kochi and Beypore and normally takes about 14 hours in a direct voyage. It is the southernmost island in the Union Territory of Lakshadweep in India. The people of Minicoy are linguistically and culturally diverse from the rest of the islands in Lakshadweep and speak ‘Mahal’, a dialect of Dhivehi, the language of Maldives.

Marine fishing and coconut-based agriculture are the principal pillars supporting the livelihood in all the islands of Lakshadweep. Tuna pole and line fishing and ‘Masmin’ (a smoke ied fish product) production are the major activities associated with fishing. Value added products like ‘Rihakuru’ (fish jaggery) is a byproduct of Masmin industry. Other value added products like coconut vinegar and coconut jaggery are two cottage industries sustaining on ‘neera’ tapping, an auxiliary revenue generation from coconut plantation.

The regional station is located at South Bandaram, 1.5 km away from the western side passenger jetty on the right-hand side of the main road towards the Minicoy lighthouse. The station has an experimental farm in main campus, field laboratory and residential quarters in another three campuses nearby occupying a total area of 6.062 ha. Soil here is coral sandy type and has an alkaline pH of (7.0-8.6). Minicoy receives a mean annual rainfall of 1613mm and a

mean annual rainfall of 27.9°C.

Mandate of the station

- To provide a research base to improve the productivity of agri-horticulture, livestock and fisheries of Lakshadweep group of islands through basic, applied and adaptive research
- Conservation, characterization and sustainable utilization of natural resources and harnessing them through post harvest and value addition
- To standardize sustainable techniques for capture and culture fisheries
- Transfer of technology, capacity building, policy support and market intelligence to stakeholders

Facilities available

- Experimental farm - 5.2 hectares.
- World Coconut Germplasm block with 12 accessions of both local and exotic origin.
- Demonstration units for vegetable and fruit cultivation in the interspaces of coconut plantation.
- Vegetable nursery with facility for protected cultivation.
- Coconut nursery and unit for producing value added products from coconut.
- Demonstration units for backyard poultry like Katakath, broad breasted white and broad breasted bronze turkey, indigenous non-descript fowl and Khaki Campbell ducks.
- Field laboratory for collection and preliminary analysis of fishery biological data.
- Laboratory cum administrative building.
- Staff residential quarters (08 no), a farmers hostel (08 rooms) and a guesthouse (02 air-conditioned rooms).

Land use pattern in the station

Block	Crop
A Block	Lakshadweep Ordinary tall coconut
B Block	Germplasm Block & Lakshadweep Ordinary tall coconut
C Block	Coconut-Lakshadweep Ordinary, Lakshadweep Micro, LCOD & Animal Components
D Block	Coconut-Lakshadweep Ordinary, Coconut Nursery, Fodder Plot
E Block	Hybrid coconut Palms & Fruit Crops
F Block	Lakshadweep Ordinary coconut palms & Type II Quarters, Guest House
G Block	Coconut Naturally crossed Hybrid, Hybrid palms & Vegetable Plots
H Block*	Laccadive - Orange Dwarf coconut, Farmers Hostel & Type II Quarters

* Plot located in residential complex campus

4.8. Krishi Vigyan Kendra, ICAR-CIARI-KVK, Port Blair South Andaman District

Training programmes

Discipline	No. of Training	Male	Female	Total
Agronomy	7	21	153	174
Horticulture	4	34	57	91
Animal Science	7	95	160	255
Fisheries	3	43	22	65
Agril.Engg.	5	35	94	129
Plant Protection	1	0	20	20
HomeScience	05	01	134	135
Total	32	229	640	869

FrontLine Demonstration (FLD)		On Farm Trials (OFT)	
Discipline	No. of FLD	Discipline	No.of OFT
Agronomy	3	Agronomy	4
Horticulture	2	Horticulture	1
Animal Science	2	Animal Science	1
Fisheries	1	Agril.Engg.	3
Agril.Engg.	3	HomeScience	2
HomeScience	2	-	-
Total	13	Total	11

ICAR-CIARI-KVK, Car Nicobar, Nicobar District

Training programmes

Discipline	No. of Training	Male	Female	Total
Agronomy	-	-	-	-
Horticulture	01	14	16	30
Animal Science	04	42	90	132
Fisheries	-	-	-	-
Agril. Engg.	-	-	-	-
Plant Protection	-	-	-	-
Home Science	-	-	-	-
Total	05	56	106	162

FrontLine Demonstration (FLD)		On Farm Trials (OFT)	
Discipline	No. of FLD	Discipline	No.of OFT
Agronomy	-	Agronomy	-
Horticulture	02	Horticulture	01
Animal Science	02	Animal Science	02
Fisheries	-	Fisheries	-
Agril. Engg.	-	Agril. Engg.	-
Plant Protection	02	Plant Protection	-
Home Science	-	Home Science	-
Total	06	Total	03

ICAR-CIARI-KVK, Nimbudera, North & Middle Andaman District
Training programmes

Discipline	No. of Training	Male	Female	Total
Agronomy	-	-	-	-
Horticulture	02	28	13	41
Animal Science	04	46	114	160
Fisheries	-	-	-	-
Agril. Engg.	03	42	35	77
Plant Protection	-	-	-	-
Home Science	-	-	-	-
Total	09	116	162	278

FrontLine Demonstration (FLD)		On Farm Trials (OFT)	
Discipline	No. of FLD	Discipline	No. of OFT
Agronomy	-	Agronomy	-
Horticulture	01	Horticulture	01
Animal Science	01	Animal Science	01
Fisheries		Fisheries	
Agril. Engg.	01	Agril. Engg.	01
Plant Protection		Plant Protection	
Home Science		Home Science	
Total	03	Total	03



Plate 61: Activities undertaken in KVK

5.Scheduled tribe component

Under the Scheduled Tribe Component (STC), various initiatives such as capacity building programmes, distribution of agricultural inputs, demonstration of technology, nursery development and exposure visits were undertaken for the benefit of tribal farmers of Andaman and Nicobar Islands and Lakshadweep Islands. The details of the same are given below.

(I) Capacity Building Programmes

Sl. No	Title	Venue	Participants
1	Training programme on improved horticulture techniques as an income earning venture for tribal community	Harminder Bay, Little Andaman	52
2	Training, workshop cum demonstration on health management of goat and poultry through ethno veterinary practices (3 numbers)	Kinyuka, Small Lapathy, Tapoiming	100
3	Training programme on backyard farming and kitchen gardens in achieving balanced nutrition	Minicoy, Lakshadweep	57
4	Awareness programme on zoonotic diseases and covid-19 of urban tribals	Small Lapathy, Perka, Tapoiming, Sawai	24
5	Hands-on training programme on entrepreneurship development of tribal farming community through value added poultry products		
6	Training on value added fishery products	Perka, Sawai, Nancowrie	20

(ii) Distribution of planting materials/ seeds

Sl. No	Particulars	Quantity	Venue	beneficiaries
1	Dragon fruit planting material	200 numbers	Harminder Bay, Little Andaman	52
2	Vegetable saplings/ seedlings & seeds of poultry/ piglets	897 numbers	Minicoy, Lakshadweep	102
3	Vegetable saplings and coconut seedlings	970 numbers	Minicoy, Lakshadweep	93
4	Seeds of bacterial wilt resistant brinjal varieties (CARI Brinjal 1 and CARI Brinjal 2)	0.35 kg	Car Nicobar	20
5	Distributed seedlings of high yielding Papaya varieties (Arka Surya, Arka Probhat)	190	Car Nicobar	85

(iii) Distribution of inputs

S. No.	Particulars	Quantity	Venue	beneficiaries
1	Coconut climbing devices	32 numbers	Campbell Bay, Great Nicobar Island	32
2	Agricultural inputs	486 numbers	Minicoy, Lakshadweep	238
3	CIARI Bio-consortia	200 kg	Car Nicobar	240

(iv) Demonstration of technology

S. No.	Technology	Venue
1	Dragon fruit production technology	Harminder Bay, Little Andaman
2	Terrace Farming (3 numbers)	Minicoy, Lakshadweep
3	Demonstration on health management of goat and poultry through ethno veterinary practices	Car Nicobar
4	Preparation of value-added products viz. quail egg pickle, quail meat tandoori, sausage from chicken and duck meat, nuggets, chicken meat pickle	Small Lapathy, Perka, Tapoiming, Sawai

(v) Kitchen garden/ demonstration block/ nursery development

S. No.	Particulars	Venue
1	Promotion of kitchen garden (10 numbers)	Minicoy, Lakshadweep



Plate 62: Training on health management of goat and poultry at Car Nicobar



Plate 63: Hands-on training programme on value added poultry products

6. Women Participation (SC/ST)

Sl. No.	Sector	Number of women farmers beneficiaries (ST)
1	Animal Science	100
2	Horticulture & Forestry	500
3	NRM	30
4	Field Crops	34
5	Fisheries	12

7. Technologies developed/ demonstrated/ transferred

1.1 Technologies developed/Transferred

(i) Dweep Gau Maa Rakshak to treat Humpsore in cattle

(P. Perumal, A.K. De, L. B. Singh, S. K. Zamir Ahmed, B. A. Jerard and D. Bhattacharya)

Humpsore caused by a filarial worm (*Stephanofilaria assamensis*) is a common problem of cattle in Andaman and Nicobar Islands and spread by fly (*Musca conducens*). A treatment schedule has been developed comprising of cleaning of wound, application of antiseptic ointment, injection of ivermectin or doramectin and feeding Diethylcarbamazine citrate for 45 days. Success rate of the treatment is more than 95%. The treatment methodology has improved milk yield in 76.47% of treated animals with 25-30%. It improved the fertility rate (30-40%). The treatment methodology has reduced the stress level and nuisance due to humpsore (decreased malondialdehyde: 15-20% and cortisol: 20-25% and increased total antioxidant capacity: 5-10%, superoxide dismutase: 20-30%, catalase: 12-30%). This methodology has reduced the inter-calving interval and improved estrus induction rate and growth rate in heifers.



Plate 64:-Stages of success rate of treatment

(ii) 2-7-10-15 module of iron therapy: A novel technology for control of Iron Deficient Anaemia (IDA) in piglets

(A. K. De, D. Bhattacharya, P. A. Bala, Perumal P. and J. Sunder)

Iron deficiency anaemia or piglet anaemia is the major cause of piglet mortality in organized as well as unorganized farms. An iron supplementation regime was developed to control the disease. It was found that oral supplementation of Ferrous sulphate @ 30-50 mg/kg body weight on 2nd-7th-10th-15th day of birth is optimum to control IDA in piglets. 2-7-10-15 module of iron therapy reduced piglet mortality rate significantly (15%) as compared to un-supplemented piglets. Moreover, iron supplementation

improved weaning body weight (10%), haemoglobin level, serum free/stored iron level and organ iron level. Therefore iron supplementation in the form of Ferrous sulphate @ 30-50 mg/kg body weight on 2nd-7th-10th-15th day (2-7-10-15 module) may be recommended to control IDA in piglets.

(iii) Dweep Carp Grower Feed

(K. Saravanan, T. Sivaramkrishnan, R. Kiruba Sankar, J. Praveenraj and Sreepriya Prakasan)

Dweep-Carp Grower Feed has been developed with locally available feed ingredients. The carp grower feed was formulated with 22-28% crude protein and 4-6% crude lipid content which can be fed to the Indian Major Carps from fingerling to adult stages at the rate of 3 to 5% body weight per day. Proper feeding practices enables the farmers to increase the stocking density of fishes thereby enhance the unit production in existing culture system.

(iv) Dweep-Carp Starter Feed

(K. Saravanan, T. Sivaramkrishnan, R. Kiruba Sankar, J. Praveenraj and Sreepriya Prakasan)

DweepCarp Starter Feed with 30-35% of crude protein and 6-8% of crude lipid content has been developed by using the locally available feed ingredients which can be fed to the Indian Major Carps from fry to fingerling stages at the rate of 6 to 10% body weight per day.

(v) Recirculatory system for mud crab fattening

(Ajina S.M, Gladston Y, Deepitha R.P, Benny Varghese, S. Murugesan and K. Saravanan)

An indoor vertical circulatory crab fattening unit with a capacity of 100 crabs has been standardised and developed at marine research laboratory. In this technique the water of salinity 15 to 22ppt passes through each crab boxes arranged in vertical racks through gravity and air water from the system collected and purified with the help of sand filter and pump in to the overhead tank. The crabs are fed with 5-10% of the body weight with shrimp/ clam meat or trash fishes and fattening period generally ranges from 25 to 50 days

(vi) Captive rearing and breeding of anemone fishes

(Gladston Y, Ajina S.M, Benny Varghese, S. Murugesan, K. Saravanan, J Praveenra and R Kiruba Sankar)

Breeding and seed production of the three species viz. *Amphiprionakallopisos*, *A. percula*, and *Premnasbiaculeatus* were standardized. Breeding and seed production of clown fishes have three important components viz., (1) brood stock development (2) the larval rearing and (3) live feed culture. In brood stock development the good quality

parent fishes raise up to spawning, in which male and female fishes are selected from a group of clown fishes and fed with shrimp meat/ squid meet/ fish gonads/ clam meat at a rate of 5% of body weight trice a day. In larval rearing the hatchlings are reared up to the advanced juvenile stage (2 to 3cm) for around 45 days. During the larval rearing the juveniles/ larvae are fed with microscopic live feed (rotifers/copepods) according to the mouth size. The live feed culture has two major components such as micro algal culture and zooplankton (rotifer/ copepod culture), and here the zooplanktons are fed with microalgae.

(vii)Mango ginger paste

(Pooja Bohra and Ajit Arun Waman)

Curcuma mangga (mango ginger) is a rhizomatous spice grown in the Andaman Islands. The species is being promoted as potential crop in these islands. Owing to the presence of raw- mango like aroma, rhizomes of this species have good scope in flavouring of foods. To develop avenues for income generation, value added product viz. mango ginger paste was prepared from the rhizomes. The product could be utilized for preparation of vegetarian and non-vegetarian cuisines in the way similar to ginger paste. The paste imparted appealing aroma to the preparations. During the storage under ambient as well as refrigerated conditions, the aroma and flavor were maintained and hence, the product holds promise for upscaling in the market.

(viii)Repeated pinching in marigold

(V. Baskaran, K. Abirami, T. Subramani and Augustine B. Jerard)

Repeated pinching (four times) has been standardised for increased yield in marigold. This has recorded maximum number of flowers per plant (382.0), flower yield per plant (1.37 kg) and increased flower duration (52.0 days). This repeated pinching in marigold increases flower production and hence yield per unit area is maximized which is beneficial to farmers. Additionally, the pinched apical shoots may be used as propagule for sapling production.

ix) A&NFish catch mobile app

(D. Karunakaran, R. Kiruba Sankar, S.K. Zamir Ahmed, Y. Gladston, R. JayaKumaravaradan and B.A. Jerard)

In order to bridge the gap in obtaining useful fish catch data,a mobile App named “A&NFish” was developed to systematically record real time marine fish catch data

from 51 landing centres across 3 districts of Andaman and Nicobar Islands. User authentication login page was developed to allow registered users to login to the site and update catch data. It is specifically designed with a purpose to garner the data from different parts of the Islands for the benefit of research and development purposes. The app has the ability to collect species wise and gear wise daily total catches landed at landing centre.

The app was developed using Anoid studio and integrated with web server and MySQL data base server to store and retrieve data in real time. The advantages of this app are to get near real-time data, which will be stored in centralised server. It allows us to save time and collect data quickly and efficiently, leading to fisheries management and policy decision. The A&N Fish App has been published in Google Play store.

7.2 Technology Commercialized:

(i) Dweep HanGreens

(Ajit Arun Waman and Pooja Bohra)

Dweep HanGreens is an equipment developed for hanging cultivation of locally popular Burmese coriander (*Eryngium foetidum*) in urban areas. The equipment facilitates cultivation of this herb in smaller area like galleries in urban areas for household consumption apart from providing aesthetic appeal to the area. Being a hanging model, it occupies limited space and could be hung in the balconies, terraces, rooftops etc. Based on the space available and family requirement, structure size could be customized and hence, it is user-friendly. It could also be used as green curtains for beautification of areas including government and private establishments, tourist spots, hotels etc.

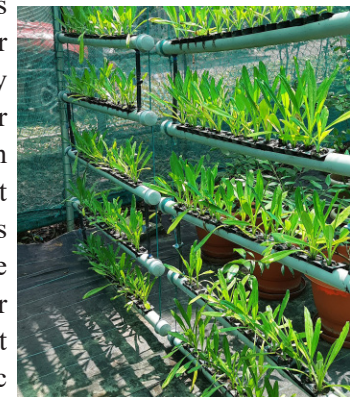


Plate 65:- Dweep HanGreens

(ii) Dweep Micro

(A Velmurugan & T P Swarnam)

Microbial consortia developed for Plant growth promoter suitable for saline soil

7.3 Technology Demonstrated:

Name of the technology	Venue	Male/female = total	Coordinators
(<i>Gau Maa Rakshak</i>) to treat Humpsore	Numnagar, Burmanella, Guptapara, Rangachang-5, Indira Nagar, Makhapahar, Sippighat	124 + 135 = 259	Dr. P. Perumal, Dr. A. K. De, Dr. D. Bhattacharya, Dr. L. B. Singh, Dr.S. K. Zamir Ahmed, Dr. B. A. Jerard
Quail chick brooding, Quail Cage making and rearing, Quail breeding&Quail feed formulation and mini feed mill	ICAR-CIARI, Port Blair	28 + 14 = 42	Dr. R R. Alyethodi, Dr. D. Bhattacharya, Dr. Jai Sunder , Dr. T. Sujatha, Dr. P.A. Bala, Dr. P. Perumal , Dr. A.K. De, Dr. K. Muniswamy,
Mud crab fattening	Marine Research Laboratory, ICAR-CIARI	20 + 8 = 28	Dr Y. Gladston, Dr R. Kiruba Sankar, Dr. Y. Ramakrishna, Dr. K. Saravanan, Dr R. P. Deepitha, Dr. J. Praveenraj, Dr. S. Murugesan
Dragon fruit production technology	Department of Defence and Jodaklan	Community benefit and Farmer	Dr. K. Abirami, Dr. V. Baskaran, Dr. B. A Jerard
Horticulture based roof top production model	Chinmaya mission, ANCOL &Department of defence, Brichgunj and 5 households at South Andaman	50	Dr. V. Baskaran, Dr. K. Abirami, Dr. B.A Jerard, Dr. T. Subramani, Dr K. Venkatesan
Speciality flower cultivation	Andaman and Nicobar Co-operative union SHG group) and an entrepreneur at Boednabad	25	Dr V. Baskaran, Dr K. Abirami, Dr B. A Jerard, Dr. T. Subramani, Dr. K. Venkatesan
Value addition with speciality flowers	SHG group Namunagar, A&N Co-operative Union SHG and Colour foundation at South Andaman	20	Dr. V. Baskaran
Cultivation of banana with commercial varieties	Lalpahar and Indranagar	02	Dr. K. Abirami, Dr. V. Baskaran, Dr. B. A Jerard, Dr. J K Varadan, Dr. S. K. Zamir Ahmed

7.4 Seed & Planting Material

Crops	Variety /Produced	Quantity (Nos. / Kg)
Coconut dwarf seedlings	Surya, Chandan, Annapurna, Omkar, Andaman green dwarf, Andaman Yellow Dwarf	557 nos
Coconut seed nut (tall)	Andaman Ordinary Tall	2500 nos
Coconut tall seedlings	Andaman Ordinary	150 nos
Arecanut	Samrudhi, Mangala	8810 nos
Betelvine (<i>Piper Betle</i>)	Andaman Local selection	1000 nos
Black pepper (<i>Piper nigrum</i>)	Panniyur 2	10000 nos
Blackpepper (<i>Piper nigrum</i>)	Panniyur 1	694 Nos
Bush pepper	Panniyur 1	18 nos
Cinnamon (<i>Cinnamomum verum</i>)	Konkan Tej, Konkan Tejpatta, Yercaud- 1 (Air layers)	403 nos
Cinnamon (<i>Cinnamomum verum</i>)	Andaman Local selection	5000 nos
Cinnamon (<i>Cinnamomum verum</i>)	Sipighat selection (seedlings)	491 nos
Clove (<i>Syzygium aromaticum</i>)	Andaman Local selection (seedlings)	1561 Nos
Curry leaf seedlings	Local	22 nos
Gajpippali (<i>Piper chaba</i>)	Kerala collection Rooted cuttings	190 nos
Long pepper (<i>Piper longum</i>)	Viswam Rooted cuttings	396 nos
Nutmeg	Sipighat selection (seedlings)	238 nos
Tejpat (<i>Cinnamomum tamala</i>)	Identified superior collection	101 nos
Thai long pepper (<i>Piper sarmentosum</i>)	Local Rooted cuttings	192 nos
Woody pepper (<i>Piper pendulispicum</i>)	Local Rooted cuttings	350 nos
Lemon grass (<i>Cymbopogon flexuosus</i>)	OD-19 Slips	1,604 nos
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep Sampada (Seed)	0.45kg
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep San jivini (Seed)	0.40 kg
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep Rakshak (Seed)	0.20kg
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep Samrudhi (Seed)	0.20kg
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep Sampada seedlings	150 nos
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep Sanjivini seedlings	150 nos
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep Rakshak seedlings	100 nos
Noni (<i>Morinda citrifolia</i>)	CIARI Dweep Samrudhi seedlings	150 nos
Acid lime (<i>Citrus aurantifolia</i>)	Local selection	500 nos
Acid lime (<i>Citrus aurantifolia</i>)	Seedlings	35 nos
Andaman Kokum (<i>Garcinia dhan-ikhariensis</i>)	Local Seedlings	700 nos
Banana	Grand Naine, Local banana, Poovan, Ney Poovan, Red banana and Monthan	500 nos
Bilimbi (<i>Averrhoabilimbi</i>)	Local Seedlings	70 nos
Breadnut (<i>Artocarpus camansi</i>)	Local Seedlings	127 nos
Dragon fruit (<i>Hylocereus sp</i>)	DGF 1 and DGF 2	2000 nos
Guava (<i>Psidium gujava</i>)	Arka Kiran, Arka Rashmi and Arka Mridula	300 nos

Crops	Variety /Produced	Quantity (Nos. / Kg)
Jamun (<i>Syzygium cumini</i>)	Seedlings	300 nos
Khattaphal (<i>Baccaurear amiflora</i>)	Local Seedlings	301 nos
<i>Leuceanaleuco cephal</i>	Seedlings	200 nos
Lime (<i>Citrus aurantifolia</i>)	Local Seedlings	800 nos
Malabar tamarind (<i>Garcinia gummi-gutta</i>)	GG-02 Grafts	22 nos
Nicobar bread fruit (<i>Pandanus lerum</i>)	Seedlings	45 nos
Papaya (<i>Carica papaya</i>)	Seedlings	35 nos
Passion fruit (<i>Passiflora edulis</i>)	Seedlings	160 nos
Passion fruit (<i>Passiflora edulis</i>)	Rooted cuttings	15 nos
Passion fruit (<i>Passiflora foetida</i> var. flavi-carpa)	Yellow collection Seedlings	728 nos
Rose apple (<i>Syzygium jambos</i>)	Seedlings	20 nos
Tamarind (<i>Tamarindus indica</i>)	Seedlings	350 nos
Velvet apple (<i>Diospyrosblancoi</i>)	Local Seedlings	70 nos
West Indian cherry (<i>Malpighia glabra</i>)	ND Rooted cuttings	439 nos
Wild cashew (<i>Semicarpus kurzii</i>)	Seedlings	75 nos
Arachnis orchid (<i>Arachnis flosaeris</i>)	-	600 nos
Calatheas (<i>Calathea sp</i>)	<i>Calathea crotolifera</i> and <i>Calathea lutea</i>	200 nos
Eulophia orchid (<i>Eulophia andamanensis</i>)	-	500 nos
Gundumalli (<i>Jasminum sambac</i>)	Ramanathapuramgundumalli	400 nos
<i>Heliconia sp</i>	-	2000 nos
Ornamental palms	-	1000 nos
Red Ginger (<i>Alpinia purpurata</i>)	-	1000 nos
Rose (<i>Rosa sp</i>)	-	300 nos
Star Jasmine (<i>Jasminum nitidum</i>)	Co-1	500 nos
Torch ginger (<i>Etlingera elatior</i>)	-	400 nos
Culantro (<i>Eryngium foetidum</i>)	CIARI Broad Dhaniya-1 (seedlings)	1850 Nos
Katta Baji (<i>Hibiscus acetocella</i>)	Rooted cuttings	150 nos
Agati (<i>Sesbania grandiflora</i>)	Seedlings	100 nos
Bakri pathi (<i>Denalobium umbellatum</i>)	Seedlings	200 nos
Bamboo (<i>Denocalamus strictus</i>)	Rooted cuttings	40 nos
Padauk (<i>Pterocarpus dalberoides</i>)	Seedlings	450 nos
Rudraksh (<i>Elaeocarpus sp.</i>)	Seedlings	60 nos
Screw Pine(<i>Pandanus tectorius</i>)	Seedlings	190 nos
Rice (<i>Oryza sativa</i>)	CARI Dhan 5	94Kg
Rice (<i>Oryza sativa</i>)	CARI Dhan 8	50Kg
Rice (<i>Oryza sativa</i>)	CARI Dhan 9	50Kg
Rice (<i>Oryza sativa</i>)	ANR 40	80Kg
Green gram (<i>Vigna radiata</i>)	CARI Mung 2	240Kg
Green gram (<i>Vigna radiata</i>)	CARI Mung3	60Kg
Black gram (<i>Vigna mungo</i>)	CARI Urd 1	60Kg

Crops	Variety /Produced	Quantity (Nos. / Kg)
Brinjal (<i>Solanaum melongena</i>)	CARI Brinjal 1	1.0Kg
Brinjal (<i>Solanaum melongena</i>)	CARI Brinjal 2	0.7Kg
Quail	<i>Coturnix Coturnix Japonica</i>	1250 chicks
Quail	<i>Coturnix Coturnix Japonica</i>	1800 fertile eggs
Cattle & Buffalo	Cross bred	4
Goat	Teressa goat & Andaman goat	32
Pig	Andaman pig & Nicobari pig	236
Poultry	Nicobari fowl	746
Fish feeds	Dweep- Carp Grower Feed	370 Kg
Fish feeds	Dweep- Carp Starter Feed	310 Kg
Fish feeds	Control Feed	210Kg
Crabs	Mud crabs	39.05 Kg



8. Mera Gaon Mera Gaurav (My Village My Pride)

The activities undertaken by various scientific teams in their respective adopted villages in South Andaman are manifested below:

- Team 1 comprising K. Abirami, Praveen Raj and Sirisha Adamala made three visits to Mannarghat and Malapuram. Technical guidance was provided on fish rearing to farmers who have constructed new ponds in their farms. Among them, Shri Rafiq has integrated fruits, vegetables and tuber crops in coconut and arecanut plantation. Vegetables fetched good yield and it was a main source of income for the farmer during the lock down period. The team advised him to take up planting of various spice crops under arecanut plantation. The water table in his field was good so natural water ponds were created for fresh water fish farming. Subsequently, he visited the Institute for detailed technical guidance on fish farming.
- Team 2 comprising S.K. Zamir Ahmed, K. Saravanan, R. Jaya Kumaravaran and V. Damodaran visited the farms of Shri. D.N. Madhu and Shri M.M. Joydar at Chouldari; Shri Ashok Roy and Shri Sameer of Gopal Nagar on 19.04.2021 for providing diagnostic services for vegetable and tuber crops, plantation crops and fish farming following COVID-19 protocols. During the visit, farmers were informed of the Radio and Doordarshan programmes undertaken by CIARI and requested to watch them periodically to get farm advisories during lockdown period. Further, they were provided with HYV of vegetables for demonstration.



Plate 66: Scientists providing diagnostic services on vegetables, tubers and plantation crops at Chouldari and Creekabad

- Team 4 comprising V. Baskaran, D. Karunakaran, Rafeeqe Rahman Alyethodi, Sreepriya Prakasan and Smt. Archana Sharma visited the fields at Collinpur on 17.04.2021 and provided agro-advisories to farmers on effective utilization of interspaces in plantation crops by scientific planting of vegetables with proper spacing.

- Team 5 comprising Debasis Bhattacharya, P.A. Bala, Ajit A. Waman and T. Subramani visited two farmers' field in Dundas Point and distributed saplings of lemon grass (20 nos.) and Burmese coriander (260 nos.). Farmers were also guided about CIARI-ProDhaniya Multi technique for cultivation of culantro and spices in their farms.
- An awareness programme on Scientific Backyard Farming was conducted at Wimberlygunj on 20.11.2021 in collaboration with AICRP on Palms and AICRP on Pig with 23 participants (14 male, 9 female).
- Team 9 comprising T.P Swarnam, Pooja Bohra, K Muniswamy and Benny Varghese conducted an awareness programme for female SHG members of Ferrargunj in collaboration with SURABI, Caddlegunj on November 25, 2021. During the programme, Pooja Bohra elaborated about the diversity of underutilized fruits of the islands, their nutritional benefits and scope for value addition. During the interaction, participants were explained about the production techniques of underutilized fruits such as blood fruit, Andaman Kokum, Andaman Kauphal, West Indian cherry, passion fruit, bilimbi, breadnut etc. Interested participants purchased the planting material as well. One farmer from Ferrargunj was guided on cultivation of fruit crops and planting material of six species was provided for establishment in backyard garden.



Plate 67:- SHG members of Ferrargunj getting awareness about underutilized fruit crops

- Women farmers from Miletalak and Aniket were given awareness on "Integrated Farming System for Doubling Farmer's Income" in which T.P. Swarnam briefed the benefits of crop and enterprise diversification to get maximum benefit from a single piece of land. Crop residue recycling through composting and value addition was demonstrated. Vegetable samples were collected from the farmers to periodically analyse the pesticide residues and farmers were given the advice on safe use of agrochemicals in crop production.

9. Success Stories & Case Reports

Community based Mini incubator for rural poultry production

As a part of the community-based demonstration under the DBT-Biotech Kisan Hub project, a total of seven mini-incubator cum hatcher unit (240 eggs capacity) were established at different villages of South Andaman and North & Middle Andaman district. As incubation facility, three units were also established at ICAR-CIARI, Port Blair, KVK, Sippighat and at Regional Station, Minicoy, Lakshadweep. Backward and forward linkage was established among the farmers by sustainable production and distribution of rural poultry chicks among the farmers. Technological support was provided by scientists for operation of the machine and scientific rural poultry production. Five successful rural women viz. Smti. Joyshanna, Smti. Meenakshi, Smti. Rani Anbumalar and Smti. Binitha Singh from South Andaman and Smti. Asima Roy from Middle Andaman initiated micro enterprise on mini-incubator for hatching and started selling rural poultry chicks on commercial mode. Within a span of two years, approximately, 1000 farmers including 650 farm women have utilized the services of mini-incubator facility to hatch out their own chicks.



Plate 68:- Mrs. Joyshanna Rana Mrs. Meenakshi Mrs. Binitha Singh



Mrs Ashima Adhikari



Mrs Rani Anbumalar

The adopted farmers have successfully produced and distributed around 25000 chicks and ducklings to other farmers. The horizontal dissemination of the technology could be visible as one of the young rural farmers, Mr Kamal Biswas from North & Middle Andaman district purchased two incubators (6000 eggs capacity) and started his business on hatching and selling of duck eggs. He is selling day old duckling @ Rs.50. So far, a total of 15 farm

women and unemployed youths have established their own mini-incubator of 80 to 250 eggs capacity and started producing desi chicks. Farm women micro - entrepreneurs are getting monthly net income of Rs. 11000 to 13000 through hatching facility with mini-incubator, own sustainable resource for desi chicks and continuous sale of rural poultry and sale of eggs. This net income is many folds higher than their previous monthly income. Now they support their family financially and purchase the ration for whole family and taking care of children education. With the income, few of them have repaid the loan, purchased automobiles and diversified their farm with goat and pig units.

(Team: T. Sujatha, Jai Sunder, D. Bhattacharya, A. K. De & S.K. Zamir Ahmed)

Successful goat farmer/entrepreneurs



Plate 69: Shri. Vikas Lal, a successful entrepreneur

Shri. Vikas Lal, aged 28 years, an enterprising youth from Coffee Bagicha, South Andaman associated with Animal Science Division in 2019 and started commercial goat farming. He started the goat farming with 16 does and one male (which was provided by ICAR-CIARI for upgradation of the germplasm). With the technical support of the ICAR-CIARI the flock size has been increased to 69 in two years. He is selling breeding buck @ Rs 800 to Rs 1000 per kg and for meat purpose @ Rs 450 per kg. He is also selling goat faecal pellets @ Rs 10 per kg and so far he has sold breeding bucks to 15 farmers which has increased the superior buck germplasm in the field.

(Team: Jai Sunder, T. Sujatha, P. Perumal, R.R. Alyethodi, A.K. De, D. Bhattacharya, S.K. Zamir Ahmed)

Mr. Bimal Baghi

Shri. Bimal Baghi is a farmer from the remote village of Baludera, Baratang associated with the ICAR-CIARI goat improvement project since 2018. Before joining the project, he was not having any scientific knowledge about the goat management, deworming, breeding etc. He was given technical know how about the scientific management



Plate 70:- Mr. Bimal Baghi

practice, provided with one superior buck, regular deworming, feeding of mineral mixture etc. After adopting scientific goat farming, now he is managing his flock in a very systematic way. He has increased his stock to 23 goats and very much happy about the progress. Mortality is now less than 5% from 25-30%, increase in body weight gain (at 3 months of age body weight of male is 7.65 kg and female is 6.50), increase in kidding rate (selecting the doe with multiple kidding) and culling the doe with single kidding. The annual income has been increased from Rs 35,000 to Rs. 60,000.

(Team: Jai Sunder, P Perumal, R R Alyethodi, A K De, D Bhattacharya)

Smti. Monica Talukdar

Smti. Monica Talukdar, aged 45 years, a progressive women goat farmer from Jaipur Village, Nimbudera, North & Middle Andaman has been rearing goat since last 13 years. After adopting the scientific practices on breeding with superior buck, timely deworming, supplementation of mineral mixture to alleviate mineral deficiency during pregnancy and lactation, now she has increased the flock to 22. The mortality was reduced from 30% to less than 5%. Body weight of the 3 months old goats increased from 5.82 to 7.27 kg. During last year she has sold 6 goats and distributed 4 goats to her relatives. She is earning net income ranging from Rs.30000 to 50000 per year through sale of adult goats at the age of 11 to 12 months.

(Team : Jai Sunder, R. R. Alyethodi, P.Perumal, A K De, D Bhattacharya)



Plate 71:- Smti. Monica Talukdar

Mr. Anod Charan, a progressive fish farmer

Mr. Anod Charan, an interested fish farmer in the Bimblitan Village, South Andaman District was identified for the demonstration purpose. He was sensitized on the need for feed based culture practices and upon his interest, a demonstration was conducted on Rohu (*Labeorohita*) fishes stocked in his pond. Further, technical backstopping on fish culture and better management practices were provided to him. With the technical guidance of ICAR-CIARI, the farmer could get the required confidence and proceeded further with the expansion of fish culture by feed based aquaculture practices. The cost of fish feed and its availability at local conditions were found to be encouraging factors for Mr. Anod Charan towards technological adoption. During the culture period of three months from 270 m² pond area, he could get a net income of Rs. 6592 with a benefit cost (BC) ratio of 1.73 from the formulated feed which was far better than his previous culture practices. The Farmer is very much satisfied with the technical support received from ICAR-CIARI and also actively participates in the capacity building programmes on aquaculture to expand his fish culture activities. He is continuing the feed-based aquaculture practices in all his fish ponds to augment the fish production. It is reiterated that proper feed and feeding methods with better management practices shall definitely revolutionize the freshwater aquaculture sector and augment the productivity of Island aquaculture.

(Team : K. Saravanan, T. Sivaramkrishnan, R. Kiruba Sankar, J. Praveenraj, Sreepriya Prakasan)



Plate 72:- Mr. Anod Charan from Bimblitan village

Shri R. Raja, a Poultry entrepreneur

Shri R. Raja, 37 years old B.A. graduate participated in various training programmes inclusive of poultry farming conducted by KVK, South Andaman & ICAR-CIARI, Port Blair. In 2010, he started a poultry farm in an abandoned shed at his backyard with 500 Vanaraja birds. In 2012, he availed a loan of Rs.8.00 lakh from State Bank of India and started broiler farming with a sales capacity of 1,000 birds per month. Subsequently, he expanded his farm to the

present sales capacity of 30,000 to 40,000 birds per month by availing loan from different banks. Initially, he used to purchase chicks from M/s. Shivani Poultry, Dollygunj @ Rs.15/- and then from Chennai. Till 2016, he struggled to penetrate the market which was dominated by a single firm. In 2019, he started M/s. Amman Hatchery with two Incubators of 15,000 egg capacity each by availing a loan of Rs.40.00 lakh from Andaman & Nicobar State Cooperative Bank, Port Blair. This move helped him to reduce the expenditure on buying chicks; and to stabilize the production and marketing. Now, he is purchasing eggs from a firm at Bengaluru. He established a network with 38 shops in Port Blair to hold a market share of 20%. He has employed 15 staff for various operations and making a turnover of Rs.52 lakh to Rs.70 lakh per month from the sale of 30,000 to 40,000 birds at the wholesale rate of Rs.175/-.



Plate 73:- Shri R. Raja, Poultry entrepreneur

Shri A. Samsuddin doing diversified agriculture under challenged conditions

He runs a 3,000 bird capacity broiler farm, rears 100 desi poultry, 60 goats, collects, processes and supplies coconut to copra units, supplies 10 to 15 tonnes of noni fruits annually to the nearby processing plant from the 1,000 trees grown



Plate 74:- Shri A. Samsuddin under challenged conditions

along the bunds and borders of his farm, raising different varieties of banana as intercrop in arecanut and cultivates pepper using noni trees as standard. In 2000, he started a broiler farm with 1,000 bird capacity under the technical guidance of KVK, South Andaman on buy-back agreement with M/s. RSN. Inspired by CIARI's promotion of Noni for marginal lands in the Islands, he has been growing 1,000 trees of Noni var. CIARI Sampada since 2008 on the bunds and borders of his farm. In 2017, he established a 3,000 bird capacity poultry farm with 700 birds per batch. He has established a consistent marketing network with shops in the locality and adjacent islands. Upon spending Rs.280 which includes Rs.60 on purchase of chick, Rs.175 on feed, Rs.20 on saw dust flooring and Rs.25 on maintenance, a bird achieves 1.8 kg weight by 45 days. By selling a bird at the wholesale rate of Rs.175 per kg, he earns a profit of Rs.20 per kg which translates into Rs.25,200 per batch of 700 birds in 45 days. Since past three years, the trees are bearing 10-15 tonnes of fruits per annum which he sells to the nearby processing plant of M/s. Alberta Agro Pvt. Ltd. at the rate of Rs.20/kg. With an expenditure of Rs.8 over DAP and FYM, he earns a profit of Rs.12/kg of fruit which translates into Rs.1.2 to 1.8 lakh per annum..

10. Information On Other Section

10.1 Priority Setting, Monitoring and Evaluation (PME) Cell

PME Cell is involved in compilation and submission of various reports viz. Institute Annual Report, DARE/ICAR Report, 12 points reports, cabinet monthly report, newsletter, ARMS, replies to parliamentary question, SFC of the institute, annual plan of the institute etc. Besides the cell is also conducting Institute Research Council meeting, PMEC meeting, Institute Germplasm Identification Committee meeting, Award screening committee meeting, Publication Review Committee meeting etc. The PME cell also maintains repository of RPFs/RPPs of the Institute funded projects along with the annual reports.

During the year, XIV Institute Research Council (IRC) meeting for the year 2021 was conducted under the chairmanship of Dr. B.A. Jerard, Director (A) from 26th to 28th April, 2021 for Institute funded project through video conferencing wherein a total of 38 projects were presented by the scientists, of which 08 were closed and 30 recommended to be continued. A total of 04 new projects and 03 technologies were also recommended by the house. Later, the midterm review meeting for Institute funded projects was held during 27th to 29th September, 2021 under the Chairmanship of Eaknath B. Chakurkar, Director, ICAR-CIARI, Port Blair. A total of 34 ongoing projects and one new project was discussed and reviewed during the meeting.

Study circle has been started under the Chairmanship of Director, ICAR-CIARI, Port Blair with a main objective to discuss various scientific issues such as discussion and refinement of publication of research articles, presentation of research papers in the conference/seminar, presentation of latest scientific research and development by the scientists.

During the year, facilitated signing of MoUs with Acharya N. G. Ranga Agricultural University, Hyderabad, Kerala Agricultural University & Tamil Nadu University of Veterinary & Animal Sciences.



Plate 75: Midterm Review Meeting of Institute Research Council

10.2 Library

The library has a total collection of 7043 books and 2621 miscellaneous publication in addition to various journals database, technical books and others reference materials. The Library maintains a special section named 'Island Special Section', which is equipped with 490 books on different aspects of Andaman and Nicobar Islands, some of them are rare in nature. Beside special collection on Hindi literature are also available. The library has been maintaining 07 nos. of old and rare British publication 'Memoirs of the Asiatic Society of Bengal' from 1925-1935 (Digitize copy also available). The software 'KOHA' has been installed for digitalized accession to books and journals. The N.T. Singh conference hall at Library has become a main place where in meetings, seminar, and workshop are regularly convened.

10.3 Official Language Cell



Plate 76 : Hindi pakhwada activities

The Hindi Cell conducted Hindi Pakhwada from 14th September to 28th September, 2021, wherein various programmes like essay competition, letter writing, noting and affing, word meaning quiz competition etc. were organized for the scientists and staff of ICAR CIARI to create and motivate the awareness about the importance of Hindi and maximum usage of Rajbhasha in research and official activities for the maximum benefit to office staff, farmers and stakeholders. Apart from this, hindi cell submits quarterly report in the prescribed proforma to Director, Rajbhasha and further online upload to Rajbhasha Vibhag website. Official Language Implementation Committee has been revised under the chairmanship of Director, ICAR-CIARI of our institute to conduct meeting every quarterly for effective and maximum usage of Hindi in our Institute

10.4 Institute Technology Management Unit (ITMU)

ITMU Cell through ITMC shortlisted technologies/ varieties having potential for commercialisation such as CIARI Dhan varieties: 5, 6 & 7, CIARI HanGreens, CIARI Bio Consortia, CIARI Gropro, and CIARI Micro. Technology on "Preparation of calcium alginate (phyc-

colloid) from brown seaweed” has been applied for patent and the first examination report for the patent application on “Novel composition for herbal acaricide and its process thereof” was responded through required documents. Two technologies were commercialized viz. Dweep HanGreens to Shri. Nishant Naskar, Swaraj Dweep, South Andaman and Dweep Micro to M/s. EID Parry (Ind.) Ltd, Nanjai Pugalur, Tamil Nadu. The technology on Trimodel Therapy to Treat Humpsore in Cattle was named as ‘Dweep-GauMaa Rakshak’ and its detailed information was sent to the Animal Science SMD for wider circulation among institutes and KVKs. Four technologies such as Dweep Vertical structure for Mud Crab Fattening, Dweep vertical farming, Dweep larval rearing methodology for fresh water fancy guppy fish and Dweep tickure were finalised through series of ITMC meetings for further commercialisation.



Plate 77:- Commercialization of Dweep Hangreens

10.5 Agriculture Knowledge Management Unit (AKMU)

Agriculture Knowledge Management Unit (AKMU) is committed to promote ICT even technology and information dissemination system for quick and cost-effective delivery of information to all the stockholders in agriculture and allied sector. The unit focus on strengthening computing facilities at the institute level. The unit is looking after Local Area Network (LAN) connected with 120 nodes with 120 computers spread across the divisions and sections using optical fiber and CAT 6 cable. Dedicated 20 Mbps leased line link has been established to share it further on the institute Local Area Network for smooth functioning of day to day talk like e-office, ERP and other online portals. The entire Institute campus is also Wi-Fi enabled with high-speed internet connection to allow the staff to access the internet connection and these facilities are extended to library, conference rooms and other common area. AKMU is delivering and showcasing technologies, policies and other activities through institute website (<https://ciari.icar.gov.in>) and other social media Face book (<https://www.facebook.com/ICARCIARI/>), Twitter (<https://twitter.com/CIARIPortblair>) and YouTube (<https://www.youtube.com/channel/UCo1xnHqjNW-r9rIPVJ2Ww>)

Major Activities of Agriculture Knowledge Management Unit (AKMU) are as follows:

- Provide E-mail and Internet facilities to the users
- Provide WiFi connectivity with the entire campus
- Development and Updating of Website (<https://ciari.icar.gov.in>)
- Maintenance of Local Area network
- Procure, integrate and install various IT component and Software
- Conduct ASRB Online Examination with having 20 Desktop
- Manage Audio / Video presentations at Conference Hall, Auditorium and Director’s Committee Room
- Maintaining e-office and ERP
- Maintaining Bio-Metric Attendance System
- Oorganized 09 National webinars which was also live streamed on institute YouTube channel
- Following live streaming event were organized for farmers/scientist /Students/Technical:
- Mega event “Nutri-Cereals Multi-stakeholders Mega Convention 3.0” organized jointly with Food and Agriculture Organization (FAO) and Department of Agriculture, Cooperation and Farmers’ Welfare, (DAC & FW) Government of India, on 17th September 2021
- Message from Shri Narendra Singh Tomar, Hon’ble Minister of Agriculture and Famers Welfare, GOI and other Dignitaries were done on on National campaign Food and Nutrition for Farmers which was attended by the farmers, Subject Matter Specialists of ICAR-KVK & Scientists of CIARI.
- Hon’ble Prime Minister, Shri. Narendra Modi Ji’s address to farmers & scientists of our country and launch mass awareness campaign for large scale dissemination of climate resilient technologies & methods on 28th September, 2021.
- Farmers-Scientists Connect Meet” was organized under “Azadi ka Amrit Mahotsav” on October 28, 2021 (virtual mode).
- Farmer Corner was introduced in the website for showcasing the latest technology for stakeholders/farmers/public. A total of 80 technologies have been uploaded.
- A total of 33 Zoom meetings were organized during this year 2021, out of which 5 were divisional meeting, Four were of online interview and 02 nos of assessment meeting of Scientists.
- The following is report on institute social media status:




Period							
Year	Impression Earned(in Nos.)	Total No of post	Total Reach (in Nos)	Total No of post	Total No of Videos	Total views (in Nos.)	Watch Time (in hr)
2021	25.02 K	200	10.4K	110	57	17.0K	835.5



Plate 78:-Training programme progress at AKMU

10.6 Sports a ctivities

The facilities for outdoor and indoor sports have been maintained in the campus for the welfare of staff members of ICAR-CIARI. In addition, International Day of Yoga (IDY) - 2021 was celebrated by the staff of ICAR-CIARI, Port Blair on 21st June, 2021 under the leadership of Eaknath B. Chakurkar, Director, ICAR-CIARI. As per the initiative of the Honourable Prime Minister of India, the United Nations General Assembly had taken a historical decision during 2014 to declare the 21st June as the International Day of Yoga (IDY). Since then, IDY has been an occasion which is observed around the world with great enthusiasm and fervour. Theme for the IDY, 2021 is “Yoga for Wellness”. Given the context of the current COVID-19 pandemic situation in the country, the benefits offered by Yoga have become even more important for the physical and mental well-being. Therefore, along with the rest of the world, the staff of ICAR-CIARI have observed the 7th IDY on 21st June, 2021 at 7.00 A.M at their respective home with their families with the message “Be with Yoga, Be at Home”. The glimpses of various Yoga postures performed by the Director and staff of ICAR-CIARI is appended below. Besides, a Workshop on Stress Management, Immunity Boosting & Balanced Life through Sahaja Yoga Meditation was conducted during 22nd January, 2021 in which a total of 58 employees of ICAR-CIARI have participated.

10.7 Women Cell activities

A demonstration programme on ‘Immunity boosting fruits and herbs for urban households’ was organized by Women’s Cell of ICAR-CIARI, Port Blair in collaboration with NABARD- Urban Horticulture Project on February

2nd, 2021. The programme was attended by 18 participants including women employees of the institute and female students. Pooja Bohra, I/c, Women’s Cell delivered a lecture on role and significance of including fruits and spices in our daily diet. Scientific methods for production of seeds and planting material of various fruits and spices were demonstrated. Planting material of passion fruit, long pepper, mango ginger and Burmese coriander were distributed.



Plate 79:-Demonstration programme conducted

10.8 Swachh Bharat Abhiyan

Swachh Bharat Abhiyan was carried out as per the direction of the GOI and ICAR. Public campaigns were organised at various places and press and electronic media were effectively used to create public awareness. Special programmes were organised by inviting public personalities, scientist, people’s representatives, students and other stakeholders. In addition, the institute has also organised to dispose off old materials. Swachhta Pakhwada was observed during 16-31, December, 2021 in which a total of 400 persons have participated including farmers, women and school children. Demonstrations were organised at farmers’ field on composting of farm waste and hygiene of farm animals by the scientists of ICAR-CIARI. During the campaign plastic wastes from the campus and public places were collected and safely disposed off. Sanitary and institute staffs were regularly engaged in cleaning the water tanks, aine lines and the surroundings.

10.9 Post Graduate Cell

Post Graduate Cell has facilitated to complete the dissertation work /internship of students as a part of fulfillment of their degree programmes such as B.Sc., M.Sc., B.Tech., B.E., M.Tech and Ph.D. A total of 12 students have registered

and completed their project dissertation works in various fields such as organic farming, Genetic variability of banana, molecular signatures in rice, processing of mango ginger, Application of bioinformatics tools and mitochondrial signatures in molecular characterization of livestock, probiotics in livestock, Ethnomedicine, Reproductive biotechnological tools in farm animals, characterization of Mangrove and General molecular techniques. The duration of training/internship varied from 2 to 6 months. Further, PG Cell also coordinated to establish academic linkage with universities such as TANUVAS, Tamil Nadu and ANGRAU, Telengana.

10.10 Estate Section

A number of infrastructure development works and maintenance works have been executed by this Section. Arch Structure and shade net house were made for planting woody pepper under DBT woody pepper project. dragon fruit demonstration unit was constructed at Beodnabad and Collinpur under NABARD funded project. As per the requirement of Fire Department, Andaman & Nicobar Administration, the building plan of Central Laboratory building was awn for fire safety audit and installing fire

safety equipments. The rooms/ labs of the Institute buildings were sequentially numbered for easy identification of rooms of each Institute building.

10.11 Central Instrumentation Facility

Central Instrumentation Facility, is equipped with highly sophisticated equipments suitable for conventional and contemporary research work in the field of agriculture and allied sciences. Repair and annual maintainence are carried out to keep the equipments in running condition to have accurate, repeatable and precise results. The facilities in CIF are suitable to conduct work on protein chemistry, nucleic acid research, ecotoxicology, soil chemistry and pathogens of plants and animals. As an awareness programme, an expert talk on “Good Laboratory Practices” was organized in CIF under *Swacchata pakhwada* Celebration 2021 to bring awareness among scientists, technicians and students working under the aegis of ICAR-CIARI.

10.12 New Initiatives under Atmanirbhar Bharat

Trainings/Demonstration/ Awareness programme/ Webinar/Gosthis/Field daywas conducted under *Azadi ka amrut Mahotsavin* the year 2021as stated below:-

Webinars organized		Training programme organized			Gosthis organized		Total	
No. of activities	No. of participants	No. of activities	No. of participants	No. of activities	No. of participants	No. of activities	No. of participants	
09	310	16	426	11	808	36	1,544	

10.13 Round up of Institute Activities

a) Republic Day



Plate 80:- Republic Day

Seventy second Republic Day was celebrated at the Institute with gaiety and fervour. B. Augustine Jerard, Director (A), hoisted the National flag and all the staff of the institute attended the ceremony with patriotism. The Director lauded the effort of the scientists, technical, administrative, skilled supporting and temporary status staff of the institute and given message for the need to work on doubling the income of farmers. The

strength and opportunities along with the challenges were highlighted for the way forward to make the farming in the Islands sustainable and regenerative. He also impressed upon the staff to strive for focused achievements in view of the ever-changing demand and priorities in these islands under climate change and organic farming regimes.

b) International Women’s Day-2021



Plate 81:- International Women’s Day

Institute celebrated International Women’s Day with the theme “Women Leadership in Agriculture: Entrepreneurship,

Equity and Empowerment” on 8th March, 2021. Three women farmers/entrepreneurs involved in high density black pepper production, fish processing, vermicompost production, poultry and mushroom production were felicitated during the occasion. Various events like essay writing and painting competitions was also organized online for school and college students. Besides, an exhibition of Institute technologies developed for the women farmers and entrepreneurs was also organized. As a token of promotion of agricultural entrepreneurship in the islands, planting material of passion fruit was distributed to the participants.

c) National Science Day

An interactive meeting with farmers, Anganwadi workers and farm women on National Science Day organised at KVK, Nimbudera on 27th February 2021 under the chairmanship of B. Augustine Jerard, Director, CIARI in which about 70 farmers, students and anganwadi staff have participated and shared their feedback on Scientific Agricultural Practices and Expectations from ICAR-CIARI-KVK. The programme was organized by Er. Manoj Kumar, I/c Head, KVK, Nimbudera with the participation of all the KVK staff. Shri. Sushil Kumar Singh, Senior Administrative Officer, CIARI as guest of honor has felicitated the celebration and participated in the interactive meeting. The farmers have praised the contributions by the Institute and KVK and urged for further strengthening the KVK facilities. Director, in his address has stressed upon the potentials of scientific findings in uplifting the knowledge levels and livelihood security. He enumerated the efforts of the Institute in disseminating the agricultural technologies through KVK and highlighted the scope for doubling the farmers income in North and Middle Andaman. At CIARI Headquarters National Science Day was celebrated under the chairmanship of D. Bhattacharya, Director I/c, CIARI organized by Y. Ramakrishna, Head, KVK, SA; N. Bommayasamy, SMS; and other staff of KVK with the participation of students. Programme conducted with the students on the theme “Future of STI: Impact of Education, Skills work” and quiz competition were also held between the students. All the staff have actively taken part in the activities.

d) World Water Day

One day workshop on world water day was conducted on 22nd March 2021 at ICAR-CIARI, Port Blair. Prof. K. Palanivel, Bharathiyar University delivered a lecture on Water resources and agriculture. The programme was organized by Velmurugan, Pr. Scientist & I/c HoD, NRM and team. All staff and representative farmers have participated in the programme. B. Augustine Jerard, Director, CIARI

addressed the gathering. Awareness programme conducted in a befitting manner among the farmers about importance of water in life and Agriculture and the Global water crisis. Further, lectures on Status of water in A&N Islands were given by Sirisha Adamala, Scientist, NRM. A writing competition were also held for the school children on the theme “Valuing Water” and the certificates issued to the participants.

e) International Yoga day

The staff of ICAR-CIARI, Port Blair have celebrated the International Day of Yoga (IDY), 2021 on 21st June, 2021 at 7.00 A.M at their respective home with their families with the message «Be with Yoga, Be at Home».



Plate 82 : The staff of ICAR-CIARI performing various yoga postures during IDY, 2021

f) 44th Institute Foundation Day

ICAR-Central Island Agricultural Research Institute, Port Blair celebrated its 44th Foundation Day on 23rd June 2021 through virtual mode. The programme was attended by all the staff members of ICAR-CIARI, KVKs of South Andaman, North & Middle Andaman & Nicobar Districts. Dr. E. B. Chakurkar, Director, ICAR-CIARI thanked Indian Council of Agricultural Research, New Delhi for recognizing the importance of island ecosystem research to established the one and only unique institute in the country which addresses the issue of research, development and extension of Island’s agri/horti/animal/fish sectors on 23rd June 1978. He greeted all the staff members of the institute on this auspicious occasion and expressed his gratitude for their dedication, devotion and commendable contribution for taking this institute to its new heights. He lauded the efforts of the scientists for development of suitable varieties, breeds and technologies for enhancing the productivity in sustainable manner. He further stressed that, the future plan of our institute will be to work on post-harvest and value addition, technology commercialization, technology fortification and up scaling to reach to the all

the farmers and stakeholder to achieve the goal of doubling farmers income and to become atmanirbhar.

g) World Bee Day-2021

ICAR-KVK, Sippighat, South Andaman and Nimbudera, North & Middle Andaman organized a one-day webinar on World Bee Day with the theme “Build Back Better for Bees” on 20th May, 2021. The function of honeybees in boosting agricultural productivity, beekeeping as a commercial activity, honey production and processing, income from beekeeping by-products, and honey for health were discussed with isle farmers at these meetings. A total of 40 peoples attended the programme.

h) World Milk Day-2021

ICAR-KVK, South Andaman, North & Middle Andaman celebrated World Milk Day through conducting an online e-Goshthi with the dairy farmers on 1st June 2021. A total of 31 farmers participated and benefitted.

i) Balanced use of fertilizers

ICAR-KVK, Port Blair organized farmer’s goshthi on balanced use of fertilizers to create awareness to the farming community on 18th June 2021. In this programme, KVK officials interacted with the farming community of islands and gave special emphasis on the role of fertilizers in supply plant essential nutrients, the importance of soil testing in the balanced use of fertilizers, judicious use of fertilizers using the 4 R approach, importance of organic fertilizers (compost, biofertilizers, etc.), soil health card scheme, ip fertigation, crop residue management, etc.,. In this event, 19 participants were benefitted out of which 16 male and three female beneficiaries.

j) Har Med Par Ped in Commemoration of ICAR’s Foundation Day Celebrated



Plate 83- awareness programme on the theme “Har Med Par Ped”.

ICAR- Central Island Agricultural Research Institute, Port Blair celebrated 93rd ICAR’s Foundation Day today on 16th July, 2021 by conducting a “Campaign on mass tree

planting and awareness programme on the theme “Har Med Par Ped”. On this occasion, 650 plants comprising of endemic plants like Andaman Kokum, Andaman Kau Phal, *Artocarpus peduncularis* (Wild jackfruit), *Garcinia celebica* (Nicobar Mangosteen), orange kau phal-rare, besides banana, aonla, guava, khatta phal, bilimbi, west indian cherry, sapota, bread fruit, bread nut, gajapippali, acid lime, neem, moringa, subabul, Karanj, sea mahua and bamboo were planted to mark the occasion with complete zeal and enthusiasm to aid GO GREEN initiatives benefitting the tropical Island Ecosystem.

k) Independence Day

Seventy-fifth Independence Day was celebrated in the institute with high spirits and fervour. Eaknath B. Chakurkar, Director, ICAR-CIARI unfurled the National flag and thereafter adressed the staff members. He applauded the hard work, dedication and devotion of all the staff members in accomplishing the targets set for research, development and extension activities. Independence Day was also celebrated in all KVK’s and Regional Station at Minicoy, Lakshadweep.



Plate 84 :- Independence Day celebrated

l) Farmers-Scientists Connect Meet by DBT Biotech Kisan Hub

A mega-event “Farmers-Scientists Connect Meet” was organized on October 28, 2021 (virtual mode) under the Biotech-KISAN Hub at ICAR-KVK, Port Blair and Car Nicobar and the programme was connected to the rest of the hubs, leading scientists and other beneficiaries’ farmers associated with Biotech-KISAN Hub at ICAR-IARI, New Delhi. The meet was live streamed in which Hon’ble Minister of States for S&T, Dr. Jitendra a Singh adressed that DBT hub has the potential to upgrade and transform the agriculture sector for betterment. It’s a science meet which is enabling 75 districts and a total of 75000 farmers to interact and showcase their innovation and success. A total of 90 farmers, SHG members, officials participated in the event at Port Blair and Car Nicobar.

m) Vigilance awareness week- 2021

Vigilance awareness week was celebrated in ICAR CIARI from 26th October, 2021 to 1st November, 2021 on the theme “Independent India @75: Self Reliance with Integrity in which essay writing competition, awareness programme on ill-effects of corruption, painting competition, seminar on policies / procedures of the organization and preventive vigilance measures and awareness rally on vigilance was conducted, A total 150 (staff and students) were participated.

n) Constitution day



Plate 84: Vigilance awareness week celebration

ICAR-KVK-CIARI celebrated Constitution Day to commemorate the adoption of constitution on 26th November, 2021 in Krishi Vigyan Kena, South Andaman. In the event many scientists were spoke on the genesis of

Constitution Day, importance of Constitution in shaping the overall development of the country and also spoke on the role of CIARI/KVK in Agricultural technology development in the island. A total 35 students were participated in the event

o) Farmer Education Day:

Dr. Eaknath B. Chakurkar, Director, ICAR-CIARI gave talk on 3rd December, 2021 in Kisanvani Programme of AIR, Port Blair on “Education in Agriculture and importance of Agriculture” and also talked about the changes of farming on old times with new times. Advance technology to be adopted; minimum cultivation maximum production by using various agriculture and allied fields.



Plate 85:- Dr. Eaknath B. Chakurkar at All India Radio on Farmers Education Day

11. Award And Recognition

Name of person	Award/Recognition	Awarding agency
Dr. B Augustine Jerard	Chairman, State level Technical Committee for High Value Agriculture Development Agency (HVADA)	Directorate of Agriculture, A&N Administration
	Member, State Governing Council of High Value Agriculture Development Agency (HVADA)	Dept. of Agriculture, A&N Administration
	Member, State Variety Release Committee (State sub-committee on Crop standards and release of varieties of horticultural crops)	A&N Administration
	Member, Working Committee of the Andaman and Nicobar Medicinal Plants Board (ANMPB)	Dept of Environment and Forests, A&N Administration
	Member, State level Sanction Committee for RKVY	A&N Administration
	Member, State level Project screening Committee for RKVY	A&N Administration
	Member, State Board for Wildlife	Dept of Environment and Forests, A&N Administration
	Member, UT level Unit Cost Committee	NABARD, Port Blair
	Member, State level approval committee (SLAC) under PMFME scheme	A&N Administration
	Chairman/Panel Expert for the Technical Session on "Crop Production" and guided finalizing the Technical Programme for 2021-22 at 30th Annual Group Meeting of AICRP on Palms	All India Coordinated Research Project on Palms conducted during 22nd & 23rd November, 2021
	Chairman, Scientific Advisory Committee meeting of KVKs (South Andaman, N&M Andaman and car Nicobar) held on 30th March 2021	ICAR-CIARI, Port Blair
	Member, State Variety Release Committee (State sub-committee on Crop standards and release of varieties of horticultural crops)	A&N Administration
	Ex officio Member, Research Advisory Committee	ICAR-CIARI, Port Blair
	Certificate of recognition for best article writing for farmers	E-pashupalan
DrB. A. Jerard and Dr, V. Damodaran	Best Centre award for Port Blair under AICRP on Tuber Crops for the year 2020	AICRP on Tuber Crops, ICAR-CTCRI

Name of person	Award/Recognition	Awarding agency
Dr.A. Velmurugan	Chairperson: State Level Committee on Implementation of Organic Farming & State level committee for selection of beneficiaries	A & N Administration
	Editor	Journal of Andaman Science Association
	Invited Speaker: National webinar on Land Modification based IFS Models for Reclamation and Management of Waterlogged Salt Affected Soils	CSSRI, RO, Lucknow
Dr.I. Jaisankar	Associate Editor	Journal of Andaman Science Association
Dr. P. Perumal	Young Scientist in Animal Science	National Academy of Veterinary Sciences (India)
	Membership award	National Academy of Veterinary Sciences (India)
	Prof. N. R. Moudgal Young Scientist Award-2021	Indian Society for Study of Reproduction and Fertility (ISSRF).
Dr.K. Saravanan	Guest Editor	Special Issue in Pathogens Journal (MDPI)
Dr.Ajit Arun Waman	Best Oral Presentation Award during National E-Conference on “Biodynamic Calendar and Technological Intervention for Horticulture Sustainability and Health Security in Changing Climate”	College of Horticulture, Bidar (UHS Bagalkot) and Melhorn Books, New Delhi.
Pooja Bohra	Invited speaker during National Online Training Programme on "Conservation, Management and Utilization of Horticultural Genetic Resources" (November 22-26, 2021)	ICAR-Indian Institute of Horticultural Research, Bengaluru
J. Praveenraj	Syllabus Editor	B. Sc. (Honours) Fishery Science, North-Eastern Hill University, Shillong, Meghalaya, India

12. ONGOING RESEARCH PROJECTS

12.1 Institute Funded

Title	PI / Co-PIs	Budget (lakhs)
Horticulture & Forestry		
Conservation and utilization of coconut and arecanut genetic resources of Andaman & Nicobar and Lakshadweep Islands for high yield and product diversification (2018-2023)	Dr. B. Augustine Jerard , Dr. V. Damodaran, Dr. I. Jaisankar, Dr. S. K. Zamir Ahmed	45.0
Improvement of vegetable and tuber crops for Andaman and Nicobar Islands (2018-2023)	Dr. B. Augustine Jerard , Dr. I. Jaisankar, Dr. V. Damodaran, Dr. S. K. Zamir Ahmed, Dr. L. B. Singh	40.00
Quality planting material production in horticultural crops (2018-2023)	Dr. B. Augustine Jerard , Dr. V. Baskaran, Dr. K. Abirami, Dr. V. Damodaran, I. Jaisankar, Dr. Ajit Arun Waman, Dr. Pooja Bohra, Dr. S.K. Zamir Ahmed	45.00
Collection, conservation and evaluation of commercial fruit crops of Andaman and Nicobar Islands (2018-2022)	Dr. K. Abirami , Dr. V. Baskaran, Dr. B. A. Jerard, Dr. K. Venkatesan, Shri. D. Basantia	40.00
Identification and characterization of superior germplasm of cinnamon, tejpat and long pepper under Bay Islands condition (2021-2026)	Dr. Ajit Arun Waman , Dr. Pooja Bohra	49.25
Conservation, bioprospection and utilization of selected underutilized fruit species of Bay Islands (2021-2026)	Dr. Pooja Bohra , Dr. Ajit Arun Waman, Dr. Deepitha R.P.	58.24
Development Collection, characterization and utilization of natural diversity of important Spice crops From Bay Islands and evaluation of their improved varieties (2015-2021)	Dr. Ajit Arun Waman , Dr. Pooja Bohra, Dr. T. Sujatha, Dr. L.B. Singh, Dr. V. Damodaran	26.57
Collection, characterization, evaluation and mass multiplication of unconventional native and exotic fruit crops for bay islands (2015-2021)	Dr. Pooja Bohra , Dr. Ajit Arun Waman, Dr. Bharathimeena T., Dr. S.K. Zamir Ahmed	28.95
Collection, conservation, evaluation and Agro Technique Standardization of Native and Commercial ornamental crops (2018-2023)	Dr. V. Baskaran , Dr. B.A. Jerard, & Dr. K. Abirami, Dr. K. Venkatesan	61.38
Enriching coconut plantations of Andaman and Nicobar Islands through augmentation of indigenous multipurpose tree resources (2018-2023)	Dr. I. Jaisankar , Dr. B. Augustine Jerard, Dr. T. P. Swarnam, Dr. V. Damodaran	28.94
Field Crop Improvement & Protection		
Genetic improvement of rice or higher productivity in Andaman and Nicobar Islands conditions (2017-2021)	Dr. P. K. Singh , Dr. T. Bharathimeena, Dr. S.K. Zamir Ahmed, Dr. K. Venkatesan	18.00
Enhancing pulse productivity of Andaman and Nicobar Islands through development and promotion of high yielding and stress tolerant varieties (2018-2021)	Dr. K. Venkatesan , Dr. P. K. Singh, Dr. S. K. Zamir Ahmed	24.20

Title	PI / Co-PIs	Budget (lakhs)
Natural Resource Management		
Organic farming studies for sustaining productivity of Island cropping systems (2018-2023)	Dr. Kiran Karthik Raj , Dr. T. Subramani, Dr. A.Velmurugan	64.00
Study of hydrological response for soil and water conservation in Island ecosystem (2019-2022)	Dr. Sirisha Adamala , Dr. A. Velumurugan, Dr. T.Subramani, Dr. V. Damodaran	46.00
Study of carbon foot prints in major farming systems of A&N Islands for climate change adaptation (2020-2023)	Dr. T.P. Swarnam , Dr. A. Velmurugan, Dr. T. Subramani	12.00
Management of moisture stress in vegetable cropping system (2021-2023)	Dr. T. Subramani , Dr. A. Velmurugan, Dr. T. P. Swarnam, Dr. Sirisha Adamala	34.3
Valorization of organic wastes for abiotic stress management (2021-2023)	Dr. A. Velmurugan , Dr. T. P. Swarnam, Dr. T.Subramani	42
Development of novel biostimulants for enhancing crop production in island agroecosystem (2021-2023)	Dr. T.P. Swarnam , Dr. A.Velmurugan, Dr. I. Jaisankar,	44.5
Animal Science		
Molecular characterization of immune system genes of Nicobari fowl (2017-2021)	Dr. K. Muniswamy , Dr. A. K. De, Dr. T. Sujatha, Dr. Jai Sunder, Dr. D. Bhattacharya	37.13
Molecular epidemiology of <i>Rhipicephalus microplus</i> complex in A&N Island and screening for its acaricide resistance (2018-2021)	Dr. D. Bhattacharya , Dr. Jai Sunder, Dr. K. Muniswamy, Dr. R. R. Alyethodi, Dr. P. Perumal, Dr. A. K. De	23.0
Pharmaco-assessment of ethno-veterinary medicinal plants of A&N Islands for poultry diseases (2018-2022)	Dr. T. Sujatha , Dr. Jai Sunder, Dr. D. Bhattacharya, Dr. A.K.De, Dr. K. Abirami	25.95
Selection and breeding of Nicobari fowl for immunity and its evaluation under different seasons (2018-2022)	Dr. T. Sujatha , Dr. Jai Sunder, Dr. D. Bhattacharya, Dr. R. R. Alyethodi	26.50
Evaluation of reproductive performance and egg quality of Nicobari fowl using molecular marker (2018-2021)	Dr. A. K. De , Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. P. Perumal, Dr. T. Sujatha	40.00
Biochemical and molecular mining of hormonal profiles of buck under abiotic stressors and managerial intervention for its mitigation (2018-2021)	Dr. P. Perumal , Dr. A. K. De, Dr. R. R. Alyethodi, Dr. K. Muniswamy, Dr. Jai Sunder	34.17
Identification of Genome-wide molecular signatures responsible for higher fecundity in Andaman Local goats (2018-2022)	Dr. R. R. Alyethodi , Dr. Jai Sunder, Dr. A. K. De, Shri.D. Karunakaran, Dr. P. Perumal, Dr. P. A. Bala	27.00
Physical, biochemical and molecular characterization of semen in pigs of Bay Islands vis-a-vis study on feasibility of artificial insemination (2018-2021)	Dr. P. Perumal , Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. A. K. De, Dr. R. R. Alyethodi	21.90
Prevalence and diversity of antimicrobial resistance in Enterobacteriaceae from livestock and poultry and its surrounding environment (2019-2022)	Dr. Jai Sunder , Dr. A. K. De, Dr. S. Bandyopadhyay, Dr. T.Sujatha, Dr. D. Bhattacharya	23.00

Title	PI / Co-PIs	Budget (lakhs)
Evaluation of hormonal and biochemical profiles of indigenous boar under abiotic stressors and melatonin intervention for its mitigation (2020-2023)	Dr. P. Perumal , Dr. A. K. De, Dr. R. R. Alyethodi , Dr. D. Bhattacharya	34.25
Goat improvement through Assisted Reproductive Techniques in Andaman and Nicobar Islands (2021-2024)	Dr. P. Perumal , Dr. A. K. De, Dr. R. R. Alyethodi, Dr. Jai Sunder, Dr. D. Bhattacharya	37.13
Nutrient intake and digestibility of the Andaman local and Nicobari Pigs in intensive system of rearing (2021-2024)	Dr. P. A. Bala , Dr. A. K. De, Dr. P. Perumal	20.00
Probiotics supplementation in pig health and immunity (2021-2024)	Dr. A. K. De , Dr. D. Bhattacharya, Dr. P. Perumal, Dr. P. A. Bala	24.00
Fisheries Science		
Assessment of elasmobranch fisheries of Andaman Islands (2019-2022)	Dr. Gladston Y , Dr. R. Kiruba-Sankar, Dr. Ajina S.M, Dr. Deepitha R.P, Benny Varghese	56.16
Biology and population dynamics of major perch fishes of Andaman Islands (2019-2022)	Dr. Ajina S. M , Dr. Gladston Y, Dr. R Kiruba Sankar,, Dr. Sreepriya Prakasan, Dr. S. Murugesan	48.14
Prevalence of parasites infecting commercial marine and freshwater fishes of the Andaman Islands (2019-2022)	Dr. J. Praveenraj , R. Kiruba-Sankar, K. Saravanan, Y. Gladston,	44.3
Seafood quality and safety assessment studies in commercial fish landing of Andaman Islands. (2019-2022)	Dr. Sreepriya Prakasan , Dr. Deepitha R. P , Dr. K. Saravanan, Dr. Gladston Y	57.3
Exploring the Post-Harvest Utilisation and market potential for value added products from commercial fish landings of Andaman (2019-2022)	Dr. Deepitha R. P. ,Dr. Sreepriya Prakasan, Ajina S. M, and T. Sujatha.	56.7
Social Science Section		
Opportunities and challenges of sustaining agriculture in South Andaman district of Andaman & Nicobar Islands: A behavioural perspective (2021-2023)	Dr. S.K. Zamir Ahmed , Dr. R. Jaya Kumaravaradan, Dr. L.B. Singh	32.00
Agricultural Information Sharing and Knowledge Generation towards sustainable management of Island ecosystem with special reference to Fishery by developing mobile apps (2018-2022)	Shri. D. Karunakaran , Dr. R. Kiruba Sankar	18.00
Indigenous adaptation strategies of tribal vis-a-vis non-tribal farmers and impact of CIARI technologies in mitigating climate change effects on agriculture in Andaman & Nicobar Islands (2018-2022)	Dr. R Jaya Kumaravaradan , Dr. S. K Zamir Ahmed, Dr. B. A Jerard	45.00

12.2 External funded

Title	PI / Co-PIs	Budget(lakhs)	Funding agency
Micropropagation, agro - techniques standardization and utilization of Woody Pepper (<i>Piper pendulispicum</i> C. DC): a Novel Spice from Andaman Islands (2020-2022)	Dr Ajit Arun Waman , Dr Pooja Bohra	38.95	DBT

Title	PI / Co-PIs	Budget(lakhs)	Funding agency
Regeneration and Molecular characterization of Andaman Padauk (<i>Pterocarpus dalbergioides</i>). (2018-2021)	Dr. I. Jaisankar , Dr. B. Augustine Jerard, Dr.Nabanita Ganguly	43.11	DBT
Establishment of Biotech Kisan Hub (2019-2022)	Dr. Jai Sunder , Dr. T. Sujatha, Dr. D. Bhattacharya, Dr. A. K. De, Dr. S. K. Zamir Ahmed, Dr. R. Jayakumaravaradan, Dr. L. B. Singh, Z. George Dr. S. V. Lal, Dr. A. K. O. Rateesh	134.23	DBT
Monitoring of pesticide residues at national level (2011-2022)	Dr. T.P. Swarnam	15.0	DAC, New Delhi
Augmenting livelihood, resilience and knowledge generation through coastal fisheries information hub for Nicobari tribes of Car Nicobar Island (2020-2024)	Dr. R Kiruba Sankar , Shri.. D, Karunakaran, Dr. Y. Gladston, Dr. Sreepriya P, Dr. Praveenraj J, Dr. K Saravanan, Dr. Utpal Kumar Sharma	158.0	DST
Genetic and Management Interventions to identify the key role players in bull semen freezability and to reduce the cryoinjury on bull spermatozoa (2018-2021)	Dr. R.R. Alyethodi	32.11	DST-SERB
Securing livelihoodof nicobari tribal communities of A&N Islands through sustainablehorticultural interventions (2020-2022)	Dr. B Augustine Jerard , Dr. S. K. Zamir Ahmed, Dr. V. Damodaran, Dr. V. Baskaran, Dr. Jaya Kumaravaradan	12.00	NASI
Livelihood and nutritional security of tribal farming community of A&N islands exploring native animal genetic resources (2019-2021)	Dr. P. A. Bala , Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. T. Sujatha, Dr. A. K. De, Dr. P. Perumal, Dr. S.K. Zamir Ahmed	17.96	NASI
Development and Standardization of DUS Characteristics Procedures for Noni (<i>Morinda citrifolia</i> L.) (2013-2022)	Dr. I. Jaisankar	27.08	PPV& FRA
Bio-prospecting of <i>Pandanus</i> sp. (Kewda) of Andaman and Nicobar Islands for its medicinal properties (2021-2024)	Dr. I. Jaisankar , Dr. B. Augustine Jerard, Dr. A.Velmurugan, Dr. M. Rajkumar, Dr. R. Jaya Kumaravaradan	32.52	NMPB
Mangrove Community Zonation and Biophysical Characterization for Coast of Andaman and Nicobar Islands (2019-2021)	Dr. I. Jaisankar , Dr. Bimal K , Dr. Bhattacharya, Dr. Nikhil Lele	17.75	SAC, ISRO,
CSS (MIDH) NHM project on spices (2022-continuing)	Dr. K. Abirami , Dr. V. Damodaran	11.00	DASD
National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) in Andaman and Nicobar Islands (2015-2022)	Dr. K. Saravanan , Dr. J. Praveenraj, Dr. R. Kiruba Sankar	82.12	Department of Fisheries, GOI
Interventions for promotion of urban and peri-urban horticulture in the islands through immunity boosting fruits, spices and herbs (2020-2022)	Dr. Pooja Bohra , Dr. Ajit Arun Waman, Dr. B.Augustine Jerard	10.88	NABARD

Title	PI / Co-PIs	Budget(lakhs)	Funding agency
Dragon fruit cultivation – a sustainable livelihood option for Island farmers (2020-2023)	Dr. K. Abirami , Dr. V. Baskaran, Dr. Augustine B. Jerard, Dr. Pooja Kapoor, Dr. N. Bommayasamy	9.79	NABARD
Horticulture based sustainable rooftop production model for nutritional and livelihood security of urban households of Andaman Islands (2020-2023)	Dr. V. Baskaran , Dr. K. Abirami, Dr. T. Subramani, Dr. K.Venkatesan, Dr. L. B. Singh	9.49	NABARD
Cultivation and value addition of cut flowers for entrepreneurship development in Andaman and Nicobar Islands (2020-2023)	Dr. V. Baskaran , Dr. K. Abirami, Dr. T. Subramani, Dr. K.Venkatesan, Dr. L. B. Singh	9.81	NABARD
Dissemination and popularization of feed-based aquaculture model to augment fish production in Andaman Islands (2019-2022)	Dr. K. Saravanan Dr. T. Sivaramakrishnan, Dr. R.KirubaSankar, Dr. Sreepriya Prakasan	10.99	NABARD
Development and demonstration of mud crab fattening to improve the livelihood of fishers at Andaman Islands (2019-2023)	Dr. Ajina S.M , Dr. Gladston Y, Dr. K. Saravanan, Dr. Deepitha. R.P, Shri.. Benny Varghese, Dr. S. Murugesan	10.82	NABARD
Promoting livelihood and entrepreneurship through value added fishery products-An initiative aimed for women empowerment (2020-2022)	Dr. Deepitha R. P , Dr. SreepriyaPrakasan, Dr. Gladston Y	10.80	NABARD
Sustainable utilization of fish wastes for by-product development – an initiative for entrepreneurship development in the Islands. (2020-2022)	Dr. Sreepriya Prakasan , Dr. Deepitha. R.P, Dr. Ajina S.M., Dr. R. Kiruba Sankar	10.84	NABARD
Production technology of least cost balanced poultry feed with mini feed mill to augment income of rural poultry farmers in South Andaman (2019-2021)	Dr. T. Sujatha , Dr. P. A. Bala, Dr. Jai Sunder, Dr. L. B. Singh	10.93	NABARD
Enhancing livelihood of farmers through dissemination of scientific package of practices for health management in rural poultry sector (2019-2021)	Dr. T. Sujatha , Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. A. K. De	10.93	NABARD
Promoting Multiplier Flock Concept in goat farming for Entrepreneurship Development among Rural Youths (2020-2022)	Dr. Jai Sunder , Dr. R. R. Alyethodi, Dr. P. Perumal, Dr. T. Sujatha	10.93	NABARD
Humpsore treatment by trimodel therapy to improve the production and reproduction performances of milch cows in South Andaman (2020-2022)	Dr. P. Perumal , Dr. A. K. De, Dr. D. Bhattacharya, Dr. Ashish Kumar, Dr. L. B. Singh, Dr. S. K. Zamir Ahmed, Dr. B. Augustine Jerard	11.03	NABARD
High value vegetable cultivation and vermicompost production in rainout shelters for doubling farmer's income (2020-2022)	Dr. T. Subramani , Dr. A. Velmurugan , Dr. Kiran Karthik Raj, Dr. Sirisha Adamala	11.3	NABARD

Title	PI / Co-PIs	Budget(lakhs)	Funding agency
Women empowerment through climate smart integrated farming systems (2020-2022)	Dr. T.P. Swarnam , Dr. L.B.Singh	10.0	NABARD
Establishment and promotion of quail farming ;an emerging field entrepreneurship in A & N Islands (2020-2022)	Dr. R.R. Alyethodi , Dr. T. Sujatha, Dr. Jai Sunder, Dr. P.A. Bala	10.87	NABARD
Mitigation of Iron Deficient Anaemia (IDA) in piglets through 2-7-10- 15 module of iron therapy (2020-2022)	Dr. A. K. De , Dr. P. Perumal, D. Bhattacharya, Dr. Ashish Kumar, Dr. L. B. Singh	11.03	NABARD
Fodder production and management to improve and support island livestock (2021-2023)	Dr. P. A. Bala , Dr. P. Perumal, Dr. R. R. Alyethodi	10.50	NABARD
Integrated Agromet Advisory Services for A&N Islands (June, 2008-March, 2022)	Dr. A. Velmurugan , Dr. T. Subramani, Dr. T.P. Swarnam, Dr. D.Bhattacharyya, Dr. P .K. Singh, Dr. R. Kiruba Sankar, Dr. S.K. Zamir Ahmed, Dr. L.B.Singh, Dr. S.K.Pandey & Dr. B.A.Jerard	75.0	IMD, Pune
Consultancy Project on ‘Preparation of State Specific Action Plan (SSAP) for Water Sector, Andaman and Nicobar Islands (2019-2022)	Dr. T. Subramani , Dr. Sirisha Adamala, Dr. A.Velmurugan, Dr. B. K. Nanda, Dr. P. A. Bala, Dr. I. Jaisankar, Dr. Y. Gladston	20.01	Director, ANSWSM, Port Blair
Effect of Nano Urea (Liquid) in reducing the application of conventional urea (2021-2022)	Dr. Velmurugan A , Dr. T. P.Swarnam, Dr. T.Subramani, Dr. Y.Ramakrishnan, Dr. N. Bommayasamy , Shri. Manoj Kumar	8.0	IFFCO, Chennai

12.3 ICAR funded

Title	PI/Co-PIs	Budget (lakhs)
National Animal Disease Control Programme on Foot and Mouth Disease (Earlier AICRP on FMD) (2014-continuing)	Dr. Jai Sunder , Dr. A. K. De, Dr. D. Bhattacharya	3.50
National Animal Disease Epidemiology Network (Earlier AICRP on ADMAS) (2014- continuing)	Dr. Jai Sunder , Dr. D. Bhattacharya, Dr. T. Sujatha	3.50
AICRP on Goat Improvement (2014-continued)	Dr. Jai Sunder , Dr. R. R. Alyethodi, Dr. P. Perumal	22.05
Poultry Seed Project	Dr. T. Sujatha	21.60
AICRP on Pig (2014- continuing)	Dr. A. K. De , D. Bhattacharya, Dr. P. Perumal, Dr. Jai Sunder, Dr. P. A. Bala	151.00
AICRP on Fruits (2016- continuing)	Dr. K. Abirami	1.10
AICRP on Floriculture (2016- continuing)	Dr. V. Baskaran	3.20
AICRP on Palms (2015- continuing)	Dr. Ajit Arun Waman	8.35
AICRP on Vegetable Crops(2005- continuing)	Dr. B. Augustine. Jerard , I. Jaisankar	8.24
AICRP on Tuber crops(2010- continuing)	Dr. B. Augustine. Jerard , Dr. V. Damodaran, Dr. L.B. Singh	5.0

Title	PI/Co-PIs	Budget (lakhs)
AICRP on PHET(2020- continuing)	Dr. B. Augustine. Jerard , Dr. V. Damodaran	2.0
AICRP Seed (Crop) (2006-Continuing)	Dr. P K Singh , Dr. K Venkatesan	75.50
AICRP on integrated farming systems (2010-2022)	Dr. T.P. Swarnam , Dr. A.Velmurugan, Dr. T. Subramani, Dr. S. Swain, Dr. P. Perumal, Dr. R. Kiruba Sankar, Dr. I. Jaisankar, Dr. A. Ajit A. Waman, Dr. B.K. Nanda	85
All India Network Project on Mariculture (2018-2023)	Gladston Y. , R Kiruba Sankar, Ajina S.M, Harsha Haridas, J. Praveenraj, K.Saravanan, Benny Varghese, S.Murugesan	60
Inter-Institutional ICAR-CPCRI		
Genetic resources management in Coconut, Arecanut and Cocoa (2018-2025)	Dr. B. A. Jerard , Dr. V. Damodaran	3.0
Breeding for higher yield in Coconut, Arecanut and Cocoa (2018-2025)	Dr. B. A. Jerard , Dr. V. Damodaran	3.0



13. Publications

13.1 Research Article

- Abirami K., Swain S., Baskaran, V., Venkatesan K., Sakthivel, K. & Bommayasmay. N. (2021). Distinguishing three dragon fruit (*Hylocereus spp.*) grown in Andaman and Nicobar Islands using morphological, biochemical and molecular traits. *Scientific Reports*. 11(1): 1-14 (NAAS Rating: 10.0)
- Ajina, S.M., Gladston, Y., SriHari, M., Kiruba-Sankar, R., Pavan-Kumar, A., Roy, S.D. & Jaiswar, A.K., (2021). New Distributional Record of Blacklash scorpionfish, *Pontinusnigerimum* Eschmeyer, 1983 from Andaman Waters, Eastern Indian Ocean. *Thalassas:An International Journal of Marine Sciences*, pp.1-5. (NAAS Rating: 6.20)
- Akhilesh, K.V., Rajan, P.T., Vineesh, N., Iees Babu, K.K., Bineesh, K.K., Muktha, M., Chellappan, A., Manjebayakath, H., Gladston, Y. & Nashad, M., (2021). Checklist of serranid and epinephelid fishes (Perciformes: Serranidae & Epinephelidae) of India. *Journal of the Ocean Science Foundation*, 38, pp.35-65. (NAAS rating 9.416)
- Bohra, P., Waman, A.A. & Devi, R.K. (2021). Seed fatty acid composition and germination studies in *Garcinia dhanikhariensis* S.K. Srivastava (Clusiaceae) – a novel tropical fruit species from Bay Islands, India. *International Journal of Fruit Science*, 21, 970-978, (Impact factor: 1.359)
- Bohra, P., Waman, A.A. & Giri, N.A. (2021). *Garcinia andamanica* King. (Clusiaceae): an important horticultural genetic resource from Indian Islands. *Genetic Resources and Crop Evolution*, 68, 1675-1689, (NAAS Rating: 7.07)
- Bohra, P., Waman, A.A., Kumar, S.S. & Devi, H.L. (2021). Morphological and physicochemical studies in blood fruit (*Haematocarpusvalidus* Bakh. f. ex Forman): A tropical fruit and natural colorant, 59(1):168-178. *South African Journal of Botany*, (NAAS Rating: 7.79)
- DamRoy, S., Saravanan, K., Kiruba-Sankar, R., Praveenraj, J. & Benny Varghese. (2021). Insights of Inland Aquaculture in Andaman and Nicobar, India. *Journal of the Andaman Science Association*, 26(1): 39-43. (NAAS Rating: 4.15)
- De, A.K., Perumal, P., Muniswamy, K., Ahmed, S.K.Z., Kundu, A., Sunder, J., Alyethodi, R.R., Ravi, S.K. and Bhattacharya, D. (2021). Prevalence of coccidiosis in Andaman local goat and its metaphylaxis in tropical island ecosystem. *Indian Journal of Animal Sciences*, 91 (6): 438-442. (NAAS Rating: 6.32.)
- De, A.K., Sawhney, S., Bhattacharya, D., Sujatha, T., Sunder, J., Ponraj, P., Ravi, S.K., Mondal, S., Malakar, D. & Kundu, A. (2021). Origin, genetic diversity and evolution of Andaman Local Duck, a native duck germplasm of an insular region of India. *Plos One* 16(2), (NAAS Rating: 9.24).
- De, A.K., Sawhney, S., Ponraj, P., Muthiyar, R., Muniswamy, K., Ravi, S.K., Malakar, D., Alyethodi, R.R., Mondal, S., Sunder, J., Banik, S., Kundu, A. & Bhattacharya, D. (2021). Maternal lineage of Nicobari pig (*Sus scrofa nicobaricus*) correlated with migration of Nicobarese, a native tribal population of Andaman and Nicobar Islands, India. *Animal Biotechnology*, 26:1-10 (NAAS Rating: 8.24).
- De, A.K., Sawhney, S., Ponraj, P., Sunder, J., Banik, S. & Bhattacharya, D. (2021). Physiological and immune responses to long road transportation in Andaman local pigs. *Tropical Animal Health and Production*, 53: 247. (NAAS Rating: 7.56).
- Gladston, Y., Ajina, S.M., Nesnas, E.A., SriHari, M., M. Benny Varghese., Deepitha R.P., & Kiruba-Sankar. (2021). First record of small ariomma, *Ariomma brevimanum* (Klunzinger, 1884) (Perciformes: Ariommatidae) from Andaman Islands. *Journal of Andaman Science Association*, 26(1);58-62. (NAAS Rating: 4.15)
- Jaisankar, I., Augustine Jerard, B., Velmurugan, A., Jaya Kumaravaradan, R. & Raj Arvind (2021). Cluster Fruit Bearing Noni Identified in Andaman & Nicobar Islands. *Journal of the Andaman Science Association*, 26(1):55. (NAAS Rating: 4.15)
- Jaisankar, I., B. Augustine Jerard & E. Manasseh Moses. (2021). Impact of Growing Media on Seedling growth and production in Andaman Padauk (*Pterocarpus dalbergioides* Roxb.) *Indian Forester*; 147 (5): 455-460, (NAAS Rating: 5.1).
- Jaisankar, I., Varadan, R.J., Vijayakumar, S., Nitiprasad, N.J., Jerard, B.A., Nabanita, G., Rajkumar, M., Moses, E.M. and Simhachalam, P. (2021). Efficacy of clonal propagation in Andaman Padauk (*Pterocarpus dalbergioides*): Augmenting conservation of an endemic ornamental timber species of Andaman & Nicobar Islands, India. *Forest Science*, 67(5):537-549. (NAAS Rating: 7.66)

- Karunakaran, D. & Balakrishnan, M. (2021). Prediction of fish production in Tamil Nadu reservoirs using Artificial Neural Network (ANN). *International Journal of Advanced Research and Communication Engineering*, 10(2):44-52.
- Kiruba-Sankar, R., Krishnan, P., George, G., Kumar, K.L., Angel, J.R.J., Saravanan, K. & Roy, S.D. (2021). Fisheries governance in the tropical archipelago of Andaman and Nicobar – opinions and strategies for sustainable management. *Journal of Coastal Conservation*. (NAAS rating: 7.87)
- Kiruba-Sankar, R., Praveenraj, J., Saravanan, K., Kumar, K.L., Harsha, H. & Biswas, U. (2021). Stakeholder perceptions and strategies for management of non-native freshwater fishes of Andaman and Nicobar Islands, India. *Aquatic Ecosystem Health & Management*, 24(2): 96-104.(NAAS rating: 7.05)
- Mahadevan, G., Gosavi, S.M., Sreekanth, G.B., Gladston, Y. & Murugesan, P. (2021). Demographics of Blue-spotted Mudskipper, *Boleophthalmus boddarti* (Pallas, 1770) from Mudflats of Sundarbans, India. *Thalassas: An International Journal of Marine Sciences*, 37(2);457-463.(NAAS Rating : 6.20)
- Moulitharan, N., Jayakumara, N., Uma, A., Praveenraj, J., & Kodeeswaran, P. (2021). New distributional record of *Istigobius diadema* (Steindachner, 1876) and *Lobotessurinamensis* (Bloch 1790) from the Pulicat lagoon, India. *Indian Journal of Geo Marine Sciences* 50: 673-676. (NAAS rating 6.496)
- Pandey S.K, Swarnam, T.P, Velmurugan A and Vikram Singh (2021). Effect of integrated application of organic and inorganic fertilizers on soil biological properties in coastal alluvial soils Andaman Islands. *Journal of Andaman Science Association*, 26(1): 28-32. (NAAS Rating: 4.15)
- Pandey, S.K., George, Z., Varadan, R., J., Swarnam, T.P., Ahmed, S.K.Z., and Jerard, B.A. (2021). Enhancing Tribal Farmers' Income through Technological Intervention: A Case Study from Car Nicobar, Andaman & Nicobar Islands. *Indian Journal of Extension Education* 57: 94-100.(NAAS rating : 5.95)
- Patil, S.S., Velankar, A., Shivaranjini, C., Sunder, J., Suresh, K.P., Hiremath, J. & Hemai, D. (2021). Seroprevalence of infectious bovine rhinotracheitis (IBR) in the Andaman and Nicobar Islands, India. *Exploratory Animal and Medical Research*, 11 : 110-114. (NAAS Rating: 5.85).
- Perumal, P., De, A.K., Alyethodi, R.R., Savino, N., Khate, K., Vupru, K. & Khan, M.H. (2021). Daily and seasonal rhythmic secretary pattern of endocrinological profiles in mithun bull. *Theriogenology*, 166, 46-54. (NAAS Rating: 8.09)
- Perumal, P., De, A.K., Bhattacharya, D., Alyethodi, R.R., Bhowmick, S. & Kundu, A. (2021). Effect of exogenous melatonin on endocrinological profiles, biochemical and antioxidant and oxidative stress profiles in post-partum anestrous Andaman local buffaloes (*Bubalus bubalis*) in tropical island ecosystem. *Indian Journal of Animal Sciences*, 91(3), 206-213. (NAAS Rating: 6.28)
- Perumal, P., De, A.K., Mondal, S., Ravi, S., Sawhney, S., Sarkar, G., Bera, A.K., Malakar, D., Kumar, A., Singh, L.B., Zamir Ahmed, S.K., Muniswamy, K., Jerard, B.A. and Bhattacharya, D. (2021). Tri-model therapy: combining macrocyclic lactone, piperazine derivative and herbal preparation in treating humpsore in cattle. *Veterinary Sciences (MDPI)*, 8(2)(27): 1-11.(NAAS Rating: 8.304)
- Praveenraj, J., Uma, A., Saravanan, K., Rebecca, G. & Mandal, C.K. (2021). Outbreak of hirudiniasis in aquarium-reared albino red-bellied pacu *Piaractus brachypomus*. *Diseases of Aquatic Organisms*, 144: 55-59. (NAAS rating: 7.37).
- Prithivi, M., Venkatesan, K., Manimaran, D., Gautam, R.K., Singh, P.K., Sakthivel, K., Zamir Ahmed, S.K., Pandey, S.K. and Rao, S.S. (2021). Molecular characterization of *Vigna marina* (Burm.f.) Merr. from the Andaman and Nicobar Islands for salt tolerance using SSR markers. *Plant Genetic Resources: Characterization and Utilization*, 19(5): 428-436.(NAAS Rating: 6.87)
- Rajesh, M.K., Gangurde, S.S., Pandey, M.K., Niral, V., Sudha, R., Jerard, B.A., Ganesh. K.N., Sabana, A., Muralikrishna, K.S., Samsudeen, K., Karun, A. & Prasad, T.S.K. (2021). Insights on Genetic Diversity, Population Structure, and Linkage Disequilibrium in Globally Diverse Coconut Accessions Using Genotyping-by-Sequencing. *OMICS: A Journal of Integrative Biology*, 25 (12): Published Online: 8 Dec 2021, (NAAS rating : 8.51)
- Sakthivel, K., Balamurugan, A., Ashajyothi, M., Yadav, S., Baskaran, V., Abirami, K., Gautam, R. K. & Kumar, A. (2021). Transboundary introduction of potato infecting *Ralstonia solanacearum* in the Andaman Islands revealed by multilocus sequence typing: A potential threat to Island Agriculture. *Journal of*

Biosciences, 46(3): 1-10. (NAAS Rating: 7.83)

- Saravanan, K., Kiruba-Sankar, R., Khan, J., Hashmi, A.S., Velmurugan, A., Haridas, H., Sreepriya, P., Deepitha, R.P. & Laxmi, M.N.V. (2021). Baseline assessment of marine debris with soil, sediment and water quality characteristics from the fish landing centres of South Andaman. *Marine Pollution Bulletin*, 172: 112879. (NAAS rating: 10.05)
- Saravanan, K., Praveenraj, J., Kiruba-Sankar, R., Devi, V., Biswas, U., Kumar, T.S., Sudhagar, A., El-Matbouli, M. & Kumar, G. (2021). Co-Infection of Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV) and White Spot Syndrome Virus (WSSV) in the Wild Crustaceans of Andaman and Nicobar Archipelago, India. *Viruses*, 13(7): 1378. (NAAS rating: 9.82)
- Saravanan, K., Sivaramakrishnan, T., Praveenraj, J., Kiruba-Sankar, R., Haridas, H., Kumar, S. & Varghese, B. (2021). Effects of single and multi-strain probiotics on the growth, hemato-immunological, enzymatic activity, gut morphology and disease resistance in Rohu, *Labeorohita. Aquaculture*, 540: 736749. (NAAS rating: 9.22).
- Subramani, T., Velmurugan, A., Swarnam, T.P., Laxmi, N.V. & Abubaker (2021). Floating beds for vegetable cultivation in waterlogged areas. *Journal of Andaman Science Association*, 26(1): 56-57. (NAAS Rating: 4.15)
- Sujatha, T., Jayanthki, C., Kumar, N.R.S., Sunder, J., De, A.K. & Bhattacharya, D. 2021. Haemato-biochemical profile of Andaman local ducks. *Indian Journal of Poultry Science*, 56(2):149–153. (NAAS Rating: 5.85)
- Sujatha, T., Lal, S.V., Mohammed, N., De, A.K., Alyethodi, R.R., Sunder, J. & Bhattacharya, D. 2021. Qualitative and quantitative characteristics of Andaman local duck. *Indian Journal of Poultry Science*, 56(1):31–35. (NAAS Rating: 5.85)
- Sunder, J., Sujatha, T., Bhowmick, S., Mayuri, S.C., De, A.K., Bhattacharya, D., Perumal, P. & Kundu, A. (2021). Distribution of TET, AAC and CTX-M genes among antibiotic resistant *Escherichia coli* isolated from poultry under various farming system of A and N Islands. *Indian Journal of Animal Research*, 55(6):689-696 (NAAS Rating: 6.40)
- Swarnam, T.P., Velmurugan, A., Banu, V. S. & Kavita, G. (2021). Exploring the potential of seaweeds of South Andaman coast for agricultural use. *Journal of Andaman Science Association*, 26(1): 1-7.

(NAAS Rating: 4.15)

- Velmurugan, A., Adamala, S., & Swarnam, T.P. (2021). Post-tsunami land degradation on a South Asian island: Implications for conservation priorities. *Land Degradation & Development*, 32(14):4018-4032. (NAAS rating 9.78)
- Velmurugan, A., Gafoor, A.V.M. & Mathai, J. (2021). Natural resource management vis-a-vis climate change impacts on Lakshadweep islands. *Journal of Andaman Science Association*, 26(1): 14-23. (NAAS Rating: 4.15)
- Velmurugan, A., Swarnam, T.P., Jaisankar, I., Swain, S. & Subramani, T. (2021). Vegetation–soil–microbial diversity influences ecosystem multifunctionality across different tropical coastal ecosystem types. *Tropical Ecology*, 107:2411-2502 (NAAS rating: 7.16)
- Waman, A.A., Bohra, P., Roy, T.K. & Shivashankara, K.S. (2021). Seed morphological and biochemical studies in wild nutmegs. *Trees*, 35, 939-945, (NAAS Rating: 8.13)

13.2 Popular / Technical Article

- A. K. De, P. Perumal, P. A. Bala, D. Bhattacharya, Jai Sunder and T. Sujatha. (2021). Unconventional approach to treat probable case of Mycotoxicosis/toxicosis of feed origin. *E-pashupalan*. 1st June, 2021.
- B. A. Jerard, Joseph Rajkumar, V. Damodaran, S.K. Zamir Ahmed, L.B. Singh and I. Jaisankar. (2021). Invasive whiteflies infesting on Coconut palms in Andaman. *The Echo of India*. Port Blair. 26th March, 2021.
- B. A. Jerard, Joseph Rajkumar, V. Damodaran, S.K. Zamir Ahmed, L.B. Singh and I. Jaisankar. (2021). Management of invasive whiteflies on coconut palms in Andaman Islands. *Indian Coconut Journal*, LXIII(12): 5-7.
- B. A. Jerard, L.B. Singh, S.K. Zamir Ahmed, I. Jaisankar and V. Damodaran. (2021). Bread fruit and Bread Nut - Potential future food crops for Bay Islands. *The Echo of India*, Port Blair. 3rd April, 2021.
- B.A. Jerard, L.B. Singh, S.K. Zamir Ahmed, I. Jaisankar and V. Damodaran. (2021). Bread fruit and Bread nut- Potential future food crops for Bay Islands. *In: The Phoenix post*, Port Blair on 5th April, 2021.
- B. A. Jerard, V. Damodaran, K. Abirami, V. Baskaran and S.K. Zamir Ahmed. (2021). Bush pepper

- production: A viable option to promote Island spices. In: *Echo of India*, Port Blair. 1st May, 2021.
- D. Bhattacharya, T. Sujatha, A.K. De, and Jai Sunder. (2021). Outbreak of immature Amphistomiasis in goat at Mithakhari. *The Daily Telegram*. 30th October, 2021.
- Jai Sunder, D. Bhattacharya, T. Sujatha, and A. K. De. (2021). Sambhalu patti: A boon to livestock farmers of Isles. *Echo of India*, 31st May 2021.
- P. Perumal, A. K. De, D. Bhattacharya and B. A. Jerard (2021). Managemental Practices in Dairy Farm. *E-pashupalan*, 4(2), 216-219.
- P. Perumal, A. K. De, D. Bhattacharya and B. A. Jerard (2021). Reproductive problems and its managemental practices in milch cows. *E-pashupalan*, 4(2), 210-212.
- P. Perumal, A. K. De, D. Bhattacharya and B.A. Jerard (2021). Humpsore or Stephanofilariasis. *E-pashupalan*, 4(2), 195-205.
- P. Perumal. S.K. Ravi, A. K. De, and D. Bhattacharya. (2021). Mastitis-metritis-agalactia synome in Andaman local pig. *E-pashupalan*, 5(2), 64-67.
- T. Sujatha, Jai Sunder, D. Bhattacharya and A. K. De. (2021). Herbal eye ops from Glycosmis pentaphylla (Raneul) and Spondias pinnata (Amra) to treat goat conjunctivitis case report of A & N Island. *E-pashupalan*, 27th June, 2021.
- T. Sujatha, P. A. Bala, D. Bhattacharya, Jai Sunder and A.K. De. (2021). Concept of Mini Feed mill cum incubation centre for production of least cost balanced rural poultry feed in South Andaman. *Echo of India*, 13th May, 2021.
- V. Baskaran, K. Abirami, T. Subramani, and B. A. Jerard. (2021). Red Ginger (*Alpinia purpurata*): A Potential Cut Flower in Plantation-Based Cropping System of Andaman and Nicobar Islands. *Biotica Research Today*. 3, 6 (Jun. 2021), 450-452.
- Subramani, T. 2021. Water harvesting through lined pond. In: *Daily telegram*, 2nd December, 2021
- Shannon Sangma. 2021. Safe use of fruits and vegetables to avoid chemical residues. . In: *Daily telegram*, 10th November, 2021
- artificial insemination. Published by Today and Tomorrow's Printers and Publishers, New Delhi. PP: 1-136. ISBN: 9789391734268.
- Mohanty, B.P., Mohanty, D., Mitra, T., Ganguly, S., Mahanty, A., Mohanty, S. and Karunakaran, D. Big data science and omics technology. In *Fisheries Biology: New Approaches and Changing Perspectives*. (2021). Narena Publishing House, Delhi, India: 251–270.
- Perumal, P., De, A.K. and Bhattacharya, D. (2021). Humpsore in cattle and buffaloes: pathobiology, treatment and control of humpsore in cattle and buffaloes. LAP Lambert Academic Publication, Mauritius. PP: 1-76. ISBN 978-620-3-83936-4.
- Waman, A.A. and Bohra, P. (2021) Perennial Underutilized Horticultural Species of India. Jaya Publishing House, New Delhi, India, ISBN: 978-93-90611-38-6, pp. 1-346.

(ii) Book Chapters

- Ajina S. M, Gladston, Y, Praveenraj J, Kiruba-Sankar (2021) Fish ID - An eBOOK : Commercially Important Marine Fish Landings in Andaman and Nicobar Archipelago (Vol-I);170. ISBN-9789385418976
- Ajit Arun Waman, Kalyan P. Kadbhane, and Gourish R. Karanjalkar (2021), Mango Ginger: Prospects for Domestication and Utilization, In: *Medicinal Plants, Sustainable Development and Biodiversity*, Vol. 28 (Eds. H.M. Ekiert, K.G. Ramawat and J. Arora), Springer Nature Switzerland, 293-313.
- Akhilesh, K.V., Das, T., Chellappan, A., Tandel, S., Gladston, Y. and Kizhakudan, S.J.(2021). Call for spatial management approach to control exploitation of juvenile sharks. *Marine Fisheries Information Service, Technical and Extension Series*, 247, 26-28.
- B. A. Jerard, V. Niral, and M. K. Rajesh. (2021). Breeding strategies. In: M. K. Rajesh et al. (eds.), *The Coconut Genome, Compendium of Plant Genomes*, Springer Nature Switzerland AG 2021. 47-76pp.
- Velmurugan, A., Swarnam, T.P. & Singh, A.K. (2021). Soil-Plant-Microbe Interactions, In: *Microbial interaction*, Ramkumar et. Al., (eds.), Springer-Nature, Singapore. pp. book.1054879/mic2020
- Perumal, P., De, A.K. and Bhattacharya, D. (2021). Domestic Pig Germplasms of Andaman and

13.3 Books / Book Chapters/ Folders / Bulletins/ Manuals/ Proceedings/ Monograph

(i) Books

- Khan, M.H., Vikram, R., Perumal, P. and Abhijit Mitra. (2021). Semen cryopreservation and

Nicobar Islands. In: Lanaces - Traditional Variety and Natural Breed. Ed: Amr Elkelish. Published by IntechOpen, UK. DOI: 10.5772/intechopen.95916. PP: 1-24.

Sankaran, M., M. R. Dinesh, K. Abirami and C. Murugan. (2021). Botany of mango. In: C. Kole (ed.), The Mango Genome, Compendium of Plant Genomes, Springer Nature Switzerland AG 2021,

V. Niral, B. A. Jerard, and M. K. Rajesh (2021). Germplasm Resources: Diversity and Conservation. In: M. K. Rajesh et al. (eds.), The Coconut Genome, Compendium of Plant Genomes, Springer Nature Switzerland AG 2021. 27-46pp

Vikram, R., Perumal, P., Narayanan, K., Madhusoodan, A.P., Manjunatha Patel, B.H. and Khan, M.H. (2021). Estrus Behaviour and Approaches for Estrus Detection in the Buffalo: An Update. Chapter-1. In: Studies of Bubalus bubalis and their Behaviors (ISBN: 978-1-53619-755-6). Ed: Hugh Louineaux. Nova Science Publishers, NY, USA. PP: 1-30.

(iii) Folders

De AK, Bala PA, Bhattacharya D and Jai Sunder (2021). Quailigual pamphlet on castration of Pigs. Published by Director, ICAR-CIARI, Port Blair, Andaman and Nicobar Islands.

वेल्मुगुन ए., स्वरणम टी.पी., सुब्रमणि टी., बस्विवस टी.के., एन.वी.लक्ष्मी (2021). जैवउर्वरक में उपलब्ध पोषक तत्व. केंद्रीय द्वीपीय कृषि अनुसंधान संस्थान, पोर्ट ब्लेयर 744101. P.10.

वेल्मुगुन ए., स्वरणम टी.पी. सुब्रमणि टी. लखन सहि एवं एन.वी.लक्ष्मी (2021). अंडमान तथा निकोबार द्वीपों में जैविकी नयित्रण द्वारा पादप रोगों में प्रबंधन . भा. कृ. अ. प. - केन्द्रीय द्वीपीय कृषि अनुसन्धान संस्थान, पोर्ट ब्लेयर.

Perumal, P., Ravi, S.K., De, A.K., Mondal, S., Singh, L.B., Zamir Ahmed, S.K., Jerard, B.A. and Bhattacharya, D. (2021). Innovative trimodel therapy Technology (*Gau Maa Rakshak*) to treat humpsore. Published by Director under NABARD funded Project “Humpsore Treatment”, ICAR-CIARI, Port Blair, Andaman and Nicobar islands.

Perumal, P., Ravi, S.K., De, A.K., Mondal, S., Singh, L.B., Zamir Ahmed, S.K., Jerard, B.A. and Bhattacharya, D. (2021). Innovative trimodel therapy Technology (*GauMaaRakshak*) to treat humpsore. Published by Director under NABARD funded Project

“Humpsore Treatment”, ICAR-CIARI, Port Blair, Andaman and Nicobar islands.

(iv) E-calender

Bohra, P. and Waman, A.A. (2021). E- Calendar on Underutilized Fruits of Andaman and Nicobar Islands, India. ICAR-CIARI, Port Blair, pp. 1-12.

(v) Policy document

Bala, P.A., De, A.K., Bhattacharya, D., Perumal, P., Sunder, J. and Chakurkar, E.B. (2021). Policy Brief on Nutritional and managemental strategies for sustainable pig production in Andaman and Nicobar Islands” (CIARI/Policy Brief/2021/01) Published by Director, ICAR-CIARI, Port Blair, Andaman and Nicobar Islands.

13.4 Conference proceedings/ Symposium/ Workshop.

(i) Lead papers:

Abirami K, Baskaran V, Augustine B Jerard, Venkatesan K and Singh PK. (2021). Effect of artificial pollination in fruiting of dragon fruit (*Hylocereus* sp.) under tropical Island condition. Presented and published in book of abstracts at 9th Horticulture Congress, Chana Sekhar Azad University Agriculture and Technology, Kanpur, Uttar Pradesh, 18-21 Nov 2021.

Ajit Arun Waman. (2021). Exploring native diversity of fruits and spices in Andaman and Nicobar Islands, India for nutritional and livelihood security. In: Cornucopia including the AGFD program and Abstracts for the 261st American Chemical Society (Virtual) National Meeting on April 5 - 16, 2021, organized by American Chemical Society held at San Antonio, Texas. Article ID: AGFD011F 3534397.

Ajit Arun Waman and Pooja Bohra (2021). Promoting cultivation of underutilized horticultural species through a dedicated nursery: a success story from Andaman and Nicobar Islands, India. In: Rajashekar P.E. et al. (Eds.), E-Compendium of invited lectures and abstracts. National Online Training Programme on “Conservation, Management and Utilization of Horticultural Genetic Resources for Livelihood and Nutritional Security”, November, 22-26, 2021. Published by Director, ICAR-IIHR, Bengaluru, p. 93.

Augustine Jerard B, Jaisankar I, Damodaran V and Shakiba Zahir. 2021. Diversity for morphological and biochemical traits in *ynaria quercifolia* (L.)

- J.Sm. in Andaman and Nicobar Islands, India. Abstract presented and published at International Conference on Vegetable Research and Innovations for Nutrition, Entrepreneurship and Environment (ICVEG-21), 14-16th December 2021, Indian Society of Vegetable Science, ICAR-IIVR, Varanasi.
- Augustine Jerard Bosco, Damodaran, V and Jaisankar, I. (2021). Utilization of trait specific coconut germplasm for climate resilience and product diversification in Andaman and Nicobar Islands. Book of abstracts - 2nd International Agrobiodiversity Congress, held virtually 15-18 November 2021.
- Augustine Jerard, B., I.Jaisankar, V. Damodaran and Shakiba Zakir (2021). Diversity for morphological and biochemical traits in *ynaria quercifolia* (L.) J.Sm. in Andaman and Nicobar Islands, India presented in “International Conference on Vegetable Research and Innovations for Nutrition, Entrepreneurship and Environment (ICVEG-21)” held at ICAR-IIVR, Varanasi, UP during 14-16th December 2021 (Virtual).
- Baskaran V, Abirami K, Augustine B Jerard, Venkatesan K and Singh 2021. Evaluation of heliconia genotypes for commercial exploitation in humid tropics of Andaman Island. Presented and published in book of abstracts at 9th Horticulture Congress, Chana Sekhar Azad University Agriculture and Technology, Kanpur, Uttar Pradesh, 18-21 Nov 2021.
- Jaisankar, I., B. Augustine Jerard, K. Pradheep and K. Joseph John. (2021). Potential of *Macaranga* leaves as an alternate for plastic plates in the ecologically fragile Andaman and Nicobar Islands, India. In: Souvenir and Compendium of Abstracts, National Conference (virtual mode) on “Value addition and Marketing of NTFPs” Tropical Forest Research Institute, Jabalpur, Madhya Pradesh, P. 85.
- Niral V, Samsudeen K, Augustine Jerard B, Nair RV and Hebbar KB. (2021). Development of multi-purpose coconut variety ‘Kalpa Ratna’. **In:** Book of Abstracts of XXIV PLACROSYM –Coping with pandemic and beyond: Research and innovations in plantation sector held from 14-16th December 2021, Kochi, hosted by ICRI, Spices Board, Kochi. Abstract No. GGPC P35: 59p.
- Pooja Bohra. (2021). Horticultural genetic diversity in Andaman and Nicobar Islands, In: Rajashekar P.E. et al. (Eds.), E-Compendium of invited lectures and abstracts. National Online Training Programme on “Conservation, Management and Utilization of Horticultural Genetic Resources for Livelihood and Nutritional Security”, November, 22-26, 2021. Published by Director, ICAR-IIHR, Bengaluru, p. 22.
- Pradheep, K., K. Joseph John and I. Jaisankar. (2021). Wild Relatives of mango in India: Taxonomy, germplasm collection and conservation. In: Book of abstracts of the International Conference on Future Challenges & Prospects in Plant Breeding (FCPPB 2021), 6-7th October 2021, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore, Editors. Geetha, S., P. Jayamani, S. Rajeswari, S. Manonmani and N. Manivannan. 2021. P.44.
- Rajesh MK, Sunil Gangurde, Manish K Pandey, Niral V, Sudha R, Jerard BA, Ganesh N Kadke, Sabana AA, Muralikrishna KS, Samsudeen K, Anitha Karun and Keshava Prasad. (2021). Use of genotyping-by-sequencing to determine the genetic structure in coconut and to identify SNP-loci associated with height and fruit colour by genome-wide association mapping. **In:** Book of Abstracts of XXIV PLACROSYM –Coping with pandemic and beyond: Research and innovations in plantation sector held from 14-16th December 2021, Kochi, hosted by ICRI, Spices Board, Kochi. Abstract No. GGPC O7: 12p.

13.5 GenBank Accession Number/ registration number /database etc :

Jaisankar, I., Arun Kumar De, B. Augustine Jerard, Nabanita Ganguly, Manasseh Moses E (2021). GenBank accession numbers for *Pterocarpus dalbergioides* gene sequences, internal transcribed spacer 2 (ITS2) for 30 accessions (MZ557839 – MZ557868) were published in NCBI on 19.07.2021.

Jaisankar I., Arun Kumar De., Augustine Jerard., Nabanita Ganguly., Manasseh Moses E (2021). GenBank Accession numbers for *Pterocarpus dalbergioides* gene sequences using the marker ribulose-bisphosphate carboxylase large (rbcL) for 30 accessions were generated on 16.07.2021 (MZ568885 to MZ568914) in NCBI website.

Jaisankar I., Arun Kumar De., Augustine Jerard., Nabanita Ganguly., Manasseh Moses E (2021). GenBank Accession numbers for *Pterocarpus dalbergioides* gene sequences using the

marker Maturase K (matk) for 30 accessions were generated on 16.07.2021 (MZ568885 to MZ568914) in NCBI website.

Jaisankar, I., B.A.Jerard, Ganguly,N., Manasseh, M., Venkadesaperumal,G. and Meyappan, V. (2021). GenBank accession numbers of 16S rRNA gene sequences of root nodule microbial isolates of Andaman Padauk (*Pterocarpus dalbergioides*) (OK465134, OK465394, OK465396 and OK465133) were published in NCBI on 17.10.2021.

Augustine Jerard, B., S.K. Zamir Ahmed, I. Jaisankar,L. B. Singh, V. Damodaran and R. Jaya Kumaravardan (2021). ICAR-NBPGR IC number IC-0641086 for Passion Fruit (*Passiflora edulis*).

Jaisankar, I., B. Augustine Jerard, D. R. Singh and Shrawan

Singh (2021). ICAR-NBPGR IC number IC-0641340 for cluster bearing noni (*Morinda citrifolia*).

Augustine Jerard, B.and I. Jaisankar (2021). ICAR-NBPGR IC number IC-0641112 for *yneria quercifolia*

Jaisankar, I., B. Augustine Jerard, A. Souna Pandiyan and M. Rajkumar (2021). ICAR-NBPGR IC number IC- 0641425 for Buglam a endemic timber tree (*Intsia bijuga*).

Naresh Kumar, Pankaj Kumar Singh, Raj Kumar Gautam, Krishna Kumar, Ajanta Birah, K. Sakthivel, SK Zamir Ahmed, K. Venkatesan and B. Augustine Jerard 2021. CIARI Brinjal 2 of Brinjal (INGR21153) registered by Plant Germplasm Registration Committee (PGRC) of ICAR on Sept 2

Name of crop	Botanical name	Common name	Accession No	Contributors name
Rice	<i>Oryza sativa</i> L.	Khusbuya	IC0638781	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryza sativa</i> L.	Maslay	IC-0638782	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryza sativa</i> L.	Nyaw-in	IC0638783	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryza sativa</i> L.	CARI Dhan 8	IC0636815	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryza sativa</i> L.	CARI Dhan 9	IC0636816	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryzasativa</i> L.	Black Burma	IC0638617	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryza sativa</i> L.	Jaya (local)	IC0638618	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryza sativa</i> L.	Jeera Dhan	IC0638619	P K Singh, R K Gautam and K Venkatesan
Rice	<i>Oryza sativa</i> L.	ANR 40	IC0638620	P K Singh, R K Gautam and K Venkatesan
Brinjal	<i>Solanum melongena</i> L.	CARI Brinjal 2	IC0640704 & INGR21153	Naresh Kumar, Singh PK,Gautam RK, Krishna Kumar, Ajanta Birah, Sakthivel K, Zamir Ahmed SK, Venkatesan K and BA Jerard

Jerard, B.A., Zamir Ahmed, S.K., Jaisankar, I., Singh, L.B., Damodaran, V. and Jaya Kumaravardan, R. IC No.0641086 for the traditional cultivar of Passion Fruit *Passiflora edulis* from National Bureau of Plant Genetic Resources, New Delhi.

Naresh Kumar, Pankaj Kumar Singh, Raj Kumar Gautam, Krishna Kumar, Ajanta Birah, K. Sakthivel, SK Zamir Ahmed, K. Venkatesan and B. A Jerard 2021.

CIARI Brinjal 2 of Brinjal (INGR21153) registered by Plant Germplasm Registration Committee (PGRC) of ICAR on Sept 21, 2021.

Bhowmick, S., Sunder, J., Pal, S. and Samanta, I. (2021). GenBank accessions of *E. coli*, *Salmonella* sp and *Klebsiella pneumoniae* ESBL genes submitted to NCBI.

Bacteria	ESBL Gene	GenBank Accession
<i>E. coli</i>	SHV-11	LC655953
<i>E. coli</i>	TEM-1 (6 nos)	LC659951-55, 60
<i>E. coli</i>	CTX-M-15 (3 nos)	LC660645-47
<i>E. coli</i>	AmpC (7 nos)	LC661855-61
<i>Salmonella</i> sp.	SHV-228 (2 nos)	LC656726-27
<i>Salmonella</i> sp.	TEM-1	LC656923
<i>Salmonella</i> sp.	AmpC (6 nos)	LC661874-79

Bacteria	ESBL Gene	GenBank Accession
<i>Klebsiella pneumoniae</i>	SHV-27	LC653140
<i>Klebsiella pneumoniae</i>	SHV-11	LC655875
<i>Klebsiella pneumoniae</i>	TEM-1 (8 nos)	LC659956-64
<i>Klebsiella pneumoniae</i>	CTX-M-15 (2 nos)	LC660643-44
<i>Klebsiella pneumoniae</i>	AMPC (12 nos)	LC661862-73

(i) Database:

S.K. Zamir Ahmed, R. Jaya Kumaravaradan, Shibu George, D. Karunakaran and B.A. Jerard (2021). Outreach Programme of CIARI-AIR for Island Farmers under COVID-19 Arena. A Compact Disc of 71 Radio Talks delivered by Scientists, Subject Matter Specialists and progressive farmers between 16.07.2020 and 14.11.2020 at ATIC.

13.6 Other publications

Poster presentation (No. XVASCBHU/Abst/186) on “Morphological characterization of green gram accessions under Andaman and Nicobar Island conditions through multivariate analysis” (K Venkatesan, RK Gautam, PK Singh, SK Zamir

Ahmed, B Gangaiah and Shyam Sunder Rao) in XV Agricultural Science Congress organized by NAAS, New Delhi and BHU, Varanasi on 13-16th November, 2021.

Poster presentation (No. XVASCBHU/Abst/197) on “Multi-parent Advance Generation Inter-cross (MAGIC) populations for creating high genetic variability in rice” (P K Singh, R K Gautam, K Venkatesan, S K Zamir Ahmed and K Shyam Sunder Rao) in XV Agricultural Science Congress organized by NAAS, New Delhi and BHU, Varanasi on 13-16th November, 2021.



14. Participation Of Scientist In Conference/ Seminar/ Symposium/ Meetings

Scientist	Programme	Organizer	Date
Dr. B. A Jerard	Review meeting attended to review the progress on the implementation of Prime Ministers Formalization of Micro food processing Enterprises Scheme (PMFME)	A&N Administration	2 nd January, 2021 & 8 th January, 2021 to 12 th January, 2021
	Webinar on technology interventions about coconut based food and products on CPCRI foundation day	ICAR-CPCRI, Kasaragod	5 th January 2021
	56 th Meeting of State Level Technical Committee of HVADA as chairman	A&N Administration	18 th January 2021
	State Level Approval Committee (SLAC) for Centrally sponsored scheme "Prime Minister Formalization of Micro food Processing Enterprises (PMFME) in the Islands	A&N administration	22 nd January 2021
	International symposium on "Flavours, Fragrances and Functional Foods (SYMSAC X)	IISR, Kozhikode	9 th to 12 th February, 2021
	State level NABARD meeting for the launching of Potential Credit Plan 2021-22 for Andaman and Nicobar Islands	NABARD, Port Blair	17 th February 2021
	Meeting with Ministry of Agriculture officials for the filing of Affidavit in Hon'ble Supreme Court of India on 'Replanting of the Red Oil Palm'	Ministry of Agriculture through online	5 th March 2021
	57 th Meeting of State Level Technical Committee of HVADA as chairman	A&N administration	19 th March 2021
	XXV ICAR Regional Committee –II meeting as Director, CIARI	ICAR	12 th April, 2021
	International webinar on "Breadfruit People webinar #2: Agroforestry"	Breadfruit people net / Bread fruit Institute, Hawaii	6 th to 7 th May, 2021
	21 st Annual Group Meeting of AICRP on tuber crops through video conference	ICAR- CTCRI, Thiruvananthapuram	27 th to 28 th May, 2021
	Webinar on Sustainable integrated cropping and farming system models with special reference to banana for enhanced income for farmers	ICAR-NRC on Banana	7 th July, 2021
	Virtual Brainstorming on Invasive whitefly complex on plantation crops: technical knowledge and technological interventions organized	ICAR-IIOPR, Pedavegi and ICAR-CPCRI, Kasaragod	17 th July, 2021

Scientist	Programme	Organizer	Date
Dr. B. A. Jerard	IIFPT - ODOP webinar on coconut processing	IIFPT, Thanjavur through online	23 rd July, 2021
	National webinar on 'The Tribal Way of Sustainable Living: Lessons from Tuhet Farms of Nicobar Islands'	ICAR-CTCRI	17 th August 2021
	National Webinar on Banana Value Chain and Marketing - New Business Horizons	ICAR-NRC on Banana	21 st August 2021
	World Coconut Day on the theme Building a safe, inclusive, resilient and sustainable coconut community amid covid 19 pandemic and beyond	CDB, Kochi- virtual	2 nd September 2021
	National Conference on Oil Palm A right choice towards self sufficiency in edible oil production" through online	ICAR-IIOPR, Pedavegi	6 th September, 2021
	Annual Group Meeting of AICRP Vegetable crops online mode	ICAR-IIVR, Varanasi	7 th to 9 th September 2021
	Webinar on Genetic molecular markers and their deployment in public sector plant breeding programs: challenges and opportunities	CCSHAU, Hissar	15 th September, 2021
	National webinar on Genetic molecular markers and their deployment in public sector plant breeding programmes: Challenges and opportunities	ICAR-NBPGR, New Delhi	15 th September 2021
	National Webinar on Jackfruit and Banana: Potential crops for food and livelihood security	ICAR-DCR, Puttur	16 th October, 2021
	National Consultation on Plant-based Local Food Systems for Health and Nutrition	Alliance of Bioversity International and CIAT, India Office, New Delhi, ICRISAT, and Trust for Advancement of Agricultural Sciences (TAAS) through ISPGR, ICAR-NBPGR, New Delhi	October 22 nd , 2021
	National Conference on Fruits and Vegetables for Health and Nutrition (FVHN 2021) on virtual mode	KSTA in association with Vigyan Prasar, New Delhi, UHS Bagalkot and ICAR-IIHR Bengaluru	8 th to 10 th November, 2021
	2 nd International Agrobiodiversity Congress, held virtually	Bioversity International, Rome, Italy	15 th to 18 th November, 2021
	30 th Annual Group Meeting of All India Coordinated Research Project on Palms conducted through Virtual Mode	ICAR-AICRP on palms and ICAR-CPCRI, Kasaragod	22 nd to 23 rd November, 2021

Scientist	Programme	Organizer	Date
Dr P.K. Singh	Virtual Joint AGM of AICRP-NSP (Crops) and ICAR Seed Project along with Annual Breeder Seed Review Meeting	ICAR-Indian Institute of Seed Science, Mau	21 st to 22 nd April, 2021.
	Webinar on “A Sustainable Option for Agricultural Crop Residues Management through Mushroom Production”	ICAR-DMR, Solan, Himachal Pradesh	31 st August, 2021
	Webinar on “Digital Field book-Paperless data collection”	ICAR-IIMR, Hyderabad	15 th September, 2021
	National Webinar Series on Agricultural Production and Entrepreneurship Development in Andaman Islands in COVID Scenario through Technological Interventions	ICAR-CIARI in collaboration with NABARD, Port Blair.	1 st - 23 rd October, 2021
	Virtual National Webinar on Crop Diversification: A way towards Nutritional Security	ICAR- Research Complex for Eastern Region, Patna, Bihar	26 th October, 2021
	Virtual National Webinar on A Critical review of global hunger index survey	ICAR- IISRI, New Delhi	11 th November, 2021
	Virtual ICAR Webinar series lecture on Protection of plant varieties, the key to improved agricultural growth	ICAR, New Delhi	1 st December, 2021
Dr P.K. Singh & Dr K. Venkatesan	Virtual XV Agricultural science congress & ASC EXPO	NAAS and BHU, Varanasi, Utter Pradesh, India	13 th to 16 th , November, 2021
Dr A. Velmurugan, Dr T.P. Swarnam, Dr Srisha Adamala, Smt N.V.Lakshmi, Shri Lakhan Singh	Webinar on Water use in Agriculture and future Challenges by ICAR-CIARI, Port Blair	Virtual	22 nd March, 2021
Dr A.Velmurugan	National webinar on Land Modification based IFS Models for Reclamation and Management of Waterlogged Salt Affected Soils By ICAR- CSSRI, Karnal	Virtual	6 th September, 2021
Dr T. P.Swarnam	National Conference on “Integrated Farming Systems:A tool for enhancing income and nutritional security” by ICAR RC for Eastern Region, Patna	Virtual	5 th to 7 th October, 2021
	Annual Review Meeting of AICRP on IFS by ICAR- IIFSR	Virtual	18 th to 20 th December, 2021

Scientist	Programme	Organizer	Date
Dr S.K. Zamir Ahmed, R. Dr Jaya Kumaravaradan	International webinar on Food System Approach to Nutritional Security: Role of Agricultural Higher Education System in India	PAJANCOA&RI, Karaikal, Puducherry	6 th February, 2021
	Workshop on National Extension Programme	IARI, New Delhi	24 th April, 2021
	Workshop on MGMG	ATARI, Kolkata	29 th November, 2021
	Brainstorming Session on Road Map to Rehabilitate 26 million ha Degraded Lands in India by 2030	NASC, New Delhi	9 th December, 2021
Dr V. Damodaran	Participated in the 21 st Annual Group Meeting of AICRP on tuber crops (Virtual mode)	ICAR-CTCRI, Trivenam	27 th to 28 th May, 2021
	Training programme (virtual mode) on Communication and soft skills for the Master trainers training programme under the PMFME scheme	IIFPT, Thanjavur	3 rd to 4 th June, 2021
	Attended the PMFME sponsored online training of (TOMT) Master trainers on Spices and Plantation crops processing	ICAR- CPCRI, Kasaragod and IIFT, Tanjavur	23 rd to 27 th July, 2021
	Webinar on High density planting of cinnamon intercropping in coconut	ICAR- CPCRI, Kasaragod in association with DASD, Calicut	23 rd September, 2021
	Training on Preparation of Germplasm catalogues in tropical tuber crops (virtual mode)	ICAR- CTCRI, Thiruvananthapuram	25 th September, 2021
Dr V. Baskaran	Waste to wealth -Adding value to crop residues	DFR, Pune	31 st August, 2021
	The 9 th Indian Horticulture Congress- Horticulture for health, livelihoods and economy (Offline mode)	CSAU of Agriculture and Technology, Kanpur, UP	18 th to 21 st November, 2021
Dr K. Abirami	International symposium on "Flavours, Fragrances and Functional Foods (SYMSAC X)	IISR, Kozhikode	9 th to 12 th February, 2021
	VIII th Annual AICRP group meeting on Fruits (Virtual mode)	AICRP on fruits at Nodal center IHR, Bengaluru	3 rd to 6 th March, 2021
Dr K. Abirami	Annual review meeting of CSS-MIDH programme on spices	DASD, Kozhikode	25 th to 26 th June, 2021
	National Conference on "Oil Palm - A right choice towards self-sufficiency in edible oil production	ICAR- IIOPR, Pedavegi	6 th September, 2021
	The 9 th Indian Horticulture Congress- Horticulture for health, livelihoods and economy (Offline mode)	CSAU of Agriculture and Technology, Kanpur, UP	18 th to 21 st November, 2021

Scientist	Programme	Organizer	Date
Dr I.Jaisankar	70 th meeting of the Project Screening Committee (PSC-II) for “R&D”	National Medicinal Plants Board, Ministry of Ayush, Govt. of India, New Delhi	19 th January, 2021.
	Virtual review meeting on DUS centers	PPV & FRA, New Delhi	26 th June, 2021
	Coastal restoration and conservation meeting	Social Forestry Division of Kerala Forest Department.	9 th October, 2021
	Regional Expert Consultation on Agroforestry for Environmental Resilience and Sustainable Livelihoods of Farmers in Asia-Pacific	CIFOR and World Agroforestry (ICRAF, Nairobi)	13 th to 14 th October, 2021
	National Conference on Fruits and Vegetables for Health and Nutrition	Karnataka Science and Technology Academy, Bengaluru.	8 th to 10 th November, 2021
	Participated and presented work plan of “Bio prospecting of <i>Pandanus</i> sp. (Kewda) of Andaman and Nicobar Islands for its medicinal properties” under NMPB fund, Ministry of Ayush, New Delhi project in the Research Advisory Committee meeting	Department of Environment and Forests, Vansadan, Port Blair	25 th November, 2021
	Participated and presented Diversity for morphological and biochemical traits in <i>ynaria quercifolia</i> (L.) J.Sm. in Andaman and Nicobar Islands, India in “International Conference on Vegetable Research and Innovations for Nutrition, Entrepreneurship and Environment (ICVEG-21)”	ICAR-IIVR, Varanasi, UP	14 th to 16 th December, 2021
	Participated National Conference (virtual mode) on “Value addition and Marketing of NTFPs”	Tropical Forest Research Institute, Jabalpur, Madhya pradesh	16 th December.2021
Dr Ajit Arun Waman and Dr Pooja Bohra	National E-Conference on “Biodynamic Calendar and Technological Intervention for Horticulture Sustainability and Health Security in Changing Climate”	College of Horticulture, Bidar (UHS Bagalkot) and Melhorn Books, New Delhi	21 st January to 23 rd January, 2021
	“International Symposium on Advances in Plant Biotechnology and Genome Editing”	ICAR-Indian Institute of Agricultural Biotechnology, Ranchi and PTCA	8 th April, 2021
Dr Ajit Arun Waman and Dr Pooja Bohra	2 nd International Agrobiodiversity Congress (virtual)	Bioversity International, Rome	15 th to 18 th December, 2021
Dr Ajit Arun Waman	International Symposium on Spices and Aromatic Crops- X	Indian Society for Spices, Kozhikode	9 th to 12 th February, 2021
	Annual Group Meeting	ICAR- All India Coordinated Research Project on Palms	22 nd to 24 th November, 2021
	National Conference on ‘Advances in Agriculture and Environment’	Loyola College, Vijayawada, Andhra Pradesh	3 rd to 4 th December, 2021

Scientist	Programme	Organizer	Date
Dr Pooja Bohra	National webinar on “Sustainable Integrated Cropping and Farming system models with special reference to banana for enhanced income of farmers”	ICAR-NRC for Banana, Trichy	7 th July, 2021
Dr K Saravanan	International Conference Eco-erisa-2021	ECOR Foundation, Cochin	5 th to 6 th June, 2021
	Webinar on Aquaculture Health Management	College of Fisheries, Kishanganj	19 th June, 2021
	International Conference on Paradigm Shift in Global Business Ecosystem Post COVID- 19 Perspectives	KUFOS and Holy Grace Academy of Management Studies, Kerala	9 th to 11 th September, 2021
Dr K.Saravanan, Dr. Deepitha R P Dr.SreepriyaPrakasan	National Webinar on Casting into the Future of Aquaculture and Fisheries	Centurion University of Technology and Management, Odisha	22 th to 23 rd June, 2021
Dr J.Praveenraj	National webinar on “Advances in diagnostic methods for fish diseases”	Tamil Nadu J.Jayalalithaa Fisheries University	9 th July 2021
Dr Gladston Y & Dr Ajina S M	National Webinar on Casting into the Future of Aquaculture and Fisheries	Centurion University of Technology and Management, Odisha	22 th to 23 rd June, 2021
	Perspectives on Fish taxonomy	TNJFU	5 th July, 2021
	International webinar Fa- Eira a side event of United Nations Framework Convention on Climate Change’s ACE YOUTH FORUM 2021	ECOR foundation	16 th July, 2021
	Webinar on photographing freshwater fishes	Rainbow Analytics	31 st July, 2021
	Webinar on Bio-floc technology	Rainbow Analytics	28 th August, 2021
	Webinar on microalgae culture	Rainbow Analytics	11 th September 2021
	Webinar on entrepreneurship for fisheries professionals	KUFOS, Kochi	18 th to 19 th September, 2021
	Webinar on ornamental fish culture	KUFOS, Kochi	25 th September 2021
	Webinar on systematics of small barbs of western Ghats	Rainbow Analytics	25 th September 2021
	Webinar on impact of COVID-19	KUFOS, Kochi	02 nd October 2021
	Webinar on vaccination in farmed fish	Rainbow Analytics	9 th October, 2021
Dr Gladston Y & Dr Ajina S M	Webinar on how to be a valuable scientist	Rainbow Analytics	23 rd October 2021
	Webinar natural aquarium and hyponics	Rainbow Analytics	6 th November, 2021
	Webinar MSY in fisheries	Rainbow Analytics	27 th November, 2021
	How to access the health of estuarine ecosystems	Rainbow Analytics	4 th December 2021
	Webinar use of histological tools	Rainbow Analytics	11 th December 2021
Shri.D. Karunakaran	Webinar on Agriculture Research through Knowledge Discovery	EBSCO information Services	23 rd February, 2021

Scientist	Programme	Organizer	Date
Dr. Deepitha R P Dr.SreepriyaPrakasan	“Fish Processing and Value addition”	PMFME	27 th October, 2021
	National webinar on “Fish Processing and Business Opportunities.”	PMFME	27 th August,2021
Dr. Deepitha.R.P	“Knock on effects of climate change in increasing the incidence of Seafood Borne pathogens and toxins”.	Tamil Nadu J. Jayalithaa Fisheries University	04 th August, 2021
Dr K. Munniswamy	International Symposium on “Harnessing the potentials of genome editing tools to augment the productivity and health of farm animals” organised by ICAR-NI, Karnal.	Virtual	19 th to 20 th July, 2021.
	International webinar on “Fighting the hunger using smart technology” organized by ICAR-IIOPR, Andhra Pradesh, India.	Virtual	26 th October, 2021
	Online Training Program on “SNP Mining GWAS & Genomic Selection” organized by ICAR-IASRI, New Delhi.	Virtual	16 th to 21 st , December, 2021
	National Conference on “Animal Breeding Strategies in the Era of Genomics and Phenomics” & XV Annual Convention of Indian Society of Animal Genetics & Breeding organized by ICAR-NBAGR, Karnal.	Virtual	17 th to 18 th December, 2021
	Online Training program on “Protein Structure Modelling and Dynamics” organized by ICAR-IASRI, New Delhi.	Virtual	27 th to 29 th October, 2021

15. Human Resource Development

Name of the Scientist	Topic	Organizer	Date
Dr.P K Singh	Training on Maintenance Breeding in Field Crops	ICAR-IISS, Mau and ICAR-IARI Regional Station, Karnal	19 th January, 2021
Dr.Kiran Karthik Raj	Radiotracer techniques related to carbon isotopes	ICAR-IARI, New Delhi	11 th to 20 th February, 2021
Dr.Pooja Bohra	Enhancing Research Skills and Refinement of Technology by a Scientist	ICAR-IIHR, Bengaluru	18 th to 20 th January , 2021
Dr.K. Abirami	Management of fruit genetic resources	IIHR	1 st to 2 nd February, 2021
Dr.S.K. Zamir Ahmed	iving performance through transformational leadership	Administrative Staff College of India, Hyderabad	15 th to 19 th March, 2021
Shri..D. Karunakaran	Geoinformatics in agriculture using open-source data and analysis platforms	IARI, New Delhi	1 st to 5 th March 2021
Dr.Gladston Y and Mrs. Ajina SM	Training on Marine finfish seed production and farming	ICAR- CMFRI regional centerVihinjam	12 th March 2021
Smt. Sreepriya P	Phenotypic and molecular methods for detection of Antimicrobial Resistance (AMR)”	ICAR-NBFGFR and ICAR-CIFT	17 th to 19 th March, 2021
Dr.K Saravanan	Phenotypic and Molecular Methods for Detection of Antimicrobial Resistance (AMR)	ICAR-NBFGFR, Lucknow and ICAR-CIFT, Kochi	17 th to 19 th March, 2021
Dr.K. Abirami	Statistics with R	Koach Scholar, New Delhi from	8 th to 14 th May, 2021.
Dr.Ajit Arun Waman	Biodiversity and Environmental Laws for Agricultural Researchers	ICAR-NAARM, Hyderabad	7 th to 9 th June, 2021
Dr.Rafeeqe. R. Alyethodi	Right to Information Act	NAHRD, New Delhi	1st to 2 nd July, 2021
Dr.Ajit Arun Waman	Plant Genetic Resources Management and Utilization	ICAR-NBPGR, New Delhi	19 th July to 1 st August, 2021
Dr.Jai Sunder	Training workshop for Vigilance Officer of ICAR Institutes	ICAR-NAARM	16 th to 18 th August, 2021
Dr.Pooja Bohra	Packaging Standards for Fruits and Vegetables	Indian Institute of Food Processing Technology, Thanjavur	31 st August,2021
Dr.K Saravanan	Recent Advances in Aquatic Animal Health & Environment	College of Fisheries, GADVASU, Ludhiana	31 st August to 10 th September, 2021
	Management for Sustainable Aquaculture		

Name of the Scientist	Topic	Organizer	Date
Dr.I.Jaisankar	Generic Online Training in Cyber Security for Central Government Ministries/Departments	Ministry of Electronics & Information Technology, Govt. of India, New Delhi	16 th September, 2021
	Germplasm registration in Horticultural crops	ICAR- IIHR, Bengaluru	1 st October, 2021
Dr.R. Jaya Kumaravaradan	Data Analysis in Social Sciences Research	NAARM, Hyderabad	4 th to 8 th October, 2021
Dr.Jai Sunder	MDP on PME	ICAR-NAARM	25 th to 30 th October, 2021
Dr.Sirisha Adamala	Fighting the Hunger using Smart Technology	ICAR-IIOPR, Pedavegi, Andhra Pradesh	26 th October, 2021
Dr.P K Singh & K Venkatesan	Analysis of Multi-Location Experiments	ICAR-NAARM, Hyderabad	28 th Oct., 2021 to 1 st November., 2021
Dr.K. Abirami	Conservation, management and utilization of horticultural genetic resources for livelihood and nutritional security	ICAR-IIHR in collaboration with NBPGR, New Delhi	22 nd to 26 th November, 2021
Dr.Ajit Arun Waman	Conservation, Management and Utilization of Horticultural Genetic Resources	ICAR-IIHR, Bengaluru	22 nd to 26 th November, 2021
Dr.S.K. Zamir Ahmed,Dr.R. Jaya Kumaravaradan	Implementation and Use of ARMS	IASRI, New Delhi.	2 nd December, 2021
Dr.I.Jaisankar	Implementation and use of ARMS	IT Unit, ICAR-IASRI, New Delhi	2 nd December, 2021
Dr.D. Karunakaran	Advances in web and mobile application development	NAARM, Hyderabad	6 th to 10 th December 2021
Dr.K. Abirami	Statistical designs and analytical methods for multi-factor experiments	ICAR-CMFRI, Cochin	8 th to 17 th December, 2021

Category:- Technical Staff

Name of the Staff	Topic	Organizer	Date
Mrs. Naga Venkat Laxmi, T2	Importance of Calibration of Equipment in quality control of insecticides	NIPHM, Hyderabad	11 th to 12 th February, 2021

16. Training And Capacity Building

Training	Date	Participant No.M+F=T	Venue	Coordinators
Identification, Conservation and Popularization of Native Horticultural Genetic Resources of Nicobar Group of Islands under NASI programme	4 th to 6 th January, 2021	14+16=30	Kinyuka Village, Car Nicobar	Dr. B.A. Jerard, Dr. Sanjay Kumar Pandey, Dr. Zachariah, Dr. V Baskaran, Dr. S.K Zamir Ahmed, Dr.JK Varadan
Cultivation of pulses in rice fallow of North and Middle Andaman	9 th January, 2021	16+3=19	Madhupur, Diglipur	Dr. B. A Jerard, Dr. Venkatesan K., Dr. P. K. Singh, Mr. D Basantia
Training programme on Mini incubator [sponsored by DBT Biotech Kisan Hub]	12 th to 13 th January, 2021	8+7=15	DBT Biotech Kisan Hub, , Livestock farm complex	Dr. T Sujatha, Dr. Jai Sunder, Dr. D. Bhattacharya, Dr. A. K. De,
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle [sponsored by NABARD, Port Blair]	13 th to 17 th January, 2021	19 + 7 = 26	Numnagar, South Andaman	Dr. P. Perumal, Dr. L. B. Singh, Dr. A. K. De, Dr. K. Muniswamy ,Dr. R. R. Alyethodi, Dr. P. A. Bala, Dr.T. Sujatha
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle [sponsored by NABARD, Port Blair]	20 th to 25 th January, 2021	8 + 2 =10	Burmanella, South Andaman	Dr. P. Perumal, Dr.A. K. De, Dr. D. Bhattacharya ,
Skill development through value added fishery products	25 th to 29 th January, 2021	3+12=15	Marine Research Laboratory, ICAR-CIARI	Dr.Deepitha R P, Dr. R. Kiruba Sankar, Dr. L.B. Singh, Mrs. Sreepriya Prakasan, Dr. Harsha Haridas, Dr. K. Saravanan, Dr.Gladston Y., Mrs.Ajina S.M & Dr. J. Praveenraj
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle [sponsored by NABARD, Port Blair]	9 th to 13 th February, 2021	8 + 4 =12	ICAR-CIARI, Port Blair	Dr.P. Perumal,Dr. A. K. De ,Dr.K. Muniswamy , Dr. R. R. Alyethodi, Dr.P. A. Bala, Dr.T. Sujatha
Identification of commercially important marine fish species of Andaman Islands	15 th to 20 th February, 2021, 1 st to 7 th March, 2021 & 14 th to 20 th March, 2021	20+25=45	Marine Research Laboratory, ICAR-CIARI	Dr. Gladston Y., Mrs. Ajina S.M.,Dr. R.Kirubasankar, Mrs. Sreepriya Prakasan, Dr. K. Saravanan,Shri. .Benny Varghese & Dr. S. Murugesan

Training	Date	Participant No.M+F=T	Venue	Coordinators
Hands-on training programmes on health and management of poultry birds [sponsored by ICAR-PSP]	15 th to 21 st February, 2021	0+21=21	Livestock farm complex, ICAR-CIARI	Dr. T. Sujatha, Dr. Jai Sunder, Dr. D. Bhattacharya, Dr. A. K. De
Training programme for value added fish products for self help groups of Andaman and Nicobar Islands	23 rd to 26 th February, 2021	0+20=20	Marine Research Laboratory, ICAR-CIARI	Mrs. Sreepriya, P, Dr.Gladson Y, Mrs. Ajina SM, Dr, Saravanan K, Dr.R Kiruba Sankar
Organic Production and Post-Harvest Management of Spices	25 th to 27 th February, 2021	0+65=65	Surabi, NGO, Caddlegunj	Dr. K. Abirami, Dr .V. Damodaran, Dr. V. Baskaran, Dr.B. A. Jerard, Dr. S. K. Zamir Ahmed
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle [sponsored by NABARD, Port Blair]	2 nd to 6 th March, 2021	14+11=25	Guptapara, South Andaman	Dr. P. Perumal, Dr. A. K. De, Dr.K. Muniswamy , Dr. R. R. Alyethodi, Dr.P. A. Bala, Dr. T. Sujatha,
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle [sponsored by NABARD, Port Blair]	11 th to 16 th March, 2021	15 + 11 = 26	Rangachang-5, South Andaman	Dr. P. Perumal, Dr. A. K. De, Dr. K. Muniswamy , Dr. R. R. Alyethodi, Dr. P. A. Bala, Dr. T. Sujatha
Improved horticulture techniques as an income earning venture for tribal community	23 th to 24 th March, 2021	23+29=52	Harminder Bay, Little Andaman	Dr. Augustine B. Jerard and Dr.V. Baskaran
Homestead farming of horticulture crops for nutritional security of tribal community under NASI programme	25 th March, 2021	12+40=52	Harminder Bay, Little Andaman	Dr.Augustine B. Jerard and Dr.V.Baskaran
Awareness on Scientific breeding of goats cum distribution of superior germplasm	17 th April, 2021	5+5=10	ICAR-CIARI	Dr. T. Sujatha, Dr. S.K. Zamir Ahmed, Dr.R.R. Alyethodi, Dr.P.A. Bala, Dr.P. Perumal, Dr. K. Muniswamy, R. Dr. Jaya Kumaravaradan
Hands on training for Administrative staff to implement e-office	27 th June, 2021	10+15=25	AKMU, ICAR-CIARI	Shri. .D. Karunakaran
Cultivation and value addition of cut flowers for entrepreneurship development in Andaman and Nicobar Islands	3 rd to 17 th July, 2021	0+20=20	Colour Foundation, Garacharma	Dr. V. Baskaran, Dr.K. Abirami, Dr. T. Subramani, Dr. Y. Ramakrishna, Dr. L. B. Singh and Dr. N.Bommayasamy

Training	Date	Participant No.M+F=T	Venue	Coordinators
Application of biotechnological tools in goat and rural poultry	31 st August to 4 th September, 2021	20+42=62	New Wandoor, Shoalbay, Manjery, Hasmadapad, Garacharma and Rangat	Dr. T. Sujatha, Dr. Jai Sunder, Dr. D. Bhattacharya, Dr. A. K. De
Hands on Training on Scientific Castration and Mitigation of Iron Deficiency Anemia in Piglets	7 th to 11 th September, 2021	18+7 = 25	ICAR-CIARI, Port Blair	Dr. A. K. De, Dr. P. Perumal, Dr. P. A. Bala, Dr. Zachariah G, Dr. K. Muniswamy, Dr. R. R. Alyethodi, Dr. T. Sujatha
Cinnamon intercropping in coconut	23 rd September, 2021	17+3=20	ICAR-CIARI	Dr. K. Abirami, Dr. V. Damodaran, Dr.Y. Ramakrishna and Dr. D. Basantia
Nursery Management in Horticultural Crops	23 rd to 25 th September, 2021	3+20=23	ICAR-CIARI, Port Blair	Dr. Pooja Bohra and Dr.Ajit Arun Waman
Cultivation of High Yielding Rice Varieties in South Andaman	7 th October, 2021	7+23=30	Shoal Bay 19, Ferrargunj	Dr. P. K. Singh, Dr. Venkatesan K., Dr. S. K. Zamir Ahmed, Dr. Y. Ramakrishna, Dr. N. Bommayasamy
Scientific nursery and plantation management in Andaman Padauk	8 th October, 2021	14+4=18	ICAR-CIARI, Port Blair	Dr. I. Jaisankar, Dr.B. Augustine Jerard and Dr. R. Jayakumara Varadan
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle	18 th to 23 rd October, 2021	25+15=40	ICAR-KVK, Sippighat, Port Blair	Dr. P. Perumal,Dr.Y. Ramakrishna, Dr. L. P. Singh, Dr. T. Sujatha, Dr. P. A. Bala,Dr.K. Muniswamy ,Dr.A. K. De,Dr.R. R. Alyethodi Dr.Zachariah George
Management practices in rice seed production	19 th October, 2021	35+20=55	Madhupur, Diglipur	Dr. P. K. Singh, Dr. K. Venkatesan, Dr. S.K. Zamir Ahmed, Dr.Y. Ramakrishna
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle	8 th to 12 th November, 2021	14 +49=63	Indira Nagar, South Andaman	Dr. P. Perumal, Dr. Y. Ramakrishna ,Dr. L. P. Singh ,Dr. T. Sujatha ,Dr. P. A. Bala, Dr. K. Muniswamy, Dr. A. K. De, Dr. R. R. Alyethodi, Dr. Zachariah George
Cultivation and value addition of cut flowers for entrepreneurship development in A & N Islands	9 th to 11 th November, 2021	0+41=41	Namunagar Panchayat Hall, South Andaman	Dr. V. Baskaran, Dr. K. Abirami, Dr. Augustine B. Jerard, Dr. S.K. Zamir Ahmed, Dr.T . Subrmani and Dr. K. Venkatesan

Training	Date	Participant No.M+F=T	Venue	Coordinators
Advanced rural poultry farming	27 th to 29 th November, 2021	10+40=50	Shoalbay	Dr. T. Sujatha, Dr. Jai Sunder, Dr. D. Bhattacharya, Dr. A. K. De,
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle	29 th November, 2021 to 3 rd December, 2021	11 + 24 = 35	Sippighat, South Andaman	Dr .P. Perumal, Dr. Z George, Dr. L. B. Singh , Dr. T. Sujatha, Dr. P. A. Bala, Dr. A. K. De, Dr. R. R. Alyethodi
Training Programme on Value-added Fishery Products	1 st to 3 rd December, 2021	12+8=20	Marine Research Laboratory, ICAR-CIARI	Dr. Deepitha R.P., R. Dr .Kiruba Sankar, K. Dr. Saravanan, Dr. J. Praveenraj
Training programme cum frontline demonstration on Humpsore treatment to improve reproduction and production performances in cattle	27 th to 31 st December, 2021	10 + 12 = 22	Makhapahar, South Andaman	Dr. P. Perumal, Dr. Z George, Dr. L. P. Singh , Dr. T. Sujatha, Dr. P. A. Bala, Dr. A. K. De, Dr. R. R. Alyethodi

b)Field day

Title	Date	Participants No.M/F/T	Venue	Coordinators
Seed Day Cum Seed Distribution of Pulses	7 th January, 2021	16+3=19	Dasrathpur, Rangat	Dr. B. A Jerard, Dr.Venkatesan K, Dr. P. K. Singh, Dr.D Basantia
Field day on “Repeated pinching technology for increasing yield in marigold”	10 th February, 2021	4+16=20	ICAR-CIARI	Dr.V. Baskaran, Dr.K. Abirami and Dr. N. Bommaysamy
Field Day on High Yielding varieties of Pulses	10 th February, 2021	16+3=71	ICAR-CIARI, Garacharma	Dr. B. A Jerard, Dr. Venkatesan K., Dr. P.K. Singh, Dr. S K Zamir Ahmed, Dr. Y Ramakrishna,. Dr.Bommayasamy
Field Day/Awareness programme/ Health camp/Demonstration on Humpsore treatment to improve reproduction and production performances in milch cattle [sponsored by NABARD, Port Blair]	23 rd to 27 th March, 2021	70+49=119	South Point, Indira Nagar, Numnagar, Guptapara, Wandoor, South Andaman.	Dr. P. Perumal, Dr. D. Bhattacharya, Dr. A. K. De, Dr.Jai Sunder, Dr.Z George
Field day on Seed production of open pollinated brinjal varieties	17 th April, 2021	14+6=20	Bloomsdale Research Farm, Chouldari	Dr. B. A Jerard, Dr. K. Venkatesan , Dr. P.K. Singh, Dr. S.K. Zamir Ahmed, Dr. Y. Ramakrishna

Title	Date	Participants No.M/F/T	Venue	Coordinators
Delivered a talk on “Potential of Bread fruit as future food crop of bay islands” to the national audience through online mode	17 th April, 2021	25+23=48	ICAR-CIARI, Port Blair	Dr. B. A Jerard
Virtual tour for Agri students of Adiparasakthi College of Horticulture about CIARI-Horticultural technologies, Island Horticulture to the Final year students of Adiparasakthi College of Horticulture, Tamil Nadu.	30 th April, 2021	50+55=105	ICAR-CIARI, Port Blair	Dr. S.K. Zamir Ahmed, Dr. R. Jaya Kumaravaradan
Field day on “Speciality flower cultivation for entrepreneurship development in Bay Islands”	14 th July, 2021	0+20=20	ICAR-CIARI	Dr. V. Baskaran, Dr. K. Abirami, Dr. Augustine B. Jerard, Dr. T. Subramani, Dr. L. B. Singh and Dr.Y. Ramakrishna
Mini feed mill for preparation of low cost balanced feed for rural poultry [sponsored by NABARD, Port Blair]	17 th July, 2021	7+6=13	Livestock farm complex, ICAR-CIARI	Dr. T. Sujatha, Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. S.K. Zamir Ahmed, Dr .P.A. Bala, Dr. A.K. De, Dr .R.R. Alyethodi, Dr. P. Perumal, Dr. Y. Ramakrishna, Dr. Zachariah George
Field Day/Awareness programme/ Health camp/Demonstration on Humpsore treatment to improve reproduction and production performances in milch cattle [sponsored by NABARD, Port Blair]	14 th to 15 th September, 2021	25+17=42	Indira Nagar, Chouldari South Andaman	Dr. P. Perumal ,Dr. D. Bhattacharya, Dr.A. K. De, Dr.Jai Sunder,Dr. Z George
Field Dayon Seed Production of CIARI Rice Varieties for its upscaling to stakeholders	13 th Oct., 2021	19+11=30	Bloomsdale Research Farm, ICAR-CIARI, Chouldari	Dr. E B Chakurkar, Dr.P. K. Singh Dr.,Venkatesan K., Dr.SK Zamir Ahmed, Dr. Y Ramakrishna Dr., Bommayasamy
Interaction with Custodian Farmers of Karen Community	20 th October, 2021	15+7=22	Webi village, Mayabunder	Dr. P.K. Singh, Dr. K. Venkatesan, Dr. S.K. Zamir Ahmed, Dr. Y. Ramakrishna

Title	Date	Participants No.M/F/T	Venue	Coordinators
Field Day/Awareness programme/ Health camp/Demonstration on Humpsore treatment to improve reproduction and production performances in milch cattle [sponsored by NABARD, Port Blair]	25 th to 29 th October, 2021	182+98=280	Guptapara, Indira Nagar, Chouldhari, Lalpahad, Crickabad, Namunaghar, Bloomsdale, Rangachang-5, Burmabaala, Austinabad, South Point, Manpur, North Wandoor, Humpherygunj, Sippighat, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya, Dr. A. K. De,Dr.Jai Sunder,Dr.Z George
DBT Biotech Kisan Hub Farmers-Scientists Connect Meet	28 th October, 2021	45+45=90	KVK, South Andaman & Nicobar	Dr. Jai Sunder, Dr. T. Sujatha, Dr.Y. Ramakrishna, Dr. D. Bhattacharya, Dr. L.B. Singh, Dr. S.K. Zamir Ahmed, Shri. D. Karunakaran,Dr. Zachariah George, Dr. P.A. Bala, Dr. A.K. De
Field day on “Success story of roof top production model for horticultural crops established in urban areas of South Andaman	20 th December, 2021	0+20=20	South Andaman	Dr. V. Baskaran, Dr.K. Abirami, Dr. Augustine B. Jerard, Dr.T. Subramani, Dr .K. Venkatesan and Dr. L. B. Singh
Interactive session on Efficient water management techniques for plantation crops at In-service training on ‘Micro-level water resource development and management’	20 th to 24 th December, 2021	10+10=20	KVK, South Andaman	Dr.B. A. Jerard

d) Field Demonstration

Title	Date	Participants (No) M/F/T	Venue	Coordinators
Seed Day Cum Seed Distribution of Pulses	7 th January, 2021	16+3=19	Dasrathpur, Rangat	Dr. B. A Jerard, Dr. Venkatesan K, Dr. P . K. Singh, Dr.D Basantia
Field day on “Repeated pinching technology for increasing yield in marigold”	10 th February, 2021	4+16=20	ICAR-CIARI	Dr. V. Baskaran, Dr. K. Abirami and Dr. N. Bommaysamy

Title	Date	Participants (No) M/F/T	Venue	Coordinators
Field Day on High Yielding varieties of Pulses	10 th February, 2021	16+3=71	ICAR-CIARI, Garacharma	Dr.B.A Jerard, Dr.Venkatesan K., Dr.P. K. Singh, Dr.S K Zamir Ahmed, Dr.Y Ramakrishna, Dr.Bommayasamy
Field Day/Awareness programme/ Health camp/Demonstration on Humpsore treatment to improve reproduction and production performances in milch cattle [sponsored by NABARD, Port Blair]	23 rd to 27 th March, 2021	70+49=119	South Point, Indira Nagar, Numnagar, Guptapara, Wandoor, South Andaman.	Dr.P. Perumal, Dr.D. Bhattacharya, Dr.A. K. De, Dr.Jai Sunder, Dr.Zachariah George,
Field day on Seed production of open pollinated brinjal varieties	17 th April, 2021	14+6=20	Bloomsdale Research Farm, Chouldari	Dr.B. A Jerard, Dr.K. Venkatesan, Dr.P.K. Singh, Dr.S.K. Zamir Ahmed, Dr.Y. Ramakrishna
Delivered a talk on “Potential of Bread fruit as future food crop of bay islands” to the national audience through online mode	17 th April, 2021	25+23=48	ICAR-CIARI, Port Blair	Dr.B. A Jerard
Virtual tour for Agri students of Adiparasakthi College of Horticulture about CIARI-Horticultural technologies, Island Horticulture to the Final year students of Adiparasakthi College of Horticulture, Tamil Nadu.	30 th April, 2021	50+55=105	ICAR-CIARI, Port Blair	Dr.S.K. Zamir Ahmed, Dr.R. Jaya Kumaravaradan
Field day on “Speciality flower cultivation for entrepreneurship development in Bay Islands”	14 th July, 2021	0+20=20	ICAR-CIARI	Dr.V. Baskaran, Dr.K. Abirami, Dr.Augustine B. Jerard, Dr.T. Subramani, L. Dr.B. Singh and Dr.Y. Ramakrishna
Mini feed mill for preparation of low cost balanced feed for rural poultry [sponsored by NABARD, Port Blair]	17 th July, 2021	7+6=13	Livestock farm complex, ICAR-CIARI	Dr. T. Sujatha, Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. S.K. Zamir Ahmed, Dr.P.A. Bala, Dr.A.K. De, Dr. R.R. Alyethodi, Dr.P. Perumal, Dr.Y. Ramakrishna, Dr. Zachariah George
Field Day/Awareness programme/ Health camp/Demonstration on Humpsore treatment to improve reproduction and production performances in milch cattle [sponsored by NABARD, Port Blair]	14 th to 15 th September, 2021	25+17=42	Indira Nagar, Chouldari South Andaman	Dr. P. Perumal, Dr. D. Bhattacharya, Dr. A. K. De, Dr. Jai Sunder, Dr. Zachariah George,

Title	Date	Participants (No) M/F/T	Venue	Coordinators
Field Day on Seed Production of CIARI Rice Varieties for its upscaling to stakeholders	13th Oct., 2021	19+11=30	Bloomsdale Research Farm, ICAR-CIARI, Chouldari	Dr. E B Chakurkar, Dr. P. K. Singh, Dr. Venkatesan K., Dr. S K Zamir Ahmed, Dr. Y Ramakrishna, Dr. Bommayasamy
Interaction with Custodian Farmers of Karen Community	20th October, 2021	15+7=22	Webi village, Mayabunder	Dr. P.K. Singh, Dr.K. Venkatesan, Dr.S.K. Zamir Ahmed, Dr.Y. Ramakrishna
Field Day/Awareness programme/Health camp/Demonstration on Humpsore treatment to improve reproduction and production performances in milch cattle [sponsored by NABARD, Port Blair]	25th to 29th October, 2021	182+98=280	Guptapara, Indira Nagar, Chouldhari, Lalpahad, Crickabad, Namunagar, Bloomsdale, Rangachang-5, Burmanaala, Austinabad, South Point, Manpur, Indira Nagar, Humphertgunj, Sippighat, South Andaman	Dr. P. Perumal, Dr. D. Bhattacharya, Dr.A. K. De, Dr. Jai Sunder, Dr. Zachariah George
DBT Biotech Kisan Hub Farmers-Scientists Connect Meet	28th October, 2021	45+45=90	KVK, South Andaman & Nicobar	Dr. Jai Sunder, Dr.T. Sujatha, Dr. Y. Ramakrishna, Dr. D. Bhattacharya, Dr. L. B. Singh, Dr. S.K. Zamir Ahmed, Shri. .D. Karunakaran, Dr. Zachariah George, Dr. P.A. Bala, Dr. A.K. De
Field day on "Success story of roof top production model for horticultural crops established in urban areas of South Andaman"	20th December, 2021	0+20=20	South Andaman	Dr.V. Baskaran, Dr.K. Abirami, Dr.Augustine B. Jerard, Dr.T. Subramani, Dr.K. Venkatesan and Dr. L. B. Singh
Interactive session on Efficient water management techniques for plantation crops at In-service training on 'Micro-level water resource development and management'	20th to 24th December, 2021	10+10=20	KVK, South Andaman	Dr.B. A. Jerard

e) Interaction Meet

Title	Date	Participants (Nos.) M/F/T	Venue	Coordinators
Delivered a talk on “Potential of Bread fruit as future food crop of bay islands” to the national audience through online mode	17 th April 2021	20+28=48	ICAR-CIARI, Port Blair	Dr. B. Augustine Jerard
Virtual tour for Agri students of Adiparasakthi College of Horticulture about CIARI-Horticultural technologies, Island Horticulture to the Final year students of Adiparasakthi College of Horticulture, Tamil Nadu has	30 th April 2021	50+55=105	ICAR-CIARI, Port Blair	Dr. B. Augustine Jerard
Interaction with Custodian Farmers of Karen Community	20 th October, 2021	15+7=22	Webi village, Mayabunder	Dr.E. B Chakurkar, Dr.P. K. Singh, Dr. Venkatesan K., Dr. S K Zamir Ahmed, Dr.Y Ramakrishna
DBT Biotech Kisan Hub Farmers-Scientists Connect Meet	28 th October, 2021	45+45=90	ICAR - KVK, Sippighat, South Andaman ICAR-KVK, Nicobar, Nicobar Islands	Dr. Jai Sunder, Dr. T. Sujatha ,Dr. Y. Ramarishna, Dr. D. Bhattacharya, Dr. L.B. Singh ,Dr. S. K. Zamir Ahmed, Dr. D. Karunakaran ,Dr. Zachariah George ,Dr. P. A. Bala , Dr .A.K. De,Dr.R. R. Alyethodi ,Dr.Pooja Kapoor
Interactive session on Efficient water management techniques for plantation crops at In-service training on ‘Micro-level water resource development and management’	20 th to 24 th December, 2021	10+10=20	KVK, South Andaman	Dr.B. Augustine Jerard

d) Field Demonstration

Title	Date	Participants (No.) M/F/T	Venue	Coordinators
Demonstration on Mini incubator under DBT Biotech Kisan Hub	12 th to 13 th January, 2021	10 + 5 =15	Livestock Farm Complex, ICAR-CIARI	Dr. T. Sujatha ,Dr.Jai Sunder ,Dr.D. Bhattacharya, Dr.A. K De
Workshop-cum-Demonstration on Rural poultry and duck farming under DBT Biotech Kisan Hub	8 th to 13 th February, 2021	43 + 49 = 92	Various villages, N&M Andaman	Dr.T. Sujath, Dr.Jai Sunder, Dr. D. Bhattacharya,Dr.A. K De
Launching of the project on “Cultivation and value addition of cut flowers for entrepreneurship development in A & N Islands at	22 nd February, 2021	15=25=40	Andaman and Nicobar Co-operative Union, Teylerabad	Dr. V. Baskaran, Dr. K. Abirami, Dr. Augustine B. Jerard, Dr. S. K. Zamir Ahmed, Dr. T. Subramani and Dr. K. Venkatesan

Title	Date	Participants (No.) M/F/T	Venue	Coordinators
Demonstration on quail farming [sponsored by NABARD, Port Blair]	8 th to 9 th April, 2021	10 + 12= 22	ICAR-CIARI	Dr. R. R. Alyethodi, Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. T. Sujatha, Dr. P. A. Bala, Dr. P. Perumal, Dr. A. K. De, Dr. K. Muniswamy
Quail farming; Demonstration cum training [sponsored by NABARD, Port Blair]	29 th to 31 st July, 2021	14 + 9 =23	ICAR-CIARI	Dr. R. R. Alyethodi, Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. T. Sujatha, Dr. P. A. Bala, Dr. P. Perumal, Dr. A. K. De, Dr. K. Muniswamy
A&N Fish App	8 th September, 2021	7+3=10	Junglighat landing center	Shri. D. Karunakaran
Cultivation of spices as profitable intercrops	18 th September, 2021	1+9=10	ICAR-CIARI, Port Blair	Dr. Ajit Arun Waman
Launching of roof top production model for horticultural crops in urban areas and distribution of seeds and planting material	14 th September, 2021	15+35=50	3 Public sector units and 5 households	Dr. V. Baskaran, Dr. K. Abirami, Dr. Augustine B. Jerard, Dr. S. K. Zamir Ahmed, Dr. T. Subramani, Dr. K. Venkatesan, Dr. Y. Ramakrishna and Dr. L. B. Singh
Quail farming; Demonstration cum training [sponsored by NABARD, Port Blair]	22 nd to 24 th November, 2021	5 + 7 =14	ICAR-CIARI	Dr. R. R. Alyethodi, Dr. D. Bhattacharya, Dr. Jai Sunder, Dr. T. Sujatha, Dr. P. A. Bala, Dr. P. Perumal, Dr. A. K. De, Dr. K. Muniswamy
Technology demonstration for school children	26 th November, 2021	20+15=35	ICAR-KVK, Sippighat	Dr. D. Karunakaran, R. Dr. Jaya Kumaravaradan
Kitchen gardening in urban and peri-urban spaces for nutritional security	6 th December, 2021	0+29=29	ICAR-CIARI, Port Blair	Dr. Pooja Bohra and Dr. Ajit Arun Waman
Effect of IFFCO-Nano urea on vegetables	10 th December, 2021	10+15=25	Garacharma	NRM & KVK, Sippighat

e) Workshop

Title	Date	Participants (No.) M+F=T	Venue	Coordinators
Workshop on Stress Management, Immunity Boosting & Balanced Life through Sahaja Yoga Meditation	22 nd January, 2021	39+19=58	ICAR-CIARI	Dr. K. Saravanan, Shri. D. Karunakaran

f) Webinar

Title	Date	Participants (No.) M/F/T	Venue	Coordinators
Webinar on National Fish Farmers Day - 2021	10 th July, 2021	25+1237	ICAR-CIARI	Dr. R. Kiruba Sankar, Dr. K. Saravanan, Dr. J. Praveenraj, Miss. Deepitha R.P., Dr. Gladston, Y., Mrs.Sreepriya Prakasan, Mrs.Ajina S.M.

g) Awareness campaigns

Title	Participants (No.) M/F/T	Date	Venue	Coordinators
Five tier awareness programme on avian influenza [sponsored by DBT Biotech Kisan Hub]	96	3 rd to 5 th February, 2021	DBT Biotech Kisan Hub, Livestock farm complex	Dr. T. Sujatha, Dr.Jai Sunder, Dr. D. Bhattacharya, Dr. A. K De
Awareness programme on by product preparation from fish waste	17+9=26	12 th February, 2021	Junglighat	Miss. Deepitha Mrs. R.P., Mrs. Sreepriya P, Dr. Gladston Y, Mrs.Ajina SM, Dr. R. Kiruba Sankar, Dr. K. Saravanan, Dr.J. Praveenraj
Water Use in Agriculture and future challenges	25	22 nd March, 2021	Virtual	
Awareness programme on National Surveillance Programme for Aquatic Animal Diseases (NSPAAD)	11+8=19	28 th August, 2021	Manglutan, South Andaman	Dr. K. Saravanan, Dr. J. Praveenraj, Dr. R. Kiruba Sankar, Dr .Gladston, Y., Miss. Deepitha R.P., Mr. Benny Varghese, Dr.S . Murugesan, Mr. Utpal Biswas
Plantation crops based cropping systems for higher profits	3+11=14	2 nd September, 2021	ICAR-CIARI, Port Blair	Dr.Ajit Arun Waman
Awareness Programme on mud crab fattening	20+8=28	25 th October, 2021	Marine Hill	Dr. Gladston, Y., Dr. R. Kiruba Sankar, Dr. Y. Ramakrishna, Dr. K. Saravanan, Miss. Deepitha R.P., Dr.J . Praveenraj, Mr. Harasit Kumar Ray, Dr. S. Murugesan

Title	Participants (No.) M/F/T	Date	Venue	Coordinators
Vigilance Awareness Week - 2021	37+40=77	26 th October to 1 st November, 2021	ICAR-CIARI, Port Blair	Dr. Jai Sunder, Dr. K. Saravanan, Shri. . D. Karunakaran, Dr. K. Venkatesan, Dr. R.R. Alyethodi, Miss. Deepitha R.P., Shri. .Shyam Sundar Rao, Mr.Alex Praveen Barla, Mrs.Sheela Paul
Awareness Programme on National Surveillance Programme for Aquatic Animal Diseases	5+12=17	6 th November, 2021	Burmanallah,	Dr. K. Saravanan, Dr. R. Kiruba Sankar, Dr. J. Praveenraj, Miss. Deepitha R.P., Dr. Gladston, Y., Dr. S. Murugesan, Mr. Utpal Biswas, Mrs. Reena Singh
Awareness Programme on Fish Nutrition and Feeding Management in Island Aquaculture	19+8=27	8 th November, 2021	Marine Hill Laboratory, ICAR-CIARI	Dr. K. Saravanan, Dr. R. Kiruba Sankar, Dr. Y. Ramakrishna, Dr. J. Praveenraj, Dr. Gladston, Dr. Y., Dr. Deepitha R.P., Dr. S. Murugesan, P. Halder, Mrs. Ritika Sarkar
Awareness on nucleus flock concept in goat farming poultry [sponsored by DBT Biotech Kisan Hub and NABARD, Port Blair]	=37	25 th November, 2021	Anganwadi school, Nimbudera	Dr.T. Sujatha
Awareness cum interaction meet with Karen community on issues in livestock & poultry farming [sponsored by DBT Biotech Kisan Hub and NABARD, Port Blair]	=12	25 th November, 2021	Karen community, Mayabunder, N&M Andaman	Dr.T. Sujatha
Awareness Programme on Scope of Diversified Value-added Fishery Products	0+26=26	27 th November, 2021	Kanyapuram	Miss. Deepitha R.P., Dr. R. Kiruba Sankar, Dr. K. Saravanan, Dr. J. Praveenraj
Scientific management of kitchen garden for health and nutrition	0+21=21	10 th December, 2021	ICAR-CIARI, Port Blair	Dr. Pooja Bohra and Dr. Ajit Arun Waman

h) Health Camp

No. of animals	Date	Venue	Coordinators
6	5 th January, 2021	Guptapara, South Andaman	Dr.P. Perumal, Dr.D. Bhattacharya, Dr.A. K. De

8	7 th January, 2021	Rangachanhg-3, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De
4	30 th January, 2021	Lalpahad, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De
5	15 th March, 2021	Rangachanhg-3, South Andaman	Dr.P. Perumal,Dr.D. Bhattachary,Dr.A. K. De
10	23 rd March, 2021	South Point, Port Blair	Dr.P. Perumal Dr.D. BhattacharyaDr.A. K. De
4	25 th March, 2021	Guptapara, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De
8	25 th March, 2021	Garacharma, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De
12	7 th May, 2021	Wandoor South Andaman	Dr.A. K. De ,Dr.P. Perumal ,Dr.D. Bhattacharya
6	16 th July, 2021	Garacharma, South Andaman	Dr.P. Perumal Dr.D. Bhattacharya,Dr.A. K. De
12	16 th July, 2021	South Point, Port Blair	Dr.P. Perumal Dr.D. Bhattacharya,Dr.A. K. De
100 birds	1 st August, 2021	Wandoor, South Andaman	Dr.T. Sujatha,Dr.Jai Sunder ,Dr.D. Bhattacharya,Dr.A. K De
100 birds	4 th August, 2021	Wandoor, South Andaman	Dr.T. Sujatha,Dr.Jai Sunder Dr.D. Bhattacharya,Dr.A. K De
6	5 th August, 2021	South Point, Port Blair	Dr.P. Perumal,Dr.D. Bhattacharya,Dr.A. K. De
100 birds	7 th August, 2021	Hasmadapad, South Andaman	Dr.T. Sujatha,Dr.Jai Sunder ,Dr.D. Bhattacharya,Dr.A. K De
100 birds	10 th August, 2021	Hasmadapad, South Andaman	Dr.T. Sujatha,Dr.Jai Sunder ,Dr.D. Bhattacharya,Dr.A. K De
100 birds	15 th August, 2021	Shoalbay, South Andaman	Dr.T. Sujatha,Dr.Jai Sunder ,Dr.D. Bhattacharya,Dr.A. K De
100 birds	21 st August, 2021	Shoalbay, South Andaman	Dr.T. Sujatha,Dr.Jai Sunder ,Dr.D. Bhattacharya,Dr.A. K De
10	8 th September, 2021	Guptapara, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De,
20	8 th September, 2021	Chouldari, South Andaman	Dr.A. K. De ,Dr.P. Perumal ,Dr.D. Bhattacharya
6	18 th September, 2021	Attam Pahar, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De
12	24 th September, 2021	Rangachanhg-3, South Andaman	Dr.P. Perumal, Dr.D. Bhattacharya,Dr.A. K. De
10	3 rd October, 2021	Attam Pahar, South Andaman	Dr.P. Perumal, Dr.D. Bhattacharya,Dr.A. K. De
7	6 th October, 2021	Wandoor, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De
17	17 th December, 2021	Maymio, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya, Dr.A. K. De
11	19 th December, 2021	Chouldari, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De

10	22 nd December, 2021	Indira Nagar, South Andaman	Dr.P. Perumal Dr.D. Bhattacharya,Dr.A. K. De
6	29 th December, 2021	Makha Pahar, South Andaman	Dr.P. Perumal ,Dr.D. Bhattacharya,Dr.A. K. De

i) Exposure visit Students /Farmers

Programme	Participants (No.) M/F/T	Date	Coordinators
Virtual All India Study Tour of final year B.Sc.(Hort) students of Adhiparasakthi Horticulture College, Kalavai, Tamil Nadu.	90	30 th April, 2021	Dr.S.K. Zamir Ahmed, Dr.R. Jaya Kumaravaradan
Virtual All India Tour for the final B.Sc.(Hort) students of college of horticulture, Mudigere, Karnataka	78	24 th August, 2021	Dr.S.K. Zamir Ahmed
Exposure visit of students to the Horticulture Farm and KVK at Sippighat brought by Air Force Wives Welfare Organization, Prothrapur.	30	20 th November, 2021	Dr.S.K. Zamir Ahmed, Dr.D. Karunakaran, .Dr. R Jaya Kumaravaradan
Seaweed research discussion regarding	2 students and teacher from Navy Chilen School, Port Blair	10 th December 2021	Dr.R. Kirubasankar, Dr.K. Saravanan & Miss. Deepitha R.P

j) Radio Talks /Advisory

Title	Date of broadcast	Expert
Production technology of star jasmine in Andaman and Nicobar Island	17 th March, 2021	Dr.V. Baskaran
Profitable dairy farming in Andaman and Nicobar Islands	15 th July, 2021	Dr.A. K. De
Zero Budget Natural farming	22 nd December, 2021.	Dr.T.Subramani

k) Doordarshan Interview

Title	Date of broadcast	Expert
Launching of NABARD project on speciality flower cultivation.	22 nd February, 2021	Dr.V. Baskaran, Dr.Augustine B. Jerard, Dr.S. K. Zamir Ahmed and NABARD officials
Star-Jasmine – a potential flower crop for Andaman and Nicobar Islands	3 rd March, 2021	Dr.V. Baskaran
<i>Jasminum acuminatissimum</i> – a potential loose flower for year-round cultivation in Andaman and Nicobar Islands	10 th March, 2021	Dr.V. Baskaran
Agricultural Technology for Income Enhancement of Farmers	8 th April, 2021	Dr.S.K. Zamir Ahmed
Live phone in programme on “Immunity boosting plants in home gardening”	15 th April, 2021	Dr.Pooja Bohra
Live phone in programme on “Scientific postharvest management of spices”	29 th April, 2021	Dr.Ajit A. Waman

Title	Date of broadcast	Expert
द्वीपों में धान की खेती का प्रबंधन	26 th August, 2021	Dr.P. K. Singh
Doubling Farmers Income in Agriculture Sector for Decent Livelihood	9 th September, 2021	Dr.S.K. Zamir Ahmed
Doordarshan Live telecast on mini feed mill	16 th September, 2021	Dr.T. Sujatha
Live phone in programme on foot and mouth diseases in livestock	29 th September, 2021	Dr.Jai Sunder
Doordarshan Live telecast on native duck farming	30 th September, 2021	Dr.T. Sujatha
Entrepreneurship potentials of Quail farming in Andaman and Nicobar Islands	28 th October, 2021.	Dr.R. R. Alyethodi
Cultivation of pulses in <i>Rabi</i> season	18 th October, 2021.	Dr.K. Venkatesan
Doordarshan Live telecast on “Profitable pig farming in bay islands”	25 th October, 2021.	Dr.A. K. De
Community based vaccination in rural poultry	9 th December, 2021	Dr.T. Sujatha
Zero Budget Natural farming	14 th December, 2021	Dr.T. Subramani
Success story of roof top production model for horticulture crops established in South Andaman” on	28 th December, 2021	Dr.V. Baskaran, Director, ICAR-CIARI, Beneficiaries (Mrs Uma and Mrs. Banumathi), AGM, NABARD

1) Technology advisories on Newspaper in *Farmers’ Corner*

Title	Expert	Date
NABARD Floriculture project launched “ Planting material of speciality flowers distributed”	Dr.V. Baskaran	25 th February, 2021
Invasive whiteflies infesting on coconut palms in Andaman	Dr.B. Augustine Jerard	26 th March, 2021
Farmers Corner - Andaman Ordinary Tall - A promising coconut cultivar	Dr.B. Augustine Jerard	8 th September, 2021
Farmers Corner - Andaman Giant Tall - A promising coconut cultivar	Dr.B. Augustine Jerard	9 th September, 2021
Farmers Corner - Auck Chang Tall – A promising coconut cultivar	Dr.B. Augustine Jerard	10 th September, 2021
Farmers Corner - Katchal Tall – A promising coconut cultivar	Dr.B. Augustine Jerard	11 th September, 2021
Farmers Corner - Tamaloo Tall – A promising coconut cultivar	Dr.B. Augustine Jerard	12 th September, 2021
Farmers Corner - Campbell Bay Tall – A promising coconut cultivar	Dr.B. Augustine Jerard	13 th September, 2021
Farmers Corner - <i>CARI Annapurna</i> – A promising coconut cultivar	Dr.B. Augustine Jerard	14 th September, 2021
Farmers Corner - <i>CARI Surya</i> – A promising coconut Variety	Dr.B. Augustine Jerard	15 th September, 2021
Farmers Corner - <i>CARI Chandan</i> – A promising coconut Variety	Dr.B. Augustine Jerard	16 th September, 2021
Farmers Corner - <i>CARI Omkar</i> – A promising coconut Variety	Dr.B. Augustine Jerard	17 th September, 2021
Farmer’s Corner - Blood fruit : a potential fruit cum natural colourant	Dr.Pooja Bohra	19 th September, 2021

Title	Expert	Date
Farmer's Corner - Nature's own vitamin C Factory : the West Indian Cherry	Dr.Pooja Bohra	20 th September, 2021
Farmer's Corner - dragon Fruit(<i>Hylocereussp</i>)- Production Technology	Dr.K. Abirami	21 st September, 2021
CIARI- HanGreens : The green curtains of <i>culantro</i> (Burmese coriander)	Dr.Waman Ajit Arun	22 nd September, 2021
Woody pepper cultivation: a potential venture for Bay Islands	Dr.Waman Ajit Arun	23 rd September, 2021
dragon fruit (<i>kamalam</i>)- A potential super fruit for Bay Islands	Dr.K. Abirami	24 th September, 2021
Burma Phal(<i>Garcinia andamanica</i>): an endemic, flavourful fruit of the islands	Dr.Pooja Bohra	25 th September, 2021
Andaman Kokum (<i>Garcinia dhanikhariensis</i>): an endemic fruit with commercial potential	Dr.Pooja Bohra	26 th September, 2021
Mangosteen (<i>Garcinia mangostana</i>): Future crop for the islands	Dr.Pooja Bohra	27 th September, 2021
Time to utilize the local Kau phal (<i>Garcinia cowa</i>)	Dr.Pooja Bohra	28 th September, 2021
Malabar Tamarind (<i>Garcinia gummi-gutta</i>): A Potential commercial crop for the island	Dr.Pooja Bohra	29 th September, 2021
Novel Systems for Cultivation of Burmese Coriander in Urban Areas	Dr.Waman Ajit Arun	30 th September, 2021
The Nicobarese Mangosteen (<i>Garcinia celebica</i>) for nutrition and aesthetics	Dr.Pooja Bohra	1 st October, 2021
<i>Kydia mangosteen</i> : a rare flavourful fruit	Dr.Pooja Bohra	4 th October, 2021
<i>Cheena Kela</i> – a local banana cultivar	Dr.K. Abirami	6 th October, 2021
<i>Khattachampa</i> – a local banana cultivar	Dr.K. Abirami	7 th October, 2021
<i>Korangi</i> Banana for nutritional security	Dr.Pooja Bohra	8 th October, 2021
<i>Mangifera andamanica</i> -an endemic wild mango species of conservation interest	Dr.K. Abirami	9 th October, 2021
<i>Mangifera griffithi</i> - an endemic wild mango species of conservation interest	Dr.K. Abirami	10 th October, 2021
<i>Mitta Champa</i> - a local banana cultivar	Dr.K. Abirami	11 th October, 2021
<i>Mangiferanicobarica</i> - an endemic wild mango species of Nicobar	Dr.K. Abirami	12 th October, 2021
<i>Passion Fruit</i> : nutritious easy fruit crop for Island cropping systems	Dr. B. Augustine Jerard	13 th October, 2021
Neil mango (Blue mango)- a custodian farmer variety	Dr.K. Abirami	14 th October, 2021
Bread fruit - a versatile crop for Bay Islands	Dr.B. Augustine Jerard	15 th October, 2021
Island spices - Bush Pepper production at home	Dr.B. Augustine Jerard	16 th October, 2021
<i>Dweep Haritha</i> - A promising dwarf coconut variety	Dr.B. Augustine Jerard	17 th October, 2021
<i>Dweep Sona</i> - A promising dwarf coconut variety	Dr.B. Augustine Jerard	18 th October, 2021
Carambola (<i>Averrhoa carambola</i>): a suitable fruit crop for the islands	Dr.Pooja Bohra	19 th October, 2021

Title	Expert	Date
Andaman Orange Dwarf - A Promising dwarf coconut cultivar	Dr.B. Augustine Jerard	20 th October, 2021
Red ginger (<i>Alpinia purpurata</i>) - best intercrop in plantation	Dr.V. Baskaran	21 st October, 2021
Maranda(<i>Calatheacrotalifera</i>):a new introduction to cut flower trade	Dr.V. Baskaran	24 th October, 2021
Spider orchid (<i>Arachnisflosaeris</i>) - a potential cut flower	Dr.V. Baskaran	25 th October, 2021
Star jasmine (<i>Jasminumnitidum</i>)- a potential loose flower	Dr.V. Baskaran	26 th October, 2021
<i>Heliconia wagneriana</i> commonly known as Easter Heliconia	Dr.V. Baskaran	27 th October, 2021
Amphistomiasis immature, a leaf worm cause of havoc mortality in organized goat herd	Dr. T. Sujatha	28 th October, 2021
Torch ginger (<i>Etlingeraelator</i>) - a new addition to flower basket	Dr.V. Baskaran	29 th October, 2021
<i>Heliconia latispatha</i> commonly known as Expanded Lobster claw	Dr.V. Baskaran	30 th October, 2021
Heliconia commonly known as Flamingo	Dr.V. Baskaran	1 st Novembe, 2021
<i>Heliconia psittacorum</i> commonly known as parrot flower	Dr.V. Baskaran	2 nd November, 2021
<i>Heliconia stricta</i> commonly known as Red Lobster claw	Dr.V. Baskaran	7 th November, 2021
A knowledge hub for Andaman Local goat	Dr. Jai Sunder	8 th November, 2021
FAMACHA to control blood sucking helminthes and anthelmintic resistance in goats	Dr.Jai Sunder	9 th November, 2021
Safe use of fruits and vegetables to avoid chemical residues	Mrs. Shannon N. Sangma	10 th November, 2021
Teressa goat - First goat breed registered from A&N Islands	Dr.Jai Sunder	13 th November, 2021
<i>Heliconia longissima</i> commonly known as Red Wings	Dr.V. Baskaran	16 th November, 2021
Nicobari fowl of A&N Islands: A hidden treasure under impending climate change scenario	Dr.T. Sujatha	17 th November, 2021
Andaman local pig	Dr.Arun Kumar De	19 th November, 2021
Siamese fighting fish, <i>Betta splendens</i> a freshwater ornamental fish successfully bred in the Islands by ICAR-CIARI	Dr.R. Kirubasankar	20 th November, 2021
Trinket cattle, A Danish colonial leftover	Dr.Arun Kumar De	20 th November, 2021
Nicobari Pig, The pride of Nicobar	Dr.Arun Kumar De	21 st November, 2021
Quail production Techniques in Andaman Nicobar Islands	Dr.R. R. Alyethodi	22 nd November, 2021
Mitigation of iron deficiency anaemia (IDA) in piglets	Dr.Arun Kumar De	23 rd November, 2021
Mini incubator for small women farmers holdings in A&N Islands	Dr.T. Sujatha	24 th November, 2021
Dweep - Carp Grower Feed	Dr.Saravanan	25 th November, 2021
Live bearer ornamental fish culture	Dr. J. Praveen Raj	26 th November, 2021
Trimodel Therapy Module (CIARI-Gau Maa Rakshak) to Treat Humpsore in cattle	Dr.P. Perumal	27 th November, 2021
Torch ginger (<i>Etlingeraelator</i>)- a new addition to flower basket	Dr.V. Baskaran	28 th November, 2021
Mud Crab fattening	Mrs. S. M. Ajina	30 th November, 2021
Rain water harvesting through lined pond	Dr.T. Subramani	2 nd December, 2021
Captive rearing and breeding technology of anemone fishes	Dr.Y. Gladston	3 rd December, 2021
Small-scale aquaponic model for fish and plant production	Dr. R. Kirubasankar	5 th December, 2021

Title	Expert	Date
Rain water harvesting through lined pond	Dr.T. Subramani	6 th December, 2021
Fertilizer from fish waste	Dr.A. K.O. Ratheesh	7 th December, 2021
Indoor biofloc system for freshwater aquaculture	R. Kirubasankar	8 th December, 2021
Breeding and seed production of <i>Betta fish</i> (Siamese fighting fish)	Dr.J. Praveenraj	9 th December, 2021
Value added fishery by-products	Miss. R.P. Deepitha	12 th December, 2021
Dweep CIARI Brinjal 1	Dr.P.K. Singh	14 th December, 2021
Dweep CIARI Mung 1	Dr.K. Venkatesan	15 th December, 2021
Dweep CIARI Dhan 5	Dr.P.K. Singh	16 th December, 2021
Dweep CIARI Urd 1	Dr.K. Venkatesan	18 th December, 2021
Quality Seed	Dr.P.K. Singh	19 th December, 2021
Captive rearing and breeding technology of anemone fishes	Dr.Y. Gladston	21 st December, 2021
Mud crab fattening	Mrs. S. M. Ajina	22 nd December, 2021
Malabar tamarind (<i>Garcinia gummi-gutta</i>):A potential commercial crop for the islands	Dr.Pooja Bohra	28 th December, 2021

m) CIARI in social media

- Reach of CIARI in Social Media during 2021

Year	Twitter	Facebook	Youtube	
	Impression Earned (No.)	Total Reach (No.)	Total views (No.)	Watch Time (in hr)
2021	25,000	10,400	17,000	835.5

17 MOMENTS TO CHERISH

Chief Secretary, A & N Administration, Shri.Jitendra Narain, IAS visited ICAR-CIARI, Port Blair on 7th August 2021

The Chief Secretary, A & N Administration, Shri. Jitendra Narain, IAS visited ICAR-CIARI, Port Blair on 7th August 2021. Dr. Eaknath B. Chakurkar, Director, ICAR-CIARI, Port Blair, welcomed the Chief Secretary and briefed about the ongoing research programme and technologies developed by the institutes. During his visit he interacted with the Scientists of the ICAR-CIARI and suggested to carry forward vision to make this island as Garden of Eaden by 2047 under the mission mode programme of Plant vegetables, fruits, flowers, community garden and save seeds campaign. Chief Secretary visited the experimental and demonstration blocks of heliconia, alpinia, other exotic flower block, spice crops, dragon fruit cultivation, modern pig farm, integrated farming system model for hilly land, nursery for underutilized fruit and spice crop, microplot facility for salinity resistance rice research at Garacharma farm. Later he visited world coconut germplasm centre, mixed cropping system model, spice plantation block at Sippighat farm. He suggested providing popular article in the “The Daily Telegrams” on suitable and potential crops for cultivation in the islands with package of practices.



Name
 Shri. Narain IAS
 CS. Andaman Nicobar
 Garden of Eden
 (Vision 2047)
 Dr. Eaknath B. Chakurkar
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 terrain - Earth slope for
 spice / fruit / planty material
 and the local captom a
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 for tourist and shud
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 7/8/21

18. Linkages And Collaboration With Other Departments

ICAR-CIARI has developed three types of linkages

- Research collaborations with different institutes for betterment of island agriculture
- Linkage with different development departments, NGOs and bankers for transfer of improved technologies

Academic exchange with Agricultural Universities (OUAT, WBUAFS, BCKV, TNAU, TNAUVAS and TNFU)

Research Collaboration

- Chau Chak Wing Museum, University of Sydney
- Coconut Development Board, Kochi
- DAHVS, A&N Administration.
- DASD, Kozhikode, Kerala
- Directorate of Agriculture, A & N Administration
- ICAR Research Complex for NE Hill Region, Tripura centre
- ICAR-AICRP on Palms, Floriculture, Fruits, Vegetables, Tuber crops
- ICAR-Central Potato Research Institute, Shimla
- ICAR-Central tuber Crops Research Institute, Trivanum
- ICAR-CIBA, Chennai
- ICAR-CIFT, Kochi
- ICAR-CIPHET, Ludhiana
- ICAR-CMFRI, Kochi
- ICAR-CPCRI, Kasaragod, Kerala
- ICAR-CTCRI, Thiruvananthapuram
- ICAR Institutes; IVRI, PD_ADMAS, CIRG, DPR, D-FMD, NRC Pig
- ICAR-CMFRI, Kochi
- ICAR-DFR, Pune
- ICAR-DMR, Solan
- ICAR-IARI, New Delhi
- ICAR-IIFSR, Modipuram
- ICAR-IIHR, Bengaluru, Karnataka
- ICAR-IISR, Kozhikode, Kerala
- ICAR-IISR, Mau, UP
- ICAR-NBAIM, Mau, UP
- ICAR-NBFGR, Lucknow
- ICAR-NBPGR, New Delhi
- ICAR-NFDB, Hyderabad
- ICAR-NRCB, Tiruchirapalli, Tamil Nadu
- ICFRE, Coimbatore
- IIRR, Hyderabad
- India Meteorological Department, Pune
- Indian Institute of Pulses Research, Kanpur
- Muséum national d'histoire naturelle, Paris
- NABARD, Port Blair
- National Horticulture Board, Gurugram
- NBAIR, Bengaluru
- NMPB, New Delhi
- RMRC, ICMR, Port Blair
- SAC, ISRO, Ahmedabad.
- Smithsonian institution, Washington
- Thackeray Wildlife Foundation, Mumbai, India
- University of Horticultural Sciences, Bagalkot, Karnataka
- UT Administration of Lakshadweep
- Zoological Survey of India, Kolkata

19. Personnel

Dr. Eaknath Bhanudasrao Chakurkar, Director w.e.f 28th April, 2021

Dr. B. Augustine Jerard, Director (Acting) upto 28th April, 2021

Head / Incharge Divisions / Section/ KVK

Head I/c, Division of Animal Science	Dr. Debasis Bhattacharya
Head, Division of Horticulture & Forestry	Dr. B. A. Jerard upto 13 th June, 2021 Head I/c w.e.f 14 th June, 2021
Head I/c, Division of Natural Resource Management	Dr. A. Velmurugan
Head I/c, Division of Field Crop Improvement & Protection	Dr. P.K. Singh
Head I/c, Division of Fisheries Science	Dr. R. Kirubasankar
Incharge, Social Science Section	Dr. S.K. Zamir Ahmed
Senior Scientist & Head, KVK (South Andaman, N & M Andaman & Nicobar)	Dr. Y. Ramakrishna
Senior Administrative Officer I/c	Mr. Sushil Kumar Singh (Upto 5 th October, 2021) Mr. Sridham Kumar Biswas (from July 2021 to till date)
Finance & Accounts Officer I/c	Mr. Amit Srivastava upto 30 th August, 2021 (AN). Mrs. Ashima Saha w.e.f 23 rd July, 2021(AN)
Incharge, Priority setting, Monitoring & Evaluation Cell	Dr. Jai Sunder
Incharge, AKMU	Dr. D. Karunakaran
Incharge, Library	Dr. T. Sujatha
Incharge, Central Instrumentation Facility	Dr. Rafeeque Rahman Alyethodi
Incharge, Estate Section	Er. Arul Selvam upto 15 th October, 2021 Shibani Sengupta, w.e.f 16 th October, 2021
Incharge, Guest House	A.K. Tripathi
Incharge, Security Officer	Mr. Benny Verghese upto 15 th October, 2021 Mr. Karapaya w.e.f. 16 th October, 2021
Incharge, Sippighat Farm	Dr. K. Abirami
Incharge, Bloomsdale Farm	Dr. P.K. Singh
Incharge, ITMU	Dr. T. Sujatha
Incharge PG Cell	Dr. T. Sujatha
Farm Manager, Garacharma	Mr. A.K. Tripathi
Farm Manager, Sippighat	Dr. V. Damodaran
Farm Manager, Bloomsdale Farm	Mr. Shyam Sunder Rao
Vigilance officer	Dr Jai Sunder
Member Secretary, RAC	Dr. S K Zamir Ahmed
Nodal officer, HRD	Dr. T P Swarnam
Nodal Officer, TSP	Dr. K. Saravanan
Nodal Officer, Swachh Bharat Mission	Dr. A Velmurugan
Nodal Officer, MGMG	Dr. S K Zamir Ahmed
Nodal Officer, ARMS	Dr. Jai Sunder
CPIO	Dr. R. R. Alyethodi
Nodal Officer, PIMS, PERMISnet, ASRB Online & KrishiKosh.	Dr. D. Karunakaran

Division of Natural Resource Management

- ❖ Dr. A. Velmurugan, Principal Scientist (Chemistry, Fertility & Microbiology) & Head
- ❖ Dr. T.P. Swarnam, Principal Scientist (Agronomy)
- ❖ Dr. T. Subramani, Sr. Scientist (Agronomy)
- ❖ Dr. K. R. Kiran, Scientist upto 21/04/2021 (AN)
- ❖ Dr. Sirisha Adamala, Scientist (Land & Water Management Engineering)
- ❖ Mrs. Shannon N Sangma, Scientist upto 28/09/2021

Division of Field Crops Improvement & Protection

- ❖ Dr. Pankaj Kumar Singh, Principal Scientist & Head
- ❖ Dr. Venkatesan, K., Scientist (Economic Botany)
- ❖ Dr. T. Bharathimeena, Scientist (Entomology)

Division of Horticulture & Forestry

- ❖ Dr. B. Augustine Jerard, Principal Scientist (Horticulture) & Head
- ❖ Dr. V. Baskaran, Principal Scientist (Horticulture)
- ❖ Dr. K. Abirami, Sr. Scientist (Fruit Science) and SIC, Sippighat farm
- ❖ Dr. I. Jaisankar, Sr. Scientist (Forestry)
- ❖ Dr. Pooja Bohra, Scientist (Fruit Science)
- ❖ Dr. Ajit ArunWaman, Scientist (SPMA)

Division of Animal Science

- ❖ Dr. D.Bhattacharya, Principal Scientist (Vet. Parasitology) & Head
- ❖ Dr. Jai Sunder, Principal Scientist (Vet. Microbiology)
- ❖ Dr. T. Sujatha, Sr. Scientist (Poultry Science)
- ❖ Dr. P. A. Bala, Sr. Scientist (Animal Nutrition)
- ❖ Dr. P. Perumal, Scientist (Animal Reproduction & Gyneacology)
- ❖ Dr. Arun Kumar De, Scientist (Animal Biotechnology)
- ❖ Dr. K. Munniswamy, Scientist (Animal Biotechnology)
- ❖ Dr. Rafeeqe Rahman Alyethodi (Animal Genetics & Breeding)

Division of Fisheries Science

- ❖ Dr. R. Kiruba Sankar, Scientist (Fish & Fisheries Science) & Head
- ❖ Dr. K. Saravanan, Scientist (Fish Health)
- ❖ Mr. J. Praveenraj, Scientist (Fish Health)

- ❖ Mr. Arun Kumar Oppoottil Ratheesh, Scientist (Fisheries Resource Management)
- ❖ Dr. Gladston Y., Scientist (Fisheries Resource Management)
- ❖ Ms. Sreepriya Prakasan, Scientist (Fish Processing Technology)
- ❖ Mrs. Ajina S.M., Scientist (Fisheries Resource Management)
- ❖ Ms. Deepitha R. P., Scientist (Fish Processing Technology)

Social Science Section

- ❖ Dr. S.K. Zamir Ahmed, Principal Scientist (Agricultural Extension) & Section In-charge
- ❖ Shri. D. Karunakaran, Scientist (Computer Application in Agriculture)
- ❖ Dr. R. Jaya Kumaravaradan, Scientist (Agricultural Economics)

Krishi Vigyan Kendra, Port Blair

- ❖ Dr. Y. Ramakrishna, Principal Scientist & Head Krishi Vigyan Kendra's
- ❖ Dr. L. B. Singh, SMS (Horticulture) upto 30th December, 2021
- ❖ Er. Bijaya Kumar Nanda, Subject Matter Specialist (Agri. Engineering)
- ❖ Mr. N. Bommayswamy, Subject Matter Specialist (Agronomy)
- ❖ Dr. Zachariah George, Subject Matter Specialist (Animal Science)
- ❖ Dr. Pooja Kapoor, Subject Matter Specialist (Home Science)

Krishi Vigyan Kendra, Nicobar

- ❖ Dr. Zachariah George, Subject Matter Specialist (Animal Science) upto 14th April, 2021
- ❖ Mr. Mohd. Sharief (Technician)

Krishi Vigyan Kendra, North & Middle Andaman

- ❖ Er. Manoj Kumar, Subject Matter Specialist, (Agricultural Engineering)
- ❖ Dr. Pooja Kapoor, Subject Matter Specialist (Home Science) upto 14th April, 2021
- ❖ Dr. D. Basantia, Subject Matter Specialist (Horticultural Science) upto 29th December, 2021
- ❖ Dr. S V. Lal, Subject Matter Specialist (Animal Science)

20. New Entrants/Transfer/Promotion/Retirement/Death

- ❖ Mrs. Shannon N. Sangma, Scientist joined on 12th January, 2021.
- ❖ Dr. Eaknath B Chakurkar, Principal Scientist joined on 28th April, 2021 as Director.

Transfer

- ❖ Dr. Sanjay Kumar Pandey, SMS, Agronomy, ICAR-KVK, Nicobar transferred to ICAR-KVK, IISR, Lakhimpur Kheri, U.P. on 19th January, 2021.
- ❖ Mrs. Harsha Haridas, Scientist (Aquaculture) transferred to ICAR-CIFE, Powerkheda, M.P on 2nd February, 2021.
- ❖ Mr. C.H. Rama Rao, SSS transferred to Regional Centre of ICAR-CMFRI, Visakhapatnam on 10th March, 2021.
- ❖ Dr. Pooja Kapoor, Subject Matter Specialist (Home Science) transferred from ICAR-KVK, Nimbudera to ICAR-KVK, Port Blair on 15th April, 2021.
- ❖ Dr. Zachariah George, Subject Matter Specialist (Animal Science), transferred from ICAR-KVK, Nicobar to ICAR-KVK, Port Blair on 16th April, 2021.
- ❖ Mr. Amit Kumar Srivastava, ACTO transferred to ICAR-Central Research Institute for Dryland Agriculture, Hyderabad on 30th August, 2021
- ❖ Dr. Shardul Vikram Lal, SMS(Animal Sci.) transferred to ICAR-IVRI, Bareilly on 20th September, 2021
- ❖ Mrs. Shannon N. Sangma, Scientist transferred to ICAR-IARI, Barhi, Gauria, Karma, Jharkhand on 28th September, 2021
- ❖ Mr. Sushil Kumar Singh, SAO to ICAR-Indian Institute of Wheat and Barley Research, Karnal 132001 Haryana on 5th October, 2021.
- ❖ Dr. D. Basantia, SMS to Eastern Regional Station, Kalyani. The Eastern Regional Station (ERS) of National Dairy Research Institute (NI), Kalyani, West Bengal on 30th December, 2021.

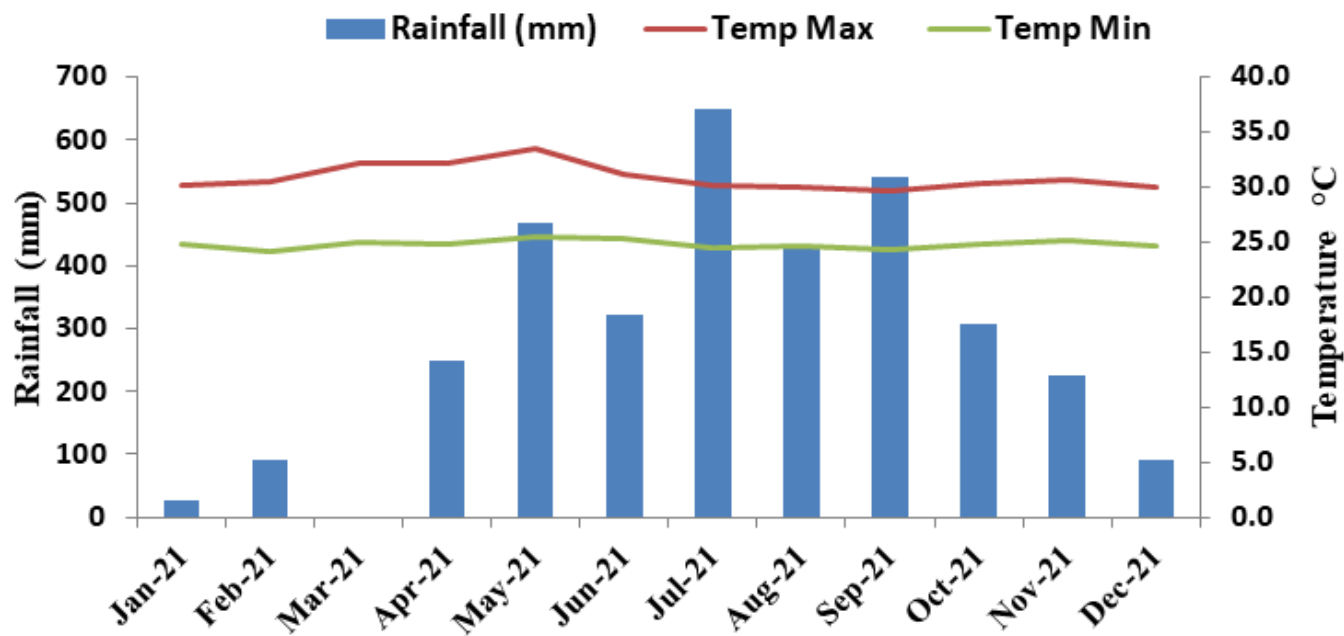
Retirement

- ❖ Mr. M.S.R.C. Murthy, LDC on 31st June, 2021
- ❖ Mrs. Archana Sharma, Technical Officer on 31st August, 2021
- ❖ Mr.Ujwal Toppo, SSS on 30th Sept., 2021
- ❖ Mr. K. Gopi, SSS on 30th Sept., 2021
- ❖ Dr. L. B. Singh, SMS, KVK, South Andaman on 31st December, 2021

Promotion

- ❖ Mrs Ashima Saha, Assistant to Asstt. Admn. Officer on 23rd July, 2021
- ❖ Mrs.Rina Saha, Jr. Steno. to Personal Asstt. On 23rd July, 2021
- ❖ Mrs. Sheela Pal, SSS to LDC on 3rd August, 2021
- ❖ Mr.A Raja Rao, TSM to SSS on 23rd August, 2021
- ❖ Mr.Y. Vijaya Rao, TSM to SSS on 23rd August, 2021
- ❖ Mr.Lalsai Ram, TSM to SSS on 23rd August, 2021
- ❖ Mr.Peter Soreng, TSM to SSS on 23rd August, 2021
- ❖ Mr. B.V.B. Swamy, TSM to SSS on 23rd August, 2021
- ❖ Mrs Florence Toppo, Personal Asstt. to Personal Secretary on 24th August, 2021
- ❖ Mrs Gyanam, TSM to Skilled supporting staff on 24th December, 2021
- ❖ Mr. R. Dharma Rao, TSM to Skilled supporting staff on 24th December, 2021
- ❖ Mr.Krishna Roy, TSM to Skilled supporting staff on 24th December, 2021
- ❖ Mr.C.H. Sampat Rao, TSM to Skilled supporting staff on 24th December, 2021
- ❖ Mr.Deep Kumar Mukherjee, SSS to Technician on 24th December, 2021
- ❖ Mrs.Champa Rani Das, SSS to Technician on 24th December, 2021
- ❖ Dr.R. Simachalam, SSS to Technician on 24th December, 2021
- ❖ Mr.Ali Akbar, SSS to Technician on 24th December, 2021

21. Weather Conditions At Port Blair, Andaman And Nicobar Islands An Overview



Fish seed distributed to fish farmers



Port Blair, Aug. 28
 The Department of Fisheries in association with Krishi Vigyan Kendra (KVK) Sippighat yesterday distributed fish seeds

produced locally in Nayagaon to the farmers identified from Fisheries Deptt. said.

Awareness prog. on plantation crops based cropping systems conducted by ICAR-CIARI

Port Blair, Sept. 3
 On the occasion of World Coconut Day-2021, an awareness programme on plantation crops based cropping systems for high yielding and profitable was conducted yesterday at ICAR-CIARI under the All India Coordinated Research Project on Palm Project. Participants from Women Self Help groups, farmers and students were taken to experimental blocks in which they were demonstrated about high density cultivation of black pepper in coconut plantation and second based intercropping blocks with cinnamon and woody pepper. Participants visited horticultural farms propagation unit of the Institute, wherein they were shown various



potential intercropping and benefits of growing them. Techniques of their multiplication were also demonstrated to them. To promote cultivation of various crops, planting material of Indian bay leaf, long pepper, lemon grass and passion fruit were distributed to them. The programme was organized under the guidance of Director, ICAR-CIARI, Dr. Ajitha Mani, principal in-charge of the project. The

CIARI conducts av...



celebration of this event. He emphasized that plantation crops have a potential to play a role in the island agriculture and profitability of farming could be improved through adoption of intercropping with profitable crops. Dr. Gopal Kumar, Scientist, ICAR-CIARI, in his address detailed about various major and minor fruit crops which could be incorporated in the plantation based cropping systems. A

'Dweep Sale Point' inaugurated at ICAR-CIARI

Port Blair, Oct. 14
 With an objective to provide quality planting material of different horticulture crops like fruits, vegetables, tubers, spices, farm service products, medicinal plants, along with agriculture, fisheries, husbandry and their products, ICAR-CIARI has started 'Dweep Sale Point' at its Port Blair Research

CIARI in the presence of Heads of the Division Section and staff. Director dedicated 'Dweep Sale Point' to the stakeholders, farmers, urban people and visiting tourists of the Island. The sale point also have the technology bulletins on different aspects for dissemination of know-how and development. Interested clients visit the 'Dweep Sale Point'.

THE ECHO OF INDIA

ICAR-KVK, CIARI celebrates Constitution Day, holds Technology demonstration



Port Blair, Aug. 28
 ICAR-KVK, CIARI celebrated Constitution Day by holding a technology demonstration. The event was held at the Institute premises. Dr. Gopal Kumar, Scientist, ICAR-CIARI, in his address detailed about various major and minor fruit crops which could be incorporated in the plantation based cropping systems. A

Inspiring story of roof top production model for horticultural crops

Port Blair, Oct. 14
 Inspiring story of roof top production model for horticultural crops was highlighted during a training programme conducted at ICAR-CIARI. The programme was held on the occasion of the inauguration of the 'Dweep Sale Point'.



ICAR-CIARI, Port Blair, in association with the Women Self Help Groups (WSHG) and other stakeholders, conducted a training programme on rooftop production of horticultural crops. The programme was held on the occasion of the inauguration of the 'Dweep Sale Point'.

Daily Telegrams

...the Largest Circulating Daily of the Islands

Training on value-added fishery products conducted at ICAR-CIARI



ICAR-CIARI, Port Blair, in association with the Women Self Help Groups (WSHG) and other stakeholders, conducted a training programme on value-added fishery products. The programme was held on the occasion of the inauguration of the 'Dweep Sale Point'.



हर कदम, हर डमर
किसानों का हमसाफर
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