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ICAR-Central Island Agricultural Research Institute

(Indian Council of Agricultural Research)

Port Blair – 744 101, Andaman & Nicobar Islands, India

भाकृअनुप
ICAR

Annual Report
2015 - 16

CIARI
ICAR
तमसो मा ज्योतिर्गमय

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ICAR-Central Island Agricultural Research Institute
(Indian Council of Agricultural Research)
Port Blair – 744 101
Andaman & Nicobar Islands, India
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Editorial Committee	R.K. Gautam
	A. Kundu
	B. Gangaiah
	R. Kirubasankar
	S.K. Zamir Ahmed
	Nagesh Ram
Layout, Graphics & Cover Design	Dibakar Khan
Type setting	Rina Saha
Photography	K. Ali Akbar
Overall Compilation & Editing	S.K. Zamir Ahmed
	Amit Srivastava
	Rina Saha
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CONTENTS

Sl. No.	Title	Page No.
1.	**Preface**	
1.1	Hindi	v
1.2	English	vii
2.	**Executive Summary**	ix
3.	**Introduction**	xvii
3.1	Mission	xvii
3.2	Vision	xviii
3.3	Mandate	xviii
3.4	Thrust Areas for XII Plan	xviii
3.5	Organisational Set up	xviii
3.6	Organogram	xix
3.7	Staff Position	xx
3.8	Budget Utilization	xx
4.	**Research Programmes**	1
4.1	Division of Horticulture and Forestry	3
4.2	Division of Field Crop Improvement & Protection	31
4.3	Division of Natural Resource Management	53
4.4	Division of Animal Science	71
4.5	Division of Fisheries Science	89
4.6	Social Science Section	121
4.7	**Krishi Vigyan Kendra**	132
4.7.1	Krishi Vigyan Kendra, South Andaman	133
4.7.2	Krishi Vigyan Kendra, Nicobar	139
4.7.3	Krishi Vigyan Kendra, North & Middle Andaman	146
5.	**Mera Gaon Mera Gaurav**	160
6.	**Tribal Sub Plan**	167
7.	**Woman Participation (SC/ST)**	176
8.	**Technologies Transferred**	177
8.1	Seed & Planting Material Produced	178
9.	**Information on other Sections**	179
9.1	Prioritization, Monitoring and Evaluation (PME) Cell	179
9.2	Library	180

9.3	Official Language Cell	180
9.4	Sub-DIC	182
9.5	Institute Technology Management Unit (ITMU)	182
9.6	Post Graduate Students Cell	183
9.7	Estate Section	183
9.8	Workshop	183
9.9	Instrumentation Cell	183
9.10	ARIS Cell	184
10.	**Awards and Recognition**	185
11.	**Ongoing Research Projects**	189
11.1	External funded	189
11.2	Institute funded	194
12.	**Publication**	198
13.	**Peer Recognition to Director and Management of R&D**	209
14.	**Participation of Scientist in Conferences/ Seminars/ Symposia/ Meetings**	213
15.	**Human Resource Development for Stakeholders**	219
16.	**Training and Capacity Building**	226
17.	**Round up of Institute Activities**	229
18.	**Impression of Delegates**	239
19.	**Linkages and Collaboration**	240
20.	**Personnel**	241
21.	**Committees of the Institute**	244
22.	**New Entrants/ Transfer/ Promotion/ Retirement/Death**	247
23.	**CIARI in NEWS**	248
24.	**Climatic Parameters**	249
25.	**Result Frame Work Document (RFD)**	250

प्रस्तावना

मुझे प्रसन्नता है कि भा.कृ.अनु.प.–केन्द्रीय द्वीपीय कृषि अनुसंधान संस्थान की वार्षिक रिपोर्ट 2015–16 आपके समक्ष प्रस्तुत करने का सौभाग्य प्राप्त हुआ है जिसके माध्यम से कृषि एवं संबद्ध क्षेत्रों में सराहनीय अनुसंधान परिणामों जैसे रामबुटान, मैंगोस्टीन, अन्नोना संकर, स्वीट कैरमबोला तथा गार्सिनिया प्रजाति की विशिष्ट जननद्रव्य का प्रवेश एवं स्थापना से संस्थान को प्रतिष्ठा प्राप्त हुई। पत्ती डंठलों के टुकड़ों के जास्मिनम सैम्बैक की नई व्युत्पत्ति पद्धति का मानकीकरण और पुष्प उत्पादन में उच्च उपज हेतु पुनर्स्थापित अधःस्तर के साथ पुनर्गठित मेड और लीक (रिड्ज एवं फर्रो) से उत्पादन प्रौद्योगिकी; स्थानीय बागानों में पहली बार पीले झींगुर लेमा पेक्टोलारिस बाली (कोलियॉपटेराः क्रैसोमेलेडी) का संक्रमण; अंडमान एवं निकोबार, भारत में इलोफिया अंडमानेनसिस रेचैब. एफ देखा गया। बैंगन के बैक्टीरियायी मुरझान रोग प्रतिरोधी किस्मों सीआईएआरआई ब्रिंजाल 2, सीएआरआई 3 तथा सीआईएआरआई ब्रिंजाल 4 का विकास किया गया। छोटी पिंडलियों वाली निकोबारी मुर्गी के लिए इन–सीटू कंजर्वेशन यूनिट की स्थापना की गई। द्वीप से पहली बार एनसीबीआई जीन बैंक में शॉवल लॉबस्टर थीनस यूनिमेक्यूलेटस की आण्विक वर्गीकी (मॉलीक्यूलर टैक्सोनॉमी) प्रस्तुत की गयी। स्कंक एनिमोन मछलियों (एम्पीप्रियोन अकल्लोपिसोस) तथा लेमन डेमसैल (पोमासेन्ट्रस मॉलिक्यूल्सेंसिस) के युग्मन और प्रजनन में सफलता प्राप्त की गयी। कार निकोबार के जनजातियों के लिए भागीदारी दृष्टिकोण से वासभूमि पर फसल प्रणाली का मॉडल विकसित किया गया। किसान पोर्टल पर तीनों जिलों के 2500 किसानों का पंजीकरण कर प्रत्येक मंगलवार और शुक्रवार को हिन्दी और अंग्रेजी में एसएमएस द्वारा कृषि–परामर्श भेजे गए।

यह भी गर्व का विषय है कि आर.एफ.डी. (2014–15) में प्रकाशनों के संदर्भ में संस्थान को परिषद के सभी संस्थानों में चौथा स्थान प्राप्त हुआ है। इस वर्ष 38 राष्ट्रीय और 45 अंतर्राष्ट्रीय लेख प्रकाशित किए गए हैं जिनमें से 9 लेखों को 7 से अधिक नास रेटिंग प्राप्त है।

द्वीप से पहली बार एनसीबीआई जीन बैंक में शॉवल लॉबस्टर थीनस यूनिमेक्यूलेटस की आणविक वर्गीकी (मॉलीक्यूलर टैक्सोनॉमी) प्रस्तुत किया गया। इसके अलावा, स्कंक एनिमोन मछलियों (एम्पीप्रियोन अकल्लोपिसोस) तथा लेमन डेमसैल (पोमासेन्ट्रस मॉलिक्यूल्सेंसिस) का सफल युग्मन और प्रजनन प्राप्त किया गया।

इसके अलावा संस्थान के प्रोफाइल को आई.सी.ए.आर. न्यूज, इनफ्लाइट मैगजीन (शुभयात्रा) तथा अंडमान क्रोनिकल में प्रकाशित किया गया ताकि राष्ट्रीय एवं अंतर्राष्ट्रीय स्तर पर संस्थान की ब्रांड इमेज बन सके।

इस अवधि के दौरान भारत सरकार के माननीय केन्द्रीय कृषि राज्य मंत्री डॉ. संजीव कुमार बलियान ने दिनांक 09 मई, 2015 को अलीगढ़ के संसद सदस्य श्री सतीश गौतम, बुलंदशहर के संसद सदस्य श्री भोलासिंह तथा अंडमान निकोबार के संसद सदस्य श्री विष्णु पद रे के साथ संस्थान का दौरा किया और निदेशक, वैज्ञानिकों और कार्मिकों से परिचर्चा की। संस्थान द्वारा किसानों के हित में किए गए कार्यों की सराहना की गई।

नाबार्ड, पोर्ट ब्लेयर द्वारा भा.कृ.अनु.प.–केन्द्रीय द्वीपीय कृषि अनुसंधान संस्थान तथा तीन कृषि विज्ञान केन्द्रों को रिसोर्स स्पोर्ट एजेंसी (आर.एस.ए.) तथा प्रॉड्यूसर ऑर्गानाइजेशन प्रोमोटिंग संस्थान का दर्जा देना; क्रीडा, हैदराबाद के सहयोग से अंडमान एवं निकोबार द्वीप समूह के तीन जिलों के लिए जिला आकस्मिक योजना का विकास करना, एन.बी.ए.जी.आर., करनाल के सहयोग से निकोबारी शूकर, टैरेसा बकरी के देशी जननद्रव्य का पंजीकरण, 39 वर्षों बाद संस्थान के अधिदेश का पुनरावलोकन, वनस्पति एवं प्राणिजात के संरक्षण हेतु जैव सुरक्षा प्रयोगशाला और जैवविविधता पार्क की स्थापना हेतु

भूमि, कीटनाशक अवशेष प्रयोगशाला, खुंब जीरा उत्पादन एकक की स्थापना का कार्य जैसे नए पहल किए गए। लक्षद्वीप के किलटन में स्थित कृषि विज्ञान केन्द्र को टेकओवर करने के अलावा किसानों के हित के लिए किसान पोर्टल प्रारंभ किया गया।

बागवानी एवं वानिकी प्रभाग के अध्यक्ष, विभिन्न प्रभागों हेतु 8 वैज्ञानिकों की नियुक्ति के अलावा कैरियर एडवांसमेंट स्कीम के तहत 2 वरिष्ठ वैज्ञानिकों की प्रधान वैज्ञानिक पद पर पदोन्नति से संस्थान सुदृढ़ हुआ। आगे यह भी उल्लेख किया जाता है कि निदेशक, भा.कृ.अनु.प.–केन्द्रीय द्वीपीय कृषि अनुसंधान संस्थान की अध्यक्षता में नगर राजभाषा कार्यान्वयन समिति, पोर्ट ब्लेयर को राजभाषा विभाग, गृह मंत्रालय, भारत सरकार द्वारा अंडमान एवं निकोबार द्वीप समूह में राजभाषा के उत्कृष्ट कार्यान्वयन हेतु तृतीय पुरस्कार तथा भा.कृ.अनु.प.–केन्द्रीय द्वीपीय कृषि अनुसंधान संस्थान को राजभाषा सेवा संस्थान, नई दिल्ली द्वारा श्रेष्ठ हिन्दी पत्रिका वर्ग में विशिष्ठ पुरस्कार से सम्मानित किया गया।

अनुसंधान एवं विकास तथा विस्तार गतिविधियों को सुदृढ़ करने हेतु अनेक कार्यक्रमों का आयोजन किया गया, जैसे ''जैवविविधता तथा जलवायु परिवर्तन को अनुकूल बनानाः चुनौतियां और अवसर'' विषय पर राष्ट्रीय सेमिनार; ''द्वीपीय क्षेत्र में कृषि एवं संबद्ध क्षेत्रों के विकास के लिए रणनीतियां'' विषय पर द्वीपीय कृषि जलवायु क्षेत्र में क्षेत्रीय कार्यशाला; ''उष्णकटिबंधीय द्वीपों में समेकित फसल प्रणाली'' विषय पर मॉडल प्रशिक्षण पाठ्यक्रम; ''मसालों का उत्पादन एवं मूल्य संवर्धन'' विषय पर जिला स्तरीय सेमिनार ''द्वीपों में खाद्य प्रसंस्करण क्षेत्र के विकास की रणनीतियां'' विषय पर राष्ट्रीय सेमिनार, राष्ट्रीय विज्ञान दिवस, हिन्दी पखवाडा, जय जवान–जय विज्ञान सप्ताह, अंतर्राष्ट्रीय दलहन वर्ष, कृषि विज्ञान केन्द्रों की वैज्ञानिक सलाहकार समिति की बैठक, राष्ट्रीय मतदाता दिवस, किसान सम्मेलन, विश्व मृदा स्वास्थ्य दिवस, सतर्कता जागरूकता सप्ताह, अंतर्राष्ट्रीय महिला दिवस तथा द्वीपीय किसान मेला एवं फार्म इनोवेटर्स मीट आदि। इनके अतिरिक्त तीनों जिलों में मेरा गांव, मेरा गौरव कार्यक्रम का भी कार्यान्वयन किया गया।

मैं इस अवसर पर उभरती चुनौतियों का सामना करने में डॉ. टी. महापात्रा, सचिव डेयर एवं महानिदेशक, भा.कृ.अनु.प. तथा डॉ. एस. अय्यप्पन, पूर्व महानिदेशक, भा.कृ.अनु.प. के दूरदर्शितापूर्ण नेतृत्व, सतत समर्थन के लिए उनका आभारी हूं। मैं डॉ. एन.के. कृष्ण कुमार, उप–महानिदेशक, (बागवानी विज्ञान) के प्रति भी आभारी हूं जिनका प्रोत्साहन एवं सुझाव संस्थान के अनुसंधान तथा कार्यक्रमों से संबंधित समस्याओं के समाधान में प्रेरणा का स्रोत है। मैं डॉ. टी.जानकीराम, सहायक महा. निदेशक (बागवानी–1) तथा विषय वस्तु प्रभाग (बागवानी विज्ञान) के अन्य अधिकारियों तथा कर्मचारियों का भी आभार व्यक्त करता हूं जिनका सहयोग संस्थान से संबंधित पहलुओं को सुलझाने में सदैव प्राप्त हुआ है। मैं प्रोफेसर आर.बी. सिंह, अध्यक्ष, अनुसंधान सलाहकार समिति तथा संबंधित समितियों के माननीय सदस्यों को द्वीप की आवश्यकताओं के अनुसार हमारे अनुसंधान कार्यक्रमों को पुनर्व्यवस्थित करने में उनके सुझावों हेतु धन्यवाद देता हूँ।

परम विशिष्ट सेवा मैडल, अति विशिष्ट सेवा मैडल, सेवा मैडल, विशिष्ट सेवा मैडल से सम्मानित माननीय उप–राज्यपाल, लेफ्टिनेंट जनरल (सेवानिवृत्त) ए.के. सिंह; श्री विष्णु पद रे, माननीय संसद सदस्य, अंडमान एवं निकोबार द्वीप समूह, श्री आनंद प्रकाश, मुख्य सचिव, अंडमान एवं निकोबार प्रशासन, सचिव (कृषि, पशुपालन एवं मात्स्यिकी), अंडमान निकोबार प्रशासन, डिप्टी कमीश्नर, दक्षिणी, उत्तरी, मध्य एवं निकोबार जिला, अंडमान एवं निकोबार प्रशासन के निदेशकगण एवं अधिकारियों, जनजातीय परिषद के अध्यक्ष एवं सदस्यों एवं नाबार्ड को उनकी सहायता एवं सक्रिय योगदान के लिए धन्यवाद देता हूँ।

अंत में, मैं अपने सहकर्मियों, अधिकारियों तथा कर्मचारियों को विशेषकर दक्षिण पूर्वी एशियाई देशों में उष्णकटिबंधीय द्वीपीय कृषि को आलोकित करने में उनके सहयोग एवं निरंतर कठोर परिश्रम के लिए बधाई देता हूँ ।

दिनांक 21 मई, 2016

(शिबनारायण दाम रॉय)
निदेशक
भा.कृ.अनु.प.–केन्द्रीय द्वीपीय कृषि अनुसंधान संस्थान

PREFACE

I am privileged to present the Annual Report of ICAR- Central Island Agricultural Research Institute, Port Blair for year 2015-16 which has brought laurels to the Institute with appreciative research outcome in agriculture and allied fields namely introduction and establishment of superior types of rambutan, mangosteen, annona hybrid, sweet carambola, and exclusive germplasm block of *Garcinia* species. Standardization of new propagation method in *Jasminum sambac* through leaf petiole cutting and production technology of modified ridges and furrow system with reconstituted media for higher yield in flower crops. First record of yellow orchid beetle, *Lema pectoralis* Baly (Coleoptera: Chrysomelidae) infestation on indigenous orchid, *Eulophia andamanensis* Reichb.f. in Andaman and Nicobar Islands, India was reported. Bacterial wilt resistant brinjal lines, CIARI Brinjal 2, CARI Brinjal 3 and CIARI Brinjal 4 were developed .*In-situ* conservation unit of short shank length Nicobari fowl has been established. Molecular taxonomy of shovel lobster, *Thenus unimaculatus* was submitted in NCBI Gene Bank for first time from Islands. Successful pairing and spawning of skunk anemone fish, (*Amphiprion akallopisos)* and lemon damsel (*Pomacentrus moluccensis)* were achieved. Beside, homestead farming system model was developed in participatory approach for tribals at Car Nicobar. Registered 5200 farmers of all three districts on mKISAN portal, SMS based agro-advisories were sent on every Tuesday and Friday in hindi and english.

It is also matter of pride that in RFD(2014-15) the Institute was placed 4th in all ICAR organization in terms of publication. This year thirty eight National and forty five International papers has been published out of which nine are having NAAS rating of more than 7.

In addition to this, the Institute profile was published in ICAR News, Inflight magazine (Subh Yatra) and Andaman Chronicle to give a brand image of the Institute at National and International arena.

Hon'ble Minister of State for Agriculture, Govt. of India, Dr. Sanjeev Kumar Balyan accompanied by the Member of Parliament, Alighar, Shri Satish Gautam, Member of Parliament, Bulandshehar, Shri Bhola Singh and Member of Parliament, A & N Islands, Shri Bishnu Pada Ray visited the Institute and interacted with the Director, scientists and staff on 9th May, 2015. The work executed by the Institute for the benefit of the farmers was appreciated.

New initiatives like according status of Resource Support Agency (RSA) and Producer Organization Promoting Institutions (POPI) by NABARD, Port Blair to ICAR-CIARI and three KVKs, developing District contingency plan for three district of A&N Islands in collaboration with CRIDA, Hyderabad, registration of indigenous germplasm such as Teressa goat, Nicobari pig with NBAGR, Karnal, revisiting mandate of the Institute after 39 years, land for establishment of bio security laboratory for conservation of flora and fauna and bio diversity park, pesticide residue laboratory and mushroom spawn production unit were done. Beside taking over of KVK, located at Kiltan, Lakshdweep and Kisan Portal for the benefit of the farmers have been initiated.

Recruitment of Head of Division for Horticulture and Forestry, eight scientists for different divisions, beside assessment of two Senior Scientists to Principal Scientists through CAS has strengthened the Institute.

Further to share that under the Chairmanship of Director, ICAR- CIARI, Town Official Language Implementation Committee, Port Blair has been awarded third prize (2014-15) for best implementation of official language policy in Andaman and Nicobar Islands by Govt. of India, Ministry of Home Affairs, Deptt. of Official Language for Zone 'A' and ICAR-CIARI "Vishistha Puraskar" in Shrestha Hindi Patrika category by Rajbhasha Seva Sansthan, New Delhi.

To strengthen the R & D and extension activities important events such as National Seminar on "Harmonizing biodiversity and climate change : challenges and opportunities, Island agro climate zone workshop on "Strategies for development of agriculture and its allied sectors of island region , Model training course on "Integrated farming system for tropical islands", District level seminar on "Production and value addition of spices", National seminar on "Strategies for the development of food processing sector in the Islands", National science day, Hindi fortnight, Jai jawan jai vigyan week, International year of pulse, Scientific advisory committee meeting of KVKs, National voters day, Kisan sammelan, World soil health day, Vigilance awareness week, International women day and Island kisan mela & Farm innovators meet etc. were organized. In addition to this Mera gaon mera gaurav (MGMG) has been implemented in all the three districts.

I take this opportunity to express my deep sense of gratitude to Dr. T. Mohapatra, Secretary, DARE and Director General, ICAR and Dr. S. Ayyappan, former DG, ICAR for their visionary leadership, unstinted support and guidance to meet the emerging challenges. I am grateful to Dr.N.K. Krishna Kumar, Deputy Director General (Horticultural Science), who has been our source of inspiration and advising us constantly on future course of action to address the emergent issues related to research and programmes of the institute. I am thankful to Dr. T.Janakiram, ADG (Hort.I), and all the officers & staff of SMD (Horticultural Science) for rendering support on various issues related to the Institute. I am also thankful to Prof. R.B.Singh, Chairman RAC, Hon'ble members of the respective committees for their suggestions in re-orienting our research to address the needs of the Islands.

I am thankful to the Hon'ble Lt. Governor, Lt. Gen. (Retd.) A.K.Singh, PVSM, AVSM, SM, VSM, Shri Bishnu Pada Ray, Hon'ble MP, Andaman and Nicobar Islands, Shri Anand Prakash, , Chief Secretary, Andaman & Nicobar Administration, Secretary (Agriculture, Animal husbandry & Fisheries), A& N Administration, Deputy Commissioner, South, North & Middle and Nicobar District, Directors, officers of A & N Administration, Chairman & members of Tribal Council and NABARD for their continued support and active collaboration.

At the end, I would like to congratulate my colleagues and staff for their constant hard work and support in achieving great height in providing the beacon of light for tropical island agriculture particularly for the South East Asian countries.

(**Sibnarayan Dam Roy**)
Director
ICAR-CIARI

Dated: 21st May, 2016

EXECUTIVE SUMMARY

Horticulture & Forestry

- A total of 36 morphological descriptors of fruits from 33 accessions of *Morinda citrifolia* were measured and documented. Based on the descriptors, developed the guidelines for the DUS characterization of the Noni trees.
- The promising resistant genotypes identified in brinjal were 2013/BRBW RES-4 (15.06 t/ha) followed by 2013/BRBW RES-1 (13.88 t/ha) in AVT-II bacterial wilt trial.
- In chilli the promising genotypes identified were 2013/CHIVAR-2 (3.84 t/ha) followed by 2013/CHIVAR-4 (3.35 t/ha), 2013/CHIVAR-1 (3.33 t/ha) in AVT II trial.
- Five superior types of rambutan and two types of mangosteen were introduced and were planted in the experimental blocks for evaluation. Further, *Annona* hybrid 'Arka Sahan' and sweet carambola were planted in high density planting system for evaluation.
- Underutilized fruits germplasm block was enriched with five potential fruit species and an exclusive germplasm block of *Garcinia* species was established.
- Seed germination studies in Khoonphal (*Haematocarpus validus*) and wild cashew (*Semicarpus kurzii*) revealed that pre-treatments significantly improved germination, reduced time taken for germination and promoted seedling growth parameters. Propagation of watery rose apple was attempted through air layering with 67% success.
- Improved varieties of black pepper (13), nutmeg (05) and cinnamon (02) were introduced from different sources and planted in the experimental fields for evaluation.
- Two accessions of *Piper colubrinum* were collected and are being multiplied. Amongst wild relatives of nutmeg, *Myristica andamanica, Knema andamanica* and *Horsfieldia glabra* were collected from different parts of the islands and planted in the germplasm block.
- Propagation experiments were conducted in spice crops and their wild relatives to facilitate large scale multiplication. Effect of time of air layering was studied in cinnamon, which suggested that layering could be successfully done upto second week of October.
- Exploratory study for propagation of nutmeg using approach grafting was done with 65% success. Seed germination study in wild nutmeg (*Horsfieldia glabra*) revealed that seed soaking in GA_3 (100 ppm) for 24 hours significantly promoted seed germination (79 %).
- Exploration surveys were made for collection of mango ginger and allied species from different islands and continental India and the collections are being maintained in polyhouse. Further, 29 improved varieties of turmeric and seven varieties of ginger were also collected and are being maintained in polyhouse.
- For establishment of nucleus seed garden, nursery is raised for coconut varieties CARI Annapurna, CARI Omkar, CARI Chandan and CARI Surya and arecanut varieties Samridhi and Andaman Dwarf type.
- To identify suitable crop combinations in the interspaces of coconut and arecanut, different models have been established. Experiment was initiated to test the performance of juvenile palms of three dwarf coconut types (AOD, AYD and AGD) in response to application of organic nutrient sources.Pre-experimental observations on plant growth parameters and soil analysis were carried out for both experiments.
- New technology has been standardized for production of high value flower crops. The growth and yield performance of the flowers were better, when compared with other treatments like ridges and furrow method with or without mulching.

- Technique of propagation in jasmine has been standardised using leaf as the propagule. This is a new technology standardized for the first time in *J.sambac* using root trainers and modified substrate.
- Thailand Red accession (8.2 cm per week) exotic dragon fruit growth rate was found to be maximum. Anthracnose disease was observed in dragon fruit at Garacharma experimental field.
- New pest has been identified on indigenous orchid *Eulophia andamanensis* as *Lema sp* and is reported for the first time in the Island.

Field Crops Improvement & Protection

- From Green Super Rice international trial, genotypes HHZ3-SAL 13-42DI1 followed by HHZ 4-SAL S-LI 1-LI 1, HHZ 10-DT8-DT 1-DT 1, HHZ 18-Y3-Y1-Y1 and HHZ 16-SAL13-LI-LI1 were found superior for grain yield (> 6.0 t/ha), besides their resistance against bacterial leaf blight disease under artificial inoculation conditions in the islands.
- Farmers' participatory variety evaluation under saline and acid sulphate soils (EC~4 dS/m, pH 4.95) revealed that varieties SIT4446 (IR84645-305-6-1-1-1) and SIT5160 (IR87938-1-1-2-1-3-B) were not only high yielding (>4.0 t/ha) compared to best salt tolerant check CST7-1, but were also highly preferred by the farmers due to better plant type, more grains/panicle and long and compact panicles under soil stress conditions.
- From amongst 301 BC_1F_1 segregants of cross CARI Dhan 5/IRBB60//CARI Dhan 5, 35 plants were resistant to bacterial blight (*Xanthomonas oryzae pv oryzae)* pathogen after artificial inoculation. Amongst 35 resistant plants, 6 revealed the pyramided presence of four resistance genes *Xa4*, *xa5*, *xa13* and *Xa21* genes through linked PCR markers based detection which were selected for further back-crossing.
- In mungbean, genotypes ANM-12-02 (IC No.0611650) recorded the highest seed yield followed by ANM-11-08 (IC No.0611664), ANM-11-15 (IC No.0611667), CIARI Mung1 (ANM-11-12, IC 0611666), CIARI Mung2 (ANM-11-05, IC 0611661) and CIARI Mung3 (ANM-11-12, IC 0611663) over the best checks IPM-02-14, VBN3 and Pusa Vishal. These new genotypes showed resistance against charcoal rot, cercospora leaf spot, powdery mildew, leaf crinkle and MYMV diseases of mungbean prevailing in these islands.
- In urdbean, genotypes ANU-11-29 recorded the highest yield followed by ANU-11-09 (IC No.0611671), ANU-11-19 (IC No.0611675), ANU-11-12 (IC No.0611674) and ANU-11-22 (IC No.0611677) compared to the best checks IPU-02-43, VBN-7 and LBG-752. These genotypes also exhibited determinate plant type and resistance to powdery mildew, leaf crinckle, charcoal rot, cercospora leaf spot of urdbean prevailing in these islands. Promising line ANU-11-29 derived from local landrace was nominated to AICRP on MULLaRP for Rabi urdbean IVT trial 2015-16.
- In Beachpea (*Vigna marina*), local collections, ANBp-14-03, ANBp-14-05 and ANBp-15-02 exhibited maximum number of seeds (5-8 seeds per pod), bold seeds with highest seed weight (8.26 g/ 100 seeds). Dry seeds exhibited wide range of protein (18.91 – 30.26 %), iron (1.8 – 2.53 mg), calcium (5.38 – 14.54 mg), magnesium (8.10 – 9.22 mg), zinc (0.60 – 1.46 mg) and cobalt (0.01 – 0.06 mg).
- Three bacterial wilt resistant brinjal lines CIARI Brinjal 2, CARI Brinjal 3 and CIARI Brinjal 4 were developed and evaluated for yield and quality characters in the field.
- A total of 1.22 q (quintal) Nucleus Seed, 5.02 q Breeder Seed and 60.64 q Truthfully Labelled (TFL) seed of 9 rice varieties were produced during *kharif* 2015-16.
- Twenty quintal truthfully labelled seeds of rice were supplied to the Department of Agriculture, Andaman & Nicobar Administration, Port Blair during *kharif* 2015. In addition, A total of 20 quintal Truthfully Labelled Seed of four rice varieties (CARI Dhan 4, CARI Dhan 5, CSR 36 and Gayatri) were distributed in tribal dominated areas in Great Nicobar and Hut Bay.

- A total of 4 quintal seeds of high yielding varieties of mungbean (CARI Mung 1, VBN2, IPM-02-14, IPM-02-3, LGG 460) and urdbean (VBN-6, IPU-02-43, VBN-7, LBG-752) and 3.00 quintals seed of maize (HPQM-4) were distributed among the tribal farmers of Car Nicobar (Nicobar) and Harmindar Bay (Little Andaman).
- A talc based formulation CIARI-Bioconsortia with multiple *Bacillus* spp has been developed for the successful management of brinjal bacterial wilt disease management under island conditions.
- A methodology of soil application of bioenriched Farm Yard Manure with biocontrol agents has been standardized and technology developed for management of soil borne plant diseases in open field and protected cultivated conditions.
- Chilli anthracnose pathogen *Colletotrichum* spp from different locations of the islands was studied for the morphological, pathological and genetic characterization (ITS, actin, tubulin genes) and the variability studies of pathogen were carried out using RAPD markers.
- A total of 70 *Bacillus* spp collected from different locations of Andaman islands were characterized for three virulent plant pathogens viz. *Ralstonia solanacearum*, *Colletotrichum* spp. and *Xanthomonas oryzae*. It was found that 15 isolates were showed high antagonistic and PGP potential.
- The chrysomelid beetle, *Madurasia* sp. and a pyralid leaf folder were noticed as the major defoliator pests of red gram, whereas the looper caterpillar and *M. testulalis* were major pests of black gram.
- The spotted pod borer, *Maruca testulalis* was found infesting flowers and pods of field bean. Infested pods and flowers showed irregular bore holes. The larva fed on almost all seeds within the pod leaving behind only immature seeds.
- The shoot and fruit borer, *Leucinodes orbonalis* was regularly associated with brinjal crop. In okra, the spotted borer, *Earias vitella* was a serious pest.
- In rodents, *Rattus rattus andamanicus* and *Mus musculus castaneus* were the predominant species caught respectively in the Sherman traps and stickers laid out. Mean trap catch was about 3 adult rats per 10 sherman traps and 2.5 mice per 10 stickers. Infestation levels in rice grains ranged from 1.11 to 35.29 per cent.
- The study of pesticide residual analysis revealed that out of 355 samples of different crop samples collected from islands, 27 % were detected with different pesticides contents, out of which 12 % were detected with multiple residues.
- Mushroom park comprising of mushroom spawn production laboratory, spawning and cropping rooms was established for continuous spawn production and for farmers' capacity building under AICRP Mushroom project. Small scale house hold oyster mushroom cultivation technology has been transferred to farmers' of Calicut, South Andaman for ensuring nutritional security.

Natural Resource Management

- Direct wet seeding of rice (DWSR) has recorded 0.47 t/ha higher yields over transplanted rice (TPR) crop due to higher number of panicles production/unit area. In addition to the above, DWSR has matured 12 days earlier and captured more rain water than TPR.
- Nutrient omission studies in transplanted rice have indicated that yield penalties ranged from lowest of 7.6 (omission of K) to the highest of 60.7% (with NPK omission). Phosphorous was found most crucial for yield realization in the experimental soils.
- Weather data of 3 districts of Andaman & Nicobar Islands during the four *El Nino* years (2002, 2004, 2006 and 2009) indicated that Car Nicobar rainfall is impacted by *El Nino*, while the other two districts (North & Middle Andaman and South Andaman) recorded normal or excess rainfall during *El Nino* years.

- Weeds have incited a yield penalty of 47.3% in transplanted rice. Two hand weedings provided the best weed management and among herbicides, Penoxsulam + Cyhalofop proved promising. Bispyribac sodium failed to show its impact due to continuous rains following its application.
- Among the rice hybirds tested, KRH4 proved promising. Rice crop responded to recommended dose of nitrogen. KRH4 performed best even at lower levels of nitrogen fertilization.
- The microbial biomass carbon (MBC) and bacterial population were found significantly higher in mangrove soils followed by littoral forest, moist deciduous and agricultural soils. Isolated bacterial strains 3A and HS/2 with higher cellulase and IAA activity (1BF and 2BF) can be used for compost production and plant growth promotion.
- Using DSSAT forecasted rice yield for *kharif* 2015 as 3160 kg/ha. Using the models the dependency of rice yield on the weather parameters (1981 to 2013) maximum and minimum temperature, rainfall, maximum and minimum relative humidity was estimated.
- During 2015-16, 80 agromet bulletins in English and Hindi were issued through print and electronic media.
- For the registered 5200 farmers from South, North & Middle Andaman and Nicobar Island on mKISAN portal, SMS based agro-advisories were sent on every Tuesday and Friday in Hindi and English.
- Water quality studied by Simpson index method showed that ground water in the villages of old Kimious, Kimious, Sawai and Passa are being subjected to seawater intrusion. Raised bed and furrow system was found to reduce salinity of the coastal water logged areas.
- Study on status of heavy metals in marine and fresh water aquatic systems of the Neil Island indicated presence of selenium (0.33 to 0.82 mg kg^{-1}) and arsenic (0.05 to 2.35 mg kg^{-1}) and absence of Hg and Pb in fish samples. The highest concentration of As was found in *Clupeids*.
- The diversification of crops and enterprises in integrated farming system resulted in improved agricultural biodiversity measured by Simpson's species diversity index and value diversity index, increased to 0.811 and 0.794 as against zero in rice mono cropped areas.
- Studies on foliar application of 3% panchagavya on brinjal indicated significant increase in fruit yield per plant (824.7 g) over control (330.1 g). The effects were also observed on biochemical parameters like, total phenols, carotenoids, antioxidant activity and ascorbic acid content.
- Homestead farming system model comprising home garden (400 m^2), backyard poultry (20 no's), goat (2 no's) and composting for nutritional, income security and employment generation was developed using participatory approach in farmers' field at Car Nicobar.
- Soil and vegetable samples collected from major vegetable growing areas of the Island indicated the presence of residues of 6 and 7 compounds. The residues concentration in soil ranged from 2.0 to 95.0 µg kg^{-1} , while in vegetables ranged from 1.57 to 13.66 µg kg^{-1}. From the residue pattern found in soil and vegetables samples, it can be inferred that acephate and acetamirpid are more frequently used in the islands.
- Developed ready-to-serve (RTS) spiced tender coconut water and zinger product with better organoleptic qualities.
- Identified six marketing channels of which four channels accounted for >90 per cent of the trade. Among the eight vegetable crops selected for post harvest losses (PHL) estimation at farmer's level, cauliflower (8.01%) followed by french bean (7.2%) recorded the maximum losses. A survey revealed infection (76.4%), injury and infection (32.0%) as the major causes of PHL.

- Cultivation of pulse crops of pigeonpea, mungbean and urdbean under coconut plantations has improved the available nitrogen of soil by 29, 8 and 13 kg/ha over the initial level of 210 kg/ha.
- Sweet corn and baby corn with both cob and green fodder production were found potential alternatives to grain maize. Intercropping of Sweet corn and baby corn with urdbean was found to enhance the land equivalent ratio.
- Four yam bean cultivars tested have produced 15 t/ha of tubers on an average.

Animal Science

- The endangered native Nicobari fowl were revived through mass segregation, selection and propagation.
- Sorghum (CO-FS-29) was found superior with respect to total bio-mass yield and height of plant at harvest.
- *In-vitro* dietary exposures to bioactive components of herbs enhance the expression of TLR gene and systemic inflammatory immune response in chicks.
- Oil based *Aloe vera* herbal eye drops worked on par with antibiotics and could be an alternative to alleviate antimicrobial resistance in the treatment of conjunctivitis in poultry.
- Water supplement of aqueous extract of Neem and *Aloe vera* @ 3 ml per bird per day has hepatoprotective, hypocholestremic and anti hyper-glycemic effect in Nicobari fowl.
- Animal Disease Monitoring and Surveillance revealed that parasitism is the major disease in A & N Islands.
- Based on the LPB-ELISA post vaccinated percent protection for type O, A and Asia 1 were 73.12%, 87.91% and 86.66% respectively.
- Goat clusters have been established in South Andaman & Baratang for genetic improvement of Andaman Local Goat through selective breeding. Flock strength of 1606 has been registered for morphometiric and reproductive parameters.
- Propagation of native Nicobari fowl was done on community basis by farm women through improved rural poultry farming practices.

Fisheries Science

- Successful captive breeding of Lemon damsel fish, *Pomacentrus moluccensis* (Family: Pomacentridae; Sub Family: Pomacentrinae) for the first time in India have been achieved in MRL, ICAR-CIARI, Port Blair. The embryonic development stages based on the morphological characteristics and the time elapsing for each stage was recorded.
- Around 308 samples of freshwater fish and prawns, 95 samples of wild marine shrimps and 95 samples of groupers were collected from North and Middle Andaman district and South Andaman district for the screening of aquatic animal diseases. Marine fish parasites like Isopod from *Amblygaster sirm* and Nematodes (*Philometra sp.* and *Capillaria sp.*) from groupers were recorded.
- The structural variability of mangrove patches in downstream and upstream areas of Porlob-Jig Creek, Andaman & Nicobar Islands were assessed. Yerrata Zone was characterized by 12 species, dominated by *Rhizophora apiculata* and codominated by *Xylocarpus granatum* and Shyamkund Zone was characterized by 6 species with dominated by *B. gymnorrhiza* and codominated by *A. officinalis*. The existence of *Pemphis acidula* in the Andaman and Nicobar Islands has been reported after a lapse of 91 years from Sir William Peel Island of Ritche's Archipelago.
- The pantropical sea grass, *Halophila decipiens* (Hydrocharitaceae), a new record to the Andaman and Nicobar Islands, was reported from two locations viz., Scissostris Bay, Port Blair at 6–7 m deep and Neil Island at

10–12 m deep. The present report is an addition to the existing 10 sea grass species from the Islands. Seaweed species belonging to 27 genera under Chlorophyceae, Phaeophyceae and Rhodophyceae were documented from 5 survey sites in South Andaman district.

- *Halgerda dalanghita* (Fahey & Gosliner, 1999), a discodoridid nudibranch was reported from Havelock Island of Ritchie's Archipelago representing a new addition to the Opisthobranch fauna of India. Four species of marine finfishes, including *Sphyraena iburiensis*, *Nemipterus marginatus*, *Nemipterus nematophorus*, *Platycephalus ragadius* were also identified and documented under new location record for the Andaman and Nicobar Island. Shovel nosed lobster, *Thenus unimaculatus* was recorded for the first time from Andaman and Nicobar Islands. Sequences were also submitted in GenBank (KT362350-KT362354).

- A new species of freshwater prawn belonging to the genus *Macrobrachium* bate, 1868 (Decapoda: Palaemonidae), *Macrobrachium minispinata* has been described from South Andaman. The Holotype (CMFRI/MBM-ED.2.2.1.10) and Allotype (CMFRI/MBM-ED.2.2.1.10.1) specimens were submitted in the Marine Biodiversity Museum of ICAR-Central Marine Fisheries Research Institute, Cochin, Kerala. Also, a total of 38 species of freshwater finfishes were documented from various streams of Andaman, of which six species, including *Barbonymous gonionotus*, *Brachydanio rerio*, *Notopterus notopterus*, *Glossogobius sparsipapillos*, *Acentrogobius cyanomos* and *Gobiopterus sp.* were identified to be new record to the Andaman and Nicobar Islands.

Social Science

- Out Reach Centre of CIARI, supported by NABARD has taken need based technological application and training following group & participatory approach on high yielding varieties of rice, pulses, seed village and spices in Diglipur cluster of villages. Farmers clubs were formed to federate as producer group, beside facilitated Soil health card. In addition market behavior for pork, chevan, marine & fresh water fish was also studied.

- The study revealed that sixty one percent of vegetables comes to market from South Andaman and 39 percent from North & Middle Andaman. The net profit in percentage was more in marine fishes (54%) followed by vegetables (37%) and fresh water fishes (9%) per vendor per month of the market. The market efficiency ranged from 0.47 to 0.75 for vegetables, 0.64 to 0.74 for marine fishes and 0.69 to 0.71 for fresh water fishes. This indicates that though the market at both Bathu Basti and Junglighat are unregulated the marketing processes are stabilized.

Krishi Vigyan Kendra, South Andaman

- Krishi Vigyan Kendra, Port Blair conducted 26 training covering South and Little Andaman for the benefit of practicing farmers/ farmwomen, rural youth and extension functionaries.

- Ten Front Line Demonstration in enterprises *viz*. HYV of paddy, elephant foot yam, zinger, cucumber, brinjal, duck, green fodder, fish culture and IFS model, beside four On Farm Trial for assessment and refinement of the selected technology on agriculture and allied fields were conducted.

- To popularize the technologies seven radio talk through All India Radio and ten through Doordarshan Kendra were delivered. Twenty two demonstration on fodder under NIFTD, two capacity building under TSP and five days training on "Technologies for Improving Production of Agri-Horticultural Crops in Andaman and Nicobar Islands sponsored by High Value Agriculture, Directorate of Agriculture, Andaman and Nicobar Administration were conducted.

- KVK conducted ICAR-Foundation Day, International Year of Soil, World Soil Day, Jai Kisan Jai Vigyan and BNPIC at Ferrargunj to transfer the technological backstopping in agriculture and allied field for the benefit of the stakeholders/ farmers.

- Under National Initiative on Climate Resilient Agriculture (NICRA), water harvesting, recycling, desilting of farm ponds and bund raising of BBF, intervention of cost effective rain shelters, drought tolerant paddy (Sahbhagi dhan), and Naveen dhan, CIARI Poi selection for saline soil, CIARI AMA-Green and CIARI-AMA-Red drought tolerant leafy vegetables, fodder cultivation for sustainable livestock production, integrated fish farming, improved shelter management practices with well ventilated system as a means to resist extreme climatic variables for poultry, goatry and dairy animal, backyard poultry production with improved Nicobari and Vanraja birds, awareness on status & control of FMD, animal health camp and breed upgradation of local goats were conducted at adopted villages.

Krishi Vigyan Kendra, Car Nicobar

- Thirty one need based trainings were conducted in disciplines comprising of agronomy, animal science, horticulture, agriculture engineering, fisheries and social science wherein a total of 1099 tribal farmers including 450 female got benefited involving 70 days and 2289 trainee days.
- For assessment and refinement of technology relevant to Nicobar, a total of four On Farm Trial were successfully undertaken with participation of 22 tribal farmers. Further, six Front Line Demonstrations were also done with the active participation of 20 tribal farmers. A total of 366 extension activities were carried-out benefiting more than 1381 tribal farmers, students and other stakeholders for agricultural development in Nicobar district.
- KVK personnel were associated in implementation of technological options recommended by the host institute for Nicobar district in agricultural and allied fields and carried-out in-situ and ex-situ conservation and registration of indigenous germplasms of livestock and plants.
- For dissemination of relevant agricultural technologies Kisan Mela, Carnic fest, International Yoga Day, and Jai Kisan Jai Vigyan Diwas were used as the platform to sensitize the tribal farmers and other stakeholders.
- Under Mera Gaon Mera Gaurav adopted 5 villages at Car Nicobar viz. Mus, Small lapathy, Big Lapathy, Kinyuka and Malacca and Kinyuka under Saansad Adarsh Gram Yojana for developing agricultural sector. 50 Soil Health Cards were distributed.
- Under Tribal Sub Plan 3410 tribal farmers were empowered through trainings and critical inputs for livelihood.

Krishi Vigyan Kendra, North and Middle Andaman

- During the year KVK, North & Middle Andaman has conducted a total of 35 trainings in disciplines comprising of agronomy, horticulture, animal science, fisheries, agriculture engineering and home science to create awareness among farming community. A total of 1092 farmers including 429 women farmers got benefited from the trainings.
- Ten on Farm Trails (OFT) were successfully conducted at farmers field for assessment and refinement of technology during the year.
- Nine area specific need based Front Line demonstrations were undertaken in agriculture and allied disciplines.
- During Kisan Sammelan, Field days, Kisan goshthis and group meetings, 2801 farmers & farmwomen got benefitted. These activities have established and fostered close liaison, mutual trust and participation of farming communities in the programmes of KVK for enriching their farming knowledge.
- KVK celebrated World Soil Health Day, Women in Agriculture Day and National Science Day for enlighting the need based technologies for the betterment of farming community.

Tribal Sub Plan (TSP)

- Under TSP a total of 31 training programmes representing field of agriculture, horticulture, animal husbandry, fisheries, field crops, land resource management, post harvest, crop protection and value addition technologies were conducted for the benefit of the tribals in Nicobar District and Little Andaman.
- Effort has benefited a total of 1678 (981 males and 697 females) farmers spread across different villages of Little Andaman and Nicobar Islands.
- Tribal farmers have been provided with OBM engine, seeds and planting materials of improved varieties, livestock, farm tools, bio-control agents, sprayer, fencing materials for effective utilization and improving the productivity of the agri-horti-animal and fisheries sector.
- Community assets *viz*. hatchery for poultry egg incubator, community based fencing of homestead area, roofing materials for construction of pig shed, water storage tank, poultry shed and vermi-composting units were also established for the benefit of the tribal farming community.

Mera Gaon Mera Gaurav (My Village My Pride)

- MGMG was initiated by constituting 13 team covering 57 villages in all the three Districts of Andaman & Nicobar Islands ie (37 in South Andaman, 15 in North & Middle Andaman & 05 at Nicobar), involving 64 scientists representing multi disciplinary expertise. In addition 02 team were constituted for giving technology and back support at Institute level.
- As per the plan, baseline survey was conducted, problems both general and in agriculture field was identified and thereafter the respective team members carried out technological intervention in agriculture and allied field, training, field visit, diagnosis services, providing literature and conduct of other extension activities involving PRIs and KVKs for betterment of the target group in the adopted villages from October, 2015 to March, 2016.

INTRODUCTION

ICAR -Central Island Agricultural Research Institute (CIARI)

ICAR - Central Island Agricultural Research Institute, is multidisciplinary Institute that caters to the specific needs of agricultural research and development for enhancing the productivity and production of crops, livestock and fishery to bridge the gap between requirement and the local production since 23rd June 1978. It is located at 6°45'North & 13°41'North Latitude and 92o12' East & 93°57' East Longitude, at Port Blair of A & N Islands. The research activities are facilitated by five divisions, one section and technology dissemination through three Krishi Vigyan Kendra's & one Out Reach Centre covering all the three districts of the Island. Flagship programme on Integrated agriculture system for Tropical Island, Establishment of Composite bio-security & quarantine facility& Tribal Sub Plan are other R & D programmes.

During the journey of thirty nine years, it has several accomplishments ,like development of thirty one crop varieties, beside dual purpose Nicobari fowl, and successful captive breeding of Sebae anemone fish, *Amphiprion sebae*, Skunk anemone fish, *Amphiprion akallopisos,* Red Saddle anemone fish, *Amphiprion ephippium* for in ANI. *Pemphis acidula* Forst. (Lythraceae) a species of mangrove was rediscovered after a lapse of 91 years.44 sponges species reported for the first time. Three new species of fruit fly, *Bactrocera zonata*, *B. correcta* and *B. caudata and a* rodent *Bandicota bengalensis* was reported as new records from Andaman Islands.Custodian farmers and communities of biodiversity conservation and utilization in Andaman & Nicobar Islands for Andaman Coconut, Nicobari Aloo, Khoon Phal, Blue mango, Noni, Khushbayya rice, Black Burma, Mushley, Nyawin, White Burma, Nicobari fowl, Nicobari pig and Teressa goat were identified and recognized for the first time.

More than 50% of the research articles are published in journals with NAAS rating above 5, beside 62 research papers have been published with NAAS rating 7.0 and above during the period 2010-11 to 2015-16. Impressive number of books and database on the biodiversity of soil, crop, livestock, butterflies, mangroves, corals and fish genetic resources of this Islands have also been published.

The remarkable impact has been made through transfer and adoption of the technologies *viz.*, Integrated farming system, Broad Bed and Furrow system, Homestead based Integrated farming system for tribal's, Protected cultivation, Seed village for providing truthfully labelled seeds of rice, HYVs of rice, Satellite fish nursery for production of fresh water IMC seeds, Composite fish culture, Mud crab fattening, Nicobari fowl & Pekin duck under Backyard, Water users association, Weather based agromet advisories, Potential fishing zone forecasts and, Micro business modules. Besides the restoration of degraded areas through different livelihood options, land shaping NICRA interventions and target programmes for the tribals has brought visible impact on increase in production, productivity and improvement in livelihood.

With the accumulated experience and expertise in Island agriculture, the Institute is envisioned to make a major stride in coming years towards our cherished goal of emerging as the Institute of Excellence on Tropical Island Agriculture in the Asian countries.

Mission

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

Vision

The Institute envisages developing the 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.

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

Thrust Areas for XII Plan

Broad research programmes for the XII Plan are as under

- Characterization and bio-prospecting of natural Island bio-resources
- Climate proofing Island agriculture for improving productivity
- Development of harvest - post-harvest management practices and value addition
- Policy support research for agriculture development in the Islands

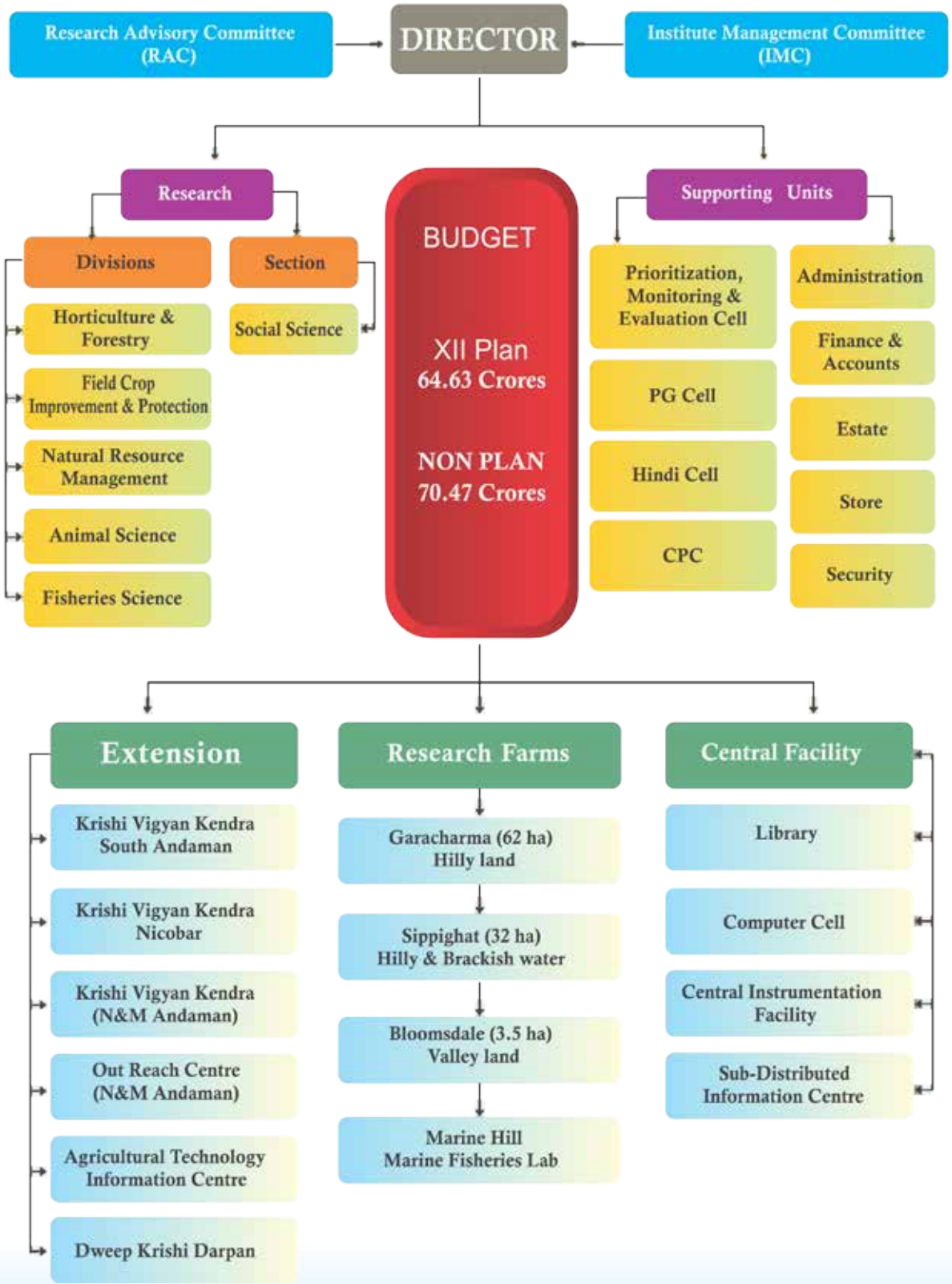
Beside three other programmes are

- Flagship programme on Integrated agriculture system for eco-regions
- Establishment of composite bio-security & quarantine facility
- Tribal sub plan

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.

ORGANOGRAM


Research Advisory Committee (RAC)
DIRECTOR
Institute Management Committee (IMC)
Research
Divisions
Horticulture & Forestry
Field Crop Improvement & Protection
Natural Resource Management
Animal Science
Fisheries Science
Section
Social Science
BUDGET
XII Plan
64.63 Crores
NON PLAN
70.47 Crores
Supporting Units
Prioritization, Monitoring & Evaluation Cell
PG Cell
Hindi Cell
CPC
Administration
Finance & Accounts
Estate
Store
Security
Extension
Krishi Vigyan Kendra South Andaman
Krishi Vigyan Kendra Nicobar
Krishi Vigyan Kendra (N&M Andaman)
Out Reach Centre (N&M Andaman)
Agricultural Technology Information Centre
Dweep Krishi Darpan
Research Farms
Garacharma (62 ha) Hilly land
Sippighat (32 ha) Hilly & Brackish water
Bloomsdale (3.5 ha) Valley land
Marine Hill Marine Fisheries Lab
Central Facility
Library
Computer Cell
Central Instrumentation Facility
Sub-Distributed Information Centre

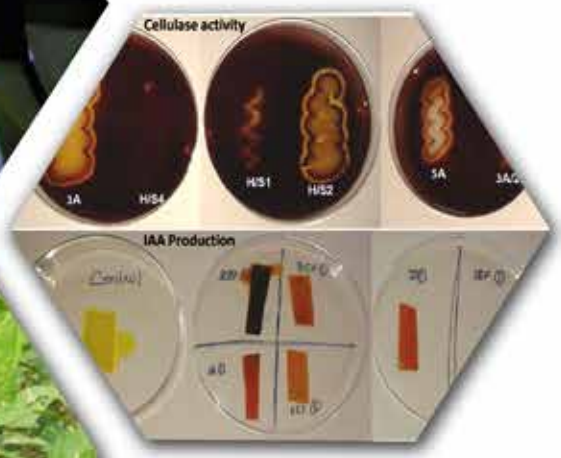
STAFF POSITION

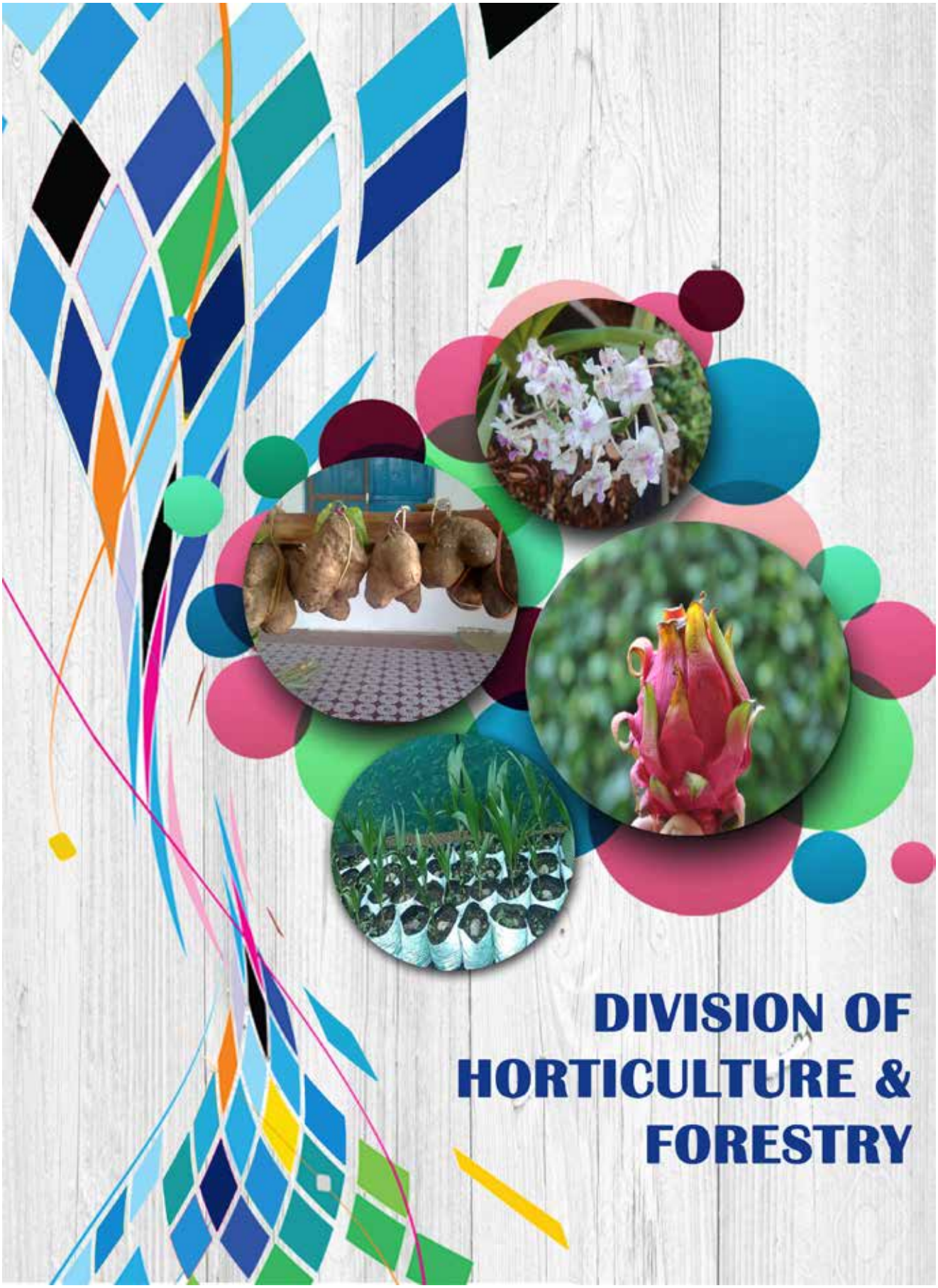
Sl. No.	Category	Sanctioned	Filled
1.	Scientific	50+ 1	36+1
2.	Technical	43	29
3.	Administrative	27	19
4.	Skilled Supporting Staff	78	63
Total		**198+1**	**147+1**

BUDGET UTILIZATION DURING 2015-2016

Head of Account	Plan (in Lakhs)		Non-Plan (in Lakhs) including IRGS	
Particulars	**Sanction**	**Expenditure**	**Sanction**	**Expenditure**
Establishment charges	-	-	1188.20	1184.68
Travelling allowances	25.0	25.0	15.0	15.0
Recurring contingencies	175.0	175.0	149.0	150.49
Works (Main)	161.50	161.50	29.00	28.22
Equipment, furniture & livestock	187.00	187.00	3.00	2.99
Books (Library)	1.50	1.32	-	-
HRD/fellowships	2.0	2.0	2.75	2.69
TSP	98.0	45.85	-	-
Pension	-	-	100.00	100.00
Total	**650.00**	**597.67**	**1507.86**	**1503.87**
P. Loans & Advances	**-**	**-**	**20.00**	**19.80**

RESEARCH PROGRAMMES





DIVISION OF HORTICULTURE & FORESTRY

Development of Production Technology for Ornamental Crops in Bay Islands

V. Baskaran, K. Abirami and *A.Velmurugan*

Varietal evaluation of new entries of gladiolus

Five new varieties of gladiolus namely Novalux, Anjali, Chandini, Summer Rose and Sunayna were evaluated for their growth and flowering performance. Maximum spike length was recorded in Novalux (92.0 cm). Maximum floret size (12.0 cm) and number of florets per spike (17) were observed in Cv. Sunayna (Plate 1).

Plate 1: Field view of best performing gladiolus cultivar Sunayna

In gladiolus propagated through corms and cormels, the vegetative and floral characteristics were better in corms than cormels (Fig 1).

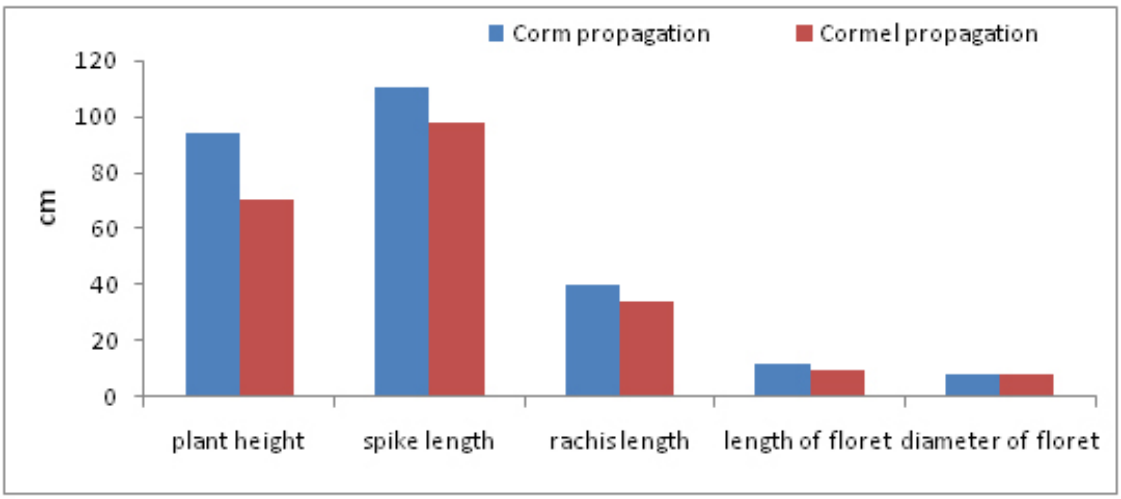


Fig 1: Growth performance of gladiolus propagated through corms and cormels

Varietal evaluation of tuberose

Thirteen varieties of tuberose were evaluated for their growth and yield performance for the second year. Early flowering was recorded in Bidhan Rajini 1 followed by Bidhan Rajini 2. Regular and round the year flowering was observed in Vaibhav and Subhasini, whereas late flowering was observed in Swarnarekha (Plate 2).

Plate 2: Flower characteristics of different varieties of tuberose

Varietal evaluation in new entries of chrysanthemum

Six new varieties of chrysanthemum namely Flirt, Yellow Gold, Pusa Centenary, Tata Century, Yellow Star and Nilima were evaluated for their growth and flowering performance. Early flowering was recorded in Flirt (103 days) followed by Yellow gold (120 days) and Yellow Star (125 days). Maximum number of flowers per plant (72.5) and duration of flowers (46.4 days) were observed in Cv. Yellow Gold and maximum flower size (8.8 cm) was recorded in Pusa Centenary.

Collection and characterization of new crossandra species

Along with the cultivated type of *Crossandra infundibuliformis*, two other *Crossandra sp* like *Crossandra nilotica and Crossandra undulifolia* were identified (Plate 3). The growth habit of *Crossandra nilotica* was dwarf and is best suitable as pot plant. Number of spikes per plant were maximum in *Crossandra nilotica* (14.3), whereas the number of flowers per spike were maximum in *Crossandra infundibuliformis* (31.6) (Fig.2).

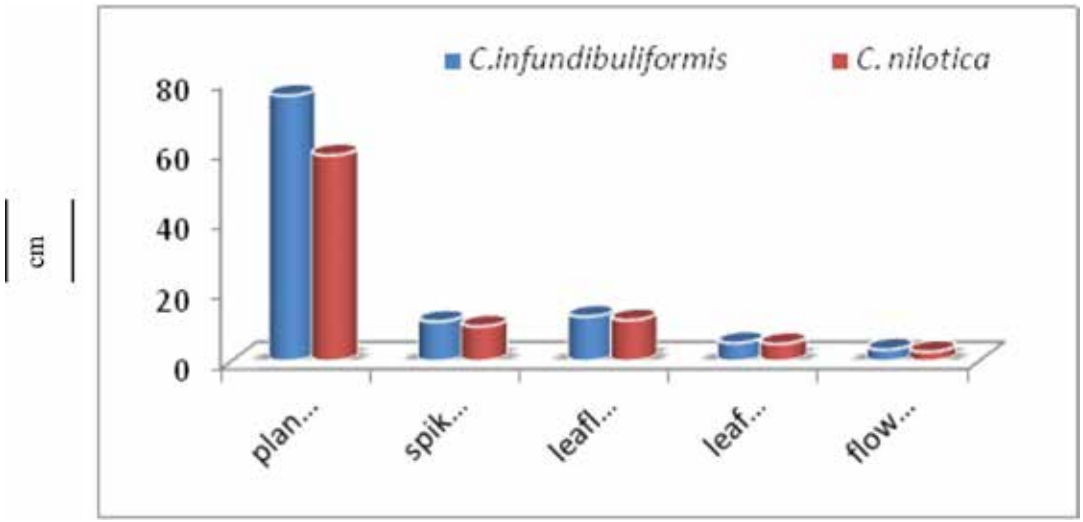


Fig.2: Growth characteristics of *Crossandra infundibuliformis* and *C. nilotica*

Crossandra nilotica ***C. infundibuliformis*** ***C. undulifolia***

Plate 3: *Crossandra Species*

Characteristics of different species of crossandra

Propagation studies in *crossandra*

Crossandra is normally propagated through seeds. Seed viability is found to be less due to pest attack in the storage period, hence, vegetative propagation of *crossandra* using cuttings and air layering was standardized. In the cutting method of propagation, maximum survival percentage was observed in terminal cuttings (100%) than the middle and basal cuttings. Air layering in *crossandra* gave 90% success (Plate 4).

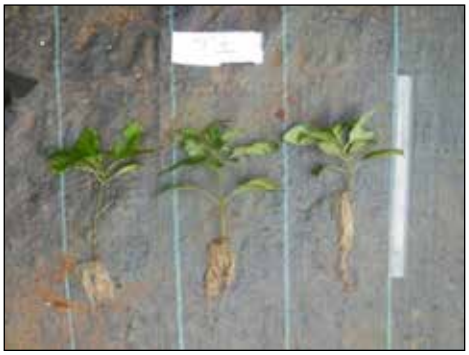


Plate 4: Propagation by terminal cuttings of *crossandra*

Varietal evaluation of gerbera and anthurium grown under protected condition

Among the 15 varieties of gerbera evaluated under polyhouse, cv. Palm Beach (43.2) recorded maximum number of flowers/plant/year (Plate 5) followed by *cv. Marinilla* (34.4). Among the 40 genotypes of anthurium evaluated, cv. Tropical Red recorded maximum number of flowers per plant (5.2) per year (Plate 6).

Plate 5: Cultivar Palm Beach Plate 6: Cultivar Tropical Red

Feasibility studies on growing fillers – Golden rod

Golden rod (*Solidago canadensis*), is used as a filler in bouquets and flower arrangements (Plate 7). A study was conducted to study the feasibility of growing this crop under Island condition. The crop performed well in the island condition with average number of spikes per plant (5.8) and stalk length (37.9 cm) respectively.

Plate 7: Field evaluation of golden rod

Feasibility studies on growing cocks comb (*Celosia argentia*)

Study was conducted on growing suitability of cocks comb in the Island (Plate 8). The crop raised in experimental field recorded good growth with average plant height and branches of 123.6 cm and 31.5 respectively. The number of flowers per plant recorded was 25.6 and days for flowering was 27.5 days after transplanting.

Plate 8: Field view of cocks comb in the experimental field

A new production technology: modified ridges and furrow system with reconstituted media

A new technology has been standardized for production of high value flower crops. Ridges and furrows were made and covered with weed mat. Reconstituted media with soil and organic substrate were filled in the furrows.

Plate 9: Modified ridge and furrow system filled with reconstituted media

Planting was done in the furrows filled with the reconstituted media. The growth and yield performance of the flowers were better when compared with other treatments like ridges and furrow method with or without mulching (Plate 9).

First report of the pest attack in indigenous orchid *Eulophia andamanensis*

A new pest has been identified which attacks the indigenous orchid *Eulophia andamanensis* as *Lema sp* and is reported for the first time in the Island. In the infested flower spike, the florets dropped which reduces the market value of the flowers. The adults of *Lema sp* forms a frothy white mass in the spike in which it lays its eggs. The larval and adult stages of the insect damages the flower spikes (Plate 10).

Plate 10: *Lema* beetle attack in *Eulophia andamanensis*

Mass multiplication of anthurium

Tissue culture experiment was initiated in anthurium for mass multiplication. Among the various explants tried, maximum sprouting was observed in apical bud when inoculated in the MS media supplemented with growth regulators like BAP (2 mg/l) and kinetin (0.5 mg/l) (Plate 11).

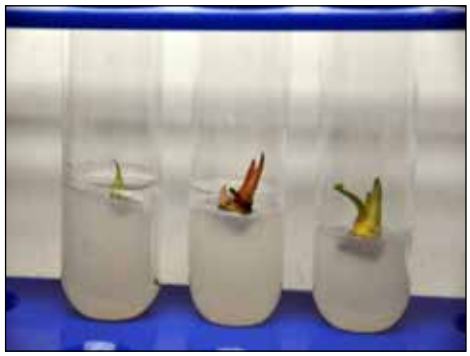


Plate 11: Apical bud sprouts of anthurium in MS media

All India Co-ordinated Research Project (AICRP) on Flowers

V. Baskaran

Testing new genotypes of china aster

Among seven varieties of china aster evaluated, local white performed well (Plate 12) when compared to other varieties with maximum height (40.2 cm), number of branches (11.5), number of days for bud initiation to flowering (9.3 days), number of flowers per plant (27.0), size of flower (6.7cm) and flower weight (3.3 g).

Plate 12: Best performing china aster variety Local white

Floriculture Based Sustainable Livelihood Model for Tropical Island Condition

V. Baskaran, K. Abirami, A. Velmurugan and *N. Bommayasamy*

This project aims at intensive cultivation of loose flowers for round the year flower production under polyhouse condition for the livelihood security of the farmers. The propagation experiment on jasmine was standardized in a modified propagation structure and the cuttings were planted in a trench filled with rooting media. The success percentages of jasmine cuttings (90%) were high in this type of propagation structure (Plate 13). Air layering was also successful in jasmine (Plate 14).

Plate 13: Successful rooted cuttings of *J. sambac*

Plate14: Roots formed in air layered jasmine

A new propagation technique in jasmine

A new technique of propagation in jasmine has been standardised using leaf as the propagule. This is a new technology standardized for the first time in *J.sambac* using root trainers and modified substrate. Maximum success percentage and early sprouting were observed in the modified propagation structure than the open condition (Plate 15).

Plate 15: Root and shoot formation in propagation from leaf propagules in *J. sambac*

Polyhouse cultivation of tuberose

Tuberose cultivation was successful under polyhouse condition (Plate 16). First spike emergence was observed in 47 days which is much earlier than open field cultivation. The duration of spike was 13.2 days with spike length 98.4 cm, rachis length 28.5 cm and number of florets per spike (29) respectively.

Plate 16: Luxurious crop of tuberose grown in polyhouse condition

Collection, Characterization and Agro-technique Standardization of Fruit Crops of Andaman & Nicobar Islands

K. Abirami, V. Baskaran V. Damodaran and T. Subramani

Effect of organic nutrients on growth and yield of Nendran variety of banana

An experiment was conducted to study the effect of organic nutrients on growth and yield of Nendran variety of banana with eight different combinations of treatments with organic nutrients. Among all the treatments the treatment combination of FYM, vermicompost, coir compost and bio fertilizers recorded maximum bunch weight (13.8 Kg/ bunch), weight of second hand (2.08 Kg), number of hands per bunch (07) with high TSS (13.9^{o}B) and acidity (0.1%) (Plate 17).

Plate 17: Performance of Nendran variety of banana in field

Collection, conservation and evaluation of dragon fruit

Dragon fruit also known as pitaya (*Hylocereus sp)* is a fast growing perennial vine cactus species. It is the most nutritious and wonderful fruit grown in the tropics. Six different accessions of dragon fruit namely Thailand Red, Thailand White, Malayan Yellow, Malayan Red, Andhra Pradesh 1 and Tamil Nadu 1 were collected and raised on concrete pillars which were constructed at a spacing of 3m x 3m. Four plants per pillar were erected and the growth performance was observed (Plate 18). Among the different accessions the growth rate was maximum in the Thailand Red accession (8.2 cm per week).

Plate 18: Dragon fruit experimental block at Garacharma farm

For the first time in the Island Anthracnose disease was observed in dragon fruit at Garacharma experimental field (Plate 19) morphologically identified as *Colletotrichum gleosporoides* (Plate 20 & 21). Further molecular characterization of the pathogen based on ITS and B tubilin genes are under progress.

Plate 19: Symptoms of anthracnose disease in dragon fruit

Plate 20: Mycelial growth of *Colletotrichum sp*

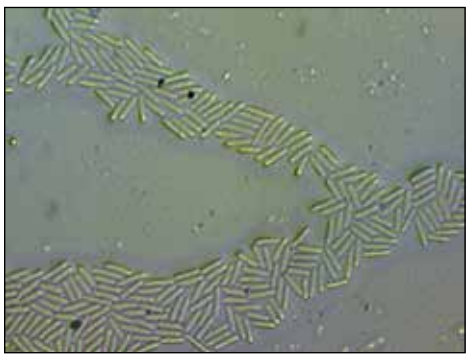


Plate 21*: Colletotrichum sp* isolated from dragon fruit

Mealy bug infestation was also noticed in dragon fruit in the experimental field at Garacharma (Plate 22) and identification of the species is under progress.

Plate 22: Mealy bug infestation in dragon fruit

Collection and evaluation of edible cacti

Cactus (*Opuntia ficusindia*) has been recently introduced in India and commercially exploited as fruit, vegetable, forage, energy and medicinal crop. Three best performing clones of edible cacti namely 1270, 1271 and 1280 were procured from CSSRI, Karnal for conservation and evaluation at CIARI (Plate 23). Among the three clones, survival percentage was high in the clone 1280 as disease infection was less when compared to other accessions (Plate 24). Four months after planting, maximum height (97.1 cm) was recorded in the clone 1280 and maximum numbers of cladodes (07 Nos.) in the clone 1270. Infestation of snails on edible cacti is shown in Plate 25.

Plate 23 & 24 : Clones of edible cacti in the field

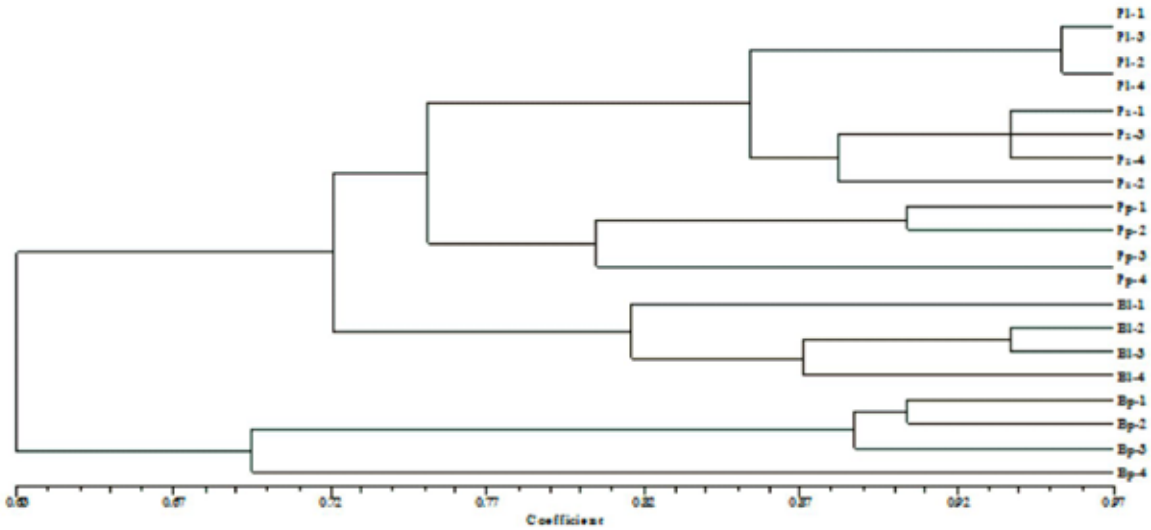
Plate 25: Infestation of snails

Collection and Evaluation of Medicinal Plants of Bay Islands

K. Abirami, V. Baskaran and *V.Damodaran*

Genetic diversity analysis of different piper species of the Island

The genetic diversity studies using ISSR markers in *Piper sp* collected from different geographical locations revealed that the ISSR marker could group e different species of the family piperaceae into two major clusters. One cluster comprises of the genotypes of *Piper nigrum* (Black pepper) collections from different regions of South Andaman, which is distinct from the other *Piper sp*. In other cluster grouped of the four species *Peperonia pellucida is* clustered with *Piper longum* and *Piper sarmentosam* and *Piper betle* is clustered together with *Piper longum*, *Piper sarmentosam and Peperonia pellucida.* Also the variability studies revealed that the ISSR marker could group the genotypes within the species based on their geographical origin (Fig.3).



Key: Pl:Piper longum; Ps- Piper sarmentosum; Pp- Piper pellucidum; Bp- Piper nigrum

Fig.3: Dendrogram of the genetic relationship among Piper sp of South Andaman by ISSR marker

Phytochemical analysis of kalmegh (*Andrographis paniculata)*

The phytochemical analysis of the leaves and stems of this medicinal herb showed that the phenolic content was high in the stems (1719.2 mg/100g), when compared with leaves (1319.2 g/100g) in methanolic extract. The flavonoids content was high in leaves (4028.85 mg/100 g) than the stems (30071.4 mg/100g). Among the different antioxidant methods analyzed, the DPPH method showed high antioxidant content in kalmegh stems (323.3 mg/100g) than the leaves (256.7 mg/100g). There was a steady increase in the inhibition capacity from 30.74% to 84.18% with the increase in concentration (50 µg/ml to 1000 µg/ml) which establishes the dose dependency of the extract in scavenging free radicals. With respect to Nitric oxide and metal chelating activity there is no significant difference between leaf and the stem with the absorbance. The andrographolide content was anlaysed for both leaves and stems and it was found to be maximum in leaves (3.49%) than the stems (1.60 %) (Fig.4).

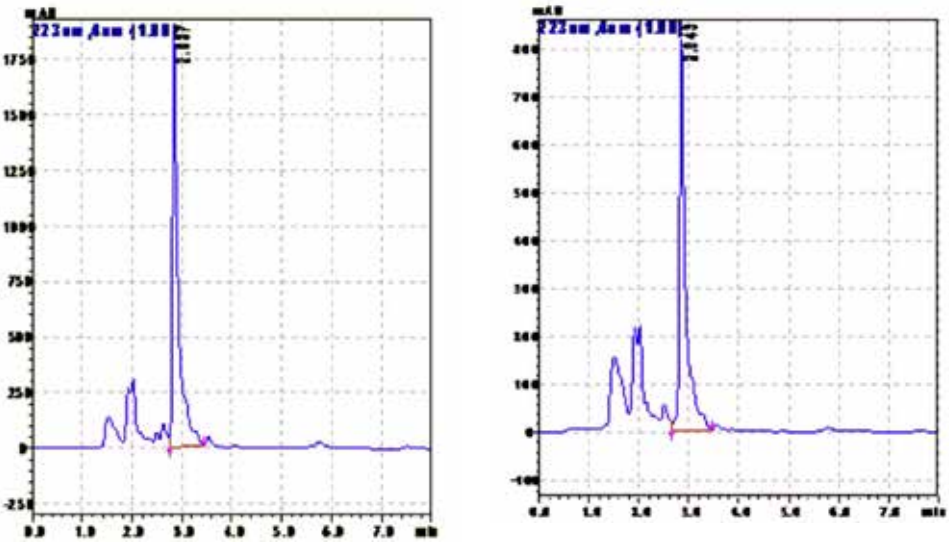


Fig.4: HPLC chromatogram of andrographolide content in leaves (left) and stems(right) of *A.paniculata*

Phytochemical analysis in black turmeric (*Curcuma caesia)*

Curcuma caesia known as black turmeric or Kalihaldi is an endangered species in many parts of the country due to over exploitation but distribution of this species is observed in Andaman Islands. The characteristic feature of this species is the presence of bluish black tinge in the rhizome (Plate 26). This species is rich in medicinal properties and used in cosmetic industry. The phytochemical analysis revealed that the rhizomes were rich in flavonoids (4371 mg/100 g). The highest antioxidant content was recorded by DPPH method (886.7 mg/100 g) when compared with the other method of analysis like H_2O_2 (64.9 mg/100g), FRAP (301.3 mg/100g) and MCA (38.5 mg/100g) respectively.

Plate 26: Bluish black rhizomes of *curcuma caesia*

Antioxidant activity of *Gloriosa superba* and *Piper sarmentosum*

Gloriosa superba is an important medicinal plant that is widely distributed in Andaman group of Islands and has high potential for industrial exploitation. Among the tuber and seed sample analyzed from different geographical locations of the Island it was found that the seeds of Hutbay were rich in total phenols (24.16 mg/100g) and the antioxidant content (276 mg/100g) was high in tubers of Hut bay by DPPH method (276 mg/100g). However, Nitric Oxide scavenging activity was highest (3460 mg/100g) in tubers of Rangat collection (Fig.5). The analysis of phytochemicals in spikes and roots of *Piper sarmentosum* showed that the spikes are rich in phenols and antioxidant content than the roots.

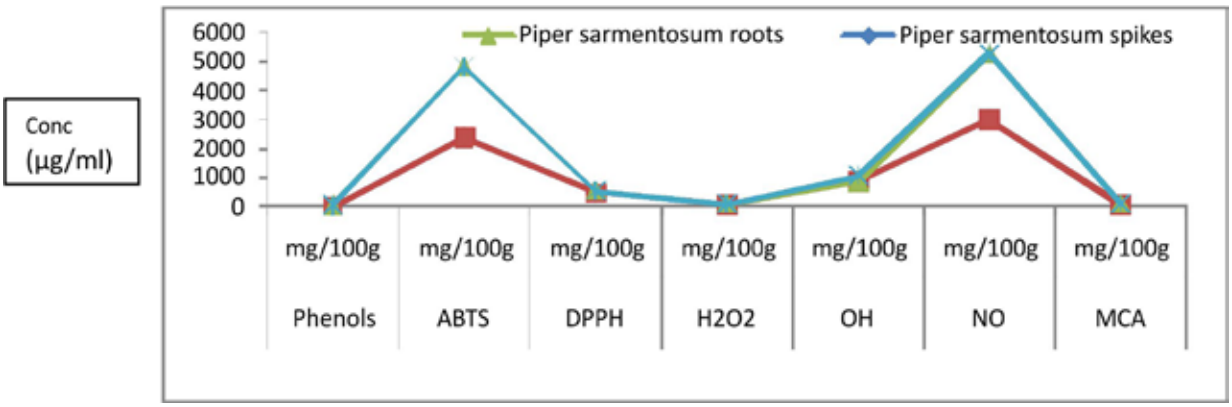


Fig.5: Phytochemical analysis in roots and spikes of *Piper sarmentosum*

All India Coordinated Research Project (AICRP) on Fruits

K. Abirami

Augmentation and evaluation of germplasm in mango

Fifteen local polyembryonic accessions were collected from South and North Andaman and their morphological characters were recorded based on the descriptors (Plate 27). The seedling growth characters were recorded from different polyembryonic accessions. The extent of polyembryony varied from 2 to 4 seedlings per stone in the accessions. Maximum plant height of the polyembryonic seedling was recorded in Neil 2 (21.8 cm) followed by Manjeri 1 (20.6 cm) six months after planting.

Plate 27: Different polyembryonic collections from Neil Island, South Andaman

CSS-(MIDH) National Horticulture Mission Scheme on Spices

K. Abirami and *V. Damodaran*

Production of quality planting material of spices

The quality planting materials of black pepper (30000 Nos.), clove (6000 Nos.), nutmeg (3800 Nos.), cinnamon (8000 Nos.), ginger (600 kg) and turmeric (400 Kg)were produced 430 Kg of ginger and 300 Kg of turmeric were multiplied and distributed to the farmers of Andaman and Nicobar Islands. The other spices distributed were black pepper (25000 Nos), clove (4000 Nos), cinnamon (4500 Nos) and nutmeg (1800 Nos) in South and North Andaman (Plate 28).

Plate 28: Distribution of planting material of spices during training programme

Technology demonstration programmes

Front line demonstration programmes were taken up in farmers field on organic production of ginger in Andaman and Nicobar Islands. One FLD each at Harminder Bay, one each at Kamorta, Kadamtala, Diglipur, 2 at Car Nicobar and

7 at South Andaman were taken. On an average the farmers recorded a yield of about 80- 100 t/ha of ginger in organic cultivation. Five FLDs were taken organic cultivation of turmeric in South Andaman and the farmers recorded an average yield of 12-16 t/ha (Plate 29) . One FLD on black pepper cultivation was taken in farmer's field at Rangachang.

Plate 29: Demonstration of organic cultivation of ginger and turmeric at Sippighat farm

Effect of organic treatments in plug tray production of turmeric transplants

The planting of transplants instead of seed rhizomes is of recent practice and the technology has been standardized using plug trays. This technology in organic method will be of high utility in the Island to save the planting material and for healthy planting material production. The sprouted rhizome bits embedded in coir pith bed were planted in protrays containing organic media. The combination of cocopeat, FYM, vermicompost in the ratio of 1:1:1 along with *Trichoderma* and VAM treatment recorded early sprouting (7.3 days) and maximum plant height (25.8 cm) combined with the foliar spray treatments of panchagavya, jeevamrutham and humic acid. The turmeric transplants were ready for planting in the main field after 40 days in this particular treatment (Plate 30).

Rhizome bits with single node sown in coir pith bed bed for sprouting

Sprouted rhizome bits planted in protrays

Turmeric transplants ready for planting in main field

Plate 30: Organic treatments in plug tray production of turmeric transplants

CRP on Agro-biodiversity
Identification of bacterial wilt resistant brinjal (CIARI Brinjal 5)

V. Baskaran, K. Abirami, K. Sakthivel, N, P. Simhachalam, N.Bommayasamy, R.K. Gautam and *S. Dam Roy*

CIARI brinjal 5 is the genotype identified by selection from the local germplasm collection. The plant is tall with semi spreading habit and smooth stem. The leaves are dark green in colour with purple veins. Trials were conducted for screening the genotype for bacterial wilt resistance under glasshouse conditions with Pusa Purple Long and CARI brinjal 1 as local check. The results revealed that the selected genotype CIARI brinjal 5 showed complete resistance when compared with susceptible check, Pusa Purple Long, whereas the disease incidence was 100% (upon 10 days after inoculation with 10^8 cfu/ml colonies by soil inoculation technique). The CARI brinjal 1 plants also showed susceptibility to bacterial wilt (Plate 31).

Plate 31: Bacterial wilt resistant brinjal identification

Glasshouse screening for bacterial resistance by artificial inoculation of pathogen

A field evaluation trial was conducted with the check variety Pusa Purple Long. The survival percentage of Pusa Purple Long was only 5% whereas CARI brinjal had 80% and CIARI brinjal 5 (100% survival) respectively (Plate 32 & 33).

Plate 32: Field view of the new brinjal genotype CIARI brinjal 5

Pusa Purple Long | CARI Brinjal 1 | CARI Brinjal 5

Plate 33: Field evaluation trial on brinjal

Development and Evaluation of Silvipasture System under Coconut Plantation in Tropical Island Condition

I.Jaisankar, T. P. Swarnam and *V. Damodaran*

Nutrition is the vital aspect in livestock production. The cultivable fodder area is only 10 ha which is insufficient to meet the green fodder requirement of the existing population of cattle in the Islands. The increase in population of Bay Islands accompanied by the improvement in general living standards led to the demand for dairy products thus led to intensive animal rearing and huge fodder requirement. The green fodder is deficit about 99% followed by concentrates (97%). Due to heavy rains for about a period of eight months, green fodder cultivation is difficult. Similarly, cereals, which can be used as source of feed is also not possible. The only option for the islanders is to establish suitable plantation based horti-silvi pastural systems for getting higher fodder production throughout the year by utilizing the residual moisture and space under coconut plantation. Hence, to evaluate the biomass production potential of different horti-silvi pastural systems an experiment was conducted with the following treatments, T_1 :Coconut, T_2 : *Leucaena leucocephala*, T_3: *Sesbania grandiflora*, T_4: *Stylosanthes scabra*, T_5:Desmanthus, T_6:Coconut + *Leucaena leucocephala,* T_7: Coconut+*Sesbania grandiflora,*T_8:Coconut+*Stylosanthes scabra,*T_9:Coconut+Desmanthus, T_{10}:Coconut + *Leucaena leucocephala* + *Stylosanthes scabra,*T_{11}:Coconut + *Sesbania grandiflora* + *Stylosanthes scabra,* T_{12}: Coconut + *Leucaena leucocephala* + Desmanthus, T_{13}:Coconut + *Leucaena leucocephala* + *Sesbania grandiflora* + *Stylosanthes scabra* + Desmanthus, T_{14}:Coconut + *Sesbania grandiflora* + Desmanthus in a randomized block design with two replication. The experiment was initiated at Sipighat Research Farm and Garacharma Research Farm of the Institute in the month of August 2015. Initial soil samples were collected from Horti silvi pasture field and analysed for total soil nutrients {N (3.1g /Kg), P (1.0 g /Kg), K (0.6 g /Kg), OC (1.65%), pH (4.8) and Ec (0.01 dSm^{-1})}. Germination percentage and gap filling of the crops have been carried out. The growth observations of intercrops were recorded at bimonthly interval. The observations showed that at the initial period of growth there was no significant difference among the intercrop growth. The maximum height was recorded in *Stylosanthus scabra* (106.28 cm) followed by Desmanthus (82.16 cm) after 6 months. The soil nutrients were analysed after 6 month and the results showed that the maximum available soil nutrients of N (163.15kg/ha), P (8.305 kg/ha), K (283.5 kg/ha) and Organic carbon (1.64%) was observed in T_{13} treatment followed by T_{10} , the same trend was also observed in soil enzymatic activities (Plate 34)

Plate 34: Field view of silvipasture system under coconut plantation at Sippighat Research farm

Development and Standardization of DUS Characteristics Procedures for Noni (*Morinda citrifolia* L.)

I.Jaisankar and *A.K.Singh*

During the period, 36 morphological descriptors of fruits from 33 accessions of *Morinda citrifolia* were analyzed and documented. Based on these descriptors the guidelines for the DUS characterization of the Noni trees were developed which includes 12 phenological characters of the tree *viz.,* tree canopy, tree height (cm), trunk diameter (cm) , bark surface, internode length (cm), leaf shape, leaf apex shape, leaf lamina colour, leaf length (cm), leaf width (cm), leaf petiole length (cm), leaf petiole colour and 24 flower and fruit characteristics like., flower colour, position of stigma in relation to another, presence of pistillate florets, flower length (cm), fruit colour , fruit surface texture, fruit shape, fruit length (cm), fruit width (cm) , fruit size (length X width), fruit weight (g), fruit bunching, fruit base shape on mature fruit, colour of floral eye ring, peduncle (fruit stalk) length positioning at maturity, length of peduncle, days to harvest from flowering to fruit ripening, fruit flesh colour, average no. of seeds per fruit, seed length (cm), seed width (cm), 100 seed weight (g), seed colour and seed wing. The line diagram of each parameter were drawn and documented.

Four varieties developed by ICAR-CIARI were released by Institute Variety Release committee for popularization among the farming communities of Islands as well as mainland India. These varieties of Noni *viz.,* CARI Sampada, CARI Rakshak, CARI Samridhi and CARI Sanjivini were also presented to State variety release committee for final approval from state authority.

All India Coordinated Research Project (AICRP) on Vegetable Crops

I.Jaisankar and *Divya Parisa*

In 2015-16, eight trials *viz.,* AVT-I trial of Hybrid Okra, AVT-II trial of Hybrid Okra, AVT-II trial of brinjal bacterial wilt, AVT-II trial of chilli, AVT-I trial of tomato (determinate), AVT-I trial of tomato (TOLCV), AVT-II trial of tomato (determinate) and IET trial of tomato (TOLCV) were received by the ICAR-CIARI, Port Blair centre.

Hybrid Okra

In AVT-I, the highest yield was recorded from 2014/OKBHYB-3 (7.02 t/ha) followed by Arka Anamika (C) (6.72 t/ha) and 2014/OKBHYB-5 (6.71 t/ha). In AVT-II trial, 2013/OKHYB-8 (8.66 t/ha), 2013/OKHYB-6 (6.99 t/ha) and 2013/OKHYB-3 (6.27 t/ha) were promising entries which outperformed national checks HOK-152 (5.32 t/ha) and Arka Anamika (5.94 t/ha).

Brinjal

In AVT-II bacterial wilt trial, significantly highest yield was recorded from 2013/BRBW RES-4 (15.06 t/ha) followed by 2013/BRBW RES-1 (13.88 t/ha). These entries out performed with the national susceptible checks [Arka Kusumakar (10.18 t/ha), PPL (11.34 t/ha)] and resistant checks [Arka Nidhi (12.03 t/ha), SM- 6-7 (14.20].

Chilli

In AVT- II trial, among the entries the highest yield of 3.84 t/ha was recorded in 2013/CHIVAR-2 followed by 2013/CHIVAR-4 (3.35 t/ha), 2013/CHIVAR-1 (3.33 t/ha) these varieties out performed with the national check LCA-334 (2.89 t/ ha).

Tomato

The check entry H-86 recorded highest yield of 121.7 q/ha in AVT – I tomato (determinate) trial followed by 2014/TODVAR-4 (115.6 q/ha). In AVT - I tomato (TOLCV) trial the highest yield was recorded in 2014/TOLCVRES-2 (153.07 q/ha) followed by 2014/TOLCVRES-3 (137.53 q/ha). In AVT – II tomato determinate trial highest yield of 185.83 q/ha was recorded in 2013/TODVAR-4 followed by 2013/TODVAR-3 (172.20 q/ha). In IET tomato TOLCV trial the highest yield was recorded in 2015/TOLCVRES-2 (120.67 q/ha) followed by H- 24 (120.40 q/ha) while the lowest yield of 97.67 q/ha was recorded in the national check Punjab Chhuhara.

Development of Dwarf and High yielding Varieties in Coconut for Andaman & Nicobar Islands

V. Damodaran and *K. Abirami*

A total of 1696 female flowers were pollinated in 12 different dwarf cross combinations in which the cross *viz* AOD x AGD recorded the highest setting percentage (81.8) followed by AGD x AYD. Among the CIARI varieties the cross between CARI-Annapurna x CARI-Surya recorded the highest setting percentage of 72.5 (Fig.6).

In D x T cross involving CARI Annapurna, CARI Surya, CARI Omkar and CARI Chandan, a total of 1653 female flowers were pollinated with Andaman Ordinary Tall, Sanraman Tall and CCNT and recorded overall setting percentage of 28.4%.

Inter se mating was carried out in 17 selected Pacific Ocean accessions and a total of 8500 female flowers were *interse mated* and recorded overall setting percentage of 42.0%. The highest setting percent (66.4%) was recorded in ACC No.4 of Fiji Island followed by Acc 30 of Nicobar Island (55.2%). Fourteen F_1 seedlings have been transplanted and maintained in the field for further evaluation of growth and yield parameters. About 107 pollinated seed nuts were sent to ICAR- CPCRI for characterization and conservation. Pollen grains from Niu lekha (20 packets), Hari papua (11 packets) and Rennel Tall (3 packets) were sent to CPCRI, Kasaragod for diallel crossing.

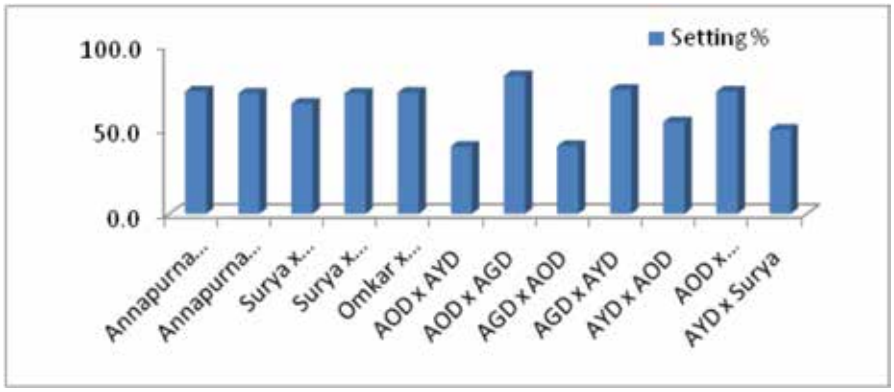


Fig.6: Percentage fruit set in D x D cross of Coconut

AICRP on Tuber Crops

V. Damodaran, L.B. Singh, K.Sakthivel and *T. Bharati Meena*

Collection, conservation, cataloguing and evaluation of genetic resources of tuber crops

Tuber crop explorations were made at Car Nicobar, Kamorta, Chowra, Terresa and Katchal and collected 14 germplasm of tuber crops. Maximum number of collections (6 nos) were made in *Dioscorea alata* (Plate 35) followed by colocasia (4 nos) (Plate 36). A total of 95 accessions are being maintained in the gene bank.

Plate 35: Different collections of dioscorea

Plate 36: Collections of colocasia

URT on colocasia (1st year)

Six entries of colocasia along with one national check variety Muktakeshi and one local check were evaluated for growth and yield parameters under Island conditions. Among the entries, the highest plant height (113.8 cm) was recorded in TTr 12-8 and highest pseudo stem girth (15.4 cm) was recorded in TTr 12-1 The individual corm weight was higher in TTr 12-8 (178.6g) followed by TTr-12-7 whereas TTr 12-8 recorded maximum weight of cormel (493.3g). With regard to yield, TTr 12-8 recorded higher yield (17.9 t/ha) followed by TTr-5 and TTr-7 which are on par. TTr-12-1 recorded the lowest yield of 8.8 t/ha.

Study on phenology of tuber crops in different agro-climatic zones

Cassava

Two varieties of cassava Sree Vijaya and H-226 were evaluated for the phenological expressions under island condition (Plate 37). Sree Vijaya took 4 days for first sprouting and recorded 50 % sprouting in 9 days and it also exhibited 4 days earliness in achieving 50 % sprouting compared to H-226. Tuber initiation was observed in 66 days with Sree Vijaya while it took 72 days in H-226.

Plate 37: Phenology study of Cassava

Yield attributes and yield

Sree Vijaya recorded maximum number of tubers (8.2) compared to H-226 (7.3) while the tuber yield was highest (2.54 kg/ plant) in H-226 compared to Sree Vijaya (1.82 kg/ plant) at 8 MAP.

Taro

Three varieties of taro *Viz.,* Muktakeshi, Sree Reshmi and Local were studied for phenology (Plate 38). Sree Reshmi took 16 days for germination where as local cultivar took 17 days and Muktakeshi took 18 days for germination. Tuber initiation started within 65 days in Muktakeshi, where as it took 68 days in Sree Reshmi and 74 days in Local. In all the varieties, the plant height and shoot weight was rapid after 2MAP and recorded maximum at 5MAP. The number of cormels per plant was highest in Shree Reshmi (19.4) followed by local (17.4). The cormel length was maximum (8.0 cm) in local where as cormel yield/plant was higher (378.6 g) in Sree Reshmi followed by local (252.7 g) and the lowest cormel yield (230 g) was recorded in Muktakeshi at harvest.

Plate 38: Phenology study of Taro

Farming system studies in tribal areas

The Nicobari tribal communities mainly rely on coconut, tuber crops, pigs and marine fisheries for their livelihood. They grow only nicobari aloo (greater yam) mainly for food and use to earn money @ Rs 10,000 per annum. They use to work for one hour daily in their garden and to take care of their animal. In addition they also do fishing for their domestic consumption. The employment generation in their traditional system was only 46 mandays/year. Tuber crop based farming system was initiated at Harminder Bay (Plate 39). The model comprises of 300 m^2 of fenced area in the vicinity of the tribal settlement integrated with piggery unit. Farmers were distributed with planting materials of tuber crops (elephant foot yam, colocasia, sweet potato), ginger and piglets. With the intervention of tuber crops based farming system, they work 2-3 hours per day which has increased the employment generation (91- 140) days/year & net income to Rs 33,225 per annum (average of 15 farm families) as compared to their traditional system. Out of 51 piglets distributed at Harminder Bay during the past two years, the population of pigs has increased to 127. With the success of intervention made, more tribal youth has come forward to adopt the tuber crops based farming system as their livelihood option.

Plate 39: Demonstration of tuber crops based farming at Harminder Bay Island

Collection, Characterization, Evaluation and Mass Multiplication of Unconventional Native and Exotic Fruit Crops for Bay Islands

Pooja Bohra, Ajit Arun Waman, T. Bharathimeena and *S.K. Zamir Ahmed*

Introduction and evaluation of exotic fruits

Exotic fruit crops, especially those grown in the South East Asian countries, have good potential for cultivation in the Islands owing to the similarity in climatic conditions.

Plate 40: View of experimental blocks of rambutan

Introduction of superior types of these fruits would not only diversify the scenario of fruit production in the Islands but would also make fruit crops cultivation more remunerative. Five superior types of rambutan were introduced from reputed nurseries of Kerala and Karnataka and were planted in the experimental blocks at Garacharma for evaluation (Plate 40). Two superior types of mangosteen were also planted in the experimental fields for evaluation (Plate 41).

Plate 41: View of experimental blocks of mangosteen

Collection and maintenance of underutilized fruit species

The underutilized fruits germplasm block was enriched with potential fruit species (Plate 42) *viz*. durian (*Durio zibethinus*), strawberry guava (*Psidium cattleianum*), sweet carambola (*Averrhoa carambola*), milk fruit (*Chrysophyllum cainito*), pulasan (*Nephelium mutabile*) and mangosteen (*Garcinia mangostana*). An exclusive germplasm block of *Garcinia* species was established with six species planted in it.

Plate 42: Established plants of milk fruit, strawberry, guava and durian

Performance evaluation of *Annona* hybrid 'Arka Sahan' and sweet carambola at closer spacing

Land being a constraint for area expansion under agriculture in the islands, adoption of high density planting systems assumes great significance. Further, evaluation of new crops with commercial potential could pave way for improving the economic status of growers. *Annona* hybrid 'Arka Sahan' is the only interspecific hybrid of *Annona* available for commercial cultivation in India. In order to test its performance under island condition, grafts were planted in field at two spacings along with pollinizer 'Balanagar Local'. Plants are well established in the field, exhibiting active growth (Plate 43). In addition, vegetatively propagated plants of sweet carambola were planted at three spacings (3.5 m × 3.5 m, 3.5 m × 2.5 m and 3.5 m × 1.5 m) for evaluation under island conditions (Plate 44) and growth parameters were recorded at 75 days after planting (Table 1).

Table 1: Growth parameters in sweet carambola planted at varied spacings at 75 DAP

Spacing	Plant height (cm)	Collar thickness (mm)	Number of branches	Number of leaves
3.5 m × 3.5 m	74.2	10.26	5.44	80.4
3.5 m × 2.5 m	85.2	12.20	8.11	100.0
3.5 m × 1.5 m	74.1	10.35	6.56	75.8

Plate 43: View of experimental field (left) and close up view (right) of Annona hybrid 'Arka Sahan'

Plate 44: General view of experimental field (left) and close up view (right) of sweet carambola

Propagation studies

Khoon phal (*Haematocarpus validus*) is an underutilized fruit crop with good potential as natural colourant. As natural population of this species is depleting and any systematic study would require sufficient number of plants, seed germination studies were conducted. Results revealed that the pre-treatments significantly improved the germination percentage (Fig 7) and reduced the days taken for first germination. Further, pre-treatments also promoted seedling growth parameters *viz*. seedling length, number of nodes and number of leaves. Pre-treatment of seeds with thiourea (0.1%) and GA_3 (1000 mg/l) were found to be the most congenial for obtaining large number of healthy seedlings for commercial scale use and habitat enrichment programmes.

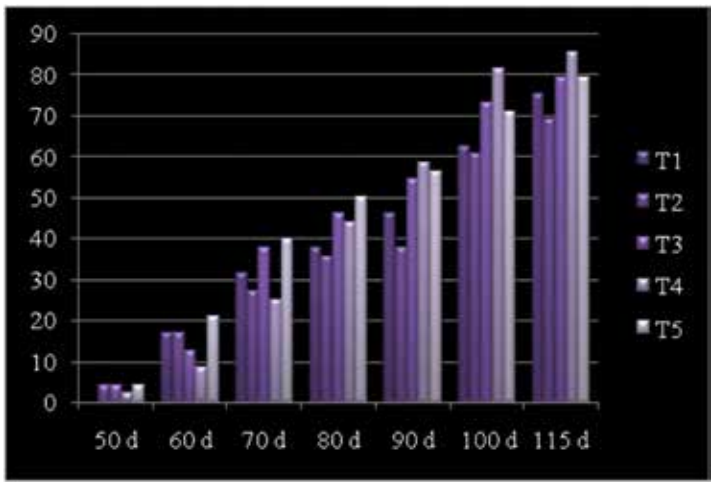


Fig.7: Percent seed germination in blood fruit seeds treated with different chemicals during the observation period.
T_1: Water soaking; T_2: GA_3 500 mg/l; T_3: GA_3 1000 mg/l; T_4: Thiourea (0.1%); T_5: Thiourea (0.2%)

Wild cashew (*Semicarpus kurzii*) is one of the underutilized species used by local tribes in the island. The species is used in anti-cancerous ayurvedic medicine and is major constituent in the preparations such as *bhallataka ghrita* and *bhallataka taila*. In order to multiply the species in large number for possible utilization as rootstock and for afforestation programmes, seed germination studies were undertaken. Twelve seed treatments were compared and use of chemical pre-treatments was found to improve the seed germination and seedlings exhibited superior growth parameters. Furthermore, significant differences were noticed for germination parameters such as mean daily germination, germination index, time for 50% germination and seedling vigour parameters. An exploratory trial was attempted to propagate watery rose apple through air layering with appreciable success (67%) under Middle Andaman conditions (Plate 45).

Plate 45: Regenerated plantlets of *Haematocarpus validus, Semecarpus kurzii* and *Syzygium aqueum*

Development of Protocols for Micropropagation of Selected Fruit Crops for Bay Islands

Pooja Bohra, Ajit Arun Waman* and *L.B. Singh

Micropropagation is a rapid method for mass multiplication of desired species. The *in vitro* techniques not only help in producing large number of disease free planting material but could also be used for conservation of useful germplasm. Considering the increasing demand for planting material of commercial fruit crops such as banana in the islands, efforts have been initiated to fine-tune the micropropagation protocols for commercial scale exploitation. Mother blocks of two locally preferred varieties *viz*. 'Cheena Kela (*Musa* ABB)' and 'Korangi (*Musa* AAB)' were established in the Experimental Farms at Garacharma and are being maintained. *Khoon phal* (*Haematocarpus validus*) is an important antioxidant rich underutilized fruit species having potential as natural colourant. Efforts have been initiated to standardize rapid multiplication protocol in the species.

Collection, Characterization and Utilization of Natural Diversity of Important Spice Crops from Bay Islands and Evaluation of their Improved Varieties

Ajit Arun Waman, Pooja Bohra, T. Sujatha, L.B. Singh* and *V. Damodaran

Climatic conditions of Andaman and Nicobar Islands are highly suitable for cultivation of spice crops. Further most of the spice crops, being amenable for intercropping, interspaces of coconut and arecanut could be profitably utilized for cultivation of these crops. This project aimed at improving spices productivity in the islands by adopting multi-pronged strategies.

Introduction and evaluation of improved varieties of spice crops

In order to make the spices cultivation more remunerative for the island farmers, introduction of improved varieties is one of the key factors. Improved varieties of black pepper, nutmeg and cinnamon were introduced from different

sources (Table 2), multiplied in polyhouse and planted in the experimental fields along with suitable checks for evaluation (Plate 46 & 47).

Plate 46: General view of the experimental blocks of black pepper and cinnamon

Table 2: Improved varieties of spice crops introduced from different sources

Crop	Varieties	Source of collection
Black pepper	Panniyur- 2, 5, 6, 7, IISR Sakthi, IISR Thevam, IISR Malabar Excel, IISR Girimunda, Subhakara, Sreekara, Panchami, Thekkan	ICAR- Indian Institute of Spices Research, Kozhikode, Kerala
	Panniyur 1	Government Coconut Farm, Chitrakoot, North and Middle Andaman
Nutmeg	IISR Viswasree	ICAR- Indian Institute of Spices Research, Kozhikode, Kerala
	Konkan Swad, Konkan Sugandha, Konkan Shrimanti	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra
	Home grown Nutmeg	Home grown Nursery, Kottayam, Kerala
Cinnamon	Konkan Tej, Konkan Tejpatta	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra

Plate 47: Close up view of an established nutmeg budded plant in experimental block

Exploration, collection and maintenance of wild relatives of spice crops

Two accessions of *Piper colubrinum* have been collected, one each from South Andaman and North & Middle Andaman. The material is being multiplied for further utilization. Amongst wild relatives of nutmeg, *Myristica andamanica, Knema andamanica* and *Horsfieldia glabra* have been collected from different parts of the islands and are being maintained in the germplasm block.

Regeneration studies in spices and their wild relatives

In order to support large scale multiplication of improved varieties under Island conditions, regeneration studies were taken up. Effect of time of layering on success of the technique was studied in cinnamon (Plate 48). Confirmatory studies will be continued during second year. Exploratory studies were made for propagation of nutmeg using approach grafting. A success rate of 65% was achieved during this year. Seed germination study was conducted in a wild relative of cultivated nutmeg *viz*. *Horsfieldia glabra* (Plate 49).

Plate 48: Successful air layering in cinnamon

Plate 49: Seedlings of *Horsfieldia glabra*

Soaking of seeds in GA_3 (100 ppm) for 24 h promoted seed germination (79 %) and was found to be superior (Fig.7) than the other treatments studied.

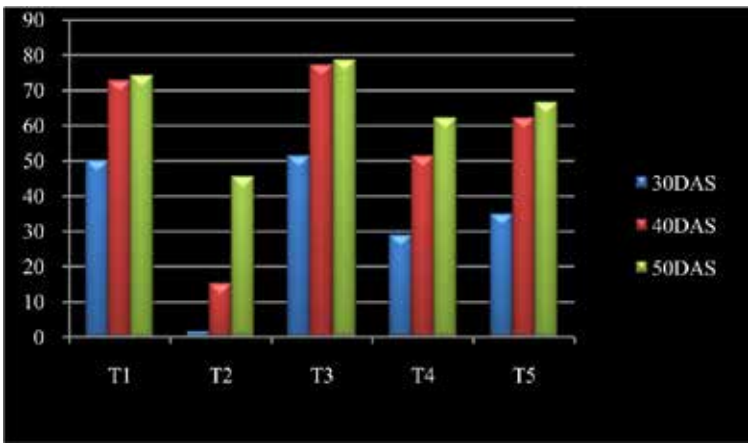


Fig.8: Germination percentage in *Horsfieldia glabra* in response to different seed treatments
T_1: thiourea (2%), T_2: thiourea (5%), T_3: GA_3 (100 mg/l), T_4: GA_3 (200 mg/l) and T_5: water soaking

Exploration, Characterization, Micropropagation and Agro-technique Standardization of Important Rhizomatous Species-Mango Ginger from Bay Islands

Ajit Arun Waman, Pooja Bohra, I. Jaisankar, D. Basantia and *V. Damodaran*

The Andaman and Nicobar groups of Islands are known to hold distinct diversity for rhizomatous species. Most of the species are used locally for their multifaceted uses including medicinal and culinary applications. Identification of superior types and their utilization could help the farmers to diversify the income avenues. A number of medicinally important *Curcuma* species have been reported to possess raw mango like aroma and hence, systematic experiments were initiated for standardization of their agronomic practices (Plate 50).

Plate 50: General view of the experimental blocks of *Curcuma* sp.

Effect of size of rhizome and biofertilizers on yield parameters

Experiment was initiated to study the effect of size of propagule on growth, yield and biochemical parameters. Rhizomes of four sizes *viz*. 5-10 g, 10-15 g, 15-20 g and 20-25 g were planted in the experimental field at Garacharma farm. Size dependent variations were noticed in the yield parameters. Another experiment on effect of four biofertilizers *viz*. *Azospirillum* sp., *Trichoderma harzianum*, *Pseudomonas fluorescens* and Kera Probio was conducted. The rhizomes have been harvested in the experiment. Further studies on quality parameters of rhizomes are in progress in both the experiments.

Plate 51: Different varieties of turmeric and ginger being maintained in the polyhouse

Collection and maintenance of germplasm

Collections of mango ginger and allied species possessing raw mango like odour were made from different parts of the islands and from continental India. Rhizomes of all the collections were planted in the grow bags and are being

maintained in the polyhouse. Apart from this, 29 improved varieties of turmeric and seven varieties of ginger were also collected from ICAR-IISR, Kozhikode and are being maintained in polyhouse (Plate 51).

All India Coordinated Research Project on Palms

Ajit Arun Waman and *T.P. Swarnam*

Nucleus seed garden in coconut and arecanut

Seed nuts of coconut varieties CARI Annapurna, CARI Omkar, CARI Chandan and CARI Surya were collected and nursery is being raised for establishment of nucleus seed garden. Similarly, in arecanut, seed nuts of Samrudhi and Andaman Dwarf type were sown in nursery (Plate 52).

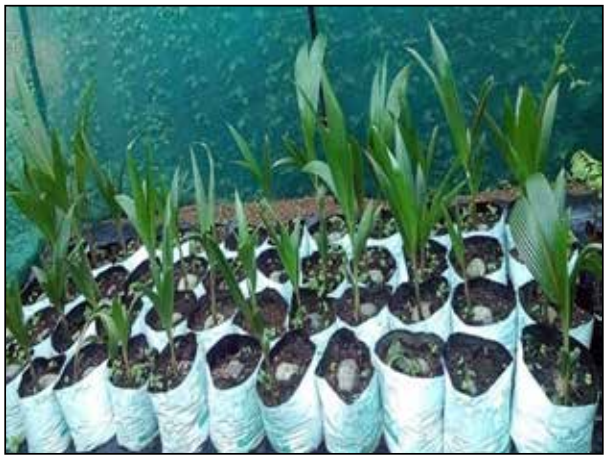


Plate 52: Germinating seedlings of coconut variety CARI Annapurna

Intercropping under coconut and arecanut plantations

In order to utilize the interspaces in coconut and arecanut plantations, intercropping of suitable crops is one of the viable options. To identify suitable crop combinations under island conditions, different models have been established. In coconut plantation, four models *viz*. coconut (sole crop); coconut + black pepper + ginger + banana; coconut + black pepper + ginger + pineapple; coconut + black pepper + ginger + elephant foot yam were established. In arecanut plantation, crop combinations *viz*. arecanut + black pepper + banana; arecanut + black pepper + ginger and arecanut + black pepper + elephant foot yam were established for comparing their profitability against arecanut sole crop (Plate 53). Pre-experimental observations on plant growth parameters and soil analysis have been carried out.

Plate 53: A field view of an intercropping model in coconut and arecanut

Organic nutrient management in juvenile coconut plantation

In order to test the performance of juvenile palms of three dwarf coconut types (AOD, AYD and AGD) in response to application of organic nutrient sources, an experiment was initiated. Various treatments comprising of Bio-fertilizer (Kera Probio), *in situ* green manure, vermi-compost, farmyard manure and poultry manure were imposed in the experimental blocks. Pre-experimental observations on plant growth parameters and soil analysis have been carried out.

DIVISION OF FIELD CROP IMPROVEMENT & PROTECTION

Augmenting Rice Productivity through Varietal Purification of Popular Land Races

R. K. Gautam, P. K. Singh, S. K. Zamir Ahmed, A.K. Singh, K. Sakthivel and *S. Swain*

Evaluation of selected progenies of Black Burma rice

A total of 15 selected lines of Black Burma rice with two check varieties *viz.* CARI Dhan 5 and Khusbuyya were evaluated across three locations (Port Blair in South Andaman, Diglipur in North Andaman and Mayabunder in Middle Andaman) during *Kharif* 2015. Data were recorded for 8 qualitative and quantitative characters. The perusal of yield data across 3 locations revealed the overall best performance in BB13-40 (3.17 t/ha) which was followed by BB13-20 (3.13 t/ha) and BB 13-62 (3.07 t/ha), thus revealing their superiority of 10.45 %, 9.05 % and 6.96 % respectively as compared to best check variety Khusbuyya (2.87 t/ha).

Evaluation of selected progenies of Khusbuyya rice

A total of 15 selected lines of Khusbuyya rice with two check varieties *viz.* CARI Dhan 5 and Black Burma were evaluated across three locations (Bloomsdale Farm, Port Blair; Diglipur and Mayabunder, North Andaman Middle Andaman) during *Kharif* 2015 (Plate 54). Data were recorded for 8 qualitative and quantitative characters. The perusal of yield data across the 3 locations revealed the overall best performance in KU 13-41 (3.73 t/ha) followed by KU 13-92 (3.70 t/ha) revealing their superiority of about 15.00 % as compared to best check variety Black Burma and CARI Dhan 5 (3.23 t/ha).

Plate 54: A view of rice land races evaluation

Certificate
Plant Germplasm Registration

It is certified that germplasm ANR 38 of Rice (INGR15014)
developed by

RK Gautam, PK Singh, SK Zamir Ahmed, Naresh Kumar, AK Singh
K Sakthivel and SD Roy
ICAR-Central Island Agricultural Research Institute (CIARI), Port Blair,
Andaman and Nicobar Islands

has been registered by Plant Germplasm Registration Committee (PGRC) of
Indian Council of Agricultural Research on August 17, 2015

Member-Secretary
PGRC

Chairman
PGRC & DDG (CS), ICAR

Plate 55: NBPGR Registration of rice germplasm

Registration of new rice germplasm

During the year a new and unique rice germplasm "ANR38" (INGR15014) having open florets has been registered by ICAR-NBPGR, New Delhi (Plate 55).

Seed production of new varieties CIARI Dhan 8 and CIARI Dhan 9

About 185 kg seed of CIARI Dhan 8 (Nucleus seed: 20 kg, Breeder Seed: 65 kg, Truthfully Labelled Seed: 100kg) and about 147 kg of CIARI Dhan 9 (Nucleus seed: 30 kg, Breeder Seed: 97 kg, Truthfully Labelled Seed: 20 kg) were produced during kharif 2015-16. Both these varieties are derived from the local land race C14-8 popularly called as *Aath Number Dhan*.

Marker Assisted Introgression of Bacterial Blight Resistance in Popular Rice Cultivars of Andaman and Nicobar Islands

R. K. Gautam, P. K. Singh and *K. Sakthivel*

Genetic management of bacterial blight- a major rice disease in the islands is an effective solution for enhanced and sustainable rice production in the islands. The project aims at the transfer of four genes pyramid (*Xa 4, xa 5, xa 13 and Xa 21)* for durable resistance in the local popular rice varieties.

Marker assisted introgression of four Xa genes in CARI Dhan 5

A total of 301 BC_1F_1 plants of cross CARI Dhan 5/IRBB60//CARI Dhan 5 were grown in natural field and were artificially infected with bacterial blight [*Xanthomonas oryzae pv oryzae (Xoo)]* pathogen. Plant number 1, 15, 17, 21, 43,46, 53, 54, 55, 57, 62, 75, 79, 80, 86, 88, 93, 110, 113, 114, 118, 131, 134, 142, 147, 157, 163, 195, 215, 232, 245, 247, 253, 261 and 269 were found highly resistant to Bacterial Blight with score of 1. The leaves of these 35 resistant plants were collected for DNA extraction. Genomic DNA extraction followed by PCR markers based detection revealed the presence of *Xa4*, *xa5*, *xa13* and *Xa21* genes in six plants *viz.* 17, 46, 93, 118, 131 and 134 (Plate 56).Therefore, based on the genotypic and phenotypic analysis (foreground selection), these six plants were selected for further back crossing with recurrent parent CARI Dhan 5. For the background selection 48 parental polymorphic microsatellite markers were run to select plants having maximum genome of CARI Dhan 5 (Plate 57). It was found that segregating plants number 46, 93 and 118 were carrying maximum genome of CARI Dhan 5 and thus were selected for further back-crossing (Plate 58).

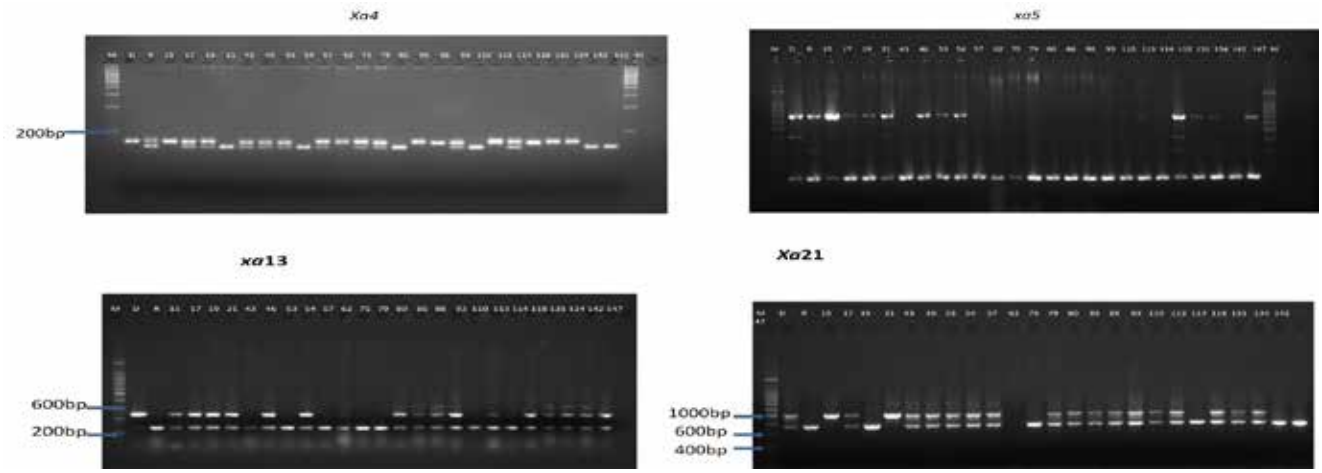


Plate 56: Rice lines showing the presence of Xa4, xa5, xa13 and Xa21 genes in the BC_1F1 plants of CARI Dhan 5/ IRBB60//CARI Dhan 5 cross through corresponding linked markers

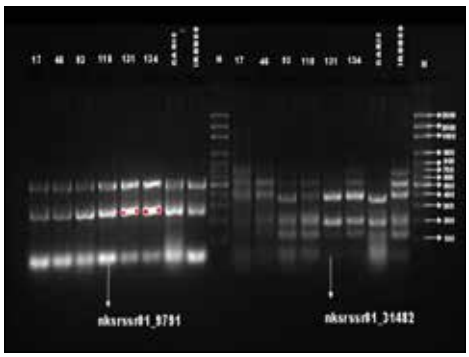


Plate 57 : PCR amplification of the SSR markers nksrssr01_9791 and nksrssr01_31482 during background selection for CARI Dhan 5

Plate 58: A view of back-crossed plants of CARI Dhan 5/IRBB60//CARI Dhan 5 cross

Marker assisted introgression of four Xa genes in C14-8

A total of 16 plants of F_1 between C14-8 and IRBB60 cross were transplanted and artificially inoculated with bacterial *Xoo* isolates. Plants No. 1,4,6,7, 9, 10 and 12 showed resistance to bacterial blight with score of 1, thus showing their hybridity on phenotypic basis. Fresh leaves were also collected of these plants for DNA extraction. The plants 6,7, 9 and 10 were found to have all *Xa 4, xa 5, xa 13 and Xa 21* genes based upon their screening for linked markers and were thus selected for attempting first back-cross (BC_1F_1) with the recipient parent C14-8.

Stress Tolerant Rice for Poor Farmers of Africa and South Asia (Andaman & Nicobar Islands, India)

R. K. Gautam, P.K. Singh, A. K. Singh,S. K. Zamir Ahmed and *A. Velmurugan*

Salinity Tolerant Breeding Network (STBN) Trial-2015-16

About one third of total rice area in A&N Islands is affected by coastal salinity as well as acid sulphate soils. Under such conditions, developing, testing and harnessing the genetic tolerance of rice to such unfavourable conditions is of paramount significance. Salinity Tolerance Breeding Network (STBN) trial 2015-16 was conducted at Creekabad village, Chouldari, Port Blair, South Andaman district under dual soil stress *i.e*. salinity (ECiw~ 4.5 dS/m^2) and acid sulphate soils (pH 5.5).

A total of 25 rice genotypes were evaluated in sandy loam soil near the sea shore area having frequent high tides. The experiment was conducted with one standard local check namely, CARI Dhan 5 and national checks like CST7-1, CSR27 and CSR36 and one sensitive check Pusa 44 in Randomized Block Design (RBD) with 3 replications. The data were recorded for plant height (cm), days to 50% flowering, tillers/plant, productive tillers/plant, panicle length, spikelet fertility, filled grains, 1000 grain weight (g) grain yield (t/ha) and phenotypic acceptability scores.

Significant variability was revealed in the genotypes for all traits recorded except number of tillers. The grain yield data showed that genotypes *viz.* SIT5168 (IR 87952-1-1-1-2-3-B) and SIT4446 (IR 84645-305-6-1-1-1) were found to be numerically better than best check CST 7-1. The genotypes gave more than 4 t ha^{-1} not only under salinity but also under combined stress of acid sulphate soils of the island agro-ecosystem.

Farmers Participatory Variety Selection for Salinity Tolerant Rice Varieties-2015-16

A total of 17 improved and previous years' selected lines of rice were evaluated under this trial at Creekabad village, Port Blair, South Andaman district in dual soil stress *i.e*. salinity (EC~4 dS/m) and acid sulphate soils (pH 4.95) near the sea shore with the sandy loam soil during Kharif -2015. The experiment was conducted with three standard local checks namely, CARI Dhan, 5 CST 7-1 and national check CSR36 in Randomized Block Design (RBD) with 3 replications. The gross plot size of 4.40 m^2 was followed by planting crop on 6th July, 2015 with a row spacing of 20 cm and plant spacing of 15 cm. The recommended doses of NPK were also applied @ 90, 60 and 40 kg/ha, respectively during the crop growth period. Yield data revealed that grain yield by SIT4446 (3.86 t/ha) followed by SIT 5160 (3.83 t/ha) compared to best check variety CSR 7-1 (3.37 t/ha) under combined stress of salinity and acid sulphate soils.

Field Day was organized on Farmers' Participatory Variety Selection on the above farmers' field site on 17th October 2015. A total of 49 farmers (34 Male and 15 Female) and 7 researchers participated in the programme. All the farmers and researchers casted their votes for the selection of superior salt tolerant varieties of rice (Plate 59). Variety SIT4446 (IR84645-305-6-1-1-1) got the highest positive votes of 22 (12 male, 7 female and 3 researchers) followed by SIT5160 (IR87938-1-1-2-1-3-B) having 11 votes (7 Male, 3 Female and 1 Researcher). However, variety SIT 4446 was voted only 1 negative vote, while variety SIT5160 (IR87938-1-1-2-1-3-B) with no negative votes. The highest positive preference score 19 was recorded for SIT4446 (IR84645-305-6-1-1-1) followed by SIT5160 (IR87938-1-1-2-1-3-B) (score: 11). The check variety CST 7-1 got 4 positive votes and 2 negative votes with preference score of 2. The results revealed that variety SIT4446 (IR84645-305-6-1-1-1) was highly preferred by the farmers and researchers (19) due to

good plant type, more grains/panicle and long panicles followed by SIT5160 (IR87938-1-1-2-1-3-B) with score of 11 due to its better tolerance to salinity and compact panicles.

Plate 59: Field Day and PVS activities under STRASA project in South Andaman during *kharif* 2015-16

Seed distribution of salt tolerant rice varieties

During the period total of 16.69 quintal seed of CARI Dhan 4, CARI Dhan 5 and CSR36 was distributed to farmers in North and Middle Andaman district, Hut Bay in South Andaman and Campbell Bay (Nicobar district) for increasing rice productivity in salinity areas in the islands especially under Tribal Sub Plan programme.

International Network for Genetic Evaluation of Rice (INGER)

Green Super Rice - Rainfed Lowland Yield Trial (GSR-RFLL)

GSR-RFLL trial was conducted during *Kharif* 2015 (Plate 60). A total of 34 improved rice lines received from IRRI, Philippines having high yield potential and multiple stress resistance/tolerance to major biotic and abiotic stresses were evaluated at Bloomsdale Research Farm under rainfed lowland conditions.

Plate 60: Green Super Rice - Rainfed Lowland Yield Trial (GSR-RFLL)

Five lines *viz*. HHZ3-SAL 13-42DI1 (7.67 t/ha), HHZ 4-SAL S-LI 1-LI 1 (7.87 t/ha), HHZ 10-DT8-DT 1-DT 1 (6.42t/ha), HHZ 18-Y3-Y1-Y1 (6.35t/ha) and HHZ 16-SAL13-LI-LI1 (6.22t/ha) were found superior for grain yield with > 6.0 t/ha yield. These lines were also found resistant against bacterial leaf blight disease under artificial inoculation conditions.

International Rice Soil Stress Tolerant Nursery (IRSSTN)

A total of 54 improved soil stress tolerant lines received from IRRI, Philippines were evaluated during *Kharif* 2015 in dual stress of salinity (ECiw~4.5 dS/m^2) and acid sulphate conditions (pH 5.5) near the sea shore area having frequent high tides at Creekabad, Chouldari, South Andaman. The yield data revealed that entries IR14T102, IR14T105 and IR11T171 were found promising for grain yield of (5.19 t/ha) and (4.44 t/ha) respectively.

Seed Production in Agricultural Crops

P. K. Singh, A. K. Singh* and *R. K. Gautam

A total of 122 kg of Nucleus Seed of 7 rice varieties (CARI Dhan 1, 2, 3, 6, 7, 8 and 9) and 502 kg of Breeder Seed of 12 varieties was produced at CIARI Farm, Port Blair. In addition, 60.64 quintal Truthfully Labelled (TFL) seed of 6 rice varieties (CARI Dhan 4, 5, 6 7, CSR36 and Gayatri) was produced under farmers participatory mode in six villages through Out Reach Centre at Diglipur during *Kharif*, 2015. Besides, 3 Kg TFL seed of CARI Brinjal 1 were produced during *Rabi* season at Bloomsdale Research Farm, CIARI, Port Blair (Plate 61).

Plate 61: Seed production in agricultural crops

Trainings imparted

Two trainings one each Field Days and Seed Day was conducted on different aspects of quality seed production and management during 2015-16 at South and North and Middle Andaman in which a total of 350 farmers got benefited (Plate 62).

Plate 62: Glimpses of training programmes

HYV's of Rice Seeds for Farmers

A total of 20.0 q Truthfully Labelled Seed of 6 rice HYVs (CARI Dhan 4, 5, 6 7, CSR36 and Gayatri) were distributed in tribal dominated areas of Nicobar and Little Andaman during 2016-17. Two kg TFL seed of bacterial wilt resistant brinjal variety CARI Brinjal 1 were also provided to the farmers in all three districts of Andaman and Nicobar Islands.

Genetic Improvement of Pulses for Andaman & Nicobar Islands Conditions

Awnindra K. Singh, P.K. Singh, R.K. Gautam, K. Sakthivel, T. Subramani and *S. K. Zamir Ahmed*

Mungbean and urdbean are the major pulse crops during rabi season and rice-fallow cultivation in these islands, while pigeonpea is cultivated under backyard. Existence of genetic diversity available among indigenous landraces of mungbean, urdbean and pigeonpea crops is under exploited in these islands. Therefore, this study aimed to identify indigenous landraces with favourable characteristics that can be used in pulse crops breeding programmes for their utilization in order to develop superior genotypes adapted for these islands conditions. Hence, from the mini core collections of pulse crops, the promising landraces of mungbean (6), urdbean (3) were promoted for advanced varietal trials. A set of mungbean (22), urdbean (20) and pigeonpea (7) advanced breeding lines derived from local landraces along with national checks were evaluated during 2015-2016.

Mung bean

In mungbean, 17 advanced breeding lines along with 5 national checks were evaluated during Rabi 2015-16. The genotypes ANM-12-02 (IC No.0611650) recorded the highest seed yield (19.76 qha^{-1}) followed by ANM-11-08 (IC No.0611664), ANM-11-15 (IC No.0611667) ANM-12-01 (IC No. 0611649), CIARI Mung-1 (ANM-11-12, IC 0611666), CIARI Mung-2 (ANM-11-05, IC 0611661) (Plate 63) and CIARI Mung-3 (ANM-11-12, IC 0611663), over the best checks IPM-02-14, VBN-3 and Pusa Vishal. The genotypes, ANM-12-02 (Plate 64), ANM-12-01, ANM-11-08 (Plate 65), ANM-11-15 (Plate 66), CIARI Mung-1, CIARI Mung-2 and CIARI Mung-3 also showed resistance against charcoal rot, *Cercospora* leaf spot, powdery mildew, leaf crinckle and MYMV diseases of mungbean .

Under the farmers' field yield evaluation trial ANM-12-01, ANM-11-15, CIARI Mung-1, ANM-11-08 and CIARI Mung-2 showed significantly higher yield over the traditional varieties and standard checks. On the basis of *per se* performance, variety CIARI Mung-2 (ANM-11-05; IC 0611661) released by the Institute Variety Release Committee was nominated to AICRP on MULLaRP for Rabi mungbean IVT trial 2015-16

Further, a set of 30 promising mungbean landraces was also evaluated for salinity tolerance under laboratory conditions, the genotypes ANM-11-63 and ANM-11-11 showed salt tolerance on the 5th day of sowing in 16.0 dS/m while the accessions ANM-14-02 at 14.0 dS/m, ANM-13-12 and ANM-14-10 exhibited salt tolerance capacity up to 10.0 dS/m.

Urdbean

Twenty advanced breeding lines of urdbean along with 5 national checks were evaluated during Rabi 2015-16. The genotypes ANU-11-29 (Plate 67) recorded the highest yield (14.28 qha^{-1}) followed by ANU-11-09 (Plate 68) (IC No.0611671), ANU-11-19 (IC No.0611675), ANU-11-12 (IC No.0611674) and ANU-11-22 (IC No.0611677) compared to the best checks IPU-02-43, VBN-7 and LBG-752. These genotypes also exhibited determinate plant type and resistance to powdery mildew, leaf crinckle, charcoal rot, *cercospora* leaf spot prevailing in these islands, whereas VBN-7 was found susceptible.

Genotypes namely ANU-11-11, ANU-12-02 and ANU-12-03 showed indeterminate plant growth habit. On the basis of *per se* performance promising line ANU-11-29 derived from local landrace was nominated to AICRP on MULLaRP for Rabi urdbean IVT trial 2015-16. While other genotypes namely ANU-11-10 (IC No.0611672), ANU-11-08 (IC No.0611670), ANU-11-21 (IC No.0611676) which are on par in yield with the standard check VBN-6

showed the resistance reaction against leaf curl virus, powdery mildew, cercospora leaf spot and MYMV diseases, while the genotypes ANU-11-08 and ANU-11-22 showed moderate resistance against these diseases.

Pigeonpea

Pigeonpea landraces pool cultivated in these islands is the result from past and contemporary patterns of natural and farmer-mediated evolutionary forces. Therefore, characterization and identification of superior lines in terms of economic traits, resistance to insect-pests and diseases from a set of 32 accessions comprising of local landraces and advanced germplasm lines was conducted during 2015-16. The assembled germplasm represented wide range of diversity for different agro-morphological characters. Among 32 entries, the 07 local landraces namely, ANP-12-02 and ANP-13-03 followed by ANP-13-01, ANP-11-13, ANP-13-02, , ANP-11-12-2 and ANP-11-14 (Plate 69) and two advanced breeding lines IPAC-68 and IPAC-7-2 showed significantly higher values for plant type, plant growth parameters, number of branches per plant, earliness over the best checks Co-6 and NA-1.

Advanced breeding trial of pigeonpea comprising of 7 promising landraces along with 3 advanced lines received from IIPR, Kanpur and 3 standard checks were evaluated for further yield and yield attributing traits under advanced breeding trials (AVT-I). The entries ANP-12-02 followed by ANP-13-03, ANP-11-13 were found significantly better for the plant type, plant growth parameters, number of branches per plant, earliness and pod bearing characteristics along with tolerance against insect-pest and diseases.

Plate 63: Mungbean advanced line ANM-11-05

Plate 64: Mungbean advanced line ANM-12-02

Plate 65: Mungbean advanced line ANM-11-08

Plate 66: Mungbean advanced line ANM-11-15

Plate 67: Urdbean landrace ANU-11-29

Plate 68: Urdbean landrace ANM-11-09

Plate 69: Pigeonpea promising lines derived from local landrace (ANP-13-02, ANP-12-02)

All India Coordinated Research Project on MULLaRP (Rabi Mungbean & Urdbean)

Awnindra K. Singh

AICRP on MULLaRP Rabi mungbean and urdbean initial varietal trial (IVT) was conducted during Rabi 2015-16. As per the technical programme, a total 11 entries of mungbean along with 2 local checks CIARI Mung -1 (ANM-11-12) and ANM-12-02 were evaluated. The local checks ANM-12-02 and CIARI Mung -1 (ANM-11-12) were recorded as early, determinate type, medium statured with high yield. The genotypes RM-15-9 followed by RM-15-8 and RM-15-14 were found the best entries for seed yield and yield attributing traits, while RM-15-13 exhibited extra earliness and determinate type. These entries also exhibited resistance against charcoal rot, yellow mosaic virus and cercospora leaf spot diseases while, only local landraces were found tolerant to abiotic stresses like heavy rainfall during the crop growth period.

Plates 70 a : Mungbean and Urdbean entries under IVT AICRP on MULLaRP

In urdbean, IVT comprising of 12 entries including 2 advanced breeding lines derived from promising landraces were evaluated. Among the entries ANU-11-19 showed determinate plant type with synchronous maturity, earliness with high yield potential. The other entries including promising landraces namely, ANU-11-29, RU-15-11, RU-15-16, RU-15-17 also showed determinate plant type with synchronous maturity, earliness with high yield potential, while the entry RU-15-10 exhibited medium duration with intermediate plant type and RU-15-7 showed long duration determinate plant type (Plate 70 a & b).

Plates 70 b: Mungbean and Urdbean entries under IVT AICRP on MULLaRP

Collection, Characterization and Utilization of Farmers Varieties, Landraces and Wild Relatives of Indigenous Pulses of Andaman & Nicobar Islands Agro-Ecosystem

Awnindra K. Singh, S. Swain, R.K. Gautam and *T.P. Swarnam*

In the present study, farmers' varieties comprising of a set of 53 accessions of mungbean (*Vigna radiata*) and 56 accessions of urdbean (*Vigna mungo*), 23 accessions of cowpea (*Vigna unguiculata*) and 25 accessions of pigeonpea were sown during 2015-16 in a mother trial to generate basic information and assess the genetic diversity.

The present study was also conducted to evaluate and characterize these landraces for DUS (Distinctness, Uniformity and Stability) parameters. The accessions were broadly classified on the basis of agro-morphological characters into extra early in mungbean (ANFVM-14-02, ANFVM-14-03, AN FVM 14-18) and in urdbean (ANFVU-14-03, ANFVU-14-08, ANFVU-14-11, ANFVU-14-14, ANFVU-14-26), early, medium and late, following the DUS test guidelines of mungbean, urdbean, cowpea and pigeonpea.

The local accessions of all the four pulse crops studied exhibited good variability for earliness, seed lustre, seed size, plant growth habit, stem colour, stem pubescence, leaf shape, leaf colour, petiole colour and seed colour which are the most stable traits for the identification of farmers' varieties. The collected accessions exhibited adequate genetic diversity among the available farmers' varieties. The results revealed that the accessions ANFVM-14-09, ANFVM-14-04, ANFVM-14-18, ANFVM-14-10, ANFVM-14-15 and ANFVM-14-11 in mungbean whereas ANFVU-14-01, ANFVU -14-03, ANFVU -14-04, ANFVU -14-08, ANFVU -14-10, ANFVU -14-11, ANFVU-4-18, ANFVU -14-29 in urdbean were quite diverse and promising farmers' varieties having economic importance in terms of seed pod and seed characteristics. Similarly, ANFVCp-14-05 followed by ANFVCp-14-01, ANFVCp-14-08, ANFVCp -14-07, ANFVCp -14-06 and ANFVCp -14-04 in cowpea while ANFVP -14-01, ANFVP -14-03, ANFVP -14-10, ANFVP -14-19, ANFVP -14-21,ANFVP -14-22 in pigeonpea were diverse and promising collections (Plate 71, 72 & 73).

Plate 71: Diversity among mungbean and urdbean farmers' varieties for seed characteristics

Plate 72: Diversity among pigeonpea farmer's varieties for flower colour and pod traits

Plate 73: Diversity among cowpea farmers' varieties for plant type and pod traits

All India Coordinated Research Network Project on Potential Crops [Beachpea (*Vigna marina*)]

Awnindra K. Singh, A. Velmurugan and *T. Sujatha*

Beachpea (*Vigna marina*)- a wild and salt tolerant relative of cultivated *Vigna* species *is* distributed throughout the tropics and shows a great similarity in floral structure with mungbean, urdbean and cowpea for a number of distinctive vegetative characters (Plate 74). The present study was undertaken under All India Coordinated Research Network Project on Potential Crops [Beachpea (*Vigna marina*)] which started during the 2015-16 and co-ordinated by NBPGR, New Delhi. To enhance the mini core collection of this important underutilized legume 6 numbers of accessions were collected from the different islands of South Andaman & Nicobar group of islands and a total of diverse 14 accessions were maintained. The beachpea (*Vigna marina*) accessions collected from different parts of the islands were sown during kharif season 2015 -16 for their agro-morphological characterization.

Beachpea accessions were found as indeterminate type creeper climber having 4.2 to 6.9 cm pod length. The accessions, ANBp-14-03, ANBp-14-05 and ANBp-15-02 exhibited maximum number of seeds (5-8 seeds per pod), bold seeds with highest seed weight (8.26 g/ 100 seeds), while accessions ANBp-14-01 and ANBp-14-02 exhibited 4-6 seeds per pod. The dry seeds of beach pea (*Vigna marina*) exhibited wide range of protein (18.91 – 30.26 %) with iron (1.8 – 2.53 mg), calcium (5.38 – 14.54 mg), magnesium (8.10 – 9.22 mg), zinc (0.60 – 1.46 mg) and cobalt (0.01 – 0.06 mg). A study on the genetic relationship of the underutilized legumes with cultivated mungbean and urdbean was also conducted to assess the genetic relationship at molecular level using ISSR markers. Cluster analysis revealed that the genotypes are grouped into three clusters with 53% similarity and it has shown that the genotypes collected from various islands showed 90 % similarity with mungbean and urdbean (Fig 9).

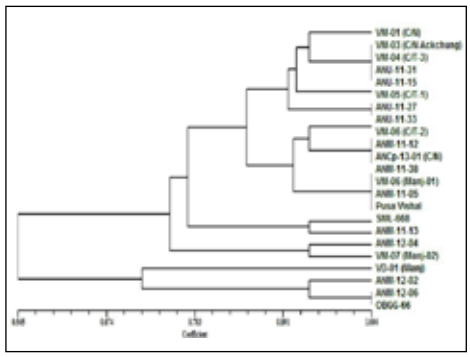


Fig.9: Genetic relationship among cultivated *Vigna* spp.

Plate 74: Plants of *Vigna marina*

Development of Biotic Stress Resistant Lines in Brinjal (*Solanum Melongena* L.)

P.K. Singh and *K. Sakthivel*

Field evaluation of bacterial wilt resistant brinjal lines during Rabi 2015

Three bacterial wilt resistant brinjal lines were evaluated with 4 checks *viz.* CARI Brinjal 1 (resistant check), hybrid check, local check and Pusa Purple Long (national susceptible check) in the field conditions during dry season (*Rabi*) 2015 (Plate 75). The experiment was conducted in CRBD with 3 replications. The planting was done following inter-row and –plant spacing respectively of 65 and 45 cm. Observations were recorded for 8 yield and yield attributing characters. The observation data revealed that all 3 developed lines of brinjal were found better for fruit yield than the ssusceptible national check variety Pusa Purple Long. CARI Brinjal 2 gave highest fruit yield/plant (679.63 g) compared to the best hybrid check variety (671.60 g/plant) (Table 3).

Table 3: Fruit yield performance of new brinjal lines

Varieties	PH	P Br	S Br	LL	LW	F/P	AFW	FY/P	DI (%)
CIARI Brinjal 2	77	5.0	20.3	8.5	8.5	7.6	88.8	679.6	3.7
CIARI Brinjal 3	88	4.3	15.5	9.9	9.9	4.7	92.6	439.5	4.1
CIARI Brinjal 4	78	3.7	14.5	9.4	9.4	5.4	102.3	556.5	9.3
CIARI Brinjal 1 (Resistant)	101	4.3	25.1	12.8	12.8	2.4	249.5	592.4	3.9
Hybrid (Check)	76	4.9	19.1	10.2	10.2	5.8	115.5	671.6	19.6
Local Check	69	4.5	17.0	13.1	13.1	3.0	203.5	484.9	23.4
National Check (susceptible)	94	4.1	16.9	13.6	13.6	3.2	83.7	259.5	21. 6
Mean	**83**	**4.4**	**18.4**	**11.1**	**11.4**	**4.58**	**133.7**	**526.3**	**-**
C.D.	**3.07**	**0.44**	**2.62**	**0.75**	**0.75**	**1.45**	**92.78**	**175.7**	**-**
SE(m)	**0.99**	**0.14**	**0.84**	**0.24**	**0.24**	**0.46**	**29.78**	**56.4**	**-**
C.V.	**2.05**	**5.57**	**7.94**	**3.77**	**3.77**	**7.53**	**8.59**	**8.6**	**-**

PH= Plant height (cm), P Br= Number of primary branches, S Br=Number of secondary branches, LL= Leaf length (cm), LW= Leaf width (cm), F/P= Number of fruits/plant, A FW=Average fruit weight (g), FY/P=Fruit yield/plant (g) and DI= Disease index.

CARI Brinjal 4 was found better (556.48 g fruit yield/plant) compared to local check variety. Bacterial wilt disease incidence was recorded at fortnightly interval from 15 days of planting to 120 days.

Plate 75: Experimental block for field evaluation of bacterial wilt resistant brinjal lines

Plate 76: Bacterial wilt resistant brinjal lines

After 105 days of planting the crop was also artificially inoculated by bacterial wilt pathogen consortia. The disease index data revealed that lowest disease index (DI) was recorded in CARI Brinjal 2 (3.7%) followed by CARI Brinjal 3 (4.15) and CARI Brinjal 3 (9.3%) (Plate 76). However resistant check variety CARI Brinjal 1 showed DI of 3.9%, while wilt incidence was quite high in hybrid check (DI,19.6 %) and local check variety (DI 23.4 %).

Induction of Systemic Resistance through Application of Potential Antagonistic Microorganisms Against *Ralstonia Solanacearum* causing Bacterial Wilt of *Solanaceous* Crops

K. Sakthivel

Multi Locus Sequence Typing (MLST)

Fourteen isolates of bacterial wilt pathogen collected from different districts of Andaman Islands in three solanaceous crops were characterized for genetic variability using MLST analysis. The e-burst analysis revealed that there was large variation among the strains of Andaman Islands. The results also confirmed that the pathogen strains might have entered in to islands through frequent introduction of seed and plant materials from mainland states and clonal complexes which might have evolved mainly from Mohanpura region of West Bengal, India.

CIARI Bio - Consortia

The talc based bioformulation with consortia of antagonistic bacteria (*Lysinibacillus sphaericus Genbank no: KP864632; Bacillus subtilis Gen Bank no: KP864635,36;* and *Bacillus amyloliquifaceans, Gen Bank no: KP864633*) were developed and tested in different sick plot field conditions for the management of bacterial wilt in brinjal. The results revealed that soil application of bio-enriched FYM with CIARI- Bioconsotia at 15 days regular intervals could successfully control the bacterial wilt disease and increase the yield of brinjal (Plate 77). This soil application of bio-enriched FYM was also found best in protected cultivation.

Plate 77: CIARI- Bio-consortia treated and untreated brinjal plots

ORP on Fungal Foliar Diseases

K. Sakthivel, R.K.Gautam and V.K. Pandey

Collection of chilli anthracnose pathogen

Twenty isolates of *Colletotrichum* spp. were obtained from infected chilli leaves and fruits, showing symptoms of anthracnose in different locations of the islands. Based on morpholocal confirmation with ascospores, 18 isolates fitted into the description of *C. gloeosporioides* and 2 fitted into the description of *C. capsici*(Plate 78).

Plate 78: Acevuli and ascospores of *Colletotrichum spp.* from chilli plant

Pathogenicity tests

All the 20 isolates were tested for pathogenecity using three varieties of chilli *viz.* big, medium and small using pinprick method.The symptoms developed within 3 days after inoculation. Of 20 isolates, 14 (70%) had showed lesion on chilli fruit which were significantly different in size from one another. It was observed that big size chillies are more susceptible than medium and small size chillies. This was a typical susceptible host reaction, with a disease score in the range 3–9 (moderately resistant to highly susceptible).

Antagonistic activities of *Bacillus spp* against chilli anthracnose pathogen

The 30 plant growth promoting bacterial strains were tested for antagonistic properties against chilli anthracnose pathogen *Colletotrichum* spp. and the results revealed that 7 *Bacillus* isolates were able to show good results by inhibiting the mycelia growth of *Colletotrichum* spp *in-vitro* (Plate 79).

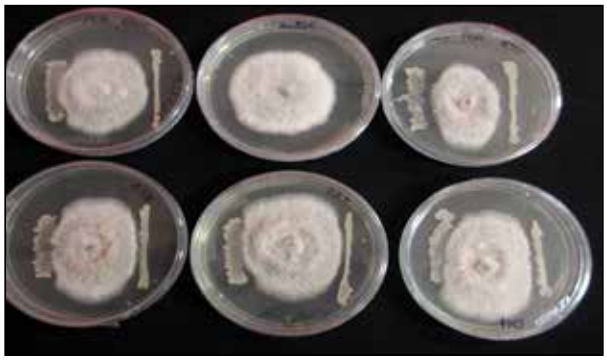


Plate 79: Antagonistic activities of *Bacillus* isolates against *Colletotrichum spp*

Exploring Antimicrobial Peptide Genes in Developing Bioformulation for the Management of Plant Disease of Andaman & Nicobar Islands (AMAAS)

K. Sakthivel and *R.K. Gautam*

Selective isolation of antagonistic activities of Bacillus isolates

In total 70 soil samples from different rhizospheres of vegetable crops were collected from Andaman Islands. The isolation of *Bacillus* strains were carried out using selective isolation as suggested by Travers *et al*. (1987), purified and maintained on 30% glycerol at -20°. The characterized organisms were tentatively identified as genus *Bacillus* spp (70 Nos).

Studies on antagonistic properties against fungal and bacterial plant pathogens

The 70 *Bacillus* isolates were tested for antagonistic properties against phytopathogens *Collectotrichum gloeosporioides*, *Ralstonia solanacearum* and *Xanthomanas oryzae* by dual culture assay (Dennis & Webster, 1971). The results showed that out of 70 isolates, 15 isolates were able to show good antagonistic activity against *Ralstonia*

solanacearum, 8 isolates isolates against rice bacterial blight pathgen *Xanthomonas oryzae* and 12 isolates were able to inhibit the mycelial growth of *Collectotrichum* spp.,

Antimicrobial peptide gene (AMP) amplification

The 2 best isolates of *Bacillus* based on *in-vitro* antagnostic activity were screened for their antimicrobial peptide gene (AMP gene) amplification. Among 13 gene primers tested, it was found that BM13 (*Bacillus amyloliquefaciens*) was able to amplify nine AMP gene primers and SM4 (*Bacillus subtilis*) was amplified with eight AMP gene primers (Plate 80).

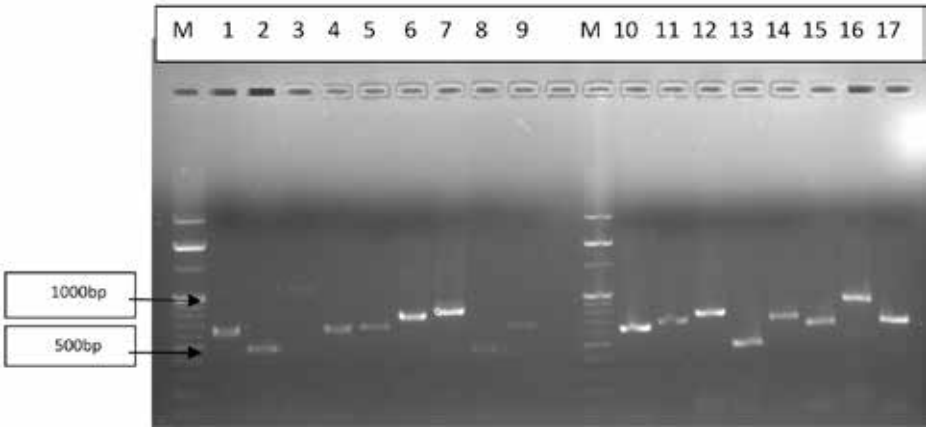


Plate 80: Standardization of AMP gene amplification in *Bacillus amyloliquefaciens* (BM13) and *Bacillus subtilis* (SM4).

M- Marker

Lane No. 1 to 9- BM13 isolate – genes amplified

1- ITUC , 2- ITUD, 3- MYCC, 4- SRFA, 5- SFP, 6- BACD, 7- BACAB, 8- SPACS, 9- SPAB-ERIB

Lane No. 10 to 17- SM4 isolate – genes amplified

10- SRFA, 11- SFP, 12- BACD, 13- SPACS, 14- SPAB-ERIB, 15- ALBA, 16- ALBF, 17- FENB

AICRP on Mushrooms

K. Sakthivel, N.C. Choudhuri, V.K. Pandey, Pooja Kapoor, R.K. Gautam and *S. Dam Roy*

Establishment of mushroom park

The mushroom spawn production laboratory and model thatched sheds of cropping and spawning rooms for continuous spawn production, cultivation of oyster mushroom and training for farmers were established in the institute.

Spawn production and mushroom cultivation

Mother spawn, first generation and bed spawns of oyster mushroom *Pleurotus florida (*TNAU strain*)* were produced with sorghum grains and mushroom cultivation was started with paddy straw and the sterilization technique of paddy straw was optimized using overnight soaking and steam boiling method. The results of the trials revealed that average of 1.2 kilogram of mushroom were produced in three harvests from one kg paddy straw bundles which is a usually higher yield, when compared to mainland (Plate 81). Also the time gap between two yields is only 7-8 days which is comparatively lesser than mainland. The six *Pleurotus* strains given under AICRP yield evaluation are being evaluated in the Institute and farmers fields. The technology of oyser mushroom production using paddy straw was also demonstrated and transferred to farmer at Calicut for small scale house hold mushroom production (Plate 82).

Plate 81: Oyster mushroom display at CIARI

Plate 82: Farmer harvesting mushroom in his field, Calicut

Monitoring of Pesticide Residue Analysis at National Level

Awnindra K. Singh

Pesticide residues analysis of vegetables, pulse (mungbean and urdbean), rice and fruits are of paramount importance as deposits of active ingredient of pesticides have been found injurious for the human, animal health and marine ecosystem. The pulse, rice, vegetable samples (cowpea, brinjal, okra, bittergourd, cucumber, cauliflower, cabbage, ridgegourd, bottlegourd, coriander leaf and green chilli) were randomly collected from farm gate, vendors of South, Middle and North Andaman vegetable markets and water samples from cultivation area of farmers' ponds of South, Middle and North Andaman (Plate 83). In the samples of food commodities different organochlorines, organophosphorus, synthetic pyrethroids, carbamates and other pesticides namely, imidacloprid, thiacloprid, thiamethoxam, acetamiprid, emamectin benzoate spinosad, pendimethalin, alachlor, Butachlor, indoxacarb, atrazine, simazine, flubendiamide & chlorantraniliprole residues were monitored using CODEX guidelines of pesticides residue analysis during 2015-16.

Plate 83: Collection of vegetable and fruit samples from farm gate & vendors

A total of 42 samples of pulse (mungbean and urdbean), 16 of rice, 355 of fruits and vegetables and water samples were collected from farm gate and vendors from different markets (Chouldhari, Guptapara, Junglighat, Mohanpura, Bathubasti) and water samples from Fisheries Division Pond (Garacharma), Bloomsdale Farm, Chouldhari pond were analyzed for Maximum Residue Limit using Gas Chromatography/ Mass Spectroscopy at Regional Plant Quarantine Station (RPQS), Chennai. The results revealed that out of 355 samples 27 percent were detected with different pesticides residue out of which approximately 12 percent were detected with multiple residues while, 4 percent of the vegetable samples were detected with above Maximum Residue Limit (MRL). Out of the total vegetable samples submitted the samples of cauliflower, okra and green chilli collected from the vendors of different vegetable markets were detected with above MRL pesticides residues.

Insect Pests of Legumes in the Andaman and Nicobar Islands: Bioecology and Management

T. Bharathimeena and *A.K. Singh*

The insect pest complex attacking red gram and black gram was studied in detail. Observations on pest incidence and damage levels were recorded on five randomly selected plants in 28 varieties. The chrysomelid beetle, *Madurasia* sp. and a pyralid leaf folder were the major defoliator pests of red gram. The adults of *Madurasia* sp. rested in tender leaf folds and also in mature leaves and bit through leaf surface making round shot holes. The grubs were found in the rhizosphere region of the plant feeding on root hairs and root nodules. They were creamy whitish in colour adhering to the root region. Pupa was slightly off white and located in 10-15 cm of the rhizosphere region. Damage assessment due to the beetle was made by categorising the percent leaf area covered by shot holes and randomly selecting five shoots and classifying them under different classes of per cent leaf damage. The pyralid leaf folder larva webbed 2-5 leaves together and fed on leaf lamina by scraping. Damage inflicted was assessed by counting the number of leaf folds per plant. The leaf folds per plant ranged from 1to 10 numbers among different varieties. The varieties ANP-14-02, CO 6 and Bahar recorded higher levels of incidence of both leaf beetle and leaf folder.

Pod borers *viz.,* the spotted pod borer, *Maruca testulalis*, the gram pod borer (Plate 84 & 85), *Helicoverpa armigera*, the blue butterfly, *Euchrysops cnejus* (Plate 86) arrive 150, 170, 175 days respectively after sowing in the flowering and pod bearing stage of the crop under sprayed conditions .The larvae of *M. testulalis* feed from inside the pods and remain concealed within pods. *H. armigera* feeds on the seeds while staying outside the pod and only inserting a part of its head and thorax. The entire larval body of *E. cnejus* is thrusted inside the pod while eating away the seeds and only about 1 cm of the terminal portion of the abdomen is visible outside.

Plate 84: Spotted pod borer, *M. testulalis* on black gram

Plate 85: M. testulalis (adult)

Plate 86: Blue butterfly larva

The variety ANP-13-01 recorded high levels of incidence of all the three pod borers. CO 6 and NA 1 showed higher infestation by *H. armigera* and *E. cnejus*. Occurrence of *M. testulalis* was higher on IPAC-452, ANP-11-14, and ANP-13-03. The looper caterpillar and *M. testulalis* were major pests of black gram. Their occurrence levels varied from 0-2 and 1-2 larvae per plant respectively.

Outreach Programme on Management of Sucking Pests of Horticultural Crops

T. Bharathimeena

The project aimed to conduct survey and document the sucking pests of vegetables and fruits in the Andaman and Nicobar Islands and study the extent of damage and specifically observe their developmental biology, life cycle and seasonal incidence. Okra and brinjal were regularly infested by hopper, *Amrasca bigutulla bigutulla* (Plate 87) and whitefly, *Bemesia tabaci*. Hence population counts of hoppers and whiteflies were recorded from farmer's field in the following locations of South Andaman: Garacharma, Chouldhari, Manglutan, Wimberlygunj, Ograbranch, Port Mout, Calicut, Tushnabad, Neil Island, Herpatabad and Humfrygunj. Adult and nymphal populations of the pentatomid bug,

Nezara viridula was recorded on cowpea from Garacharma during second fortnight of February 2015 and first fortnight of July 2015. It ranged from 0.20 to 1.20 adults and 0.20 to 6 nymphs per plant. The population was observed to move from cowpea to okra after the pods were harvested. Adult and nymphal population in okra varied from 0 to 0.89 and 0 to 1.20 per plant respectively. The bug completed a total development period of 22-25 days in vegetable cowpea.

High levels of populations of the mirid bug, *Nesidiocorius tenuis* was found associated with tomato. Adult and nymphal counts ranged from 0.6 to 5.8 and 0.6 to 6.4 per plant respectively.

Plate 87*: Amrasca biguttula biggutula* on okra

Plate 88: Nymphs of *Leptoglossus* sp. on coccinia

The leaf footed bug, *Leptoglossus* sp. was found to infest coccinia in South Andaman (Plate 88). Nymphs and adults desapped from green fruits making the fruit rind rough and slightly wrinkled. Population levels of adults and nymphs ranged between 0.2 to 7.60 and 2 to 8.20 per 8 vines respectively. The bug completed its development from egg to adult in 41.20 to 41.60 days.

The seed bug, *Cletus* sp. was a regular pest of amaranthus and could cause up to 50-80 per cent seed loss. Severe infestation of grain amaranthus was noticed from January 2015 till July 2015. Population levels of 0.40-3.80 adults per plant were noticed. The bug completed its development in 20.70 days.

Consortium Research Platform on Insect Borers (Network Mode)

T. Bharathimeena* and *I. Jaisankar

The shoot and fruit borer, *Leucinodes orbonalis* was regularly associated with brinjal crop. In okra, the spotted borer, *Earias vitella* was a serious pest. Damage assessment studies were carried out by observing the number. of plants with bore holes in shoots and fruits. Survey was conducted in ten locations in South Andaman, *viz.,* Garacharma, Chouldhari, Manglutan, Wimberlygunj, Ograbranch, Port Mout, Calicut, Tushnabad, Harpatabad, Humfrygunj and Manpur. Percent damage of fruits ranged from 20 to 100% per plant in brinjal and only lesser than 5 per cent fruit borer infestation was observed in okra.

The polyphagous borer pest, *Conogethus* sp. (Plate 89). was found infesting fruits of chalta, *Dillenia indica* (Plate 90). The infested fruits showed bore holes with frass and excreta plugged in. A pinkish spotted larva measuring about 1-1.5 cm was found feeding on the internal fruit contents. The larva pupated in 14.60 days from the date of collection. Pupal period lasted for 9.20 days. Adults on emergence could live up to 5 days. Infestation was recorded from the second fortnight of August 2015 onwards. Moderate to high level infestation (14.70 - 60%) was observed in this period and larva persisted in the field till the first fortnight of November 2015 after which the occurrence of the pest was meagre and sometimes unnoticed. Later the prevalence of larval stages in field was noticed from the first fortnight of December 2015 onwards. Intermittently the occurrence of larva was rarely or never noticed in the preceding fortnights and this seasonal pattern was noticed till the first fortnight of February 2016.

The spotted pod borer, *Maruca testulalis* was found infesting flowers and pods of field bean. Infested pods and flowers showed irregular bore holes (Plate 91). The larva fed on almost all seeds within the pod leaving behind only

immature seeds. The partially eaten seeds rotted and gave off unpleasant odour. Infestation levels ranged from 4.00 to 13.79 per cent damaged pods per plant and 1-3 larvae per inflorescence in Manglutan and Guptapara.

Plate 89: Chalta fruit borer *Conogethus* sp

Plate 90: Pupa of *Conogethus* sp. on chalta fruit

The fruit borer, *Helicoverpa armigera* causes serious menace affecting fruit set and yield of tomato (Plate 92). The larva was found making a circular bore hole and feeding on the fruit contents while remaining outside the fruit. Infestation levels were calculated based on percent fruits with bore holes. Infestation levels of 33-100, 10 - 40, 9.09 – 33.33 per cent in Neil Island, Garacharma and Chouldhari respectively were observed.

Plate 91: Pod borer damage on field bean

Plate 92: *Helicoverpa on tomato*

All India Network Project on Vertebrate Pest Management

T. Bharathimeena

Survey activities were undertaken in nine locations of South Andaman, *viz.,*Bhathubasthi, Chouldhari, Garacharma, Dollygunj, Junglighat, Aberdeen bazar, Mohanpura, Haddo and Delanipur to assess the infestation levels of rodent pests in grain storage areas and groceries.

Plate 93:*Rattus rattus andamanicus*).

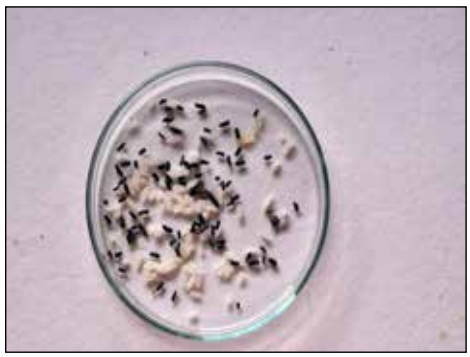


Plate 94: Contaminated rice grains

Rodent infestation (Plate 93) was confirmed by presence of excretory pellets and contaminated grains in rice grains sampled (Plate 94).

Traps and rat stickers were also laid in the concerned locations to know the species of rodents associated with stored grains. *Rattus rattus andamanicus* and *Mus musculus castaneus* were the predominant species caught respectively in the Sherman traps and stickers laid out. Mean trap catch was about 3 adult rats per 10 sherman traps and 2.5 mice per 10 stickers. Infestation levels in rice grains ranged from 1.11 to 35.29 per cent. Laboratory experiments were conducted in open space where frequent rodent movement was noticed. About 8-10 samples of rice grains and poultry feed weighing 5g were left in open space in containers between evening and night hours and weight of grains/feed consumed and number of excretory pellets/hairs were counted every 24 hours (Table 4). The results are presented in Fig.10 and 11.

Table 4: Rice grains infestation levels in different locations of S. Andaman

Locations	No. of sacks observed	No. of sacks with infestation	Percent infestation
Bhatubasthi 1	6	2	33.33
Bhatubasthi 2	17	6	35.29
Bhatubashti 3	17	2	11.76
Aberdeen Bazar	10	3	30
Dollygunj 1	10	1	10
Dollygunj 2	9	2	22.22
Dollygunj 3	8	2	25
Dollygunj 4	10	1	10
Junglighat 1	9	1	1.11
Junglighat 2	10	2	20
Junglighat 3	9	1	1.11
Junglighat 4	7	2	28.57
Delanipur	10	5	50
Mohanpura 1	6	1	16.66
Mohanpura 2	7	2	28.57
Mohanpura 3	19	2	10.52

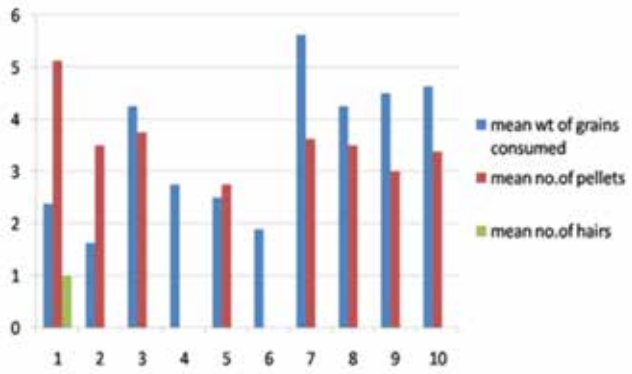


Fig.10: Rice grain consumption and contamination levels in open space

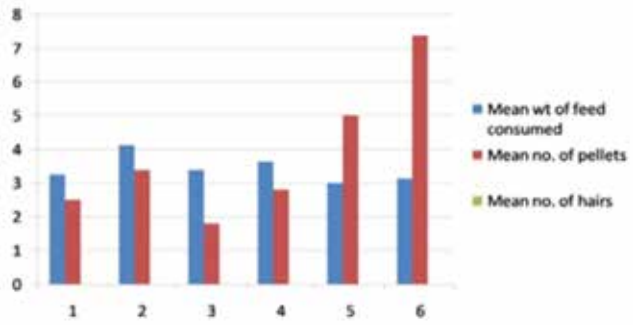


Fig. 11: Poultry feed consumption and contamination levels in open space

DIVISION OF NATURAL RESOURCE MANAGEMENT

Vulnerability Assessment and Adaptation Led Mitigation Strategies of Andaman and Nicobar Islands Farming to Climate Change

B. Gangaiah, T. Subramani, S. Swain, A. Velmurugan, B.K. Nanda, V. Damodaran, K. Lohit Kumar and *M.S. Kundu*

Studies were made to assess the utility of direct wet seeding of rice (DWSR) over conventional transplanting (TPR) to intensify the cropping and effectively utilize the rain water for higher performance of crop. In this study four varieties of rice (sub-plots) were tested under two methods of establishment i.e. TPR and DWSR (in main plots) in split plot design with five replications. The study revealed that Swarna (4.52 t/ha) out yielded the varieties / hybrid (Fig 12). Among the methods of planting, direct seeded rice taking 12 days less time to maturity gave 0.47 t/ha higher yield (Fig 13) than the transplanted crop (3.81 t/ ha). The performance of US 312 was more or less similar in both the methods of planting while the other varieties performed better when direct seeded. DWSR has removed the labour and inputs required for nursery raising, uprooting seedling and their transplanting. This has resulted in higher profits in rice crop. The water use functions were higher in DWSR than TPR due to more rainfall capture and higher yields.

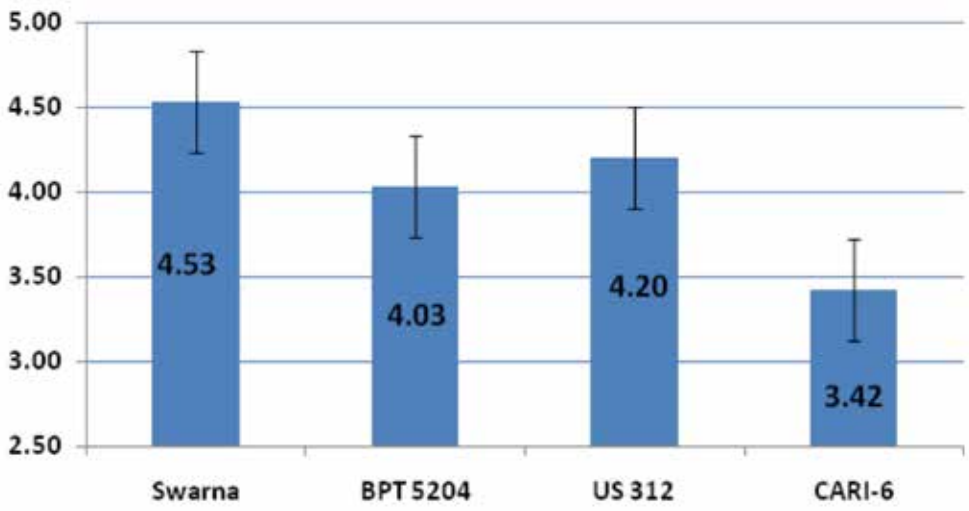


Fig 12. Grain yield (t/ha) of rice as affected by varieties

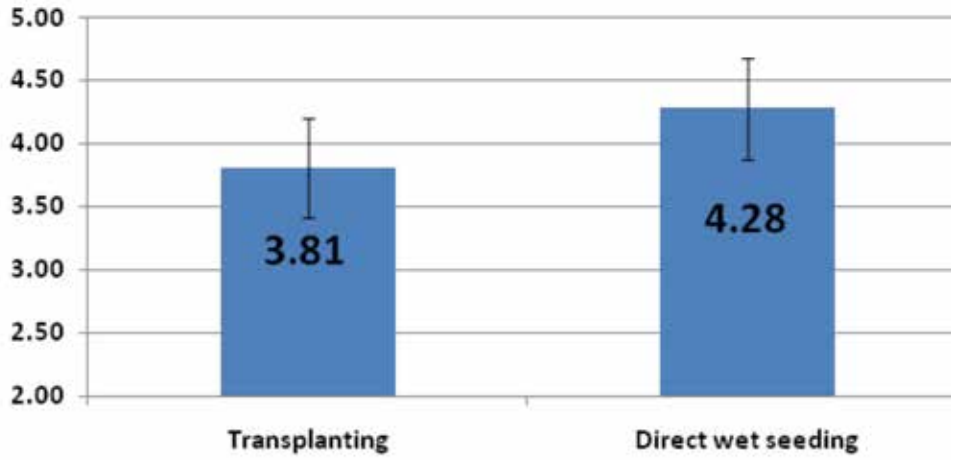


Fig 13. Grain yield (t/ha) of rice as affected by method of establishment

Nutrient omission studies were made to find out the relative importance of a nutrient for fertilization in rice at Bloomsdale farm with $DRRH_3$ rice. The study was made in RBD with seven treatments that were replicated thrice. The data (Table 5) reveals the greater importance of P fertilizer nutrient followed by N and last by K. The yield penalty was found to be a function of number of nutrients omitted and was of the highest magnitude when no fertilizer was applied (60.7% loss) and was least when K was omitted (7.6%). Balanced fertilization (NPK) has resulted in the highest rice productivity.

Table 5: Impact of nutrient (NPK) omission on performance of rice

Nutrient omission	Grain yield (t/ha)	Yield penalty (t/ha) over no omission treatment
-NPK	1.70	-2.63
-NP	2.15	-2.18
-NK	3.65	-0.68
-PK	2.98	-1.35
-N	3.92	-0.42
-P	3.32	-1.02
-K	4.00	-0.33
None	4.33	
SEm±	0.104	
CD (P=0.05)	0.316	

The historical weather data of the three districts of Andaman & Nicobar islands (South Andaman, North & Middle Andaman and Nicobar districts) up to 2014 was collected for contingency plans preparation for changing climate under NICRA project. The weather data analysis for *El Nino* years of the current century (2002, 2004, 2006 and 2009) has indicated that its impacts are discernible on rainfall of Nicobar district only. This is evident from the fact that out of the four El Nino years, (2002, 2004, 2009) have shown deficit rainfall (>-19% less rain fall over normal). The other two districts have recorded normal rainfall during all the *El Nino* years and in fact North & Middle Andaman has recorded excess rainfall during 2009 (Fig. 14).

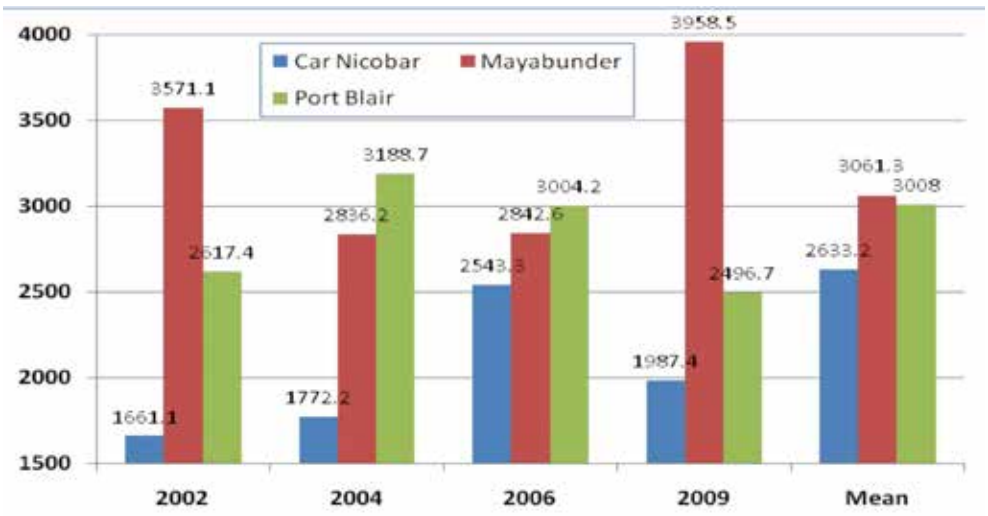


Fig 14: Impact of *El Nino* on rainfall of Andaman & Nicobar districts

The information on soil, crop / livestock / fisheries data was also collected for contingency plans preparation. In this direction, 250 soil samples from South Andaman (149) and North & Middle Andaman (101) districts were collected and analysed for 11 parameters (pH, EC, organic carbon, available N, P, K, S, Zn, Fe, Mn, and Cu). Based on soil fertility, fertilizer recommendations were made and Soil health cards (250) were issued to the farmers on International Soils Day on 5th December, 2015 (Plate 95).

Plate 95: Soil Health card distribution

Herbicides Combinations for Control of Complex Weed Flora in Transplanted Rice (All India Coordinated Research Project (AICRP)-Weed Management)

B. Gangaiah

A field study was made at Bloomsdale farm during *kharif* -2015 season to assess the performance of rice (BPT 5204) under 8 different weed management practices in randomized block design with three replication. The experimental soil with 6.3 pH was tested low for available N, P and K (258, 11.0 and 132 kg/ha) nutrients. Pendimethalin and Pretilachlor was applied immediately after transplanting, Cyhalofop, Penoxsulam / was applied 15 days after transplanting (DAT) and Bispyribac and Almix were applied at 25 DAT. There was continuous rain after Bispyribac and Almix application.

The study indicates that there is a yield penalty of 47.3% due to presence of weeds over nearly weed free situation that is obtained with 3 hand weedings (Table 6).

Table 6: Performance rice crop as impacted by different weed management treatments

Treatment	Grain yield (kg/ha)	Panicle/m^2	Grains/ panicle	Test weight (g)	Weed dry weight (g/m^2)*
Bispyribac	1792.6	250.7	87.7	14.3	10.77 (116.3)
Penoxsulam	2617.3	335.3	109.0	14.8	7.46 (55.7)
Bispyribac + Almix	1814.8	271.7	91.3	14.6	10.74 (115.3)
Pretilachlor + Almix	2555.6	317.0	101.3	14.6	6.97 (48.7)
Penoxsulam + Cyhalofop	2839.5	345.3	107.3	14.6	6.24 (39.0)
Pendimethalin + Bispyribac	2456.8	327.3	110.7	14.7	7.08 (50.3)
Hand weeding (twice)	3308.6	400.0	117.3	14.8	5.22 (27.5)
Hand weeding (thrice)	3427.2	427.0	117.7	14.9	3.82 (14.9
Weedy check	1804.9	250.3	88.7	14.2	10.33 (106.8)
SEm±	49.04	4.85	1.08	0.022	0.145
CD (P=0.05)	147.03	20.02	3.24	0.090	0.434

* Figures in parenthesis are original values that is square root transformed

Among the herbicides, Penoxsulam + Cyhalofop application proved promising (though it had 14.2% yield loss over 2 hand weedings treatment). In the current study, two hand weedings gave significantly higher yields than all the treatments and providing one more hand weeding (3 hand weedings) failed to enhance the crop performance. Bispyribac failed to prove its utility as there was a continuous rain after its application.

All India Coordinated Rice Improvement Project (AICRIP) - Hybrid Rice Evaluation Trial (AVT2-IHRT-MS)

B. Gangaiah

A field study was made at Bloomsdale farm during *kharif* -2015 season to assess the performance of five varieties (three hybrids and two varieties) of rice (in main plot) at four levels (%) recommended dose of nitrogen (RDN) fertilization (in sub plot) in split plot design with three replication. The experimental soil with 6.3 pH was tested low for available N, P and K (258, 11.0 and 132 kg/ha) nutrients. The RDN used in the study i.e. 100 kg/ha was applied in equal splits on 5, 27 and 47th day after transplanting. The crop also received uniformly 60 kg P_2O_5 and K_2O each/ha at the time planting.

The data (Table 7) reveals that KRH4 rice hybrid out yielded all other varieties / hybrids. The rice hybrid IET 24156 is the next best performer after KRH4. There is significant response to N fertilization up to 100% RDN only. At lower levels of N fertilization (no N and 50% RDN), KRH4 hybrid performed the best.

Table 7: Performance of rice hybrids / varieties as influenced by nitrogen fertilization

Rice variety/ hybrid	% Recommended dose of nitrogen				Mean
	0	50	100	150	
IET 24156	1977.4	2447.1	3042.3	3216.9	2675.9
WGL 14	1878.3	2156.1	2600.5	2658.7	2323.4
DRRH3*	1931.2	2314.8	2566.1	2640.2	2363.1
KRH4*	2545.0	2791.0	3121.7	3174.6	2908.1
CARI Dhan 6	1798.9	1957.7	2235.5	2354.5	2086.6
Mean	2030.2	2333.3	2713.2	2809.0	
	N dose	Variety	V at same N	V at different N	
SEm±	59.1	46.0	92.1	101.3	
CD (p=0.05)	144.5	93.8	187.5	220.5	

*RDN: 100 kg/ha

Assessment and Utilization of Soil Biodiversity for Improving Soil Health under Tropical Island Condition

A.Velmurugan, T.P.Swarnam and *K. Sakthivel*

There is paucity of information about the diversity and activities of soil microbial communities in different vegetation types and its relation with the soil properties in an island ecosystem. Therefore, during 2015-16 the ongoing study was continued to understand the relationship between soil biological properties in relation to land use and vegetation types found in the coastal landscape. The results showed that bacterial population and microbial biomass carbon (MBC) were significantly higher ($p < 0.05$) in mangrove soils followed by littoral forest, moist deciduous and agriculture. Both the properties closely followed the trend in soil organic carbon (SOC) content which decreased in disturbed sites as in the case of agricultural land use. When compared to the mangrove soils, MBC was 53% and 40% less for agriculture and moist deciduous forest, respectively. Since microbial biomass in soils is largely governed by SOC, nitrogen and organic matter addition, greater microbial biomass reflects greater accumulation of plant residues

and organic carbon, which are substrates for soil microbes. This was reflected in the form of strong correlation between MBC with SOC ($R^2 = 0.7249$*), TN (R^2=0.5082*) and SOC/TN ratio (R^2=0.732*) (Fig. 15). It was also found that acid and alkaline phosphatase activity was 18% and 14% lower in agricultural soils, when compared to moist deciduous and mangrove soils, respectively. The results emphasized the close association between above and below ground biological diversity with soil properties in the island ecosystem.

The study on hydrolytic properties of different isolates showed cellulase and IAA activities (Plate 96). Among the isolates 3A and HS/2 showed higher cellulase activities which are potential microbes in compost production. Similarly 1BF and 2BF showed higher IAA activity which can be used in plant growth promotion.

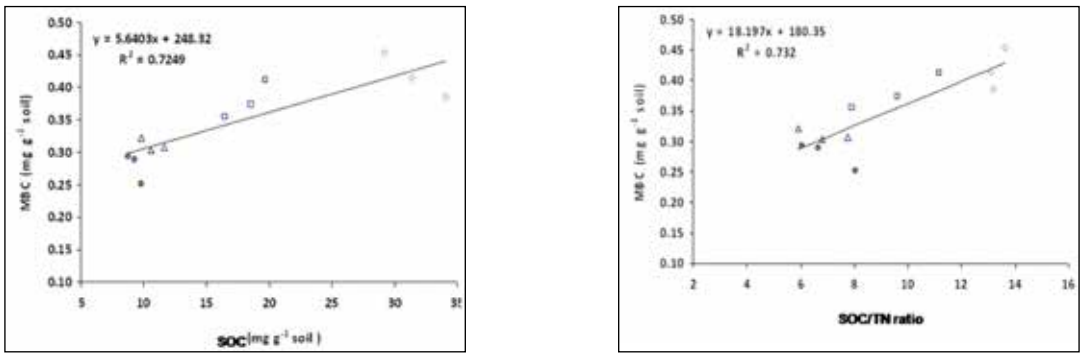


Fig. 15: Relationship between MBC and soil properties

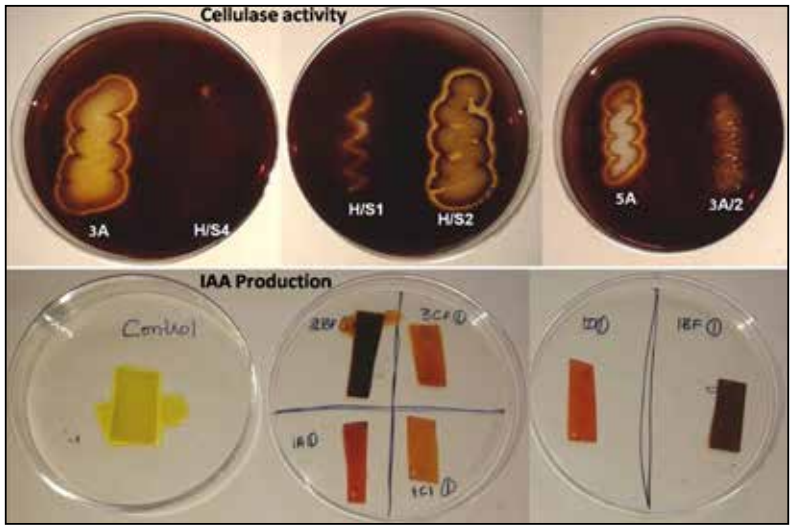


Plate 96: *In vitro* performance of bacterial isolates for cellulase and IAA production

Forecasting Agricultural output using Space, Agro-meteorology and Land based observations (FASAL)

A.Velmurugan and *T.Subramani*

In the island ecosystem of Andaman and Nicobar, it has been observed that the crop production is highly vulnerable to inter-annual and sub-seasonal climate variability. Therefore, understanding the impact of weather on crop yield apart from ensuring timely availability of production information to support policy decision at National level has became more important. During 2015-16 the ongoing experiments on validation of crop yield models for rice was continued. Simulation and regression based crop yield forecast models were developed for kharif rice using meteorological and crop data and validation of the same was carried out. Using these models the dependency of rice yield on the weather

parameters (1981 to 2013) such as maximum and minimum temperature, rainfall, maximum and minimum relative humidity was estimated. It was observed that linear regression model predicted rice yield more accurately ($R^2 = 0.872^*$) than trend analysis (Table 8). Similarly using the experimental data Decision Support System for Agro-technology Transfer (DSSAT) model was calibrated and used for yield prediction. The model predicted rice yield for kharif 2015, was 3160 kg/ha with the total potential production of 26200 tones (±1050).

A field survey was also conducted to study the effect of time of sowing and varieties on the productivity of rice and subsequent crop. The data revealed that late showing of medium duration varieties has no added benefit rather it accounted for nearly 20-40% yield loss. On the other hand, long duration rice should be harvested before the second week of January to ensure the sowing of summer crop in January. Majority of the farmers (64%) practicing rice-pulse and rice-vegetable system in North and Middle Andamans could not take up the second crop due to lack of water availability and late harvest of long duration rice.

Table 8: Rice yield forecast model for Andaman Island

Method	Model	R^2	Forecast
Rice (kg ha^{-1})			
Trend Analysis	Y=45.279x-87906	0.561	3100
Linear Regression	Y=3076.875+ 2.832*(Z251) + 0.853* (Z141))	0.872	2900
DSSAT model	Yield = Simulated Yield- C.F; C.F = Deviation of S.Y from the Trend yield		3160

* C.F – correction factor = 176

Integrated Agromet Advisory Services (Gramin Krishi Mousam Seva)

Velmurugan, T. Subramani and *S. Dam Roy*
Advisory Team: *T.P. Swarnam, P.K. Singh, A. Kundu, R. Kiruba Sankar, Nagesh Ram and S.K. Zamir Ahmed*

The on-going Integrated Agromet Advisory Services provides district wise weather based agro-advisories twice a week covering all the aspects of agricultural activities for the benefit of island farmers and other stakeholders.

Agro-advisory service

During the period (2015-16) the Agro-Meteorological Field Unit (AMFU) at CIARI, Port Blair has issued 80 agromet bulletins in English and Hindi through print and electronic media. It was aimed at minimizing the production losses and aid in timely decision making in farm operations. The agromet unit effectively utilized the services of Doordarshan and All India Radio (AIR) to reach out to the farmers by using regional language as well. A multidisciplinary team of scientists has delivered more than 15 talks on AIR in regional language on weather and agricultural production.

mKISAN and SMS service

AMFU Port Blair has activated mKISAN portal of Department of Agriculture, GOI, on 24th June 2014 and registered more than 5200 farmers from South, North and Middle Andamans and Nicobar Islands. All the farmers have been receiving agro-advisories through SMS on every Tuesday and Friday in Hindi and English.

Verification of forecast

Verification of forecasted and observed values of rainfall was carried out for pre–monsoon, monsoon and post-monsoon period (Table 9). The results revealed that on an average forecasted and observed values of rainfall were matching to the tune of 80.6% for pre monsoon, 67.9% for monsoon and 73.3% for post-monsoon period. Concurrently

monsoon and post-monsoon seasonal forecast and advisories were also issued for long-term planning of agricultural and land improvement activities through mass media.

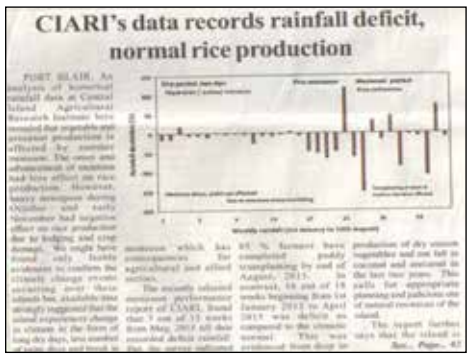
Table 9: Verification of forecast

Sl.No.	Particulars	Pre-monsoon (April-May, 2015)	Monsoon (June-Nov, 2015)	Post-monsoon (Dec, 2015 –Jan, 2016*)
1.	No. of days when rain was forecasted and also observed (YY)	19	94	7
2.	No. of days when rain was observed but not forecasted (YN)	4	11	3
3.	No. of days when rain was not observed but forecasted (NY)	8	38	13
4.	No. of days when rain was not observed and also not forecasted (NN)	31	10	37
5.	No. of matching cases (YY+NN)	50	104	44
6.	Skill score or ratio score of rainfall	**80.6**	**67.9**	**73.3**

Farmer's awareness programme

In order to sensitize the farmers on changing weather and agricultural production an awarness programme was organised on 28th July at Collinpur village of South Andaman. It was focused on crop planning, water harvesting and minimizing input loss in agricultural operations. During the period suitable pre and post monsoon agro-advisories encompassing all aspects of agriculture were issued for the benefit of all the stakeholders (Plate 97).

a. Awareness programme at Collinpur


CIARI's data records rainfall deficit, normal rice production

b. Analysis of monsoon performance

Plate 97: Creation of awareness on the changing pattern of weather and crop production

AICRP on Management of Salt Affected Soils and Use of Saline Water in Agriculture

Velmurugan, T.P. Swarnam and *T. Subramani*

During 2015-16 the ongoing study was continued to assess the hydrochemistry of the groundwater reserves of Car Nicobar and identify the potential areas for groundwater exploitation using multivariate analysis. A total of 21 water samples were collected from ring wells by the end of monsoon season in October, 2015 (Fig. 16).

Results revealed that the island's groundwater was of calcium bicarbonate type. The quality of ground water showed that throughout the island it was slightly acidic to neutral and mostly non saline except at few locations. Most of the ion concentrations fall within permissible limits for multiple water uses, particularly after monsoon season.

Electrical conductivity (EC) emerged as being significantly related to Ca^{2+}, Mg^{2+}, Na^{+}, Cl^{-} and SO_4^{2-}concentrations, and a strong correlation was observed between chloride and sodium levels. A corresponding increase in chloride levels and EC indicated the intrusion of sea water into groundwater reserves. HCO_3^{-} tended to dominate over Cl^{-} except in samples from the Southern part of the island which an indication of the mixing of seawater. Water quality was studied by Simpson index method (Table 10). The results showed that ground water in the villages of Old Kimious, Kimious, Sawai and Passa are being subjected to seawater intrusion.

Raised bed and furrow system was evaluated at farmers' field as an alternate land management option in the coastal waterlogged areas. The results showed that the mean initial soil salinity (ECe) of the raised bed at surface was 3.6 dS m^{-1} which slightly decreased with depth. One year after the intervention the soil salinity has significantly decreased in the beds and rain water was harvested in the furrows. This facilitated the year around cultivation of vegetables in the raised beds.

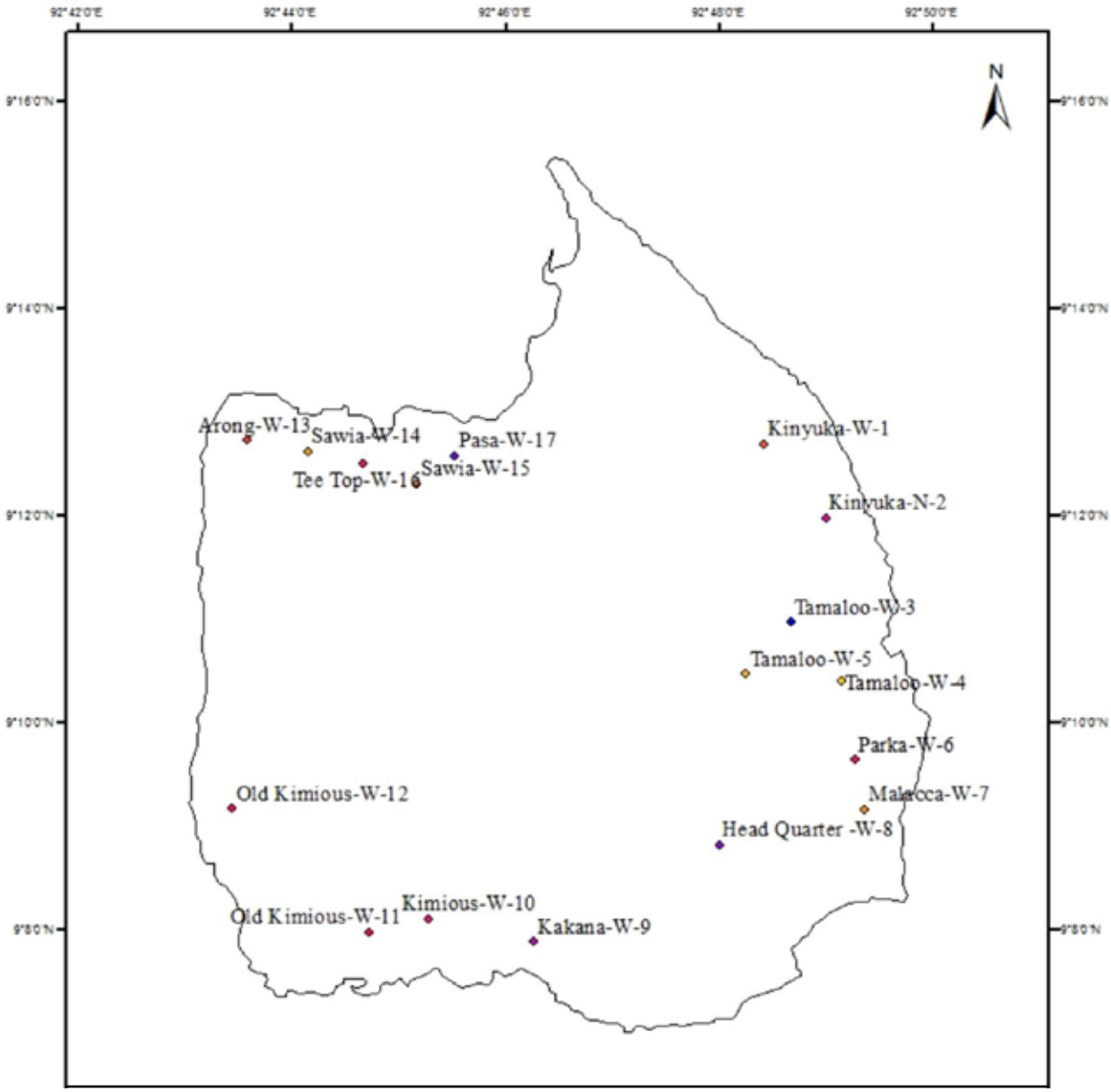


Fig. 16 : Location of the water sampling sites

Table 10: Water quality at Car Nicobar as per Simpson index

Sl. No	Place Name	Good 0.5<	Slightly contaminate >1.3	Moderately contaminate >2.8	Injurious >6.6	Highly contaminated >15.5
1	Kinyuka-2	0.19	-	-	-	-
2	Kinyuka-3	0.20	-	-	-	-
3	Tamaloo-1	0.18	-	-	-	-
4	Tamaloo-2	0.30	-	-	-	-
5	Tamaloo-3	0.45	-	-	-	-
6	Head quarter	0.04	-			
7	Kakana	0.49	-			
8	Parka		0.58	-	--	-
9	Malacca		0.87	-	-	-
10	Sawai-2		0.77	-	-	-
11	Sawai-4		0.92	-	-	-
12	Sawai-5		0.58	-	-	-
13	Kinyuka-1		1.39	-	-	-
14	Arong		1.13	-	-	-
15	Tea Top		1.01	-	-	-
16	Pass-2		1.47	-	-	-
17	Sawai-1	-	-	2.29	-	-
18	Old Kimious-1	-	-	-	7.63	-
19	Old Kimious-2	-	-	-	9.20	-
20	Kimious	-	-	-	-	92.98
21	Passa-1	-	-	-	-	20.24

Assessing the Status of Pesticide Residues in Sediments and Aquatic Biota in Neil Island

S. Dam Roy, T.P. Swarnam, A. Velmurugan and *R. Kiruba Sankar*

A study was conducted to assess the status of heavy metals in marine and fresh water aquatic systems of the Neil Island. For this purpose, fish, water, sea grass and sediment samples were collected from fresh water ponds and mangrove areas and heavy metals *viz*. mercury (Hg), lead (Pb), arsenic (As) and selenium (Se) were determined. The results indicated the presence of As and Se in almost all the samples, while Hg and Pb were not found except in one sample (Table 11). The hierarchy of concentrations of the heavy metals in muscle tissues of fish samples is Se > As > Pb > Hg.

Table 11: Concentration of heavy metals in fish samples collected from Neil Island

Name	Concentration (mg kg^{-1})			
	Mercury (Hg)	Lead (Pb)	Arsenic (As)	Selenium (Se)
Elagatis bipinnulata	ND*	ND*	0.42	0.33
Euthynnus affinis	ND	ND	0.70	0.35
Catla catla	ND	ND	ND	0.42
Tillapia sp.	ND	0.31	0.24	0.82
Macrobrachium rosenbargii	ND	ND	0.18	0.49
Clupeids	ND	ND	2.35	0.38

* ND- below the detection limit

Selenium and arsenic were found in all the fish samples with concentrations ranging from 0.33 to 0.82 mg kg^{-1} and below 0.05 to 2.35 mg kg^{-1} respectively. The highest concentration of As was found in *Clupeids*. Unlike in other coastal regions of India, the Hg and Pb were not detected as the island waters are pristine and are free from large scale industrial pollution.

All India Coordinated Research Project on Integrated Farming Systems

S. Dam Roy (N.O), T.P. Swarnam (P.I), A. Velmurugan, T. Subramani, S. Swain, M.S. Kundu, R. Kiruba Sankar, B.K. Nanda, I. Jaisankar, S.K. Pandey and *Zacharia George*

The inclusion of different components with diversified species of crops *viz.,* rice, pulses, oilseeds, vegetables in the cropping system and integrating other farm enterprises like dairy and fishery in an area of 0.75 ha in coastal low lands not only increased the overall farm production but production of diversified food items resulted in achieving food and nutritional security of the household (Fig 17). The study indicated that the on farm production was sufficient to meet the household needs of major food items, while the surplus production of cereals, vegetables and milk could be used to generate income generation. The diversification of crops and enterprises in integrated farming system also resulted in improvement of agricultural biodiversity. The agricultural biodiversity measured by Simpson's species diversity index and value diversity index increased to 0.811 and 0.794 as against zero in rice mono cropped areas.

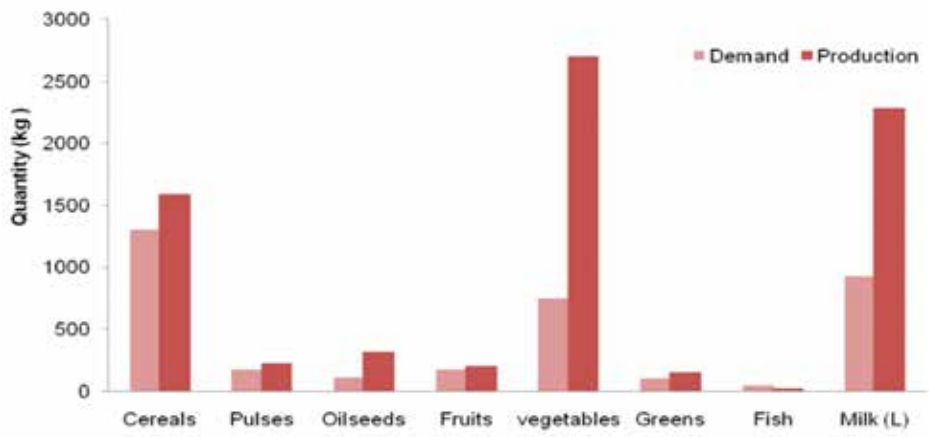


Fig 17: Demand and production of various food items in an integrated farming system

Studies on foliar application of 3% Panchagavya on brinjal Var.VNR 18 indicated a significant increase in number of fruits, fruit weight and yield per plant (Table 12). The mean fruit yield was 824.7 g $plant^{-1}$ in treated plants as against 330.1 g $plant^{-1}$ in untreated plants. The effect was also observed on biochemical parameters like total phenols, carotenoids, antioxidant activity and ascorbic acid content, where 51% higher antioxidant activity measured by DPPH was observed in treated plants. Similar increase was also observed for other parameters like total carotenoids (24.8%) and phenol (15.7%) in treated plants as against untreated plants.

Table 12: Effect of Panchagavya on growth and yield parameters of brinjal

Parameter	Treated	Untreated
Plant height (cm)	94.3 ± 11.2	87.0 ± 8.45
Branches $plant^{-1}$(No.)	11.7 ± 2.41	10.3 ± 1.95
Fruits $plant^{-1}$(No.)	20.9 ± 3.03	13.4 ± 4.20**
Single fruit weight (g)	36.5 ± 7.95	25.3 ± 2.80**
Yield $plant^{-1}$ (g)	824.7 ± 64.1	330.1 ± 22.6**

** Significant at 5% level

The study on physicochemical properties of banana grown with pig slurry, vermicompost and without any chemical inputs indicated that the fruit length, breadth and thickness were 14.4 ± 0.2 cm, 2.06 ± 0.12 cm and 2.69 ± 0.16 cm. The pulp recorded 21.1% of soluble sugars (TSS) with 73.4 % moisture content. The pulp contained 45.1 µg 100 g^{-1} of total carotenoids, 31.2 mg 100 g^{-1} of total phenols and 48.4 mg 100 g^{-1} of flavonoids.

Considering the remoteness, dietary intake, limited land availability and lack of market for the farm produce, a small scale homestead farming system model comprising home garden (400 m^2), backyard poultry (20 no's), goat (2 no's) and composting was evaluated on participatory approach in farmers' field at Car Nicobar to improve food and nutritional security of the tribal household (Plate 98).

Plate 98: Homestead Farming system for Nicobar Islands

From the system about 300 kg of seasonal vegetables, 117 kg of greens, 214 kg of tubers, and 200 kg of fruits were produced from an area of 400 m^2 in a year. The egg production also significantly increased. After the intervention the consumption of vegetables including greens, fruits and egg increased significantly by 50 to 250% due to their on farm production. The consumption of tubers decreased by 25% with increased consumption of other food items indicating a change in dietary pattern. After consumption, the surplus farm produce and goat kids resulted in supplementary household income of about Rs.7500/- from the system. A total of 95 man days were generated by the system spread throughout the year. Composting of organic residues on farm resulted in effective recycling of farm waste for crop production.

Baseline Survey to Ascertain the Status of Chemical Residues in Soil, Water and Agricultural Products and its Regular Monitoring in Andaman Islands

T.P. Swarnam, A. Velmurugan and *S.K. Zamir Ahmed*

Soil and vegetable samples were collected from major vegetable growing areas of the Island and were tested for the presence of organochlorine (OC), organophosphorus (OP), synthetic pyrethroid (SP) and neo necotinoid compounds. The results indicated that residues of 6 compounds were found in soil samples with mean concentration ranging from 2.0 to 95.0 µg kg^{-1} where acetamiprid recorded higher mean concentration (95.0 µg kg^{-1}) followed by acephate (26.8 µg kg^{-1}), imidacloprid (12.2 µg kg^{-1}). The acephate was found more frequently followed by imidacloprid, dimethoate, p□- p□ DDT, acetamiprid and α cypermethrin (Fig.18)

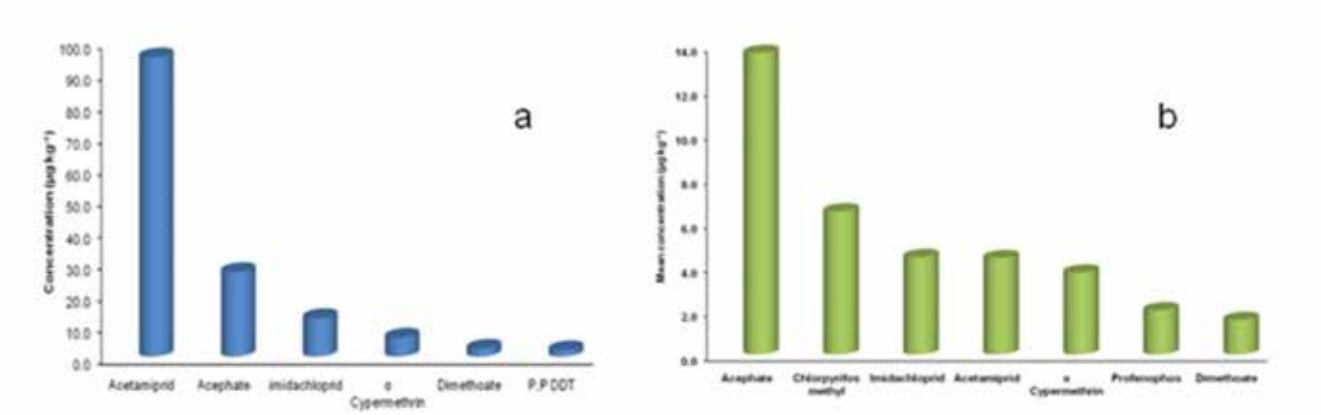


Fig.18: Mean concentration of pesticide residues in soil (a) and vegetable (b) samples

The analysis of vegetable samples showed the presence of 7 compounds with mean concentration ranging from 1.57 to 13.66 µg kg^{-1}. The OP compounds *viz.,* acephate (13.66 µg kg^{-1}) and chlorpyrifos methyl (6.48 µg kg^{-1}) recorded higher concentration of residues followed by neo nicotinoids such as imidacloprid (4.41 µg kg^{-1}) and acetamiprid (4.37 µg kg^{-1}). As in soil samples, acephate was also found in all the vegetable samples followed by imdacloprid (64.3%) and acetamiprid (57.1%). From the residue pattern found, it can be inferred that acephate and acetamirpid are more frequently used in the islands at present.

The green chilies showed the presence of residues of 6 compounds with higher mean concentration of acephate (27.59 µg kg^{-1}) followed by chlorpyrifos methyl (6.48 µg kg^{-1}) and imidacloprid (6.21 µg kg^{-1}). In brinjal, okra, cow pea and bitter gourd residues of 5 compounds were detected. In all the vegetables, acephate was found in higher concentration with mean values ranging from 9.6 to 27.59 4.41 µg kg^{-1}.

Development of Nutraceutical Beverages from Potential Underutilized Fruits and Medicinal Herbs of Andaman and Nicobar Islands

Sachidananda Swain, K Abirami, Pooja Bohra and *Pooja Kapoor*

Characterisation of Phytochemicals in noni, mango ginger and brahmi

Fresh mature noni fruits, rhizomes and brahmi leaf were dried at 50^0C and powdered into fine particles. One gram each of powdered samples were extracted with 20 ml of 80 % methanol twice and the solutions were filtered using Whatman no. 40 and the supernatant was used for estimation of phytochemicals. Total phenolic content in noni, mango, ginger and brahmi leaf powder was found to be 460.21, 401.81 and 42.19 mg GAE (gallic acid equivalent)/100 g respectively. The highest flavonoid content was observed in mango ginger (3528 mg/100g rutin equivalent) followed by brahmi leaf (3257 mg/100g) and noni pulp (56.14 mg/100g) (Table 13).

Table 13: Phytochemical constituents in fruits

Sl. No.	Phenol (mg/100 g)	Flavonoids (mg/100 g)	DPPH (mg/100 g)	ABTS mMtrolox /g	FRAP µM/g	NO mg/100 g Vit-C	OH (mg/100g)	H_2O_2 (mg/100 g)	MCA (mg/100 g) EDTA
Noni	460.21	56.14	1800	910	284	240	391	630.66	132.5
Mango ginger	401.81	3528	1720	145	247	616	481	70.66	197.8
Brahmi	547.27	3221.44	2733	881	438	130	2602.5	1233.34	325.41

The radical scavenging activity (RSA) were measured by seven different methods (Fig. 19 & 20). The effective scavenge of different radicals reveals the strong free radical scavenging activity of the three selected plant species and this is attributed to the presence of different phytoconstituents mainly phenolic compounds such as flavonoids. The DPPH scavenging activity was found to be highest (2733 mg/100 g BHT eq.) in brahmi leaf followed by mango ginger and noni pulp. The highest activity of brahmi leaf is due to high level of flavonoids. Mango ginger had highest (616 mg Vit-C/100 g) hydroxyl radical scavenging activity (OH) followed by noni and brahmi leaf. FRAP, OH and metal chelating activity (MCA) between noni and mango ginger was found to be identical. The inhibition capacity varied from 24.21 to 56.29 %, 18.85 to 62.19% and 12.93 to 74.77% for noni pulp, mango zinger pulp and brahmi leaf extract at 250 µg/ml. There was a steady increase in the inhibition of the radicals with concomitant increase in concentration (250-2500 µg/ml) of the extract establishing dose dependence of the extract in scavenging free radicals. Again from IC50 (concentration required for 50% reduction of scavenging activity) value, it was seen that the extracted pulps are weak in scavenging ABTS radicals (Fig. 2) where high doses could be required to increase their capacity. However, the extract are strong in NO and peroxide scavenging activity indicated as a viable source of antioxidant for the preparation of nutraceuticals and functional foods.

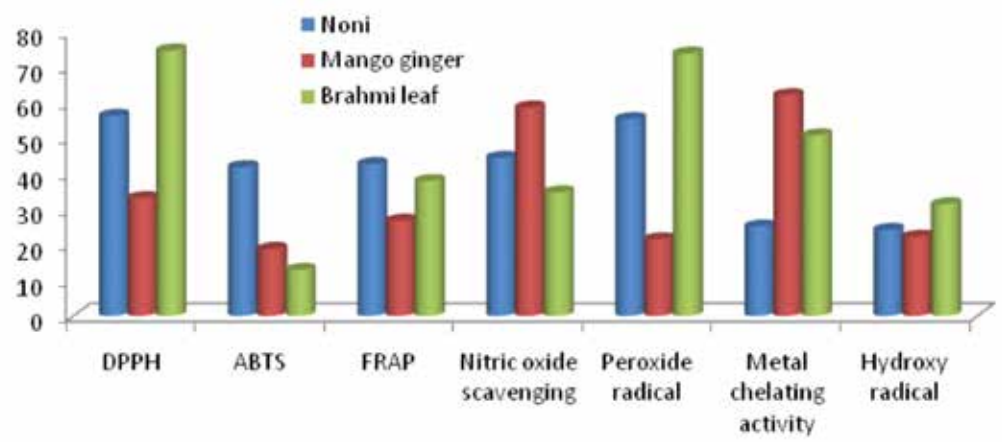


Fig. 19: Free radical scavenging capacity (RSA) of noni pulp, mango ginger and brahmi leaf extract in percentage

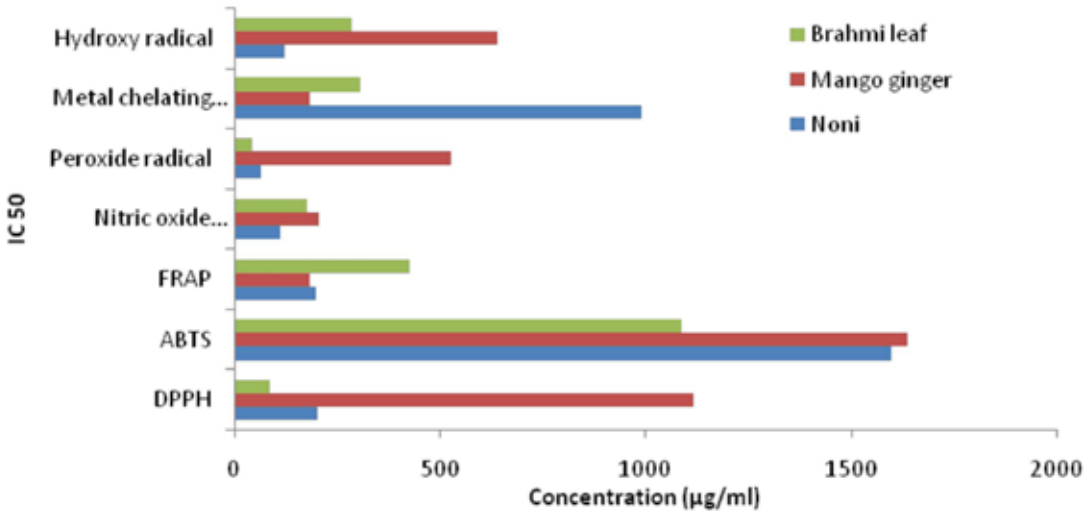


Fig. 20: Free radical scavenging capacity (RSA) of noni pulp, mango ginger and brahmi leaf extract

Food Processing Training Centre (FPTC)

Sachidananda Swain

Development of spiced tender coconut water ready-to-serve (RTS) beverage

Tender coconuts were cut on the top and the water was collected. The TSS, TA and pH was found to be 6.5^0 brix, 0.19 % and 4.86. Sugar, citric acid and water required for RTS preparation were added. The extract of flavoring agent (cardamon) was added to the RTS beverage. Then, the blended solution was pasteurized (75-80 ^oC for 2-3 minutes) to inactivate spore forming organisms and enzymatic browning followed by filling into glass containers (crown corking) and stored at room temperature (27 ± 3^oC) and refrigerated temperature (4 ± 1^oC). For preparation of "Ready-To-Serve" (RTS) beverage, 12% TSS and 0.26 % TA and preservative (mainly citric acid) were found satisfactory (Table 14).

Table 14: Biochemical parameters used in preparation of RTS juice

Particulars	Total Soluble solid (TSS)	Titrable acidity (TA) (%)	pH
Tender coconut	6.5	0.19	4.86
Ginger	3.1	0.22	6.52

Development of ready-to-serve beverage (RTS) ginger

Healthy and blemish free rhizomes (*Zingiber officinale*) were washed and cut into pieces followed by juice extraction using hydraulic juice press and pulper. After pulping, the pulp was strained and kept for 1 hour for settling down the sediments at bottom. The TSS, TA and PH was found to be 3.1^0 brix, 0.22 % and 6.52. The clear juice was siphoned off and mixed with sugar syrup solution, water and citric acid. Then, solutions were subjected to pasteurisation of 85^0C for 5-6 min followed by addition of Potassium Metabisulphite @ 45 mg/ litre of RTS. Then, the beverage was packed in glass bottles and stored in the refrigerated container (Plate 99,100 & 101). For the preparation of RTS, 12% pulp, 0.22% TA and 6.1 pH was found satisfactory with better organoleptic quality.

Plate 99: RTS Coconut

Plate 100: RTS Ginger

Plate 101: Training and demonstration for coconut based value added products

Assessment of Post Harvest Losses in Fruits and Vegetables Produces and Strategy for their Reduction in Andaman and Nicobar Islands

Sachidananda Swain, S. K. Zamir Ahmed, L. B Singh, Chandrika Ram and *Manoj Kumar*

In the current year, seven food crops (cauliflower, cabbage, radish, cucurbits, chilly, french bean and leafy vegetables) were selected for estimation of post harvest losses (PHL) at farmer's level. Harvesting is a short-period operation and a labour-intensive one. After harvest, quality/quantity loss of products can take place at all stages in the supply chain but more particularly during inadequate ventilation during packing and storage, overloading, inappropriate packing materials and inefficient transport systems. Lack of storage, unprecedented rainfalls during harvest time and inefficient transportation forces to sell the produce directly to the market. This in turn causes glut in the market and consequently increased the incidence of post harvest losses. The marketing system is not reasonably well networked in the Islands.

Out of six marketing channel observed, four major channels together accounted for more than 90 per cent of the trade as depicted below.

Channel-1 Farmers → PHC → Wholesaler (Distant) → Retailer → Consumer

Channel-2 Farmers → PHC → Wholesaler (Local) → Wholesaler (Distant) → Consumer

Channel-3 Farmers → Wholesaler (local) → Retailer → Consumer

Channel-4 Farmers → Wholesaler (Distant) → Retailer → Consumer

Farmers/pre-harvest contractors (PHC) transported the produce to assembly market mostly by rented vehicle for selling to the whole seller or sometimes the whole seller directly purchase at the field. Auctioning of fruits is done by open type and the payment to the seller was made immediate on the next day.

Post harvest constraints encountered by the farmers

A total of 32 respondents (progressive farmers) were surveyed to reveal the constraints in growing vegetables. The long distance to market (North and Middle Andaman) coupled with the poor transport network was reported by 97.3 and 99.1% (Fig. 21) of the farmers respectively. Some farmers, because of their inability to pay the transport cost, harvest their produce and sell as much as they can at the farm gate. Pest and disease infestation as well as lack of access to credit were major constraints faced by almost (99.1%) and about 95.3% of the farmers respectively.

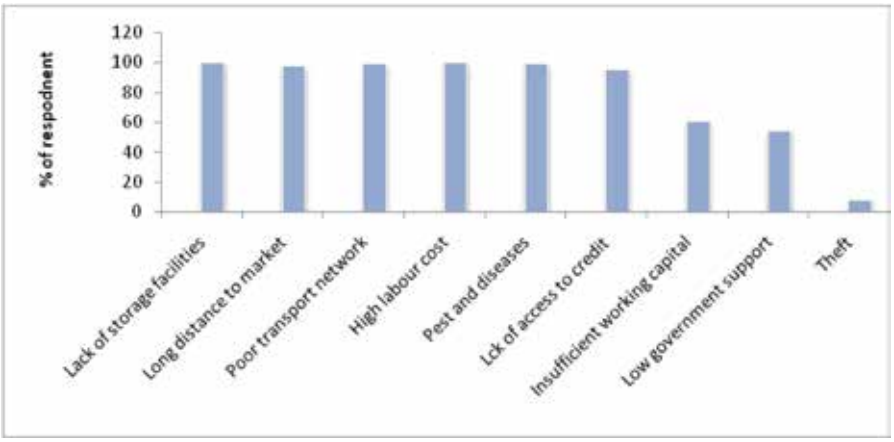


Fig. 21: Post harvest constraints

Problems faced during production and causes of postharvest losses

The major causes of postharvest losses as replied by the respondents are infection (76.4%), injury and infection (32.0%) and nature of the produce (respiratory pattern). With respect to market condition from farmers point of view,

majority of the respondents (90.9%) replied that there is no satisfactory market and the reason for these unsatisfactory market were higher supply of the produce at a time (53.5% of respondents), middle men exploitation and higher supply at a time (28.8%) and most of the time (87.5%) they are selling their products on farm itself due to high labour cost and undulated topography. During handling/packaging, there are problems of bruising during loading and unloading. Generally, 50.9 % of the respondents said that there is around 5% and others (34.1% for distant transport) believed that the loss of such products from production until marketing is estimated as high as 25% and rarely above this (Table 15).

Table 15: Post-harvest losses in vegetables

Vegetables	Stages				Total loss (%)
	Harvesting (%)	Grading and packaging (%)	Handling and transportation (%)	Marketing (%)	
Cauliflower	1.35	2.02	1.98	2.66	8.01
Cabbage	2.11	1.88	0.74	1.04	5.77
Cucurbits	1.1	-	1.89	1.85	4.93
Chilly	3.72	-	1.87	0.52	6.11
French bean	2.98	0.12	3.44	0.66	7.2
Radish	2.44	-	0.87	1.1	4.41
Leafy vegetables	0.02	-	2.44	0.68	3.14

The extent of losses varied from vegetable to vegetable as well as at different stages. On the overall basis, the maximum loss was estimated in cauliflower (8.01%) followed by french bean (7.2%) and so on. Grading and packaging are not practised by the farmers except cauliflower and cabbage. Cucurbits and cauliflowers registered maximum losses while cabbage and radish had minimum losses during the handling and transportation stage.

Feasibility Evaluation of Pulses Cultivation and Resource Optimization under Coconut Plantation

T. Subramani, A. Velmurugan, B. Gangaiah, A.K. Singh, V. Damodaran, B.K. Nanda and *T. Bharathimeena*

Post harvest soil samples analysis after cultivation of pulse crops (pigeonpea, mungbean and urdbean) under coconut plantations revealed that the available nitrogen has increased by 29 kg/ha after pigeonpea over the initial level of 210 kg/ha. The increase in available nitrogen of soil was low after mungbean and urdbean (8 and 13 kg/ha). There is no significant change in the available P & K contents of the soil due to pulse crops.

Studies were made to identify a new niche for pulse cultivation i.e. as intercrops in specialty corns (sweet corn, baby corn) as compared to grain maize. The study was made during *rabi* 2015 at Bloomsdale farm with 7 treatments in RBD with three replications. The data revealed that intercropping of sweet corn with black gram is promising. This was evident from the enhanced Land Equivalent Ratio (LER) of 1.23 which indicated 23 per cent yield advantage under intercropping as compared to sole crop (Table 16). Similar advantage was noticed in baby corn (1.29) and the gain was meagre in urdbean intercropped grain corn (1.06).

Table 16: Performance of urdbean in intercropping with different corns

Treatment	Yield (kg/ha)		Land Equivalent Ratio	Green Fodder Yield (t/ha)
	Main crop	Intercrop		
Sweet Corn (SC)	8000 *	-	1.00	30.0
Baby Corn (BC)	1200**	-	1.00	25.0
Grain Maize (GM)	2500	-	1.00	7.2 ***
Urd bean (U)	600	-	1.00	3.5***
SC +U (1:1)	7200	200	1.23	1.1***
BC +U (1:1)	1100	225	1.29	1.4***
GM+ U (1:1)	2000	158	1.06	0.9***

*Mature green cobs ** Baby corns *** Dry stover

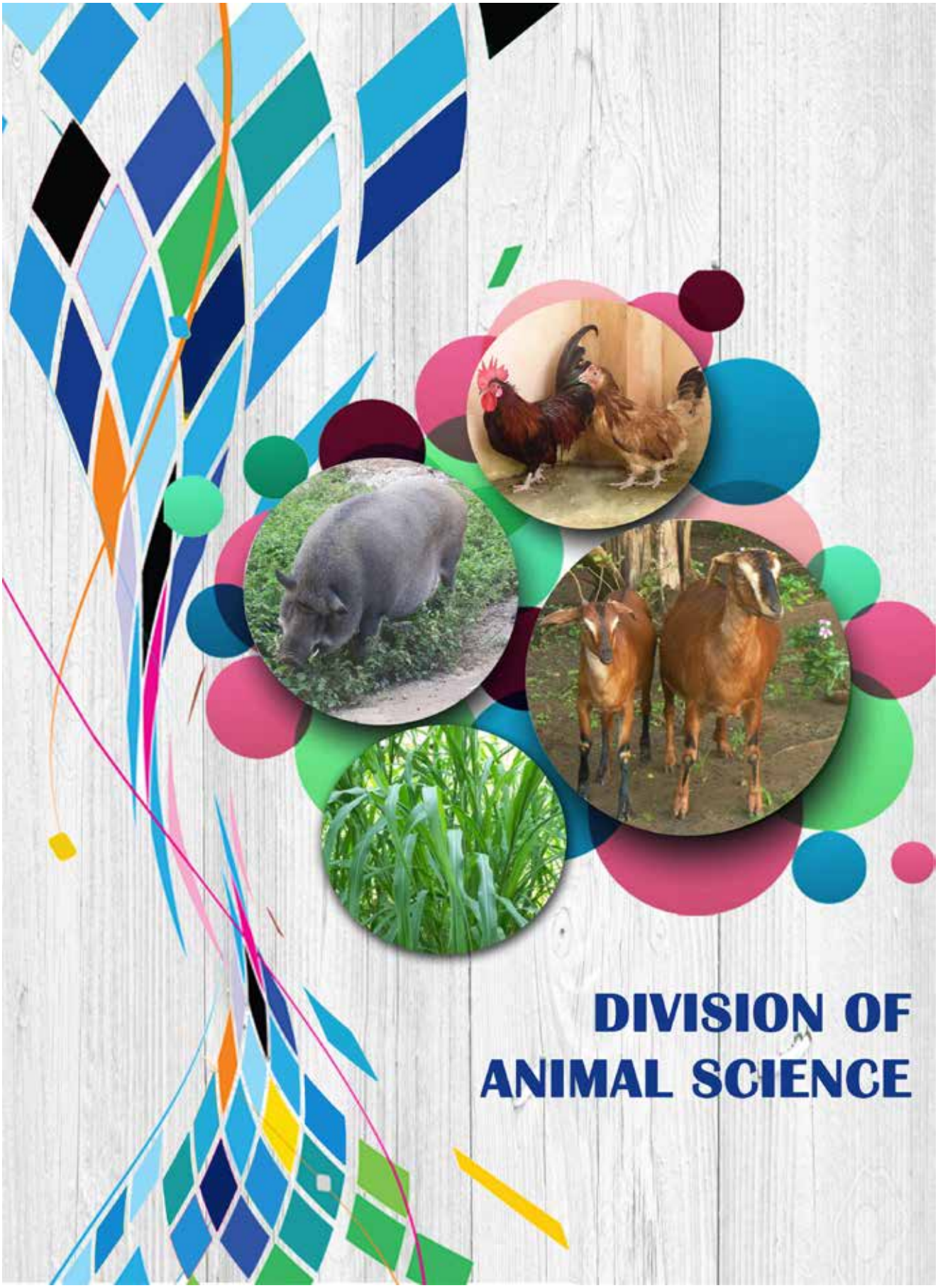
To tide over the nitrogen fertilization problems, green manures are looked at as potential solutions. However, this practice has limited utility in absence of ensured seed supply of green manure crops. Hence a study was made to assess the performance of two green manure crops for their biomass and seed production potential at Garacharma farm during kharif 2015. The data indicated significantly higher biomass (at flowering stage) and seed production in sun hemp (30 t/ha and 1200 kg/ha) as compared to dhaincha (18 t/ha and 815 kg/ha).

Performance of yam bean, a legume crop for tuber production in the islands

A field trail was conducted to assess the performance of four yam bean cultivars / accessions at Garacharma farm during *kharif* 2015 in RBD with six replications. The data (Table 17) revealed that the accessions did not differ for tuber production and on an average produced 14.95 t/ ha of tubers.

Table 17: Performance of yam bean cultivars/ accessions

Yam bean cultivar	Tuber yield (t/ha)
8 x 9 (154)	14.93
L-No-3 (134)	14.29
RM1	15.67
EC100546	14.94
SEm±	0.866
CD (p=0.05)	NS


DIVISION OF
ANIMAL SCIENCE

Poultry Seed Project

A. Kundu and T. Sujatha

Evaluation of breeding performance

During the year 2015, a total of 500 female and 100 male vanaraja breeders (Parent stock) entered into breeding stage. A total of 700 female and 300 male vanaraja breeder chicks number of day old chicks were procured from Directorate on Poultry Research, Hyderabad. A total of 19,845 numbers of hatchable eggs were produced in a period from 24 to 52 weeks from vanaraja breeders. The egg production trend line has been given in Fig 22. The age at sexual maturity (ASM) was 24 weeks with average egg weight as 43.22±12.2g and the egg weight of 50 g was reached at 35 weeks of age. The age at 5% and 50% egg production were 32 and 40 weeks respectively. After 40 weeks, the peak egg production trend was maintained for a period of 6 weeks with the average egg weight of 57±10.46 g. During breeding period, average feed allowance was 150g per bird per day. The body weight during the period of 24 to 30 weeks of age ranged from 2660±42.63g to 2963±34.2g for males and 1964±36.1 to 2770±31.24g for females (Table 18)

Table 18: Sex wise adult body weight (g) of Vanaraja parent stock

Particulars	Number of Birds (N)	Adult body weight (g) during breeding period	
Age in weeks		Male	Female
24	50	2660±35.6	1964±41.6
25	50	2875±41.5	2496±40.6
26	50	2963±35.6	2770±38.4
27	50	2813±36.8	2504±35.9
28	50	2811±37.4	2352±31.4
29	50	2660±38.4	2329±30.5
30	50	2946±39.6	2768±37.5

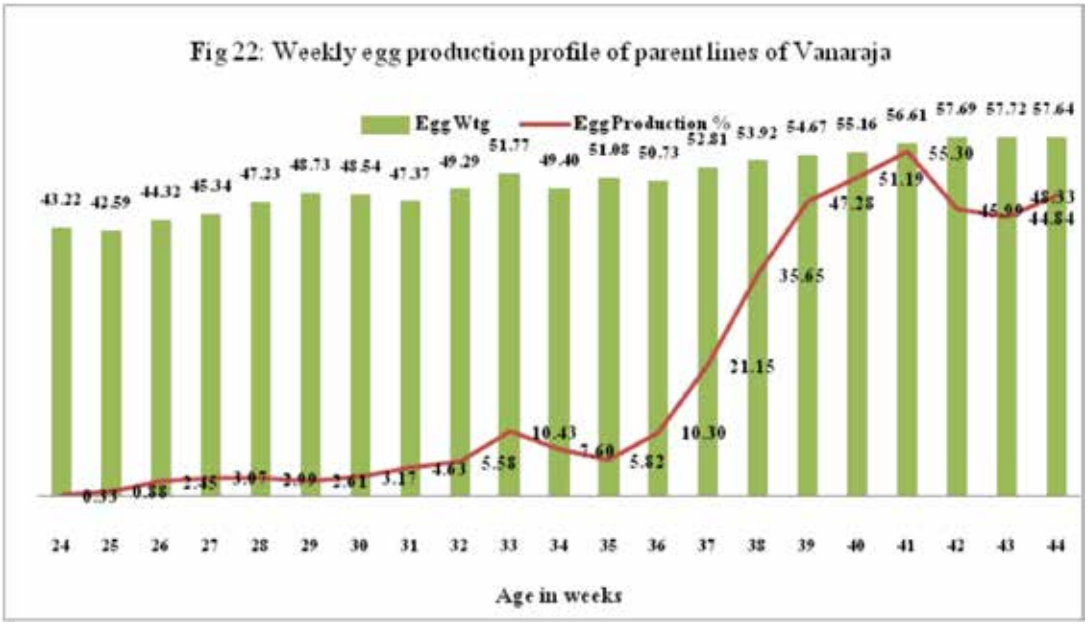


Fig 22: Weekly egg production profile of parent lines of Vanaraja

Production and distribution of vanaraja chicks

A total of 2068 vanaraja chicks were produced and 939 chicks were distributed (Plate 102).

Plate 102: Distribution of vanaraja chicks to farmers at Animal Science Farm complex

Growth performance of vanaraja chick at field level

Hatched out vanaraja chicks were sold at 3 weeks of age and their average body weight at 9 weeks was 980 ± 27 g in the field which was lower than those reared under farm condition (intensive system)

Growing performance of second batch Vanaraja breeders

The second batch of 500 female and 70 male vanaraja breeder chicks were brought from Project Directorate on Poultry, Hyderabad and their growth performance was presented in Table 19. The standard managemental practices were followed for the parent stock. The shed was cleaned, washed, flame gunned and fumigated with formaldehyde solution prior to the arrival of chicks and commencement of the experiment. The cemented brooding area was covered with paddy husk/saw dust (used as litter) and standard brooding arrangement was made. All the chicks were provided with uniform brooding facilities using 60 watt incandescent bulbs. The floor space of 675 cm^2 per chick was provided. All the chicks were vaccinated with RDVF at the age of 5th week and with IBD (Georgia intermediate strain) at 14th and 21st week of age, all the vaccination were applied as eye drops.

Table 19: Growth performance of 2nd batch of Vanaraja breeders

Body weight (g)	0 day	1 week	2 week
Female	33.80 ± 0.50	56.4± 1.63	93.7 ± 1.14
Male	38.30 ± 2.60	65.35 ± 2.39	170.5 ± 2.47
Cumulative feed (g/bird) for Female	280	560	
Cumulative feed (g/bird) for male	300	670	
FCR: Female (g feed per g weight gain)	0.20	0.167	
FCR: Male (g feed per g weight gain)	0.21	0.254	

AICRP on Pig

M.S. Kundu, Jai Sunder and A. Kundu

The Project has been sanctioned under XII five year plan. The work started from January 2015. The unit stared with 11 numbers of breed able stock with five female and 6 male. The herd dynamics has been given in table no 20. During this reporting year total 5 farrowing has been recorded. Salient parameters like litter size at birth (no.), litter weight at birth (Kg) and litter size at weaning (no.), were recorded as 8.4±0.68, 11.16±0.91 and 6.6±0.24 respectively. The details of the performances have been given in Table 20 & 21.

Table 20: Herd dynamics

Details	Andaman local pigs			Nicobari pigs		
	M	F	Total	M	F	Total
Opening balance as on 1/5/2015	6	5	11	5	4	9
Birth 1/5/2015 to 29/2/2016	28	16	44	9	13	22
Total	**34**	**21**	**55**	**14**	**17**	**31**
Mortality	8	4	12	8	10	18
Sold/ Slaughter/ Field unit	0	1	1	0	0	0
Total	**8**	**5**	**13**	**8**	**10**	**18**
Closing balance as on 29/2/2016	26	16	42	6	7	13

Table 21: Performance of Andaman local pig

Sl.No.	Traits/ Characters	Mean ± SE (5)		
		M	F	Total
1	Litter size at birth (No.)	9.33±0.51	6.4±0.71	8.4±0.68
2	Litter weight at birth (Kg)	12.03±0.59	7.88±0.93	11.16±0.91
3	Litter size at weaning (No.)	7.0±0.73	4.8±0.58	6.6±0.24
4	Litter weight at weaning (kg)	94.17±10.66	69.6±11.73	91.3±12.41
5	Avg. individual weight at birth (Kg)	1.25 ±0.03	2.32±0.06	1.24 ±0.03
6	Avg. individual weight at weaning(Kg)	22.92±1.89	22.25±1.83	24.87±4.40
7	No. of days for weaning (d)	56	56	56
8	Pre weaning mortality rate (%)	21.05±7.00	28.3±10.31	25.4±13.88
9	Post weaning mortality rate (%)	0	0	0
10	Pre weaning growth rate (gm/d)	0.38±0.01	0.40±0.02	0.21±0.01
11	Post weaning growth rate (gm/d)	0.33±0.01	0.280±0.01	0.327±0.01
12	Overall growth rate (gm/d)	0.31±0.03	0.21±0.03	0.258±0.02

Sero-Surveillance and Monitoring of FMD in Andaman and Nicobar Islands Under FMDCP

Jai Sunder and Arun Kumar De

The sero-surveillance for monitoring of foot and mouth diseases in cattle, buffalo and goats were conducted during the year. During the year a total of 1165 paired sera samples were screened for detection of antibodies against serotype O, A and Asia 1.

Plate 103: Awareness on FMD at Calicut, South Andaman

The post vaccination percent protection for type O, A and Asia 1 were 73.12%, 87.91% and 86.66% respectively. Out of 558 cattle samples screened for DIVA-ELISA, 24 (4.30%) were found positive, which were from vaccinated areas and had a history of FMD outbreak. During the year a total of four awareness programme were conducted in South Andaman. Based on the LPB-ELISA seroprevalence, it is concluded that the level of immunity for the serotype O, A and Asia –I has increased manifold over the years (Plate 103).

AICRP on Goat Improvement

Jai Sunder, M.S.Kundu and A.Kundu

Goat clusters have been established in South Andaman & Baratang. A total of 186 goat farmers from both the clusters have been registered under the project. The total flock strength of 1606 goats (309 adult male and 612 adult female) from the South Andaman cluster, while flock strength of 283 goats (46 adult male and 146 adult female) were recorded from the Baratang cluster respectively. During the period body weight at birth, 3, 6, 9, 12 and fist kidding were recorded and reproductive and productive performances from male and female goats were recorded. The average mean body weight (kg) at birth, 3, 6, 9 and 12 month of female goat was 1.34 ± 0.29, 5.37 ± 0.10, 8.63 ± 0.15, 12.58 ± 0.26 and 15.88 ± 0.16 and the respective weight of male goat was 1.42 ± 0.03, 5.80 ± 0.25, 10.34 ± 0.19, 13.64 ± 0.26 and 16.17 ± 0.13. Age at first mating, weight at first mating, age at first kidding, weight at first kidding, service period, kidding interval and gestation period was 260 ±15.0 days, 8.49±0.89 kg, 420.0 ±12.0 days, 18.79±0.30 kg, 101.20±11.23 days, 300.0 ± 20.0 days and 147.0± 2.0 days respectively. During the period a total of 64 goats died and 93 are sold. The cause of death is mainly due to bloat, diarrhoea, dog bite, accidents etc. during the period a total 61 newborn kids were also recorded. A total of 4 awareness programmes on "Scientific rearing of goat for improving productivity" was conducted at Indiranagar, Mithakhari, Namunaghar and Baratang (Plate 104). A total of 132 farmers have been trained under the project for scientific goat rearing. Mineral mixture powders were also distributed to the 248 farmers. A total of 6 elite Andaman local goat (Plate 105) male bucks were distributed to adopted farmers for use as a breeding buck for improvement of the germplasm (Plate 106).

Plate 104: Training at Baratang cluster

Plate 105: Adult male Andaman local goat

Plate 106: Distribution of male buck, mineral mixture and fodder slips to adopted farmer

AICRP on Animal Disease Monitoring and Surveillance

Jai Sunder and T. Sujatha

There were no major diseases outbreaks in livestock during the year 2015. Based on passive surveillance, a total of 20 diseases having clinical symptoms were reported in all three districts during the investigation period in livestock and poultry. A total of 19306 livestock were affected from these diseases. Parasitic diseases (99%) were of major problem followed by bacterial disease *viz.* leptospirosis and Salmonellosis (1%). Out of parasitic diseases, Ascariasis was the major disease (33%) followed by Fasioliasis (29%), Amphistomes (25%) and Strongyles (10%) (Table 22)

Table 22: List of the parasitic diseases reported in 2015

Parasitic diseases	Total no.	%
Fasioliasis	5049	26.30
Ascariasis	6356	33.10
Amphistomiasis	4430	23.07
strongyloides	1681	8.76
Babesiosis	42	0.22
Staphanophilariasis	485	2.53
Paraamphistome	611	3.18
Monizia	64	0.33
Strongyl	111	0.58
Trichuris	11	0.06
Bunostromum	169	0.88
Coccidiosis	191	0.99
Total	19200	

Temporal distribution

Fasioliasis: The number of cases of fascioliasis on a monthly average was 255 (cattle), 75 (buffaloes) and 91 (caprines). The overall percent prevalence was found to be high in buffaloes (1%) followed by Cattle (0.6%). The trend of facioliasis occurrence was observed erratic during the period among all species. The peak occurrence of fascioliasis was reported in buffaloes in January, June and September.

Amphistomiasis: The average number of recorded cases per month were 113 in cattle, 16 in buffaloe and 241 in caprine; but the percent prevalence was found to be high in caprine (0.4%) followed by cattle (0.3%). The frequency trend of Amphistomiasis was highly fluctuating among all hosts throughout the period. The peak occurrence of Amphistomiasis was reported in caprine in August 2015.

Ascaris: The average numbers of recorded cases per month were 239 in cattle, 75 in buffaloe and 352 in caprine. But the percent prevalence was found to be high in buffalo (1%) followed by cattle and caprine (0.6%). The frequency trend of Ascaris was also highly fluctuating among all hosts throughout the period. The peak occurrence of Ascaris was reported in buffaloe in June 2015 (Fig. 23).

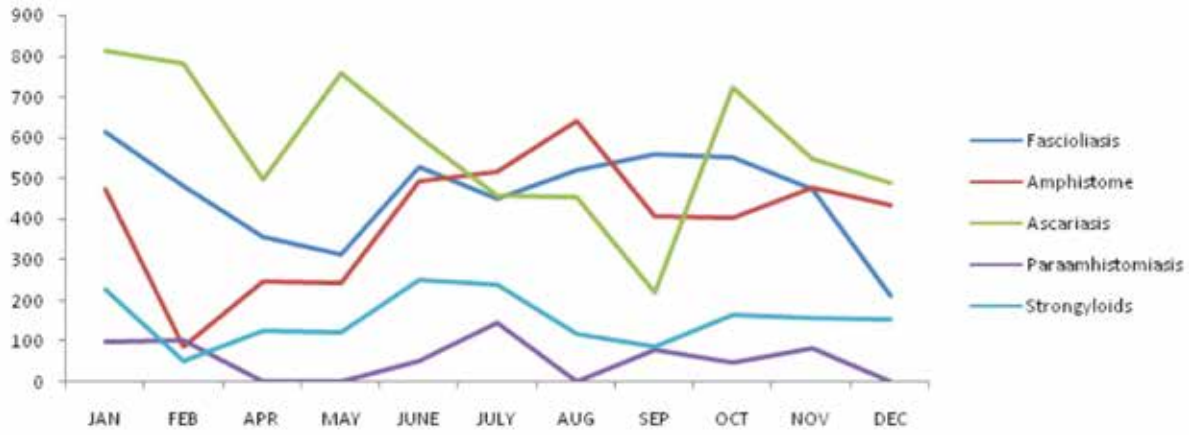


Fig 23: Temporal disease pattern of major parasitic diseases during 2015

Spatial distribution of major parasitic diseases

South Andaman has major proportion of 65% of total parasitic cases. The proportion of parasitic cases were recorded more in South Andaman (26%) while it was 9% in N&M Andaman and only 8 % in Nicobar Islands according to the proportion of livestock population density and distribution (Fig. 24).

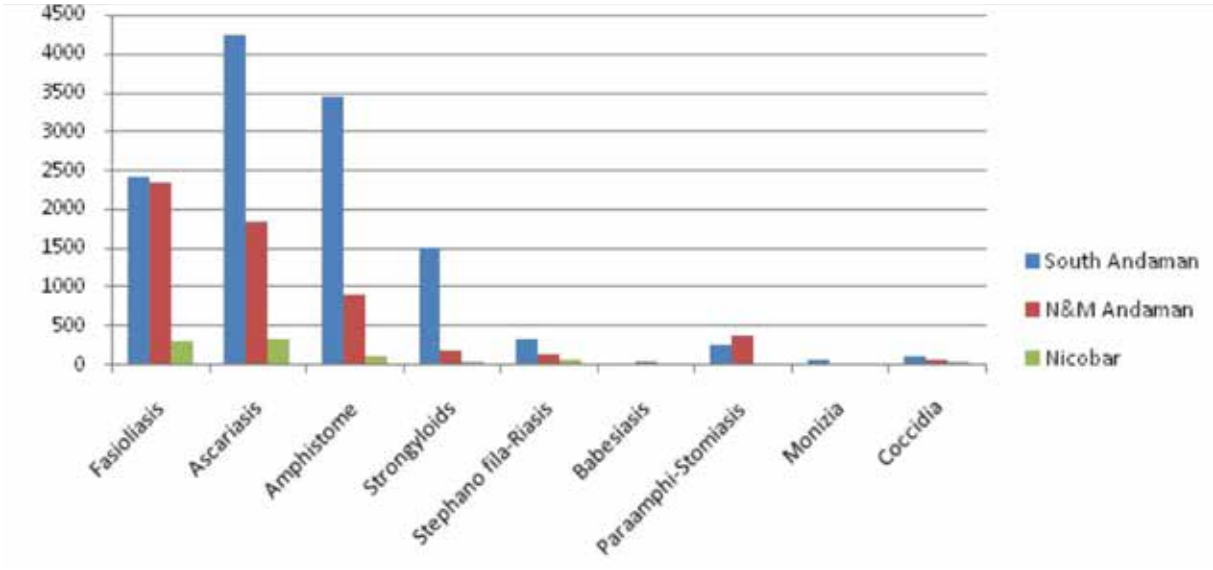


Fig. 24: Spatial distribution of major parasitic diseases

Sero-surveillance of important disease

A total of 427 cattle sera samples were collected from different parts of these islands. The samples were screened for presence of antibodies against different serovars of leptospira by microscopic agglutination test (MAT). The results revealed that out of 427 sera sample 180 (42.15%) showed antibodies against different serovars of leptospira. The serovars which showed positive results are *L. australis, L. autumnalis, L. canicola, L. hardzo, L. hebdomadis, L. icterrohaemorrhagiae, L. Pomona, L.pyrogenes, L.grippotyphosa, L. lai like*. The percent prevalence rate of leptospira ranged from 0.65 % (*L. autumnalis*) to as high as 19.61% (*L. hebdomadis*). It was also found that seropositivity of *L. grippotyphosa , L. icterohaemorrhagiae, L.hebdomadis* were higher compared to other serovars as these serovars are commonly detected from human cases also. Based on the present finding and the history of this disease in these islands it is revealed that the prevalence of leptospirosis in animal is high and also an alarming situation as these serovars are commonly prevalent in human being also. Sero-screening of sera samples for infectious bovine rhinotracheatis and brucellosis revealed that out of 294 samples only 15 showed positive to IBR and out of 588 samples only 6 samples showed positive to brucellosis by ELISA.

Rejuvenation and Improvement of Endangered Nicobari Fowl through Collection, Propagation, Selection and Conservation

A.Kundu, T.Sujatha, Zachariah George and *N.C.Choudhuri*

Mass selection of brown Nicobari fowl (Plate 107) was carried out based on segregation for short shank length at sexual maturity from base population of 50. G_2 (Generation 2) progeny from the selected population was propagated to 200 numbers including adults, growers and chicks. They were evaluated for production performance (Table 23).

Plate 107: White Nicobari fowl

Table 23: Effect of selection for short shank length on shank length of Brown Nicobari fowl

Shank length (mm)						
Age in months	**0 day**	**1**	**2**	**3**	**4**	**At age at sexual maturity (ASM)**
Generations						
Before selection	16.56^{b} ± 0.56	11.5^{b} ± 1.29	15.57^{b}± 2.37	20.33^{b} ±1.75	25.21^{b} ±4.18	44.28^{b}±5.23
G_1	13.62^{a} ±1.33	19.03^{a} ±1.50	26.56^{a} ±2.00	33.85^{a} ±2.63	38.71^{a} ±3.46	40.32^{a}±9.56
G_2	8.56^{a} ±2.42	16.41^{a} ±1.23	16.74^{a} ±3.12	23.26^{a} ±4.63	35.71^{a} ±1.72	35.56^{a}±8.43
G_3	6.56^{a} ±1.26	14.83^{a} ±5.86	16.74^{a} ±3.12	20.86^{a} ±4.93	30.89^{a} ±5.46	34.75^{a}±9.15

Values in the same column with different superscripts differ significantly ($p<0.01$)

From the table it is evident that the shank length reduced gradually from base population to G_1, G_2 and G_3 at all ages of measurements. At ASM, the shank length of G_3 reduced to 34.75 mm. There was no significant difference between second and third generation in shank length at all stages (Table 24).

Table 24: Effect of selection for short shank length on growth performance of Brown Nicobari fowl

Body weight (g)						
Age in months	**0 day**	**1**	**2**	**3**	**4**	**5**
Generations						
Before selection	33.2^{a} ±1.80	190.7 ^{a}±7.7	497.9^{a} ±30.1	799.1^{a} ±50.0	1008.5^{a} ±77.2	1215.8^{a} ±101.6
G_1	28.25^{b} ±0.75	157.4^{b} ±10.11	456.7^{b} ±19.87	718.4^{b} ±66.5	876.6^{b} ±66.5	1192.8^{b} ±52.80
G_2	27.53^{b} ±25.8	155.4^{b} ±35.7	289.4^{b} ±51.4	599.6^{b} ±53.6	786^{b} ±30.1	1098.9^{b} ±55.3
G_3	26.56^{b} ±5.23	130.6^{b} ±10.79	250.1^{b} ±9.52	550.46^{b} ±45.22	750.8^{b} ±43.55	998.50^{b} ±40.31

Values in the same column with different superscripts differ significantly ($p<0.01$)

From the above table it is evident that selection for shank length influenced body weight during the growing phase. There was gradual decrease of body weight in G_1, G_2 and G_3 generation at all ages of measurements in brown Nicobari fowl that happened in other varieties of black and white Nicobari fowl (Table 25, 26 & 27).

Table 25: Effect of selection for short shank length on egg production performance of Brown Nicobari fowl

Traits (at Age in weeks)	Before selection	Brown G_3
HDEP at 26	35.68± 6.53	28.42± 6.89
HDEP EP at 30	48.84± 6.23	39.62± 8.16
HDEP at 34	56.68 ± 5.25	48.86 ± 7.43
HDEP at 38	65.83± 4.72	50.46± 3.71
HDEP at 42	69.44 ± 8.57	49.86± 8.46

Table 26: Effect of selection for short shank length on egg parameters and feed efficiency of Brown Nicobari fowl

Traits	Before selection	Brown G_3
ASM (days)	158	186
Hatchability	64.85 ± 3.86	48.59 ± 9.5
Egg weight (g)	50.56 ± 9.48	46.38 ± 0.87
Egg mass (g / hen /day	32.79 ± 7.35	22.54 ± 6.56
Feed intake (g/bird/day)	130.56 ± 15.2	114.23 ± 15.6
Feed efficiency per g egg mass	3.98± 7.32	5.07 ± 4.25

Table 27: Innate immune competence status in progeny of Brown Nicobari fowl selected for short shank length

Generations	HA titre			
	0 dayNS	7th day	14th day	21st day
Before selection	0.55 ± 0.17	1.01^b **± 0.23**	0.90^b **± 0.21**	0.60^b **± 0.35**
G_3	0.54 **± 0.16**	5.81^a **± 0.87**	4.92^a **± 0.56**	3.84^a **± 0.29**

Values in the same column with different superscripts differ significantly ($p<0.01$)

The effect of selection for short shank length on body weight and production performance has negative correlation. Selection for shank length reduced the body weight during the growing phase. The onset of sexual maturity was delayed by 28 days in G_3 as compared to the groups before selection. Egg mass and feed intake was lower with G_3 as compared to groups before selection. Improved antibody titer of 3.51 at 3rd week post inoculation of GRBC was found in the progeny of selected brown Nicobari fowl for short shank length. 310 numbers of pure Nicobari fowl distributed to farmers.

Sustainable Rural Livelihood for Rural Women through Enhanced Rural Poultry Farming Techniques in Andaman Islands

T. Sujatha, A.Kundu, M.S. Kundu and N.C. Choudhuri

In the second phase of the project, it was implemented at Neil Island. The preliminary survey was conducted to select the farm women at Neil Island (Plate 108). A survey proforma was developed for this purpose. A total of Rural Poultry Farming was collected and tabulated (Table 28).

Plate 108: Preliminary survey at Neil Island

Table 28: Survey report on rural poultry farming at Neil Island

Particulars	Remarks
Average size of family	4 Nos.
Education status	VIII - XII
Average no of hatchings per year	4
Average Egg production	50 – 60 nos.
Knowledge on improved farming practices	Nil
Feeding	Occasional feeding with rice
Type of birds	Desi
Housing	No
Income from rural poultry	Negligible

Capacity building and establishment of initial units and mini incubator

Hands on training was imparted on *Women Empowerment on Rural Poultry by enhanced Rural Poultry Farming Techniques* for a total of 30 farm women on various aspects of scientific packages of technologies *viz*. germplasm of Nicobari fowl, elevated housing, low cost balanced feed for rural poultry, feeding and watering management, vaccination and artificial incubation using mini incubator (Plate 109). Demonstrations were made on brooding, feeding and watering of poultry using locally made feeder and waterer and incubator operation (Plate 110). Based on the interest shown by the women farmers in adoption of package of practices particularly hatchery operation, 10 farmers were selected on merit. Exposure visit was arranged for the farm women from Neil Island to ICAR-CIARI, Port Blair to see the advancements in the poultry farming (Plate 111).

Plate 109: Capacity building

Plate 110: Demonstration on mini incubator

Plate 111: Exposure of target farmer

Establishment of mini incubator and input units

A total of 10 units of poultry and one mini incubator were established (Plate 112, 113 & 114).

Plate 112: Mini incubator

Plate 113: Poultry shed

Plate 114: Farmers meet

Farmers meet cum distribution of Nicobari fowl

Farmers meet was organized at Neil Island to give technical guidance to the farmers of Neil Island to improve their production system of rural poultry since it is the main source of egg for the farmers of Neil Island. A total of 250 Nicobari fowls were distributed. Formulation of feed using locally available feed ingredients was demonstrated to them using rice, wheat, fish, used- bone and egg shells and coconut. Mini incubator was established and its operation was demonstrated to the farm women (Plate 115).

Plate 115: Distribution of Nicobari fowl at Neil Island

Augmentation of Fodder Resources to Improve Livestock Productivity in Andaman & Nicobar Islands

M.S. Kundu, B. Gangaiah, T. Sujatha and A. Kundu

Performance evaluation of three popular varieties of hybrid Napier, *viz* CO4, CO5, DHN 6 and one variety of multi cut Sorghum (COFS 29) were conducted under rain fed conditions. The treatments comprised of 3 different cultivars of hybrid Napier and one variety of sorghum planted at the onset of monsoon. The root slips were planted at a spacing of 60 x 60 cm for hybrid Napier and seed were sown for sorghum in the same spacing. The randomized block designs (RBD) with three replications were followed in this experiment. The first harvest was taken at 65 days after planting (DAP)/ sowing and subsequently harvests were taken at 50 days of interval. Total four harvests were made. Bio-mass yield from each plot was recorded immediately after cutting and expressed in ton/ha. Dry weight was recorded by randomly selecting five plants from each plot and drying them at 80 ± 5°c for 24 hours until constant weight was achieved. The data related to plant height and tillers/ Culm at each harvest has been recorded (Table 29 and 30). Maximum height was recorded at the time of 2nd harvest. Plant height decreased towards the later part of the experiment. This may be due to low availability of nutrient as earlier harvest exhausted the nutrient from the soil as well as due to low rain. The average height was higher in sorghum (163 cm) while minimum for CO5 (111.5 cm).No. of tiller per Culm was less at the initial stages of experiment, which increased gradually in the subsequent harvest. The average number of tillers was maximum for DNH-6 followed by sorghum and the lowest number was recorded in CO5.

Bio-mass yield (recorded as fresh green fodder) was highest in sorghum (COFS-29) throughout the experimental period irrespective of rain fall (Table 31). The maximum yield for sorghum was recorded as 231.2 tons per hectare and the lowest in CO5 (103.9 ton/ ha).

Among these four cultivars sorghum (COFS-29) was found superior with respect to total bio-mass yield better height of plant at the time of harvest.

Table 29: Plant height (cm) of grasses at different harvest

Cultivars	Harvest -1	Harvest -2	Harvest -3	Harvest -4
Days→	65 DAP	115 DAP	165 DAP	215 DAP
DHN6	156.5±6.92	175.75±3.66	163.125±5.99	124.25±5.45
CO4	135.625±6.01	158.75±6.01	135.125±6.58	98.25±3.47
CO5	114.375±6.76	136.625±4.14	118.5±4.28	78±2.76
Sorghum	164±4.13	176.25±3.22	172.375±2.88	140.75±5.22

Table 30: Tillers/ Culm of grasses at each harvest

Cultivars	Harvest -1	Harvest -2	Harvest -3	Harvest -4
Days→	65 DAP	115 DAP	165 DAP	215 DAP
DHN6	11.38 ± 0.8	14.25 ± 1.15	26.12 ± 1.32	20.12 ± 1.69
CO4	18 ± 2.32	21.75 ± 2.39	18.75 ± 2.07	14.87 ± 1.59
CO5	10.25±1.08	13.5±1.43	13±1.31	11.25±1.19
Sorghum	15.25 ± 3.01	18.75 ± 3.59	16.875 ± 2.9	15 ± 1.88

Table 31: Green fodder yield of different cultivars at each harvest (ton/ha)

Cultivars	Harvest -1	Harvest -2	Harvest -3	Harvest -4	Average yield per harvest	Total
Days→	65 DAP	115 DAP	165 DAP	215 DAP	-	-
DHN6	35.9	48.9	45.7	56.9	46.85 ± 4.34	187.4
CO4	33.5	45.8	52.6	43.9	43.95 ± 3.95	175.8
CO5	20.5	28	33.5	21.9	25.975 ±2.99	103.9
Sorghum	44.75	55.75	95.5	35.2	57.8 ± 13.25	231.2

Intercropping of fodders and perennial sorghum for enhanced fodder production

A field experiment was conducted to assess the performance of four fodder crops (maize, sweet sorghum, perennial sorghum, cowpea, Agathi) in sole and intercropping stands at Garacharma farm during kharif 2015 under rainfed conditions. Six treatments (sole and intercrops) were tested in randomized Block Design with four replications. The data (Table 32) reveals that sweet sorghum (SSV 74) in sole stands has produced significantly higher dry fodder yield than its counterpart maize crop. The low fodder production of sole maize crop as compared to sole sweet sorghum was compensated by intercropping of maize with cowpea. When two cuts were taken, perennial sorghum (CoFS29) has recorded 6.28 and 9.51 t/ha higher dry fodder production over sole sorghum and maize. Intercropping of maize/ with cowpea has enhanced the dry fodder production and thus has higher land equivalent ratio, (LER) over sole maize. Though the LER is increased with intercropping of sorghum with cowpea, there is no significant productivity gain. Per day fodder productivity (kg/day) was the highest in sweet sorghum and was the least in sole cowpea. Proximate analysis of fodder was also done.

Table 32: Performance of sole intercropped fodder crops and perennial sorghum

Treatment	Fodder yield (t/ha)		LER (based dry matter yields)
	Green	Dry	
Maize sole	38.3	11.95	1.00
Sweet sorghum sole	42.2	14.18	1.00
Perennial sorghum sole*	64.5	20.46	1.00
Cowpea sole	24.6	6.01	1.00
Maize + cowpea	34.0 (10.5)	10.75 (2.52)	1.31
Sorghum + cowpea	38.4 (9.6)	12.83 (2.30)	1.12
SEm±	1.65	0.46	
CD (p=0.05)	5.00	1.68	

Figures in parenthesis are intercrop cowpea yield; * Yield from two cuts

Development of Enriched Chicken Egg and Meat

T.Sujatha, M.S. Kundu and A. Kundu

In ovo - Immunomodulatory effect of Kalmegh (*Andrographis panniculata* Nees) on Expression of Toll-Like Receptors in Nicobari fowl

Andrographis paniculata (AP) has potent immunomodulatory role in the native indigenous Nicobari fowl. Toll Like Receptors are innate immune receptors and induce fast and appropriate host defence reaction against pathogens. However, basic information on changes at expression of Toll Like Receptors in progeny from Kalmegh fed breeders is not very well known; the level of *in-ovo* exposure of developing embryo to dietary factors affects subsequent deposition of bioactive components in tissues of the post-hatch chick. The effects of dietary factors on the avian immune system may be confounded by in ova exposure. Therefore, the objective of the present study was to examine

the effect of *in-ovo* exposure of embryo to bioactive components present in Kalmegh and Noni and its subsequent effect on TLR expression in post hatch chicks.

Experimental design

Two hundred seventy breeding Nicobari fowls belonging to same batch were selected at 35 weeks of age. Optimal male female ratio was maintained. Birds were managed under deep litter system and 16 hours light with 3 lux of intensity per sqft. Birds were not subjected to vaccination at the start of experiment. All birds were fed *ad libitum* feed as per Bureau of Indian Standards (BIS, 2007) recommendation. Thirty six breeders were assigned to each of following dietary treatments in a completely randomized design with three replicates of 30 birds in each replicate;

T1 - Control group, T2– Kalmegh @ 3g per bird per day & T3: Noni @ 10ml per bird per day

Ad-libitum feeding was done under standard mangemental condition. Experimental diet was fed for 60 days. Chicks were hatched out from experimental birds. Slaughtered by humane method at the age of 21 days and spleen samples were removed from the chicks.

RNA Isolation and cDNA synthesis

Total RNA was extracted from spleen samples (n=6) of each group by using RNA isoplus (DSS Takara India P Ltd, India) as per the manufacturer's instruction. Quantification of total RNA was done by using Bio spectrophotometer (Eppendorf, Germany). cDNA was synthesized from 2 ug of total RNA by using high capacity cDNA synthesis kit (Applied Bio system, USA) as per the manufacturer's instruction. Primers were synthesized from the sequences mentioned by Michailidis *et al.* (2010) and used in PCR and real-time PCR.

Real- time PCR

The mRNA expression levels in progeny of control and herbal feeding groups treatment were quantified by Real-time reverse transcriptase (RT)-polymerase chain reaction (PCR) method using ABI Prism 7500 Sequence Detection System in Realplex 4S (Eppendorf, Germany) machine with SYBR green master mix (DSS Takara India P Ltd, India). Real-time PCR was carried out with 1 ul of cDNA, 5 pmoles of each forward and reverse primers, 5 ul of SYBR green master mix and nuclease free water to make up the volume to 10 ul. Cycling parameters were as follows: an initial denaturation at 95^0C for 10 min; 40 cycles of 94^0C for 30s, 58^0C for 30 sec, 72^0C for 30 sec. RT-PCR reactions of gene for each sample were done in triplicates in 96-well plates. The relative expression levels for target gene were calculated according to ΔΔCT method. mRNA values from *Andrographis* and *Morinda* fed groups were expressed as relative expression compared to control samples.

Results

Analysis by Real - time PCR revealed that supplementation of Kalmegh and Noni in the breeder diet influenced the expression levels of TLR3, TLR4 and TLR5 in progeny significantly ($P<0.05$) as compared to control. Present study shows that TLR-4 gene expression varied significantly ($P<0.01$) among progeny from herbal fed groups. Progeny from Kalmegh fed breeder showed an up regulation of 9.7 fold in TLR4 gene expression compared to control progeny. On the other hand showed a moderate expression of TLR-4 (5 fold) by noni group when compared to control. Higher TLR-4 expression in progeny from herbal fed breeders indicates it to be having more immunity while the progeny from control group to be the most susceptible. Similarly, expression of TLR3 and TLR5 gene were elevated in the progeny of kalmegh fed breeders by 5.4 and 1.6 fold respectively as compared to control progeny. The progeny from noni supplemented breeders showed moderate expression of TLR3 and TLR5 gene by 2.9 and 0.48 fold when compared to control. With reference to GADPH, the kalmegh supplementation modulated the expression of TLR3, TLR4 and TLR5 receptors by 4.1, 11.4 and 4.1 times while chicks from noni group could express only TLR4 by 4 times where as the expression levels in chicks from control group was not satisfactory. The present study showed up regulation of TLR genes' expression in the progeny from breeders fed with herbal feed additive having immune modulating properties. Further, kalmegh has shown to be more potent up regulator of TLR gene expression as compared to noni.

Overall, these data suggest that the elevated expression of TLR-3, TLR-4 and TLR-5 genes indicated that supplementing Kalmegh and Noni in breeder diet induces antiviral and antibacterial responses in their progeny. In ova dietary exposures to bioactive components present in the medicinal plants enhances the expression of TLR gene and systemic inflammatory immune response in chicks. They might be promising alternative medicinal plants for antibiotic growth promoters and commercial immune boosters in the platform of production of antibiotic residue free poultry produce.

Development of Aloe Vera N. based herbal Treatment for Conjunctivitis in Poultry

Conjunctivitis, a common eye disorder, is usually caused by bacteria, virus and fungus. Conjunctivitis is also a symptom of many other medical problems, including respiratory infections. It is a wide spread problem among rural poultry in A&N Islands where more than 80% of poultry population belong to backyard poultry. Eye diseases have significant economic value since they negatively affect birds' health and performance. The conventional treatment for most forms of conjunctivitis is a topical antibiotic or antifungal application that usually involves high cost. Further, it may lead to allergies due to resistance to antibiotics or over usage. Aloe vera is readily and naturally available in all over the island. This natural remedy has proven antibacterial, antifungal and antiviral properties in human medicine. Therefore, the clinical trial was taken up with aloe vera based herbal eye drops to treat conjunctivitis.

Preparation of Aloe eye drops

Aloe vera juice was prepared from the pulp and eye drop was prepared using castor oil as base. Antibiotic sensitivity of Aloe drops: zone of 12 mm diameter and the efficacy was on par with Norfloxacin.

A total of 18 birds with conjunctivitis having swollen and closed eyes with pus were selected for the trial (Plate 116) and divided into three groups; T1: Control, T2: Norflox eye drops, T3: Treatment with aloe eye drops.

Plate 116: Selected bird

Plate 117: Aloevera eye drop

Plate 118: Swelling of eyes reduced

It was found that aloe drops (Plate 117) recorded the antibiotic sensitivity zone of 12 mm diameter and the efficacy was on par with Norfloxacin. Eye swabs were collected from all the birds at regular intervals to see the microbial load. Before the treatment, the respective total bacterial count in control (T1), antibiotic (T2) and aloe vera (T3) groups were 7.6 X 10^5,7.9 X 10^5cfu/ml and uncountable. In control groups, on 5th day onwards, birds started dying one by one. While, in the antibiotic groups, the total bacterial count reduced to 5 X 10^5cfu/ml on 9th day. With aloe treatment, the total count was found to be reduced from uncountable to 2 X 10^5cfu/ml on 9th day; and birds completely recovered from swelling of eyes, were clear and open (Plate 118).

The study clearly showed that oil based aloe herbal eye drops worked better than antibiotics and could be an effective ethno veterinary medicine and best alternative to alleviate antimicrobial resistance in the management / treatment of conjunctivitis in poultry.

Effect of supplementing Aloe Vera and Neem in pre-starter on performance, haematology and serum biochemistry

A total of 48 birds were assigned to each of four treatments during period from 1 to 14 days.

T1: Aloe juice @ 3 ml per day per bird, T2: Neem juice@3 ml per day per bird & T3: Aloe + Neem @ 3 ml per day per bird. Performance was monitored till 5th week (Table 33)

Table 33: Weekly body weight (g) of Nicobari fowl as influenced by herbal supplementation

Duration of supplementation	Aloe Vera	Neem	Aloe + Neem	Control
Before	31.91 ± 0.64	33.08± 0.82	34.25± 1.05	33.58± 1.11
1 wk	64.5 ± 2.03	53.4±1.56	46.3 ± 2.37	0.6±2.27
2 wk	87.16 ± 6.70	77.75 ±3.83	75.25 ±3.88	67.27 ± 4.19
1st wk without	187.4±8.39	140.0±10.04	124.6±5.90	133.7±9.42
2nd k without	231.45 ±12.98	181.63 ±10.43	198.00±16.05	183.72 ±11.98
3rd wk without	251.4±15.52	218.7±10.03	219.1±12.62	183.2±10.21
Cumulative Feed intake (g) per bird NS				
Duration of supplementation	**Aloe vera**	**Neem**	**Aloe +Neem**	**Control**
1 wk	320.0	290.3	290.5	298.0
2 wk	550.0	434.3	436.9	500.6
1st wk without	1650	1640	1590	1790
2nd k without	1780	1760	1725	1860
3rd wk without	1830	1923	1950	1912
Feed conversion efficiency for weekly body weight gain				
Duration of supplementation	**Aloe vera**	**Neem**	**Aloe +Neem**	**Control**
1 wk	0.10 ±0.15[a]	0.07±0.19[b]	0.04±0.26[b]	0.02±0.36[b]
2 wk	0.04±0.75[a]	0.06±0.62[b]	0.07±0.45[b]	0.05±0.86[b]
1st wk without	0.06±0.26[a]	0.04±0.34[b]	0.03±0.41[b]	0.04±0.53[b]
2nd k without	0.02±0.48[a]	0.02±0.16[b]	0.04±0.39[b]	0.02±0.42[b]
3rd wk without	0.01±0.46[a]	0.02±0.19[b]	0.01±0.18[b]	0.0031±0.17[b]

Growing performance indicated that there was no significant difference in body weight gain and feed intake. However, there was significant difference in feed efficiency. Feed efficiency was better with aloe supplemented group. At day 14, whole blood was collected from treatment groups and subjected to haematology. **(Table 34 & 35)**

Table 34: Haematology and serum biochemistry

Particulars	Aloe	Neem	Aloe + Neem	Control
WBC (thous/cumm)	147.48±6.6	152.57±7.6	141.42±10.2	162.71±4.8
Lym%	77.29±4	80.82±2.5	83.62±2.0	78.43±1.6
Gran%	13.1±2.74	10.8±1.69	8.8±1.38	12.0±1.10
RBC (Millions/cumm	2.64±0.14	2.96±0.12	2.73±0.17	3.22±0.14
Hbg (mg/dl)	14.94±0.73	16.44±0.70	15.94±1.03	18.04±0.61
PCV%	35.01±1.85	39.49±1.61	36.86±2.25	43.16±1.52

MCV	133±1.38	134±1.57	136±1.62	135±2.74
MCH	56.84±0.57	55.54±0.60	58.43±1.25	56.60±2.22
MCHC	42.79±0.77	41.56±0.77	43.13±0.77	41.84±0.77

Hematology profile of supplementation of aloe and neem indicated that birds are good in health and herbs did not produce any undue effects on health status of birds.

Table 35: Serum biochemical parameters as influenced by herbal supplements

Treatments	SGOT^{NS}	SGPT^{NS}	TG	CHO	UA	Glucose^{NS}
ALOE	223.0 ±15.5	20.1±1.7	101.8±19.9^{a}	157.0±12.7^{a}	3.6±0.2^{a}	312.0±7.3
NEEM	256.5±6.6	19.1±1.5	115.5±18.4^{a}	208.9±17.8^{ab}	4.3±0.4^{b}	301.5±7.0
ALOE +NEEM	246.4±9.3	17.8±1.4	173.3±31.7^{a}	208.1±14.3^{ab}	4.0±0.3^{b}	302.3±9.7
CONTROL	242.0±12.8	21.8±1.9	257.8±55.5^{b}	222.0±18.7^{b}	5.9±0.7^{b}	334.5±8.3

Aloe, neem and their combination reduced the serum SGOT and SGPT as compared to control group. There were statistically lower triglycerides in serum of Nicobari fowl given all treatments as compared to control. There was 60% reduction with aloe supplementation while it was 30% with neem and its combination. Similarly there was significantly lower serum cholesterol with all treatments as compared to control. The aloe had significantly lowest serum cholesterol and neem and its combination had statistically moderate level of serum cholesterol. The aloe treatment significantly reduced serum uric acid as compared to other treatments and control groups. With regard to glucose, though all the groups did not differ significantly, all the herbal treatments apparently reduced the serum glucose level. The biochemical study on aloe and neem supplementation indicated that they have hepatoprotective and anti-hyperlipidemic properties. In addition, the aloe has anti uremic property while all the treatments have anti-hyperglycaemic effect.

Ad-hoc:project Prevalence of Gastrointestinal Parasites of Livestock in Andaman and Nicobar Islands

Sophia Inboraj and *A. Kundu*

Andaman and Nicobar Islands are free from major dreadful diseases affecting livestock such as anthrax, haemorrhagic septicaemia, black quarter etc. But parasitic diseases remain a continuous health challenge for livestock in the islands. The moderate temperature, high relative humidity and rainfall prevalent in the islands favour parasitic diseases. A

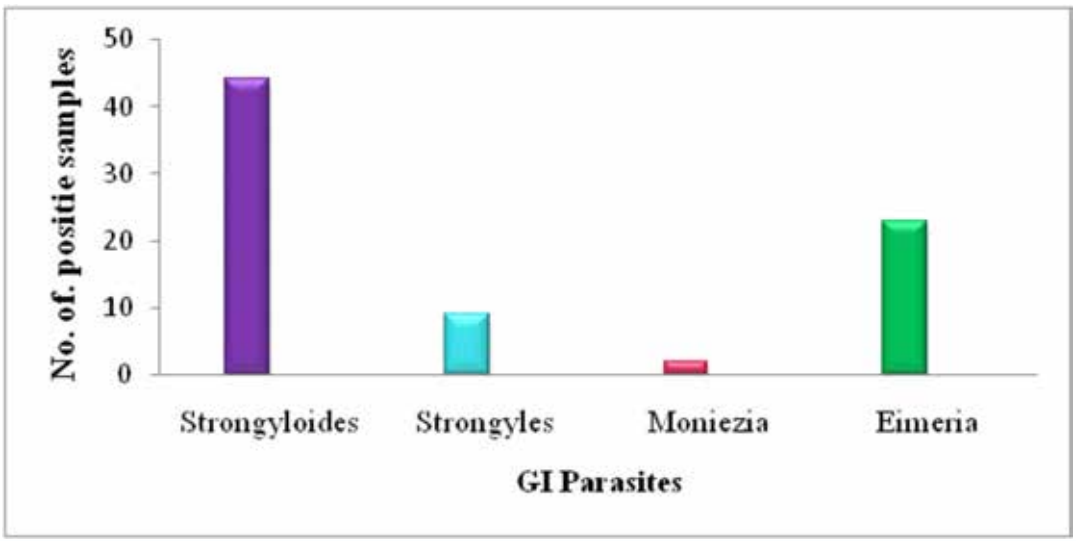


Fig.25: Prevalence of gastrointestinal parasites of livestock in Andaman and Nicobar Islands

study was performed from October, 2015 to February, 2016 to understand the prevalence of subclinical gastrointestinal parasitism in goats of South Andaman. About 70 dung samples were collected from healthy local Andaman goats and examined by routine centrifugation and floatation techniques to study the predominant parasites present in the islands. Among 70 samples, 51 samples were reported to be positive depicting an overall prevalence rate of 72.85% (Fig.25).

The study revealed the predominant presence of Strongyloid nematodes. Among the strongylid species, *Hemonchus* spp and *Trichostrongylus* spp. are highly pathogenic and are avid blood suckers. Moreover, these strongylid groups of nematodes are involved in parasitic gastroenteritis causing anaemia, reduced weight gain, hypoproteinemia, diarrhoea and mortality in susceptible animals. During the study period, about 54 blood samples were also collected to evaluate the anaemic status of animals studied. The haemoglobin content of the blood samples was estimated using Automatic Haematological analyzer (Prokan Electronics Inc., China) which revealed an average of 9.39g/dL with a range of 4.2-13.5 g/dL which was within the normal range (8-12g/dl). It is suggested that quantitative, coproculture and molecular studies are required to assess the actual worm burden and the pathogenic species prevalent in the livestock of these islands to implement suitable control and preventive strategies. The various parasitic eggs as well as larvae recorded during the study have been shown in the pictures below (Plate 119).

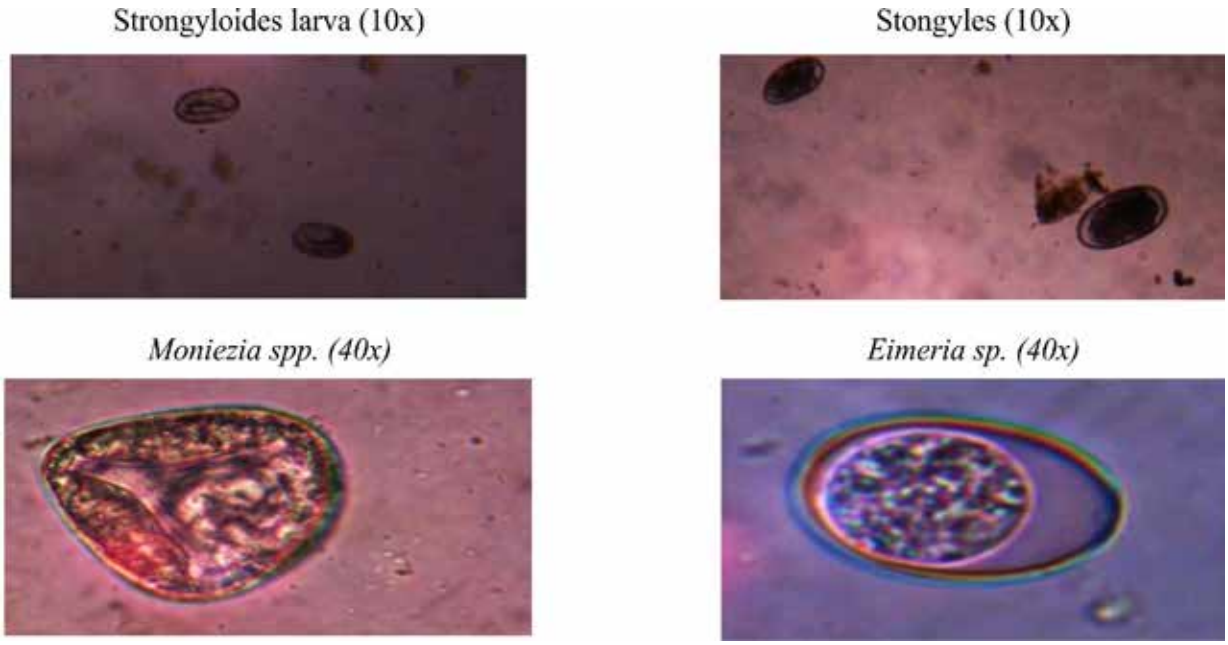


Plate 119: Parasitic eggs recorded during the study

DIVISION OF FISHERIES SCIENCE

Characterization and Conservation of Agricultural Biodiversity of A & N Islands

Kiruba Sankar, R and *J Raymond Jani Angel*

Documentation

A total of 23 true mangrove species belonging to 9 family and 13 genera have been documented during the reporting period (Table 36). Maximum species was recorded from Middle Andaman, Rangat (18) followed by South Andaman (15), Richet archipelago (14), North Andaman (14), Mayabunder (9) and little Andaman (7). The existence of *Pemphis acidula* (Plate 120) in the Andaman and Nicobar Islands has been reported after a lapse of 91 years from Sir William Peel Island of Ritchet's Archipelago. Coral biodiversity surveys were conducted at Havelock Island, Ritchet's Archipelago through snorkelling and North Bay, South Andaman through snorkelling and SCUBA diving. A total of 69 species belonging to 13 families and 31 genera were documented from Havelock and 44 species belonging to 13 families and 24 genera were documented from North Bay.

Table 36: List of true mangrove species documented during the reporting period

Family	Genus	Species
Avicenniacae	*Avicennia*	*Avicennia marina*
		Avicennia officinalis
Myrsinaceae	*Aegiceras*	*Aegiceras corniculatum*
Rhizophoraceae	*Bruguiera*	*Bruguier acylindrica*
		Bruguier agymnorhiza
		Bruguier aparviflora
	Ceriops	*Ceriops tagal*
	Rhizophora	*Rhizophora apiculata*
		Rhizophora mucronata
		Rhizophora stylosa
		Rhizophora hybrids
Euphorbiaceae	*Excoecaria*	*Excoecaria agallocha*
Combretaceae	*Lumnitzera*	*Lumnitzer alittorea*
		Lumnitzerar acemosa
Arecaceae	*Phoenix*	*Phoenix paludosa*
Rubiaceae	*Scyphipora*	*Scyphiporahy drophyllacea*
Lythraceae	*Pemphis*	*Pemphis acidula*
	Sonneratia	*Sonneratia alba*
		Sonneratia griffithii
		Sonneratia ovata
Malvaceae	*Heritiera*	*Heritiera littoralis*
	Xylocarpus	*Xylocarpus granatum*
		Xylocarpus moluccensis

Plate 120: *Pemphis acidula* tree and inflorescence (inset)

Characterization

The pantropical sea grass, *Halophila decipiens* (Hydrocharitaceae) (Plate 121), a new record to the Andaman and Nicobar Islands, was reported from two locations *viz.,* Scissostris Bay, Port Blair at 6–7 m deep and Neil Island at 10–12 m deep. The present report is an addition to the existing 10 sea grass species from the Islands and this species could have been overlooked due to its habitat in deeper water.

Four species of marine finfishes, including *Sphyraena iburiensis*, *Nemipterus marginatus*, *Nemipterus nematophorus*, *Platycephalus ragadius* and one species of lobster, *Thenus unimaculatus* were identified and documented under new location record for the Andaman and Nicobar Island. *Halgerda dalanghita* Fahey & Gosliner, 1999 (Plate 122), a discodoridid nudibranch was reported from Havelock Island of Ritchie's Archipelago representing a new addition to the Opisthobranch fauna of India. The present record extends the known geographical distribution of *H. dalanghita* and this is the sixth species representing the genus *Halgerda* in India.

Plate 121: *Halophila decipiens*

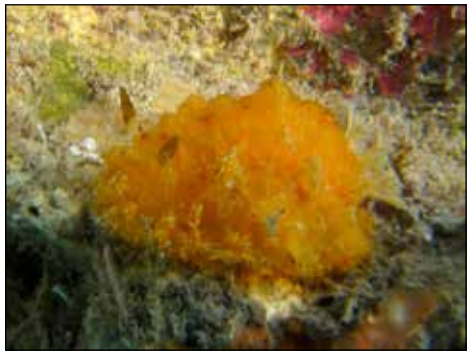


Plate 122*: Halgerda dalanghita* Fahey & Gosliner, 1999

Also, a total of 38 species of freshwater finfishes were documented from various streams of Andaman, of which six species, including *Barbonymous gonionotus*, *Brachydanio rerio*, *Notopterus notopterus*, *Glossogobius sparsipapillos*, *Acentrogobius cyanomos* and *Gobiopterus sp.* were identified to be new record to the Andaman and Nicobar Islands (Plate 123).

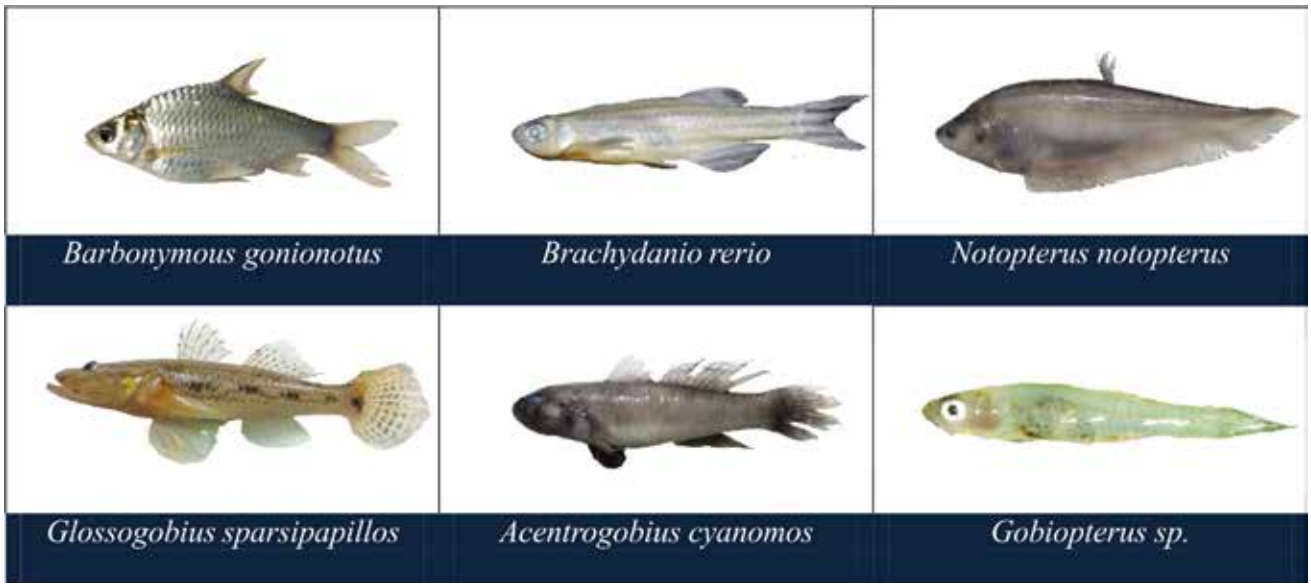


Plate 123: New records of freshwater finfishes from the Andaman and Nicobar Islands

Regeneration

Regeneration of *Rhizophora apiculata* will be attempted at two sites in Middle Andaman. Brood stock management of Skunk anemone fish, *Amphirion akallopsis* is being carried out at Marine Research Laboratory, Marine Hill. Captive breeding of this species has been standardised and after successful larval rearing, ranching will be done at North Bay.

Cataloguing Inland Aquatic Diversity and Breeding of Indigenous Freshwater Fishes of Andaman &Nicobar Islands

Venkatesh R. Thakur, J. Praveenraj, J .Raymond Jani Angel, Anuraj A and *Kiruba Sankar R*

Andaman and Nicobar Islands (ANI) are bestowed with rich faunal biodiversity and endemism has not been explored completely. Survey was carried out at different sites of inland areas, wherein fishes and crustaceans were collected and identified with help of available standard keys, reference papers and books (Table 37). Altogether 52 species of freshwater fish and 07 species of crustaceans were documented which are presented in the Plate 124 and 125 respectively.

Table 37: Locations of all sites surveyed in each region

Region	Survey Site
South Andaman(6)	Mannarghat 1
	Mannarghat 2
	Lohabarrack
	Dhani Khadi
	CIARI Stream
	Manjeri
North & Middle Andaman (4)	Kalpong River
	Kalara
	Kalipur
	Saddlepeak Station 1

Nicobar (2)	Kinmai Stream
	Pasa Stream
Campbell Bay (3)	Laxmi Nagar
	Govind Nagar
	Joginder Nagar

In the recorded freshwater fishes some are re-records after long gap i.e. (*Microphis insularis* which was described by Hora in 1925 as Andaman Pipefish from Andaman, some are recorded as new addition to the freshwater ichthyofauna of Andaman such as (*Glossogobius sparsipapillus, Oryzias dancena, Gobiopterus sp and Oryzias javanicus*) and most of them are native. Mostly, native fishes such as *Aplocheilus panchax, Rasbora daniconius, Redigobius tambujon, Sicyopterus sp,* and *Giurus margaritacea* have striking colouration and shall be considered as ornamental. By standardising breeding technology of such fishes it will be helpful to boost the local ornamental fish industry that will be helpful for people to enhance their income in the Island. As Island Aquaculture is generally dominated by IMC, Magur etc. and mostly depends on seed supply from mainland. Some species which are available in the streams of islands and having preference for consumption by local peoples such as *Eleotris andamanesis, Eleotris fusca, Channa sp., Machrobrachium lar, Glossogobius giurus & Glossogobius sparsipapillus* which can be a potential species for aquaculture diversification in the islands.

In the recorded freshwater fishes some are re-records after long gap i.e. (*Microphis insularis* which was described by Hora in 1925 as Andaman Pipefish from Andaman, some are recorded as new addition to the freshwater ichthyofauna of Andaman such as (*Glossogobius sparsipapillus, Oryzias dancena, Gobiopterus sp and Oryzias javanicus*) and most of them are native. Mostly, native fishes such as *Aplocheilus panchax, Rasbora daniconius, Redigobius tambujon, Sicyopterus sp,* and *Giurus margaritacea* have striking colouration and shall be considered as ornamental. By standardising breeding technology of such fishes it will be helpful to boost the local ornamental fish industry that will be helpful for people to enhance their income in the Island. As Island Aquaculture is generally dominated by IMC, Magur, etc. and mostly depends on seed supply from mainland. Some species which are available in the streams of islands and having preference for consumption by local peoples such as *Eleotris andamanesis, Eleotris fusca, Channa sp., Machrobrachium lar, Glossogobius giurus & Glossogobius sparsipapillus* which can be a potential species for aquaculture diversification in the islands.

Microphis insularis (Endemic)

Anguilla bicolor (Native)

Ophiocara porocephala (Native)

Glossogobius giurus (Native)

Giurus margaritacea(Native)

Rasbora daniconius (Native)

Redigobius bikolanus (Native)

Sicyopterus microcephalus (Native)

Glossogobius celebius (Native)

Glossogobius sparsipapillus (New record)

Oryzias dancena (New Record)

Aplocheilus panchax (Native)

Gobiopterus sp (New Record)

Ambassis urotaenia (Native)

Eleotris andamanesis (Endemic)

Eleotris fusca (Native)

Redigobius tambujon (Native)

Sicyopterus sp (Native)

Oryzias javanicus (New Reord)

Plate 124: Freshwater fishes from Andaman and Nicobar

Caridina brachydactyala (Native)

Caridina gracilirostris (Native)

Caridina typus (Native)

Machrobrachuim sp. (New species)

Macrobrachiuma scabriculum (Native)

Palaemon sp (Native)

Macrobrachium lar (native)

Plate 125: Freshwater *Palaemonidae* and *Atyidae* Shrimps from Andaman And Nicobar

From current ichthological surveys, we have also recorded freshwater prawns, belonging to Family: Palaemonidae (*Macrobrachium* sp.) and Atyidae (*Caridina* sp.). Athyid prawns are small in size, having beautiful colouration, and have demand in ornamental industry. Since, most of the Athyid prawns are native, standardising their breeding will boost ornamental industry in the island. The Freshwater fish fauna of this region is considered to be impoverished due to low habitat diversity and due its long isolation from continental Asia by some authors. As main aim of our study to document the inland aquatic diversity of Andaman and Nicobar islands, we have to conduct surveys in the unexplored parts of these islands so that more species may be identified and documented. Still many of the native species of Andaman's are threatened due to habitat loss and non-native species introduction. So, it is the need of hour to protect freshwater streams in the Andaman, as they harbour a unique biodiversity, thus documentation and protection of this unique biodiversity is necessary before they undergo extinction.

Mariculture of Selected Marine Finfishes and Shellfishes from Andaman Waters

Kiruba Sankar R, Raymond Jani Angel, Venkatesh R Thakur, Anuraj A* and *Benny Varghese

The basic requirement for the captive breeding of clown fishes and damsel fishes is to have a sufficient number of brood stock or breeding pairs, which are wildly collected from the coral reef habitat in the bay areas of the Andaman & Nicobar Islands. 5 numbers of Lemon damsel fish, *Pomacentrus moluccensis* and a total of 18 clown fishes, including

Tomato clown, *Amphiprion ephippium* (10) and Skunk Anemone fish, *Amphiprion akallopisos* (08) were collected through skin diving and SCUBA diving and reared along with the symbiotic sea anemone, *Entacmaea quadricolor* and *Heteractis magnifica* respectively to develop the breeding pairs.

Successful breeding of Lemon damsel fish, *Pomacentrus moluccensis*

Successful captive breeding of Lemon damsel fish, *Pomacentrus moluccensis* (Plate 126) (Family: Pomacentridae; Sub Family: Pomacentrinae) **for the first time in India** have been achieved in Marine Hill Research Laboratory, ICAR-CIARI, Port Blair. Nutrient rich broodstock diet including fresh squid meat (09:00) and shrimp meat (13:00) in the morning hours and enriched live adult *Artemia* (17:00) in the evening hours was given in required quantities. Initial breeding of *Pomacentrus moluccensis* was observed within 36 days of captive rearing and brood stock management. Water quality parameters in the tanks were maintained at temperature 26± 1 ^{0}C, salinity 34±1 ppt and pH 8±0.2 with a photoperiod of 12 hours (06:00 to 18:00). Incubation period was observed to be 3-4 days at 29±1^{0}C. The newly laid eggs were white in color and elliptical in shape with an average length of 1.0045±0.0117 mm and average width of 0.4611±0.0083mm. The embryonic development stages (Plate 127) based on the morphological characteristics and the time elapsing for each stage was recorded.

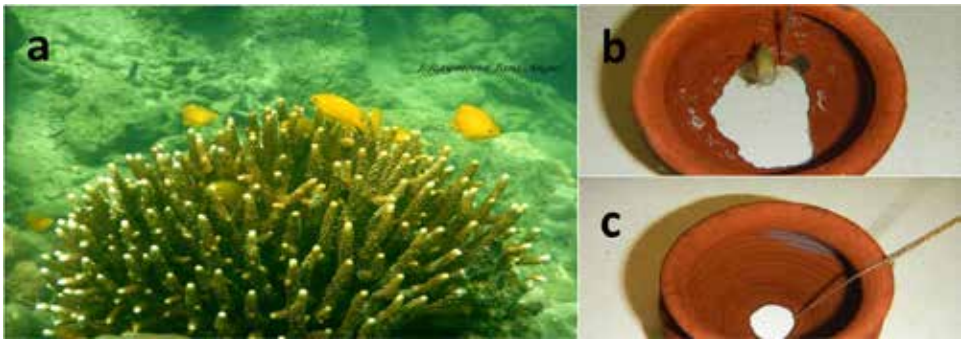


Plate 126: (a) *P. moluccensis* in natural habitat; (b) male brooder of *P. moluccensis*; (c) eggs laid on the inner wall of clay pot.

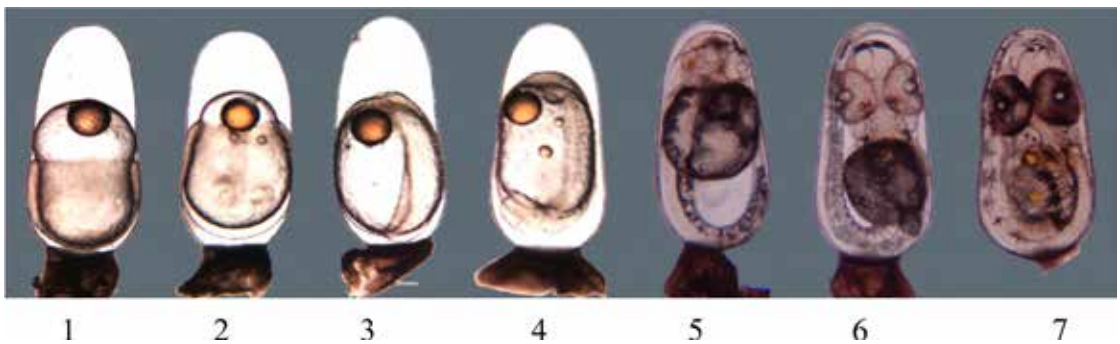


Plate 127: Embryonic development stages: 1-late blastula; 2- mid gastrula; 3- neurula; 4- notochord formation; 5- day 1; 6- day 2; 7- day 3.

Broodstock development of *Amphiprion akallopisos* and *Amphiprion ephippium*

In the wild, the clown fishes are generally seen in social groups centered in a symbiotic host sea anemone with a sexually active pair of adults (male and female) and one to three juvenile or sub adult fishes (Plate 128 a) . Invariably the female will be always larger and dominant than the male (Plate 128 b). In some cases, it was not possible to collect the mating pairs as such, so the fishes having different size groups were collected and made to pair under captive condition.

After pair formation, the breeding pairs were transferred to separate glass aquaria/ FRP tanks for broodstock development; *Amphiprion akallopisos* (Plate 128 c) and *Amphiprion ephippium* (Plate 128 d). The broodstocks were fed with wet feeds such as meat of green mussel, shrimp, clam and fish and formulated feeds enriched with vitamins, minerals and algal powder at the rate of 5-10% of their body weight roe during the morning hours at 4 hrs intervals. The broodstocks were also fed with enriched rotifer 800 to 1000 nos/ml and artemia nauplii (200-400 nos/ml) and adult artemia (3 to 5 nos/ ml) during the evening hours to improve the egg quality and thereby hatchability and survival of the offsprings.

During the broodstock development, maintenance of high water quality is one of the critical factors for the breeding of clown fishes. Proper filtration using external canister filter was provided to maintain optimum water quality inside the tank throughout the rearing period. The water quality parameters including, temperature (26 to 30°C), dissolved oxygen (4.8 to 6.3 ppm), pH (8.0 to 8.9) and salinity (32 to 36 ppt) were maintained at optimum during the entire rearing period.

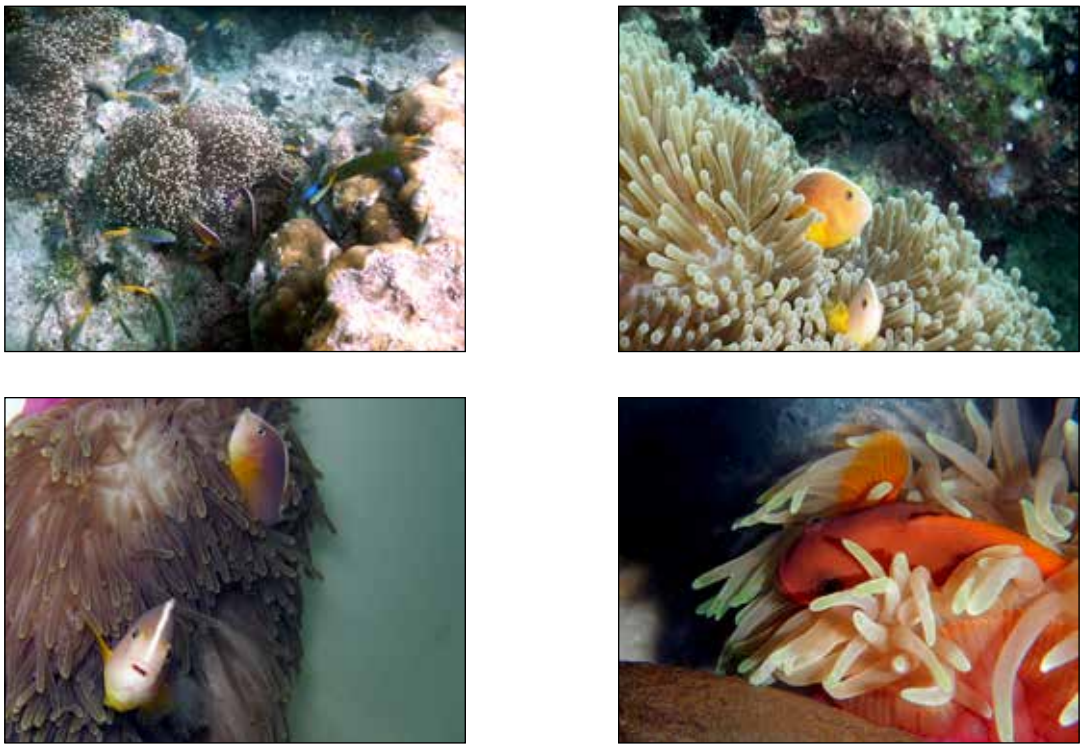


Plate 128: A colony (a) and male and female (b) of *A. akallopisos* in natural habitat; Brood stock management of *A. akallopisos* (c) and *A. ephippium* (d)

Location-Specific Augmentation of Potential Fishing Zones Using Satellite Altimetry and Fishing Ground Database

S. Dam Roy, Kiruba Sankar, P. Krishnan, A. Anand and *K. Lohith Kumar*

The coastal waters around the Andaman and Nicobar Islands are known for their frequent mesoscale eddy activity. Traditional fishing grounds coincide with upwelling areas associated with cyclonic and anticyclonic eddies and also with areas between two adjacent eddies. Fishing ground database is an important pre-requisite to determine the influence of the meso-scale eddies on the fishery potential in each of the fishing grounds.

A total of 9 landing centres of South Andaman (6 from Port Blair; 2 from Havelock and 1 from Neil) were covered (146 visits in total; 16.22 ± 1.58 landing centre days per month) during the reporting period and baseline data

with respect to fish landings and traditional fishing grounds were collected. Fish catch data was collected from 824 commercial fishing operations deploying ring seine (183), gillnet (258), hand-line (118), long-line (170), trawl (61) and others including shore-seine and anchor net (34) with a mean (mean ± SE) of 91.5 ± 6.97 fishing operations per month. The study showed that the mean catch per trip varied significantly ($p > 0.001$) (Table 38) among the fishing gears, which could be attributed to the nature of fishing and the habit and habitat of fishes targeted by different gears. Ring-seine targets smaller pelagic fishes with a shoaling behaviour, which results in large hauls. Trawler is a non-selective gear, actively targeting column and benthic fish resulting in large hauls of indiscriminate catch. Gillnet, long-line, and hand-line are passive and selective fishing gear which target individual fish by size as governed by mesh size, hook size, and bait, respectively.

Table 38: Mean catch (mean ± SE) (kg) /trip

Gear	Mean catch (mean ± SE) (kg) /trip
Ring-seine	1039.33 ± 89.20
Gillnet	301.83 ± 36.17
Hand-line	201.83 ± 36.35
Long-line	517.50 ± 56.65
Trawl	1009.33 ± 82.95

Analyses of the seawater samples collected from the traditional fishing grounds (10 locations off Port Blair and 3 locations off Havelock) were carried and it was found that the hydrographical parameters were of the following ranges, pH: 7.8-8.7 (8.0 ± 0.05); temperature(˚C): 29-31 (29.2 ± 0.12); Secchi depth (inches): 188-1136 (593.5 ± 93.72); Salinity (‰): 29-35 (31.87 ± 0.52); Alkalinity (ppm): 90-190 (115.88 ± 5.13); DO (µmol/l): 12.81-20.31 (16.59 ± 0.63); Nitrate (mg/l): 0.6-20.9 (7.88 ± 1.58); Phosphate (mg/l): 0.05-14.7 (5.4 ± 1.01); Chlorophyll (µg/l): 0.1-3.7 (1.07 ± 0.25); TSM (mg/l): 0.29-0.43 (0.37 ± 0.01) and TDS: 34.1-35.2 (34.53 ± 0.33).

Morphometric investigations have been carried out for 7 pelagic fishes *viz*., *Atule mate, Decapterus* sp (Carangidae), *Herklotsichthys quadrimaculatus, Sardinella albella, S. fimbriata*, *S. sirm* (Cluepidae) and *Rastrelliger kanagurta* (Scombridae). Details with respect to the sample size (n), the mean (± SE) length and weight are summarized in Table 39.

Table 39: Morphometrics of the pelagic fishes from the traditional fishing grounds off Port Blair

Species	*n*	Range		Mean (mean ± SE)	
		Length (cm)	Weight (g)	Length (cm)	Weight (g)
Family: CARANGIDAE					
Atule mate	337	10.5-28.5	12-281	17.20 ± 0.26	68.02 ± 3.17
Decapterus sp	70	14-18.2	29-348	22.42 ± 0.23	134.80 ± 4.25
Family: CLUEPIDAE					
Herklotsichthys quadrimaculatus	306	9.2-15	7-28	12.02 ± 0.05	15.89 ± 0.22
Sardinella albella	68	13.0-15.3	18-33	14.4 ± 0.63	26.76 ± 0.37
Sardinella fimbriata	70	13-16.6	21-43	15.01 ± 0.16	31.48 ± 1.02
Sardinella sirm	176	13-23	18-122	18.06 ± 0.22	60.80 ± 2.23
Family: SCOMBRIDE					
Rastrelliger kanagurta	404	14.2-31.0	29-348	22.42 ± 0.23	134.80 ± 4.25

Analyses of the distribution of the plankton from the fishing grounds off Port Blair revealed that *Cerataulina bergonii, Thallasiothrix* sp, *Ceratium* sp *and Skeletonema* sp were dominant with a mean density (cells/ml) of 320, 90,

50 and 45 respectively among the phytoplankton and copepods (60) followed by foraminiferans (45) were dominant among the zooplankton.

Gut contents of the two pelagic fishes, *viz*., *Atule mate* and *Rastrelliger kanagurta* revealed no significant difference as the crustacean appendages was found to be dominant in both of the species with a frequency occurrence (%F) of 57.8 and 26.6 respectively. Cyclopoids, Calanoids and Harpacticoids were commonly found in both species, indicative of similar food preferences.

The data on hydrographical characterization of the traditional fishing grounds derived from the present study is envisaged to determine the influence of the meso-scale eddies on the fishery potential in each of the fishing grounds. However, further investigations are imperative in order to understand the link between the physical and biological processes for developing species-specific PFZ forecasts.

Biophysical Characterization and Site-Suitability Analysis for Indian Mangroves

S. Dam Roy, J. Raymond Jani Angel, K. Lohith Kumar and Kiruba Sankar R

Twenty quadrats were selected from two zones, namely, Yerrata and Shyamkund and the species composition was recorded. Yerrata Zone, lies between bar mouth to the Yerrata creek and Shyamkund Zone, starts from Bakultala to Shyamkund creek (Fig. 26). Quadrats were selected based on species availability and site suitability.

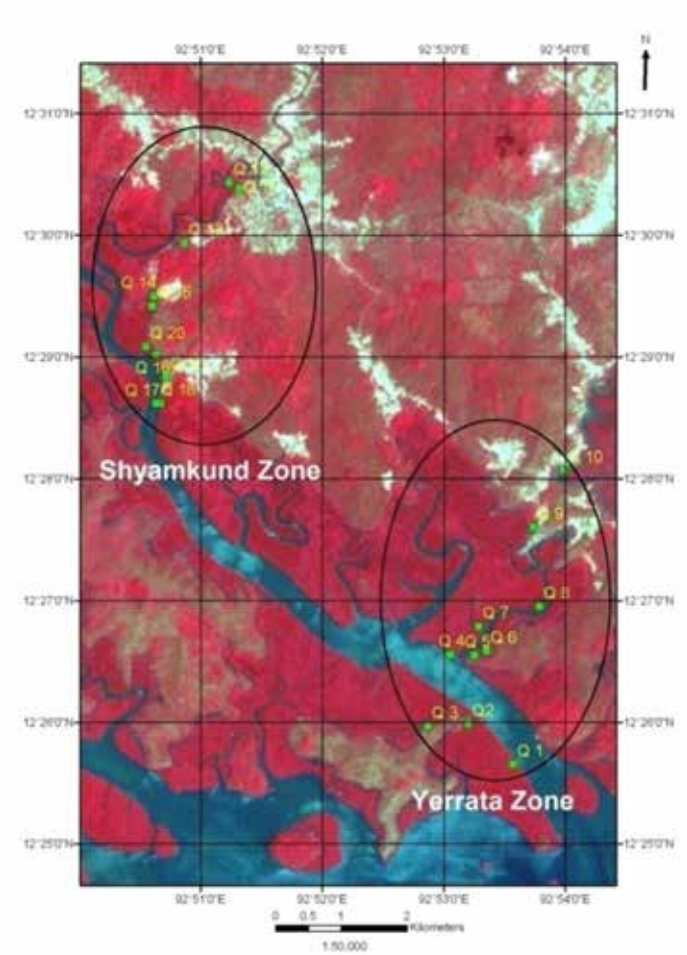


Fig.26: Porlob-Jig creek and environs as seen on FCC of Resourcesat-1 LISS-III image (10/03/2007)

A total of 586 trees were studied and the total mangrove flora of Porlob Jig creek comprises of about 14 species belonging to 8 families and 10 genera with *Rhizophora apiculata*, *Bruguiera gymnorrhiza* and *Ceriops tagal* as dominant species based on the tree density. The least diverse species in the study area are*Heritiera littoralis* and *Xylocarpus moluccensis* in Yerrata zone and Shyamkund zone respectively. Details of distribution of mangroves in each zone are tabulated in Table 40.

Table 40: Distribution and occurrence of true mangrove species of the Porlob-Jig creek

Family	True mangrove species	Survey zones			
		Yeratta Zone	No. of sites	Shamkund Zone	No. of sites
Acanthaceae	*Avicennia marina*	●	1	---	---
	Avicennia officinalis	---	---	●	4
Arecaceae	*Phoenix paludosa*	●	1	---	---
Combretaceae	*Lumnitzera littorea*	●	2	---	---
Euphorbiaceae	*Excoecaria agallocha*	●	1	●	3
Lythraceae	*Sonneratia alba*	●	1	---	---
Meliaceae	*Xylocarpus granatum*	●	5	---	---
	Xylocarpus moluccensis	---	---	●	2
Rhizophoraceae	*Bruguiera cylindrica*	●	1	---	---
	Bruguiera gymnorrhiza	●	2	●	5
	Ceriops tagal	●	5	---	---
	Rhizophora apiculata	●	4	●	3
	Rhizophora mucronata	●	1	●	1
Sterculiaceae	*Heritiera littoralis*	●	1	---	---

Phytosociological parameters

The parameters of each quadrat, including density, frequency, basal area and their relative values and Importance Value Index (IVI) of each mangrove species were calculated using standard phytosociological methods. Yerrata Zone was characterized by 12 species, dominated by *Rhizophora apiculata* and codominated by *Xylocarpus granatum* and Shyamkund Zone was characterized by6 species with dominated by *B. gymnorrhiza* and codominated by *A. officinalis.* of the two zones, the total basal area was high at Shyamkund (44.83 m^2/ ha) (Plate 129).In Yerrata, the relative density is high for *Rhizophor aapiculata* (34.42%), and the relative basal area is high for *X. granatum* (24.87%). In Shyamkund, both the relative density (59.04%) and relative basal area (40.74%) were high for *Bruguiera gymnorrhiza*. Based on the Important Value Index (IVI), it was found that *Rhizophora apiculata* was dominant in Yerrata zone and it accounts for 22% of the total IVI. In Shyamkund zone, *Bruguiera gymnorrhiza* was dominant and it accounts for 43 % of the total IVI (Table 41). Yerrata zone have high diversity, richness and evenness when compared to Shyamkund zone (Fig.27).

Table 41: Phytosociological parameters of mangroves in Prolobjig creek, Andaman and Nicobar Islands

Species	Yerrta					Shyamkund				
	Density/ Ha	Basal area m2/ha	Relative density	Relative basal area	% of IVI	Density/ ha	Basal area m2/ha	Relative density	Relative basal area	% of IVI
Avicennia marina	16.67	0.03	0.30	0.22	1.50	-	-	-	-	-
Avicennia officinalis	-	-	-	-	-	816.67	8.55	19.68	19.08	20
Bruguiera gymnorrhiza	516.67	1.67	9.20	24.00	9.78	2450.0	18.26	59.04	40.74	43
Bruguiera cylindrica	766.67	1.28	13.65	9.31	8.99	-	-	-	-	-
Ceriops tagal	1033.33	0.52	18.40	3.78	14.06	-	-	-	-	-
Excoecaria agallocha	33.33	0.25	0.59	1.82	2.14	383.33	4.56	9.24	10.17	12
Heritiera littoralis	16.67	0.57	0.30	4.15	2.81	-	-	-	-	-
Lumnitzera littorea	183.33	2.82	3.26	20.51	10.59	-	-	-	-	-
Phoenix paludosa	50.00	0.21	0.89	1.53	2.14	-	-	-	-	-
Rhizophora apiculata	1933.33	2.03	34.42	14.76	21.73	433.33	10.97	10.44	24.48	17
Rhizophora mucronata	700.00	0.91	12.46	6.62	7.69	33.33	1.36	0.80	3.03	3
Sonneratia alba	150.00	0.04	2.67	0.29	2.32	-	-	-	-	-
Xylocarpus granatum	216.67	3.42	3.86	24.87	16.24	-	-	-	-	-
Xylocarpus moluccensis	-	-	-	-	-	33.33	1.12	0.80	2.50	5

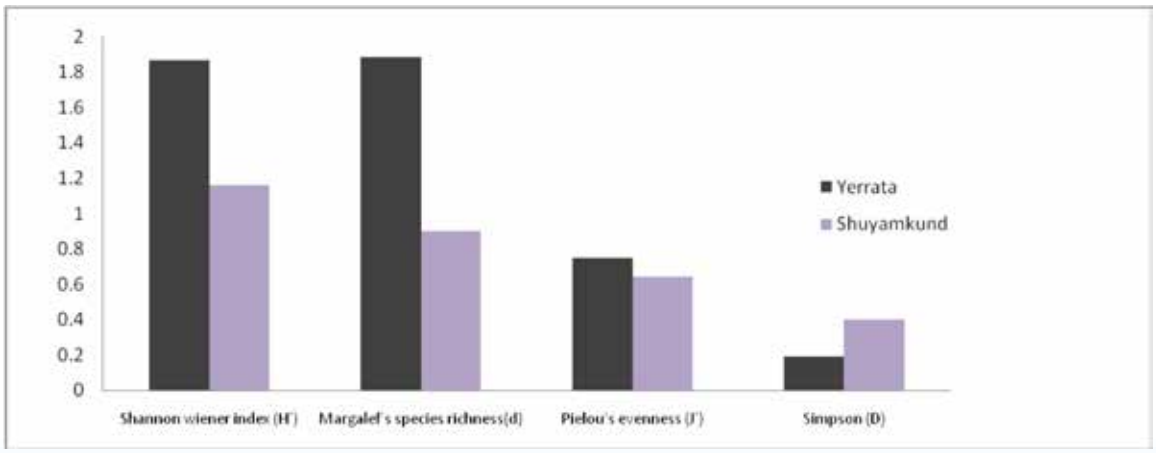


Figure 27: Comparative univariate measures in two zones of Prolobjig

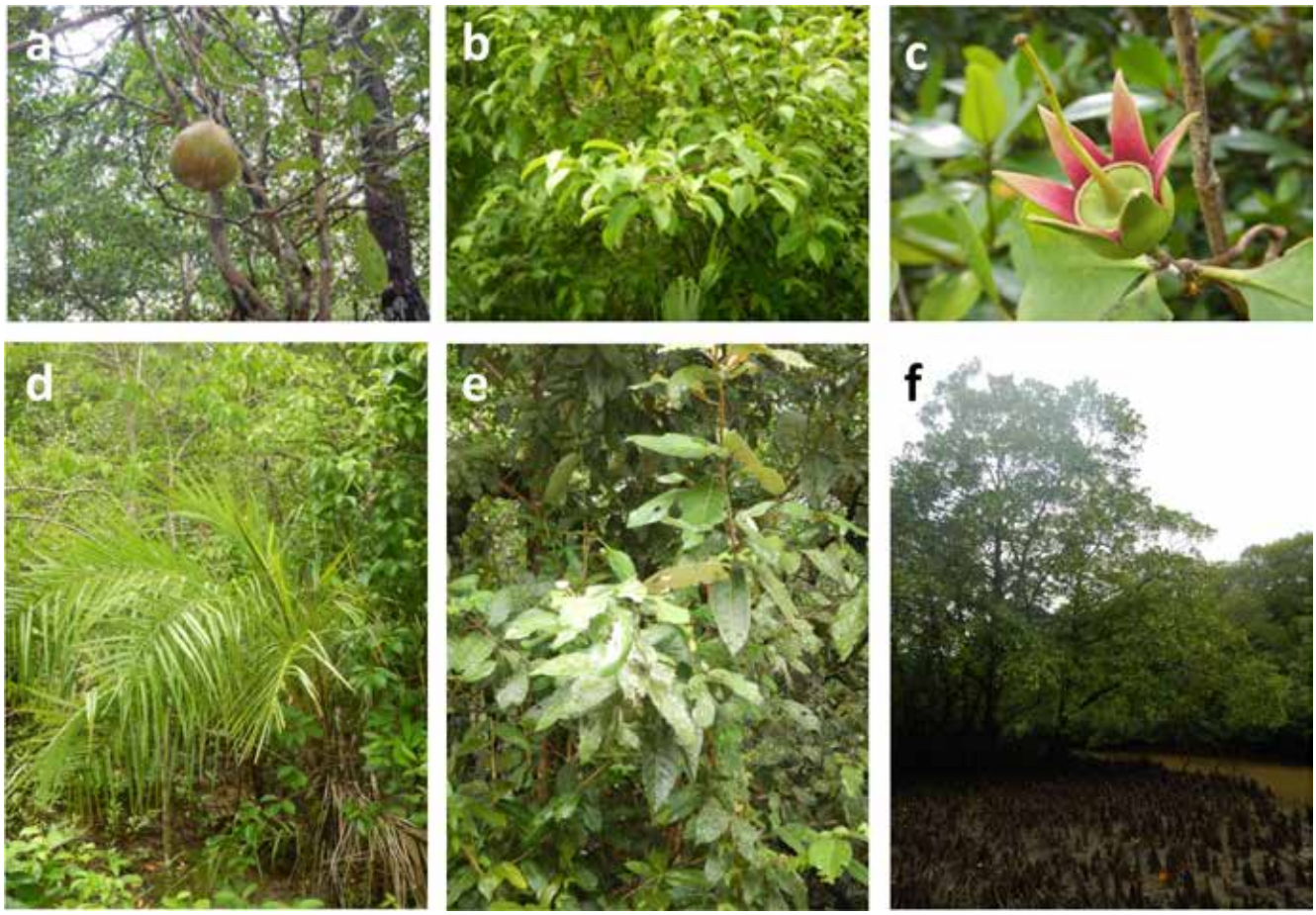


Plate 129: Common mangrove species of Prolobjig area: a) *Xylocarpus granatum*; b) *Excoecaria agallocha*; c) *Sonneratia alba*; d) *Phoenix paludosa*; e) *Heritiera littoralis*; f) *Bruguiera gymnorrhiza*

Seaweed Diversity and its Culture Prospects in Andaman Waters

Anuraj, A., Venkatesh R Thakur., J Raymond Jani Angel., K. Lohith Kumar* and *Kiruba Sankar R

The coastal waters of Andaman and Nicobar Islands support diverse kinds of seaweeds including commercially important alginophytes and agarophytes. Field surveys were conducted at South Andaman during low tides in the intertidal regions to document the seaweed species. Surveys were conducted at 5 regions *viz*. North Wandoor ($11^0$37'10''N & $92^0$37'15'' E), Chatham (11°41'16''N 92°43'27''E), Burmanallah ($11^0$33'30''N & $92^0$43'47''), Chidiyatapu (11° 29' 30N & 92° 35' 10'' E) and Kurmadera ($11^0$39'59''N & $92^0$35'40''). Seaweed species belonging to 27 genera were documented from survey and Burmanallah region was found to the most diverse with 23 genera (Plate 130,131&132). Water quality parameters were also analysed in the survey areas and were found to be in the range of 8.5-11.5 ppm, 8.1-8.5, 30.6-33.3 ppm, 27.6-28.5 ^{0}C, 28-30 ^{0}C for DO, pH, salinity, water temperature, atmospheric temperature respectively (Table 42).

Table 42: Seaweed genera documented in the survey at South Andaman (1: North Wandoor, 2: Chataham, 3: Burmanallah, 4: Chidiyatapu, 5: Kurmadera)

Sl. No.	Genera	1	2	3	4	5
Chlorophyceae						
Ulvales						
1	Ulvaceae *Ulva spp*		+	+		
Bryopsidales						
2	Codiaceae *Codium spp*			+	+	
3	Caulerpaceae *Caulerpa spp*			+	+	
4	Halimedaceae *Halimeda spp*	+	+	+	+	+
5	Udotaceae *Udotea spp*	+	+	+	+	
6	Udotaceae *Avrainviella spp*		+	+		
Dasycladales:						
7	Dasycladaceae *Neomeris spp*		+	+	+	+
8	Polyphysaceae *Acetabularia spp*	+		+	+	+
Cladophorales						
9	Cladophoraceae *Chaetomorpha spp*			+	+	+
Siphonocladales						
10	Siphonocladacea *Boergesenia spp*		+	+	+	
11	Siphonocladacea *Dictyosphaeria spp*			+	+	+
12	Siphonocladacea *Valoniopsis spp*			+		
Phaeophyceae						
Fucales						
13	Sargassaceae *Sargassum spp*	+	+	+	+	+
14	Sargassaceae *Turbinaria spp*	+		+	+	+
15	Cystoseiraceae *Hormophysa spp*	+				+
Dictyotales						
16	Dictyotaceae *Padina spp*	+	+	+	+	+
17	Dictyotaceae *Dictyota spp*			+	+	+
Rhodophyceae						
Gracilariales						
18	Gracilariaceae *Gracilaria spp*			+	+	
19	Peyssonneliaceae *Peyssonnelia spp*			+	+	
Bonnemaisoniales						
20	Bonnemaisoniaceae *Asparagopsis spp*			+		
Nemaliales						
21	Galaxauraceae *Galaxaura spp*		+		+	+
Corallinales						
22	Corallinaceae *Amphiroa spp*		+	+	+	
Ceramiales						
23	Rhodomelaceae *Laurencia spp*	+				

24	Rhodomelaceae					
Gigartinales						
25	Hypneaceae *Hypnea spp*					
Gelidiales						
26	Gelidiellaceae *Gelidiella spp*			+		+
Cryptonemiales						
27	Rhizophylliadaceae *Portieria spp*			+		+

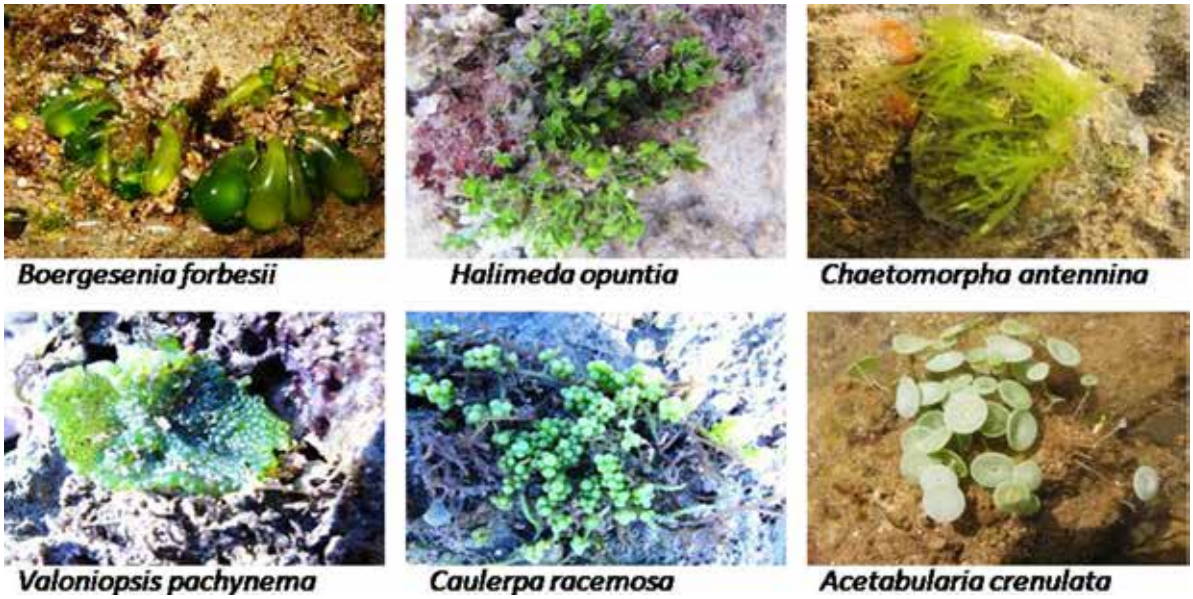


Plate 130: Chlorophyceae

Plate 131:Phaeophyceae

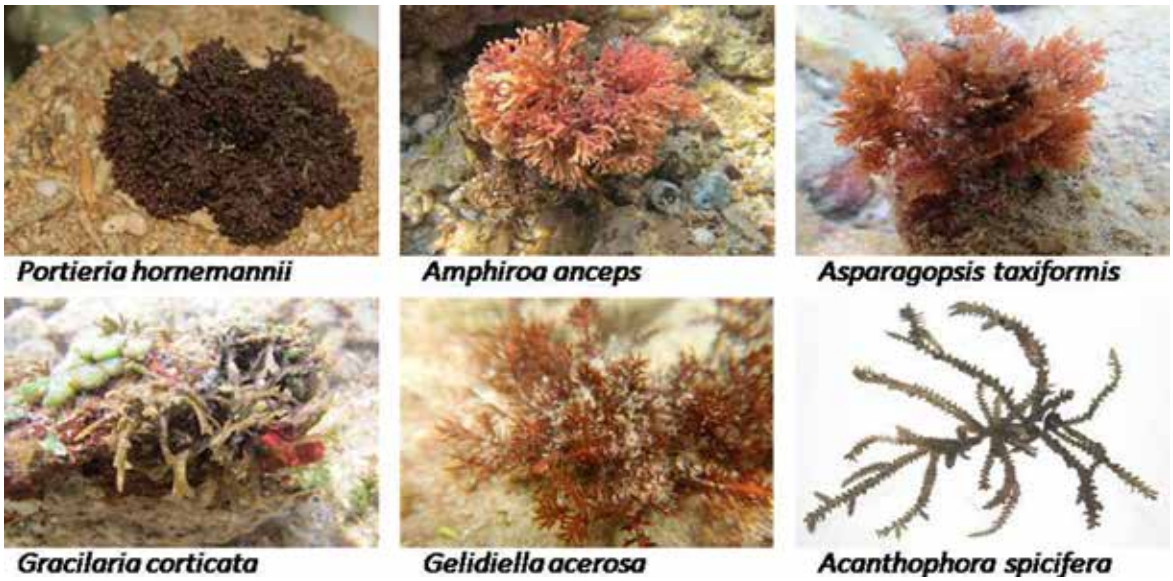


Plate 132: Rhodophyceae

Assessment of Stock of Neretic Sharks of Andaman Waters

Kiruba Sankar R, S. Monalisha Devi, K . Lohith Kumar and *A K O Ratheesh*

Sharks, rays and skates represent Chondrichthyan fisheries with 65 species among 21 families in Andaman and Nicobar Islands (ANI). In marine fisheries of ANI gill nets are most dominantly used particularly drift gill net followed by line fishing. Sharks mainly of the family Carcharinidae are mostly caught as by catch from long line fishery where skip jack tunas and yellow fin tunas are frequently caught. Shark fishery is a major concern as they are viviparous in nature with longer gestation period (Plate 133). Accidental by catches naturally reduces their stock which are not properly even utilized and discarded after removing fins. The major gears used in Andaman and Nicobar Islands for harvesting shark fishery resources are two *viz*., hand-liners and long liners. Hand-liners are deployed from motorized dinghies with fishing duration ranging from 4-5 days. Long liners are involved in multiday fishing ranging from 20-30 days.

Plate 133: Drying of shark fins

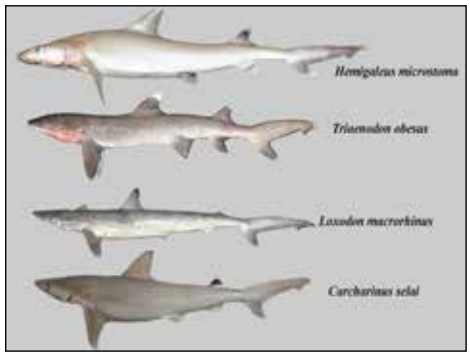


Plate 134.Shark species recorded from Junglighat fish landing centre

The present study was initiated as an observatory study on shark diversity, their landings and their by catch or intentional exploitation for fins. Long lining is the major fishing gear for shark fishing in ANI and sometimes reported as by catch in mechanized fishing vessels. Under the exploratory study a new shark *Hemigaleus microstoma* was

reported as new record for Andaman and Nicobar islands. Other species recorded during landing centre visits are shown in Plate 134.

Sharks are mainly caught in long lines operated by the mechanized long liners. The catch per unit effort (CPUE) was calculated by taking catch in kilograms and effort in day basis for different fishing grounds around the Andaman and Nicobar islands. The same has been depicted in the Fig.28 through gradient map for easy understanding.

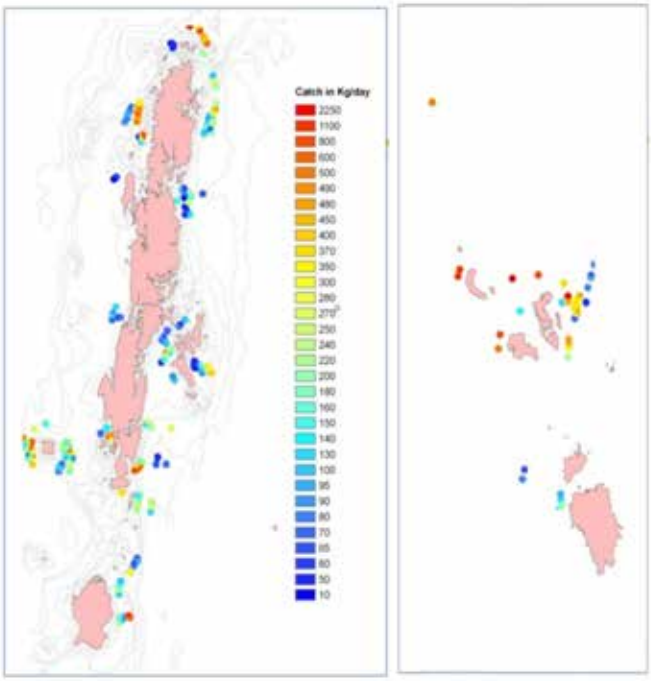


Figure 28: Showing catch per unit effort of Elasmobranchs in the ANI waters

The dark blue color in the legend indicates the least catch (i.e, 10 kg/day) whereas the bright red color indicates the highest catch (i.e, 2250 kg/day). It is clear from the map that the waters around Nancowry group of islands harbor richest resource of elasmobranches along with areas off Munda Pahad, off Wandoor and north of Diglipur whereas the waters surrounding Ritchie's Archipelago show mixed trend of average catch. The areas off Mayabunder, off Interview Island and some parts around Little Andaman and Great Nicobar show the least catch per day.

Study on Biology and Stock Assessment of Selected Tuna Species from Andaman Waters

K . Lohith Kumar, Kiruba Sankar R, S. Monalisha Devi, A K O Ratheesh* and *S. Dam Roy

Tuna, also known as '*wanderers of the world ocean'* because of their highly migratory nature, belongs to family Scombridae (Order: Perciformes). Tunas form one of the important marine fish resources and are highly valuable hence, play a vital role in the economies of many countries especially oceanic Islands. Andaman and Nicobar waters harbor more than 60,000 tons of harvestable potential of tuna resources and the present harvest of these resources is less than 1000 tons. Also, the studies on the biology and stock structures of these resources from the ANI are very few. Hence, this project was initiated with the objectives; to study the landing pattern of tunas in Andaman waters, to investigate the distribution, growth and mortality, feeding biology and reproductive biology of selected tuna species in Andaman waters and to estimate Biomass, Maximum Sustainable Yield, optimum Sustainable Yield etc. of the selected tuna species in Andaman waters. Visits were made to landing centers' *viz;* Junglighat, Dignabad, Burmanallah, Wandoor and Guptapara for recording the catches of tuna. It was observed that tunas mainly landed in Junglighat landing centre followed by Burmanallah and Dignabad whereas, incidental landings were recorded from Wandoor

and Guptapara landing centers'. Tuna catch was comprised of *Thunnus albacares* (yellow fin tuna), *T. obsesus* (big eye tuna), *Katsuwonus pelamis* (skipjack tuna), *Gymnosarda unicolor* (dogtooth tuna), *Euthynnus affinis* (little tuna), *Thunnus tonggol* (longtail tuna), *Sarda orientalis* (oriental bonito), *Auxis thazard* (frigate tuna) and *Auxis rochie* (bullet tuna). A few species to tunas landed in Junglighat fish landing centre are shown in Plate 135.

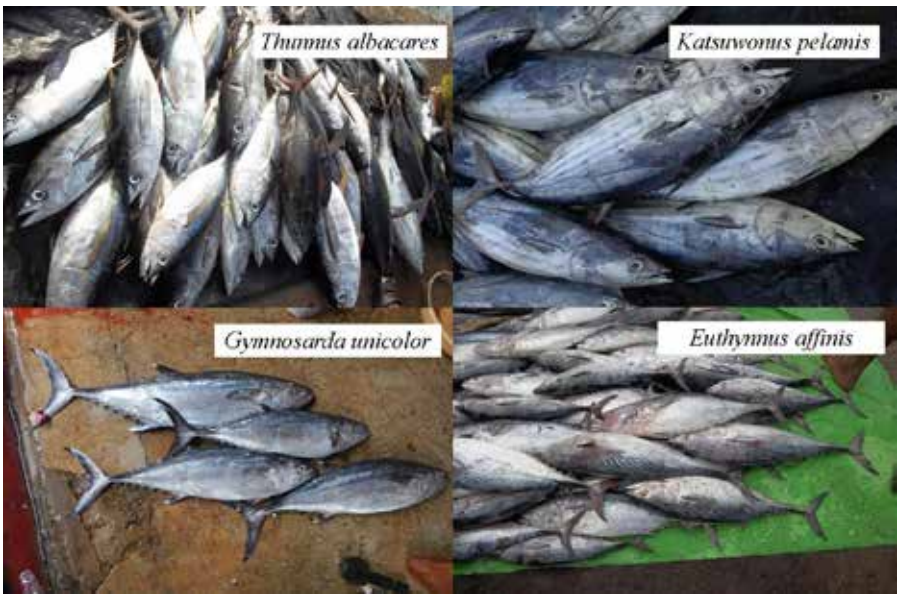


Plate 135: Landing of different species of tuna at Junglighat fish landing centre

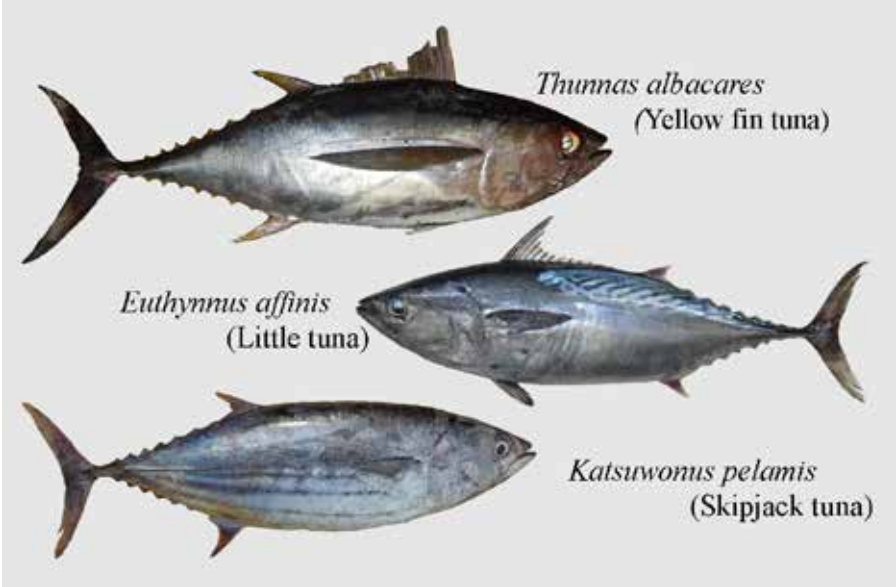


Plate 136: Three species of tuna landed in large quantity

The catch of tuna was dominated by yellow fin tuna followed by skipjack tuna, little tuna and frigate tuna. The dominant tuna species as per their landings are shown in Plate 136. Other tuna species appeared in meager quantities. Landing pattern of yellow fin tuna (YFT), skipjack tuna (SJT) and little tuna (LT) were gathered over the months and the plot is shown in Fig.29.

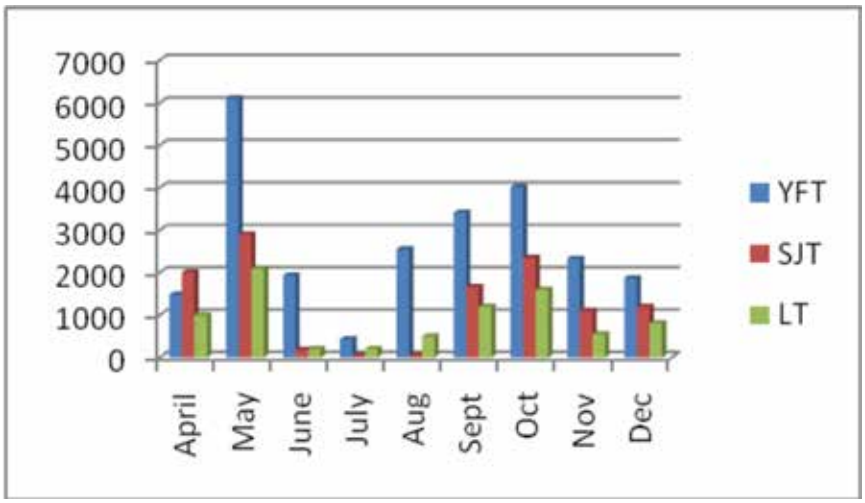


Fig.29: Graph showing variations in landings of tuna species

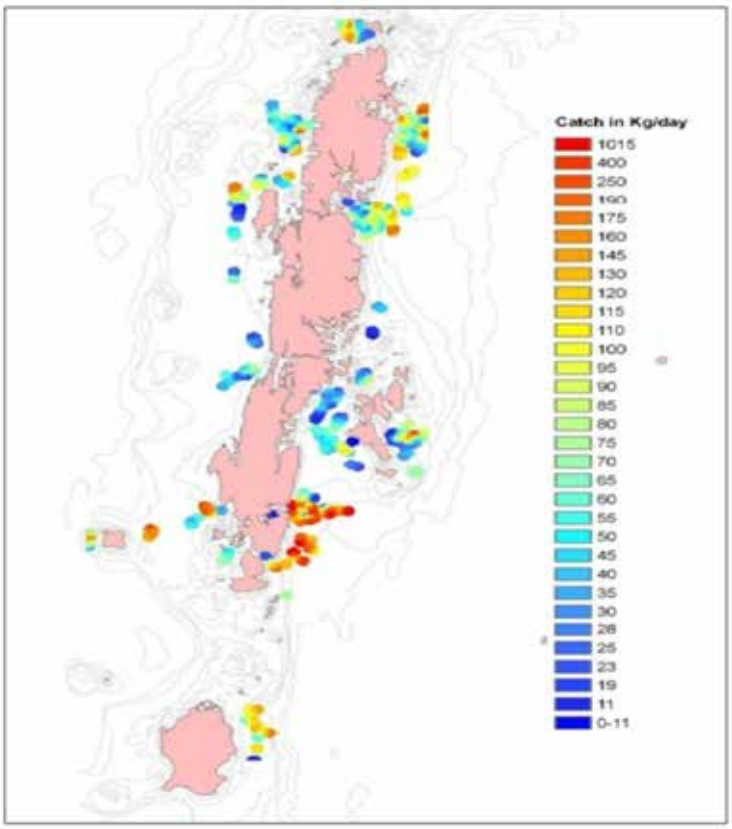


Fig.30: Map showing fishing grounds with average catch of tuna species per day

Catch of tuna species from Andaman waters was plotted as catch per day by collecting the information from the fishermen (Figure 30). East coast of Andamans was generally observed to be good in tuna fisheries specifically the areas off Ross Island, off Munda Pahad, off Mayabunder and off Diglipur.

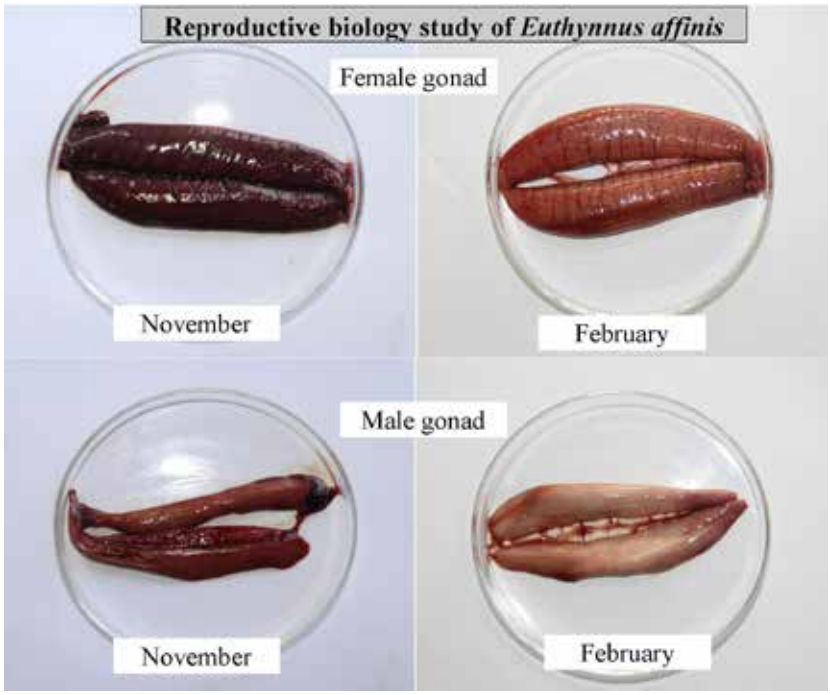


Plate 137: Gonads collected from *Euthynnus affinis*

Samples are being regularly collected for studying feeding and reproductive biology. Plate 137 shows gonads collected from *Euthynnus affinis* (Little tuna/ Kawakawa) over a period of three months for reproductive biology studies. Data on length and weight of fishes are been collected for population studies.

Characterization of *Bacillus spp.* from Andaman Mangroves and Evaluation of its Antagonistic Effect on Fish Pathogens

K. Saravanan, Arunjyoti Baruah, J. Praveenraj, J. Raymond Jani Angel, T. Sivaramakrishnan and *Kiruba Sankar R*

A comprehensive study on *Bacillus spp.* associated with the rhizosphere of various mangrove species were carried out from different parts of Andaman and Nicobar group of Islands. A total of 54 sites were surveyed (Table 43) and rhizosphere soil samples were collected (Plate 138 & 139).

Table 43: Mangrove rhizosphere sediment sample collection sites

S. No.	Area	Location	Mangrove species
1.	Bharatpur (Neil)	11°50 ‘28.86″N; 93°2’47.40″E	*Rhizophora apiculata*
2.	Bharatpur (Neil)	11°50 ‘28.86″N; 93°2’47.40″E	*Rhizophora apiculata*
3.	Bharatpur (Neil)	11°50 ‘28.86″N; 93°2’47.40″E	*Rhizophora apiculata*
4.	Kishori Nagar LC (Diglipur)	13°7 ‘28.9″N; 92°56 ‘48.7″E	*Avicennia officinalis*
5.	Yerrata (Rangat)	11°36’40.7″N; 92°42’45.8″E	*Rhizophora apiculata*
6.	Kalipur (Diglipur)	13°16’11″N; 93°2’25.6″E	*Avicennia marina*
7.	FLT Landing Centre (Diglipur)	13°16’19.3″N; 93°2’31.2″E	*Rhizophora mucronata*
8.	Durgapur (Diglipur)	13°16’42.9″N; 92°2’12.1″E	*Avicennia* species
9.	Lamia Bay (Diglipur)	13°12’58.61”N; 93°2’35.62”E	*Scaevola taccada*
10.	Rampur (Mayabunder)	12°44’8.8″N; 92°53’11.1″E	*Rhizophora apiculata*

11.	Mohanpur LC (Diglipur)	12°52’56.4″N; 92°52’31″E	*Ceriops tagal*
12.	Panighat (Austin Strait) (Mayabunder)	12°54’53.9″N; 92°53’55.9″E	*Rhizophora apiculata*
13.	Yerrata Mangrove Park (Rangat)	12°18’43.19”N; 92°46’59.20”E	*Bruguiera gymnorrhiza*
14.	Kalighat (Diglipur)	13°16’53.1″N; 93°1’35.8″E	*Rhizophora mucronata*
15.	Pokkadera (Mayabunder)	12°54’35.2″N; 92°54’29.1″E	*Rhizophora apiculata*
16.	Karmatang LC (Mayabunder)	12°44’8.8″N; 92°53’11.1″E	*Bruguiera gymnorrhiza*
17.	Aerial Bay (Diglipur)	13°17’35.79”N; 93° 0’55.03”E	*Rhizophora apiculata*
18 .	Sippighat	11°36’42.5”N; 92°40’46.8”E	*Bruguiera gymnorrhiza*
19.	Sippighat	11°36’38.0”N; 92°40’37.8”E	*Bruguiera cylindrica*
20.	Sippighat	11°36’25.4”N; 92°40’29.7”E	*Acanthus ebracteatus*
21.	Dhannikhari	11°36’20.7”N; 92°40’55.6”E	*Nypa fruiticans*
22.	Dhannikhari	11°36’36.1”N; 92°40’01.3”E	*Bruguiera sexangula*
23.	Ograbraj	11°39’16.4”N; 92°40’04.0”E	*Avicennia marina*
24.	Ograbraj	11°39’17.3”N; 92°39’56.9”E	*Rhizophora apiculata*
25.	Namunagarh	11°39’32.5”N; 92°40’32.7”E	*Avicennia marina*
26.	Namunagarh	11°40’11.3”N; 92°42’20.6”E	*Rhizophora mucronata*
27.	Lohabarack	11°37’55.4”N; 92°38’43.2”E	*Avicennia officinalis*
28.	Lohabarack	11°38’41.5”N; 92°38’55.1”E	*Ceriops tagal*
29.	Chouldari	11°37’25.5”N; 92°40’29.7”E	*Rhizophora apiculata*
30 .	Chouldari	11°37’43.1”N; 92°40’22.0”E	*Avicennia marina*
31.	Wandoor	11°35’21.0”N; 92°36’51.0”E	*Excoecaria agallocha*
32.	Wandoor	11°35’11.4”N; 92°37’02.5”E	*Rhizophora apiculata*
33.	Carbyn’s Cove	11°38’28.8”N; 92°44’30.4”E	*Avicennia officinalis*
34.	Carbyn’s Cove	11°38’28.8”N; 92°44’32.8”E	*Sonneratia alba*
35.	Burmanallah	11°33’33.9”N; 92°43’45.2”E	*Bruguiera gymnorrhiza*
36.	Burmanallah	11°33’33.5”N; 92°43’38.9”E	*Heritiera littoralis*
37.	Chidyatapu	11°30’28.8”N; 92°41’59.2”E	*Rhizophora apiculata*
38.	Chidyatapu	11°30’28.0”N; 92°41’59.5”E	*Ceriops tagal*
39.	Chidyatapu	11°30’25.0”N; 92°42’01.2”E	*Excoecaria agallocha*
40.	Manjery	11°32’26.4”N; 92°38’55.0”E	*Avicennia officinalis*
41.	Manjery	11°32’22.5”N; 92°38’53.7”E	*Lumnitzera littorea*
42.	Guptapara	11°33’22.5”N; 92°39’15.9”E	*Acanthus ilicifolius*
43.	Guptapara	11°33’22.0”N; 92°39’15.4”E	*Bruguiera gymnorrhiza*
44.	Collinpur	11°41’36.8”N; 92°35’54.6”E	*Cerbera manghas*
45.	Wrightmyo	11°47’22.6”N; 92°42’34.6”E	*Bruguiera gymnorrhiza*
46.	Wrightmyo	11°47’22.6”N; 92°42’34.6”E	*Sonneratia alba*
47.	Wrightmyo	11°47’26.6”N; 92°47’31.9”E	*Rhizophora apiculata*
48.	Shoalbay	11°50’40.9”N; 92°53’48.0”E	*Phoenix paludosa*
49.	Shoalbay	11°51’11.5”N; 92°43’56.9”E	*Scyphiphora hydrophyllaceae*
50.	Bambooflat	11°42’31.0”N; 92°42’13.4”E	*Avicennia marina*
51.	Bambooflat	11°42’31.0”N; 92°42’13.4”E	*Rhizophora apiculata*

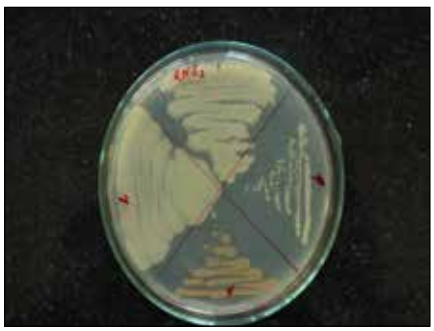
52.	Bambooflat	11°42'46.7"N; 92°42'03.0"E	*Bruguiera cylindrica*
53.	Dollygunj	11°38'18.2"N; 92°41'59.9"E	*Lumnitzera littorea*
54.	Dollygunj	11°38'24.4"N; 92°42'00.2"E	*Xylocarpus granatum*

Plate 138: Collection of rhizosphere soil samples

Plate 139: Collected soil samples

Isolation of bacterial colonies from soil samples

Spore forming isolates were selectively screened from soil samples by heat treatment using the method of Nicholson and Setlow (1990). Around 72 numbers of different suspected bacterial colonies were isolated from 21 soil samples (Plate 140). These isolated colonies were maintained as pure culture for further use (Plate 141).



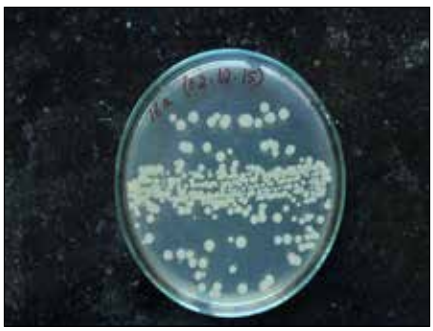


Plate 140: Different colonies

Plate 141: Maintenance of pure culture in plates and tubes

DNA extraction, PCR and sequencing of isolated bacterial colonies

DNA extraction was done following CTAB method and DNA was isolated from 28 numbers of samples. PCR of isolated DNA was carried out in a thermal cycler with following condition: denaturation at 92°C for 2 min followed by 35 cycles of 92°C for 0.30 sec, 48°C for 0.30 Sec, 72°C for 2 min and final extension at 72°C 10 min.PCR amplified products were resolved in 1% agarose gel (Plate 142).

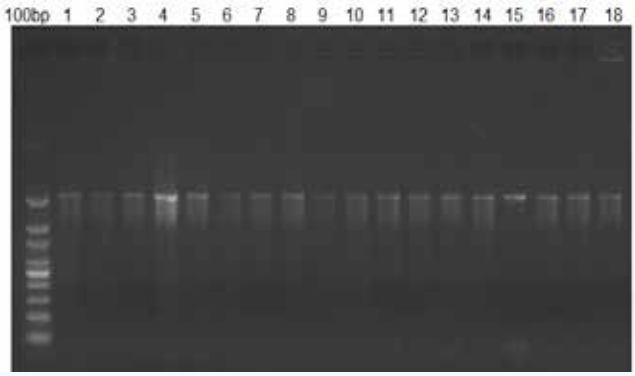


Plate 142: 5 PCR amplified products

The amplicon size was 1500bp. A total of 8 numbers of samples were sequenced which were identified as *Bacillus infantis, B. amyloliquefaciens, B. thuringiensis, B. licheniformis, B. cereus* and *B. aquimaris* by using BLAST analysis.

National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) of Andaman and icobar Islands

K. Saravanan, Arunjyoti Baruah, J. Praveenraj, A. Anuraj, Venkatesh R Thakur* and *J. Raymond Jani Angel

Baseline data has been collected from 31 freshwater fish farms of North and Middle Andaman (N&M) district and South Andaman (SA) district (Plate 143). Freshwater fish and prawn samples (N&M-156, SA-152), wild marine shrimp samples (N&M-60, SA-35) and Grouper samples (N&M-40, SA-55) were collected from North and Middle Andaman district and South Andaman district (Plate 144). The collected samples were screened for target pathogens by following OIE protocol. All the analysed samples gave negative result for the screened pathogens like Koi Herpes Virus (KHV), White Spot Syndrome Virus (WSSV) and Red Sea Bream Irido Viral Disease (RSIVD). Detailed study on marine fish parasites were also carried out during this period which leads to the finding of marine Isopod from *Amblygaster sirm* and Nematodes *(Philometra sp.* and *Capillaria sp.)* from Groupers (Plate 145).

Plate 143: Collection of baseline data

Plate 144: Collection of fish & shellfish samples

Plate 145: Parasites from marine fishes

A total of 6 awareness programmes were conducted at various places of North and Middle Andaman district (Diglipur, Mayabunder, Billi Ground and Rangat) and South Andaman district (Havelock and Neil) in which 160 farmers and 13 State Fisheries department officials benefitted (Plate 146). A sensitization workshop on NSPAAD was conducted at CIARI on 31st August, 2015 in which a total of 53 participants including 32 fish farmers and 9 State Fisheries department officials were participated (Plate 147). Three days training on "Fish Health management in Island Aquaculture" was conducted at CIARI in which the farmers of South Andaman participated. Technical bulletin entitled "Diseases of Freshwater Fish and its Management", folder "Better Management Practices (BMPs) of Freshwater Fish Farm", pamphlet entitled "National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) of Andaman and Nicobar Islands" and "Proceedings of the Sensitization Workshop" and "Fish Health Card" were published in both English and Hindi version and distributed to the stakeholders (Fig. 5).

Plate 146: Awareness programme conducted at various places

Plate 147: Sensitization Workshop on NSPAAD at ICAR-CIARI

Plate 148: Publications

Capture Based Aquaculture of Economically Important Marine Finfishes of Andaman

J. Raymond Jani Angel, Anuraj A, Venkatesh R. Thakur, K. Saravanan and *Kiruba Sankar R*

Designing cages that are better suited to the protected bays and creeks of the Andaman and Nicobar Islands, and also to the species that are cultured, plays foremost role. The designed cage needs to withstand strong sea currents/tidal flow and also retain their effective volume. Expert advice from ICAR-CMFRI, Kochi was taken to design open sea cages for grow out culture of marine fin fishes in this regard. Accordingly, the following factors including, size, cage frame, floats, nets suitable for open sea cage culture, mooring system and anchor system were studied and considered for designing the cage.

Size: Due to its easy maneuvering, less maintenance and reduced labor, 6 m diameter cages were selected for grow out culture.

Cage frame: Construction of low cost cages, with 1.5" galvanized iron; round; 6 m diameter; 1.2 m height from base to railings, is in progress. After fabrication, the frame will be painted with single coat epoxy primer and double coat epoxy grey paint to prevent rusting.

Floats: Eight numbers of 250 L plastic barrels filled with 30 lbs air will be procured from local market. It will act as a stable platform around the cage, where fisherman can stand and safely carry out works like net clearing, net replacement, *etc.*

Suitable nets: Two net cages of 6 m and 7 m diameter, made with UV treated HDPE netting material of 1.5 mm thickness; 28 mm mesh size and 2.5 mm thickness; 50 mm mesh size respectively were already procured.

Mooring system: Materials like 24 mm polyester ropes, 18 mm GI chain and 20 L plastic barrels will be used for mooring.

Anchor system: Concrete blocks of 100 kg will be used in addition to grapnel anchors for better anchorage.

Seed availability of candidate marine finfish species including, groupers, snappers and carangids were also studied during November, 2015 to January, 2016. Fishing surveys were conducted at North Bay (Plate 149), Carbyn's Cove and Lohabarrack (Plate 150), creek using shore seine, shooting net and cast net respectively. Shore seining and cast net operation was found to be a better method for seed collection in bay areas and mangrove areas respectively. The collections were dominated by silver bellies in North Bay and mullets in Lohabarrack creek. Though seeds of carangids were observed in Carbyn's Cove area, collection of the same using shooting net was complicated and unsuccessful.

A group of 11 members under a Self Help Group (Andaman Marine Products Self Help Group) approached the institute for demonstration of cage culture technology and the participation of them will be ensured throughout the culture period.

Plate 149 : Operating shore seine at North Bay

Plate 150: Cast net operation at Lohabarrack

Study on Stock Assessment and Biology of *Pristipomoides filamentosus* (Valenniennes, 1830) from Andaman Waters

S. Monalisha Devi, S. Dam Roy, K. Lohith Kumar and *Kiruba Sankar R*

Pristipomoides filamentosus maximum landing started from month of October 2015 till March 2016 with few landings during April 2015 to September 2015 and almost no landings in heavy rainy days. Since the fish is abundant in deep water the landing usually starts when sea is calm and in good weather conditions. Therefore, *P. filamentosus* is not landed throughout the year. The landings have been recorded month-wise and visit to landing was whenever there was landing. A fix schedule of visiting once or twice in a week was not followed since the landing is so unpredicted. With the fishermen contact whenever they will be going for fishing in deeper water expectations for *P. filamentosus* was high and visit to landing centre was fixed. Biology study on food and feeding and reproductive biology was recorded. Otoliths has been preserved for age and growth study. Taxonomic differentiation with the use of bones, otoliths and scales was carried out for the closely resembling species *P. filamentosus* and *P. multidens*. Food and feeding study showed that except for a single fish all the fish was recorded with empty stomach. Food consist of fishes and semi-digested materials (Plate 151).

(a) (b)

Plate 151: (a) Fish samples with size variation for biology study (b) Food encountered from stomach

Reproductive Biology: Sex identification for smaller size group of fish is difficult. In order to study hermaphrodite nature in fish, gonads has been process for histology study and to identify at what particular size group fish changes sex. In majority of fish sex identification is difficult. Gonads of mature stage in which eggs were very much prominent were used for fecundity study.

$$\textbf{Absolute fecundity} = \frac{\text{No. of ova in sub-sample X Total ovary weight}}{\text{Weight of sub-sample}}$$

$$\textbf{Relative fecundity} = \text{Absolute fecundity/ Weight of fish}$$

Gonads were examined macroscopic and microscopic (Plate 152 &153) for sex identification, for identifying different stage of maturity, ova diameter study and for studying hermaphrodite nature. Absolute fecundity ranged between 24,126 to 1, 37,310 for 949g and 762g of fish respectively and relative fecundity ranged between 25 to 180.

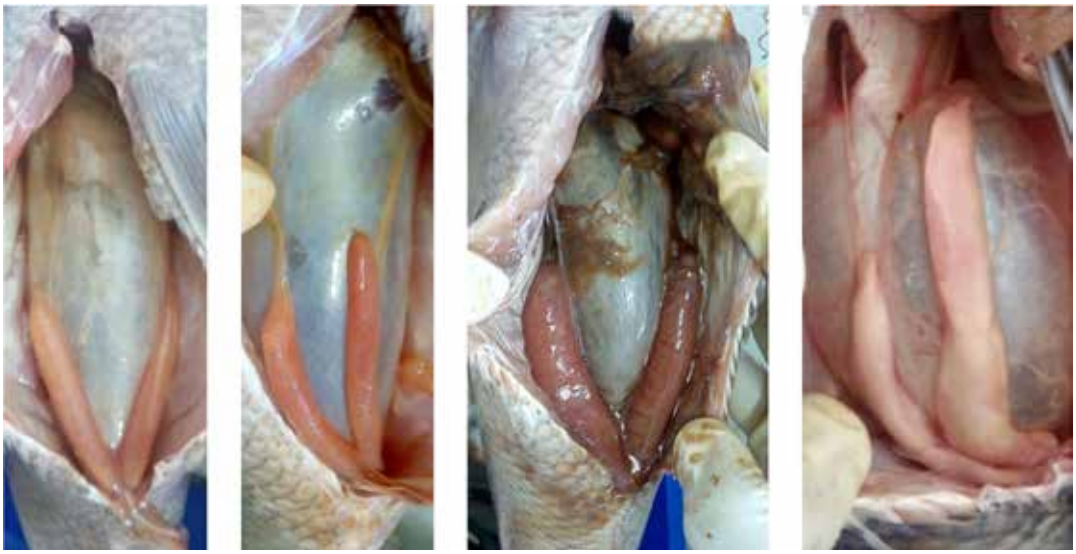


Plate 152: Macroscopic examination of gonads

Plate 153: Gonads use for histological examination sex identification, maturity stages

Sagittaotolith of *P. filamentosus*

Sagittaotolith of *P. mutidens*

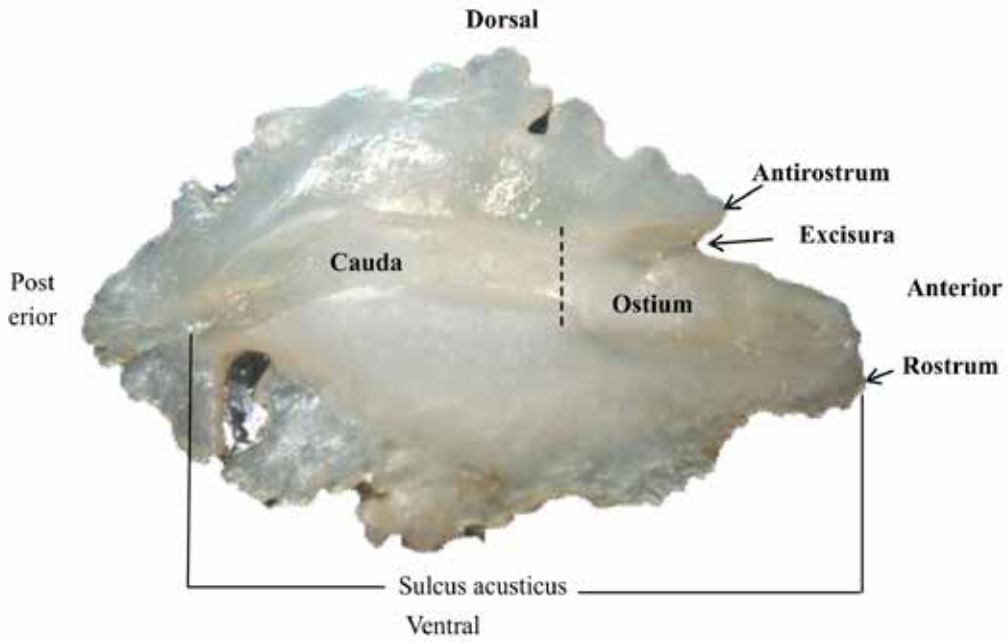


Plate 154: Otoliths used for species differentiation

Otoliths: Otoliths are acellular concretions of calcium carbonate and other inorganic salts, which develop over a protein matrix. The sagittal otolith for two similar looking species *P. filamentosus* and *P. multidens* is been compare for species differentiation. Different parts of otolith use for species differentiation is presented in Plate 154. Species differentiation is done based on morphological descriptions otolith shape, outline and sulcus acusticus features (cauda and ostium). In *P. filamentosus* and *P. multidens* the shape of otolith is fusiform to oblong, slightly crenated, Sulcus acusticus is heterosulcoid, ostial, median. Ostial is funnel-like shorter than the cauda. Cauda is tubular, curved, strongly flexed posteriorly, ending close to the postero-ventral margin. Anterior region is peaked, rostrum poorly define, antirostrum short and blunt. Excisura wide without notch. Posterior region is oblique. The main difference between the two species of *P. filamentosus* and *P. multidens* is cauda is strongly curved in *P. multidens*, excisura is shallow and ventral margin is dentate as compare to *P. filamentosus.*

Scale: Scales from two different part of fish body (10th lateral line scale and scale from caudal peduncle) has been chosen for comparing with similar looking fish *P. filamentosus* and *P. multidens* (Plate 155). Detail study on scales for species identification is in process.

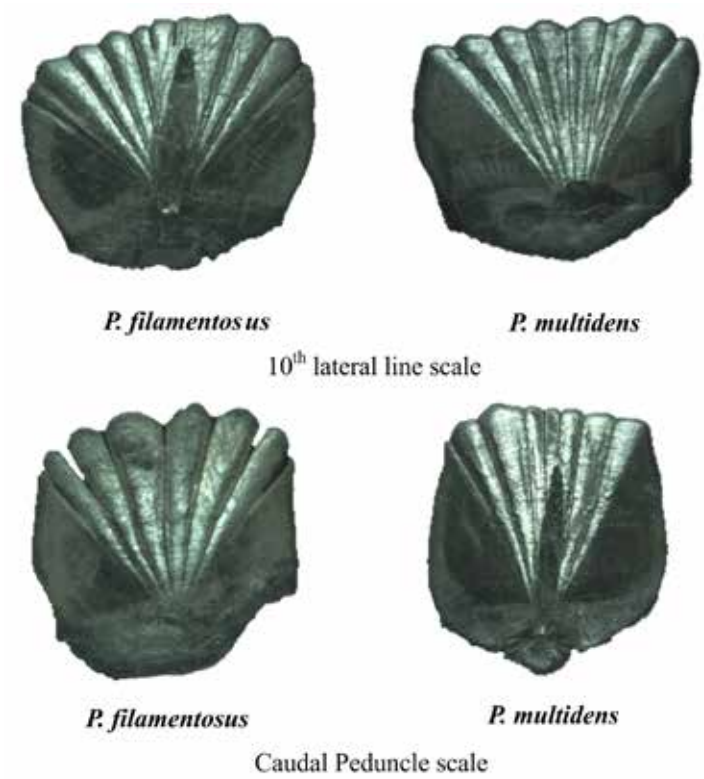


Plate 155: Scales use for species differentiation

Osteology: Jaw bones (maxillae and mandible) and cranial bones have been used to differentiate among two species of *P. filamentosus* and *P. multidens* (Plate 156, 157 &158).

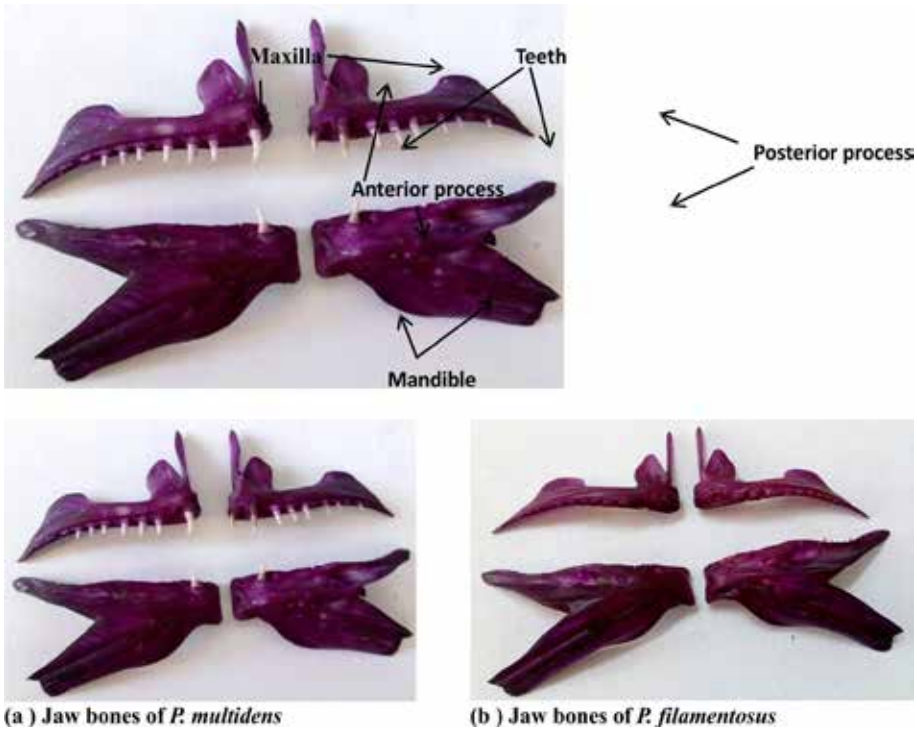


Plate 156: Jaw bones of *P. filamentosus* and *P. multidens*

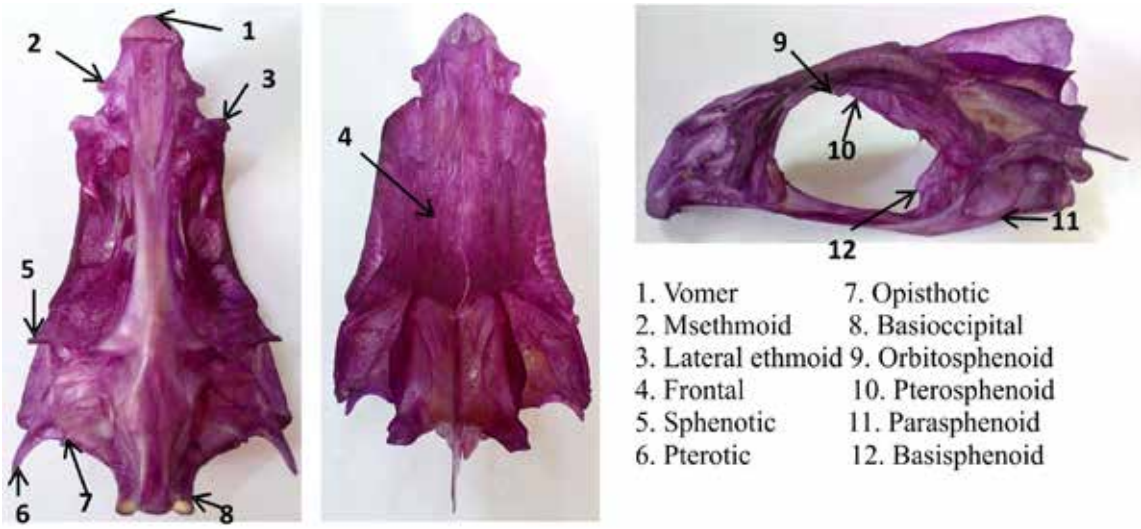


Plate 157: Nuerocranium of *Pristipomoides* with different anatomical features
(a) Ventral view (b) Dorsal view (c) Lateral view

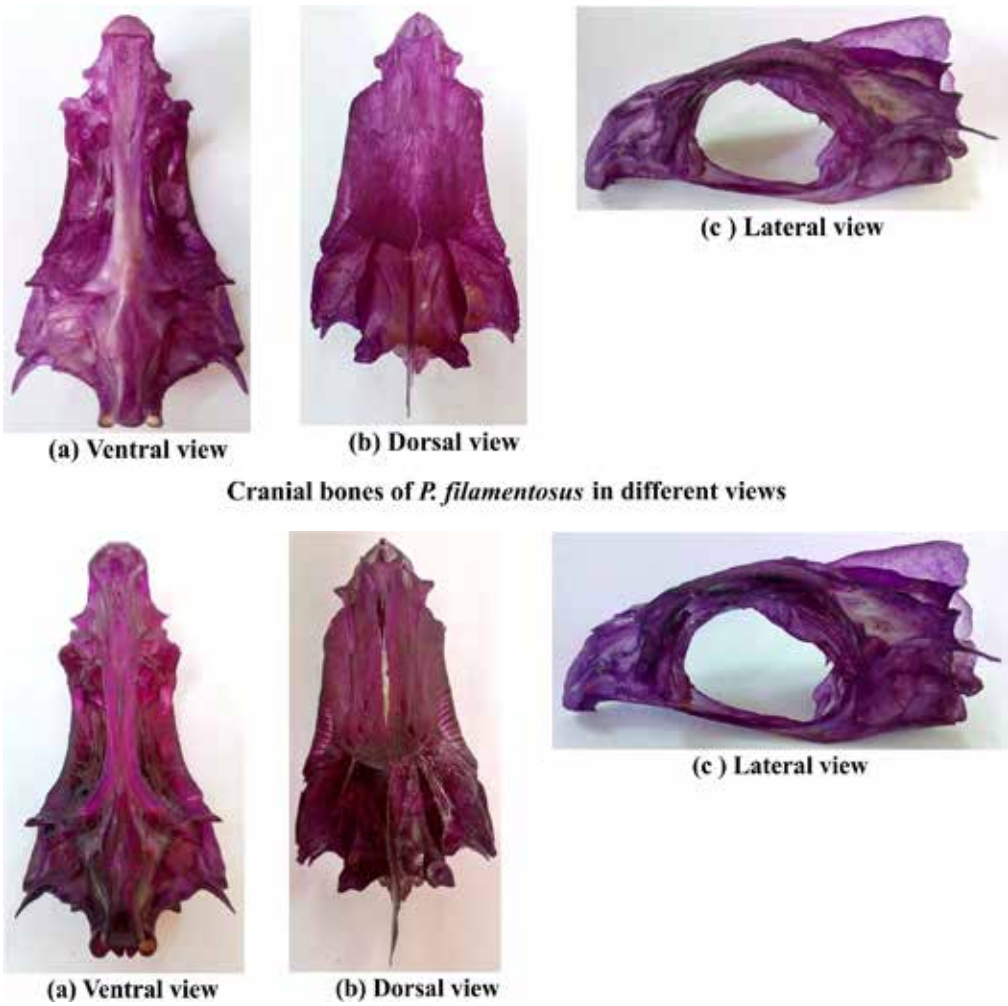
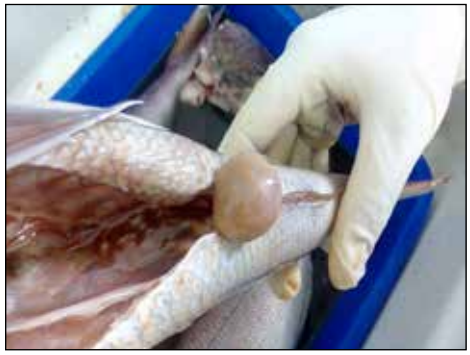


Plate 158: Neurocranium bones of *P. filamentosus* and *P. multidens*

Disease: Specimens brought for biology study was found with disease and abnormality. Fish with abnormal look in particular size group was identified with disease in the body cavity near the posterior end of gonad and near anus Plate 159. Sample has been process for further examination and exact identification.

(a) Fish sample found with disease

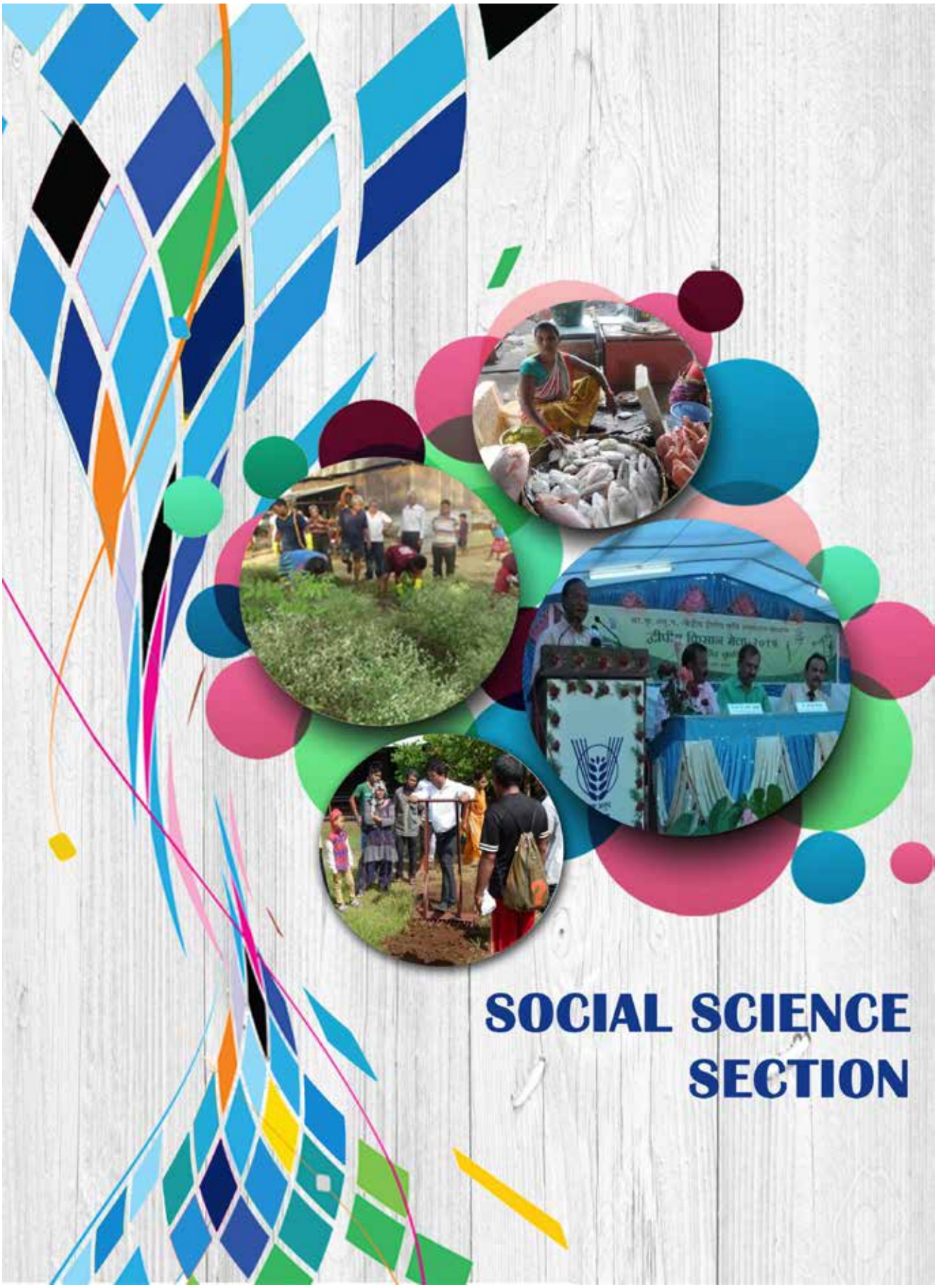


(b) Sample identified as disease

(c) Coiled structured in the sample

(d) Elongated structure of the sample

Plate 159: Disease encountered in fish sample



SOCIAL SCIENCE SECTION

Establishment of Out Reach Centre at Diglipur, North & Middle Andaman District

S. Dam Roy (Programme Leader) and S. K. Zamir Ahmed (Coordinator & Principal Investigator)

Training

Seven trainings were conducted in agriculture and allied fields for the farmers, youths and other stakeholders with the Institutional support. A total of 214 men and 102 women totaling to 316 got benefited, utilizing 416 training days. The percentage of participation was 68 men and 32 women respectively. (Plate 160)

Plate 160: Director deliberates during training

Kharif technological application on high yielding varieties of rice

A total of 35 demonstrations in 10 clusters of villages, covering 9.93 ha with four HYVs of rice in the farmer's field representing R.K. Gram, Madhupur, Krishnapuri, Subhash gram, Rabindra pally, Swarajgram. D.B. Gram, Badurtikry, Nabagram, and Talbhagan was conducted at Diglipur, North Andaman. The result revealed that variety Gayatri gave an average yield of 3.82t/ha. followed by CARI Dhan 4 (3.61 t/ha.) , CARI Dhan 6 (2.83 t/ha.) and CARI Dhan 7(2.5 t/ha) against the local check Jaya (1.9 t/ha.) respectively. The percentage increase in yield of CIARI rice varieties over the local check ranged from 13.64 to 50.26 % in farmers field. (Plate 161 & Fig 31).

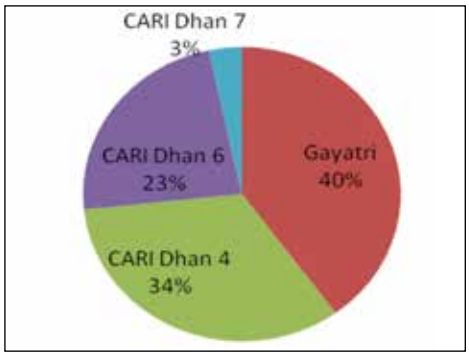


Fig. 31: Distribution of FLD paddy varieties

Plate 161: CARI Dhan 4 demonstration

Seed production of TLS of rice through seed village concept in participatory mode

For the 5th successive year, seed production of truthfully labelled seeds of CARI varieties namely CARI Dhan 4, 5, 6, 7, Gayatri & CSR 36 was taken in **seed village concept** mode with six farmers in 5 clusters *viz Madhupur-1, Madhupur-2, Kerelapuram, V.S.Pally, and R.K.Gram* covering 3.37 ha. A total of 9.2 Tonnes of seeds were produced under the technical guidance of breeders of Division of Field Crop Improvement and Protection of the Institute. Beside many other farmers who have gained competence in TLS production are earning through production & sale of seeds to the neighbouring farmers.

Rabi technological application of HYV of Pulses

A total of twenty five demonstrations have been conducted with two each of mung IPM-02-14, VBN 3 and urd IPU-02-43, LBG 645 varieties in the cluster of villages namely R.K.Gram, Ramnagar, Kerelapuram, Rabindrapally, Madhupur, & Kalipur covering 4.31ha (Plate 162 & Plate 163).

Plate 162: Distribution of TFL Seeds of Urd

Plate 163: FLD on variety of LBG-645(Urd)

Farmer's club formed for effective ToT

Keeping the importance to deliver effective ToT and other market led enterprise ORC of CIARI has formed twelve farmers clubs during the period beside two farmers club formed during the previous year (Plate 164 & 165). A total of 178 famers have been linked. The account of the clubs has been opened with the A & N Cooperative bank, Diglipur and Chief coordinator and Associate co-coordinator were appointed. This clubs will empower the farmers to transmit the latest agriculture techniques , orienting them to establish better relationship with banks, adoption of latest post-harvest technology, value addition etc. and enjoy the benefits of collective bargaining power both for procuring inputs and select their produce (Table 44).

Table 44: Details of farmers club promoted at North Andaman

Sl. No.	Name of Farmers Club	Village	Date of formation	Bank Account No.	Total Members
1.	Welfare Farmers Club	Badurtikry	31/10/2014	000734040100006	15
2.	Nabajagran Farmers Club	Kalipur	20/02/2015	000734040100007	10
3.	Vikash Farmers Club	R.K.Gram	09/09/2015	000734040100008	12
4.	Uday Farmers Club	Swarajgram	11/09/2015	000734040100009	10
5.	Ujala Farmers Club	kerelapuram	28/09/2015	000734040100010	12
6.	Active Farmers Club	Madhupur	26/10/2015	000734004100024	10
7.	Evergreen Farmers Club	Ramnagar	28/10/2015	000734004100025	21
8.	Suryauday Farmers Club	Paranghara	02/11/2015	000734040100011	15
9.	Roshni Farmers Club	Shyamnagar	30/11/2015	000734010100013	16
10.	Laxmi Devi Farmers Club	Khudirampur	03/12/2015	000734040100014	10
11.	Krishna Farmers Club	Krishnapuri	27/11/2015	000734040100012	10
12.	Milan Farmers Club	Milangram	18/12/2015	000734040100016	10
13.	Udaan Farmers Club	Radhanagar	18/12/2015	000734040100015	13
14.	Perfect Vikash Farmers Club	Durgapur	05/01/2016	000734040100017	14

Plate 164: Vikash farmers club of RK gram

Plate 165: Evergreen farmers club of Ramnagar (Sansad Adarsh Gaon)

Price behaviour of fresh, marine fish, pork and chevan meat at Diglipur market, North Andaman

For the period of 20 weeks from October 2015 to February 2016, the prices of the both fresh and marine water fishes were collected for the unregulated market and thereafter pooled (Plate 166). The selling prices of the major fresh water fishes ranged from Rs.150-200/kg for *Heteropneustes fossilis*(singhi), Labio rohita(rohu) Rs. 150-180/kg and *Plectorhynchus sp*.(katla) was Rs.160-200/kg, whereas in marine water fish, it ranged from Rs. 250-300/kg for *Penaeus monodon*(jinga big), Rs.150-300/kg for *Penaeus monodon/ Metapaeneus* sp. (Jinga small) *& Liza tade*(farsha), Rs. 100-200 kg for *Leiognathus* sp. (chanda),& Rs.30-100/kg for *kanagurta* (bangdi), *Trachurus* sp.(topi), *Sardinella* sp.(tarni) and *Stolephorus* sp.(maya) respectively. It is seen that the price of the fresh water fishes remain almost same, whereas there was steady increase in the marine water fishes on every month during the period. This shows good demand and market efficiency to the tune of 76 percent in the unregulated market.

Plate 166: Diglipur Market, North Andaman

On viewing the quantity & selling price of pork meat (White Yorkshire) sold on every Monday and Sunday , ranged from 84 to 89 Nos (approximately 3950 to 4050 kgs of meat @ Rs 200/- , whereas goat mostly the black bengal breed 16 to 23 nos .(approximately 132 to 193Kgs) are sold only during Sunday with the price range of Rs 480 to 600/ kg. This reflects for good demand and market for pork meat followed by goat**.**

Extension Activities

Field visit i.e., monitoring of field demonstration & guidance: 354 visits were made to monitor the FLDs on rice, pulses, spices , selection of farmers for formation of farmers Club, for getting the feedback on the technological application , seed production of TLS of rice, survey for MERA GAON MERA MERA GAURAV (Plate 167 & 168).

Farmers linked with agromet cell: A total of 259 farmers from ORC have been linked with the Institute agromet cell. The information on agro advisory is sent to them regularly through SMS, which enables them for effective management of crop and its related activities.

Plate 167: Interaction with experts

Plate 168: Monitoring of crop

Soil health card: A total of 40 farmers of which, 21 farmers from village Ramnagar and 19 belonging to R.K.Gram, Kerelapuram, Madhupur, and Subashgram were given with the Soil Health Card prepared by NRM Division of the Institute (Plate 169).

Spices technological demonstration: Out of five farmers selected two technological demonstration in an area of 0.10 ha each has been done at farmer's field situated at Keralapuram & R.K.Gram with spices variety P 2 under arecanut plantation. The objective is to provide more returns from the existing area in the long run.

Plate 169: Soil health card distribution

Plate 170: Breeders monitoring variety PA 6444 (hybrid rice) at farmer's field

On farm testing of rice varieties: Three rice varieties i.e, 02 Hybrids and 01 HYV were tested at three location i.e, R. K. Gram, V.S. Pally and Kalipur. The mean yield data indicated superior performance of PA 6444 hybrid followed by KRH4 which was infested by BLB. Swarna performance was very poor at the test locations (Plate 170).

Other extension activities

- Field day on varietal selection of Aath number Dhan were conducted, wherein a total of 57 beneficiaries participated and got benefitted.
- Ten video shows on technological intervention in agriculture & allied fields & Farmers Right were screened, wherein 425 beneficiaries got benefitted.
- Twenty two telephonic advisories were imparted by the scientists of the Host Institute to address to the problems faced by the farmers in pest and disease management in turmeric, ginger , arecanut, banana and paddy respectively.
- 17 visits were made by Scientists of host Institute, PMC members, Pradhan & officials of Development Department to have face to face interaction and jointly addressing the problems of the farmers to logical ends (Plate 171 & 172).

- 158 target clientele visited Out Reach Centre (ORC) for discussion on crop, training and reading technical books for updating information.

Plate 171: Sensitization on farmers producer organization at Diglipur

Plate 172: GM, NABARD interact with farmers club members

Economic Impacts Studies on Crops Diversification and Technology Adoption in Horticulture

S.K. Zamir Ahmed and *Nagesh Ram*

Market potential of agricultural produce in unregulated market of South Andaman - an ex- post facto study

The vegetable, fish, chevan and pork market is unregulated at A & N Islands, which meets to the daily requirement of the cosmopolite families representing different parts of India, residing in this Island. An attempt has been made over here to study the market potential of agriculture produce, pockets of vegetables producer and supplier, types of vegetables (fruits, tubers, leafy, leafy spice), marine and freshwater fishes landing at market, sold, post harvest losses, along with profit margin of the shopkeepers in two most preferred unregulated market of South Andaman namely the Bathu Basti vegetables market and Sunday market at Junglighat. Information were collected through a well structured interview schedule for the period of eight months (June 2015 to January 2016) from respondents selected randomly on every sunday & wednesday totaling to 64 visits. The data of two markets under study has been pooled and summarized in Fig.32.

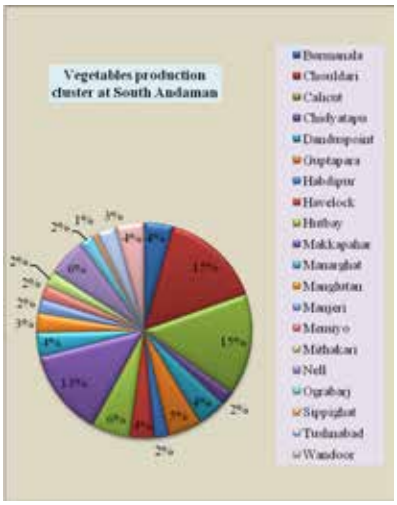


Fig.32: Vegetable production potential

Pockets of producer & supplier of vegetables

Studies divulge that around 47 types of vegetabes ie 26 in fruit & tuber, 16 leafy and 5 in leafy & tuber spice have become commercially important and are sold in the market for consumers. At South Andaman, twenty cluster of villages were the pockets of vegetables production and supplier ,of which Calicut and Chouldari contributed an average of 15% followed by Makkapahar (13%), Hutbay and Neil (6%), Guptapara (5%), Burmanala, Danduspoint, Havelock, Manarghat and wandoor (4%), Manglutan & Tushnabad (3%), Chidyatapu, Habdipur, Manjeri, Memyo, Mithakari & Ograbraj (2%), and Sippighat (1%). From North & Middle Andaman, Diglipur contributed 27%, followed by Nimbudera (26%), Billiground (25%) and Rangat (22%) respectively. Overall it is reflected that 61percent of the vegetables landed in these two markets from South Andaman and 39 percent from North & Middle Andaman (Fig.33).

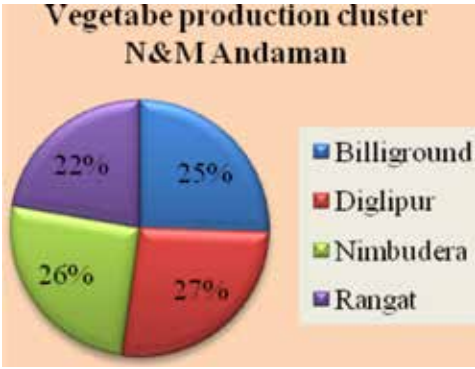


Fig.33: Vegetable production cluster

Vegetables landing, post harvest loss and profit

Under this sector approximately 2685.40 Mt of vegetables landed during the period. The same was classified based on the parts sold like fruits & tubers , leafy vegetables, leafy spice & rhizomes and further grouped as per the selling price in the market. The details on the group wise landing, post harvest loss and profit is given below:

(a) Vegetables in category of fruits & tubers

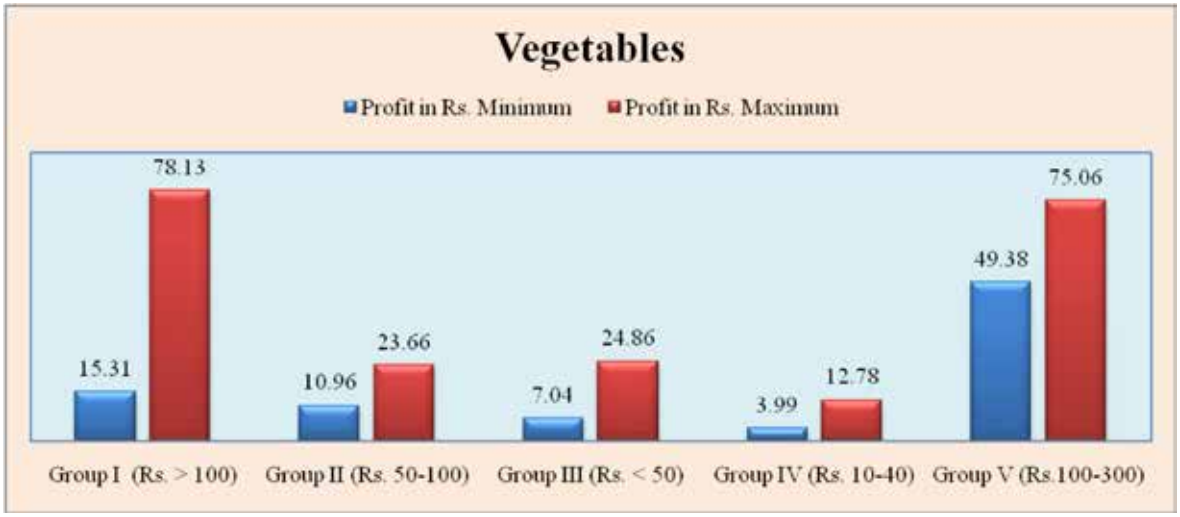
Twenty six different types of vegetables representing fruits, & tubers were found to be sold in the market which were grouped into three based on the market price namely, group I (Rs. >100), approximately 206.90 Mt of vegetables landed of which 2.90 Mt(1.4%) were subjected to post harvest loss in the both markets. The maximum profit per kilogram was from drumstick Rs. 78.13, followed by dolicus Rs. 21.56, bitter gourd Rs. 16.06 and beans Rs.15.31. In group II (Rs. 50-100), approximately 910.90 Mt landed of which 16.10 Mt (1.7%) were lost after post harvest in the both market. The maximum profit per kilogram was Rs.23.66 from lady finger followed by tomato Rs. 22.59, brinjal Rs. 22.02 cauliflower Rs.20.71, cowpea Rs. 20.36, pumpkin Rs. 19.33, potal Rs. 18.66, kakrol Rs.18.62, cabbage Rs.15.18, coccinia Rs.13.18, snake gourd Rs. 12.83 and ribbed gourd Rs. 10.96. Group III (Rs. < 50), of 802.60 Mt quantity of vegetables landed, 6.4 Mt (1.3%) were post harvest loss. Maximum profit per kilogram was Rs.24.86 for cucumber followed by topica Rs. 13.71, colocasia Rs.13.49 ,sweet potato Rs.13.06, Nicobari aloo Rs.12.78, bottle gourd Rs.12.07, banana Rs.12.06, radish Rs. 11.26/ kg, guinea aloo Rs.10.96 and yam Rs. 7.04 respectively. Market efficiency was 0.66, 0.61 and 0.47 in group I, II and III respectively.

(b) Leafy vegetables

This group of leafy vegetables includes 16 (sixteen) types which was available in the market. Approximately 446.3 Mt landed of which 2.1 Mt (0.5%) were post harvest losses. The maximum profit recorded was Rs.12.78 per kg from poi followed by medak bhaji Rs. 12.22, madrash bhaji Rs.11.50, jai bangala, Rs.11.11, kumda bhaji Rs. 10.94, helancha Rs. 10.40, mita bhaji Rs. 9.75, ghuniya bhaji Rs. 9.67, mooli bhaji Rs. 9.33, shanti bhaji Rs. 7.06, green marsha Rs. 6.19, deki bhaji Rs.6.00, lal marsha Rs.5.39, palak Rs. 4.44, dumoor bhaji Rs. 4.30, nali bhaji Rs.4.10 and khari bhaji Rs. 3.99 respectively. The market efficiency of leafy vegetables was found to be 0.64.

(c) Leafy & tuber spices

In this group approximately 318.7 Mt landed in the market of which 0.6 Mt (0.2%) were post harvest loss recorded. The maximum profit was in green chilli Rs. 75.06 per kg followed by broad dhaniya Rs. 68.13, coriander Rs. 54.38, ginger Rs.51.25 and mint Rs. 49.38 respectively and the market efficiency was 0.75. The pooled data of minimum and maximum profit in vegetables group wise is given in Fig.34.



Fish Landing and Profit

Under this sector approximately 558.70 Mt of marine and 28.53 Mt of fresh water fishes landed during the period. The same was classified and grouped as per the selling price in the market. The details on the group wise landing, post harvest loss and profit is given below:

(a) Marine fishes

Study divulge that around17 species of fishes are commercially important and are frequently caught from this islands water. The fishes reached the market from nine landing centers during June 2015 to January 2016. Junglighat landing centre contributed an average of 18% followed by Haddo & Marine (16%), Dignabad (15%), Dairy farm (14%), Wandoor (9%), Carbynes Cove (5%), Dandus point (4%), and Panighat (3%) respectively (Fig.35)

Marine fishes which landed both at Junglighat & Bathu Basti were grouped into three based on price range. In group I (Rs. > 200), 311.80 Mt landed, wherein maximum profit margin per kg was in *Penaeus monodon*(jinga big) Rs. 172.30 followed by *Carangoids sp.*(kokari) Rs. 111.40, *Scylla serrata*(kekda) Rs. 101.00, *Scomberomorus guttatus*(surmai), Rs. 89.00 and & *Penaeus monodon/ Metapenaeus sp.l* (jinga small) Rs. 77.00. In group II (Rs. 100-200), 80.8Mt landed and the maximum profit margin was seen in *Plectorhynchus sp.*(katla) Rs. 47.70 per kg followed by *Liza tade*(farsha big).Rs. 45.70, *Mugil cephalus*(farsha small) Rs. 24.30, *Stolephorus sp.*(maya). Rs. 22.20, and *Sphyraena jello*(dandus) Rs. 21.40. In group III(Rs. <100), 185.1 Mt landed and the maximum profit margin per kg was in *Trachurus sp.*(topi) Rs. 22.30 followed by *Skate and Rays*(shankar) Rs. 18.70, *Leiognathus sp.*(chanda), Rs. 18.10, *Sardinella sp.*(tarni) Rs. 15.60 and *Rastrelliger kanagurta*(bangdi) Rs. 13.30 respectively. The market efficiency of marine fishes were recorded to be 0.64, 0.74 and 0.69 in group I, II and III respectively.

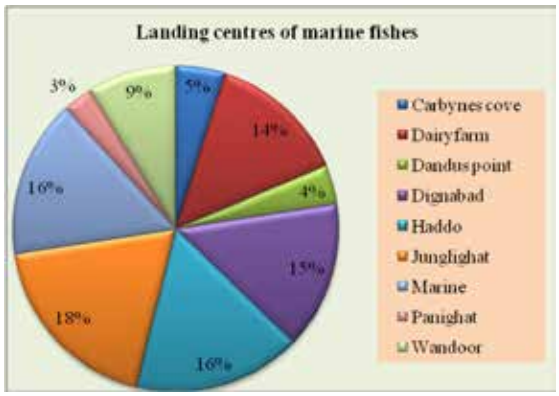


Fig.35: Landing Centres of marine fishes

(b) Fresh water fishes

Around 5 species of fresh water fishes were found to be available in the market under study. 37% of fishes came from Chouldari followed by Wandoor (33%), Mameyo (13%), Sippighat(10%), and Mithakari (3%). Comparatively very small quantity of fishes lands on sunday and wednesday at Junglighat and Bathu Basti market (Fig.36). Hence

the availability for sale is limited. It was found that in group I (Rs.>200),19.02 Mt landed, of which the maximum profit margin per kg was earned by *Heteropneustes fossilis*(singhi) Rs. 140.33 followed by *Penaeus monodon* (jinga) Rs.125.11, *Labio rohita*(rohu), Rs. 82.78 and *Clarias batrachus(magur)*, Rs.76. In group II (Rs. 100-200), 9.51 Mt landed and the maximum profit margin was by *Oreochromis sp.*(telapiya), Rs.51.89 for the period. The market efficiency was 0.71 and 0.69 for group I & II. The pooled data of minimum and maximum profit in marine and fresh water fishes group wise is given in Fig.37.

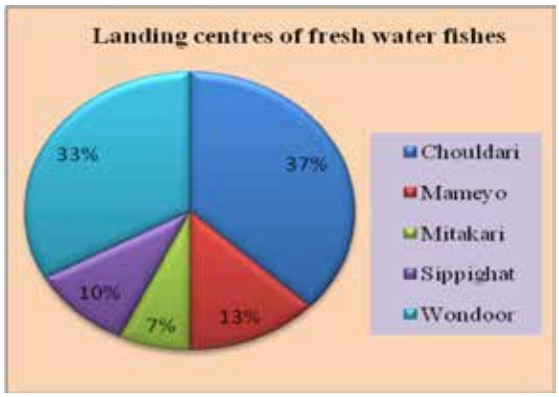


Fig.36: Landing centres of fresh water fishes

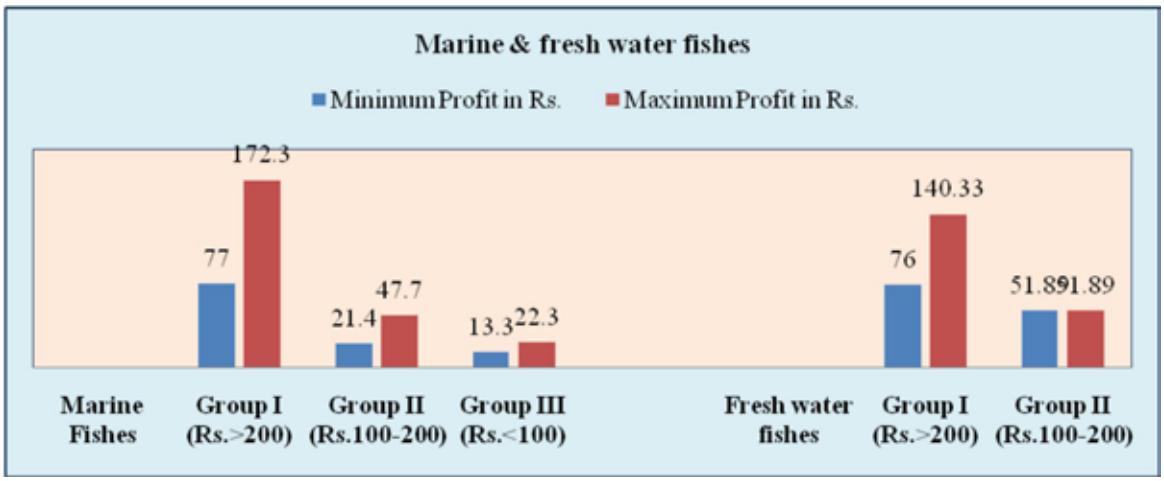


Fig.37: Maximum & minimum profit in sale of marine & fresh water fishes

Income of Shop Vendors and market efficiency of Junglighat & Bathu Basti Market

Sunday market at Junglighat comprises of shops namely, 42 permanent & 168 temporary on vegetables,104 permanent & 6 temporary for marine fishes, and 16 temporary for fresh water fishes , whereas at Bathu Basti there are 64 permanent & 5 temporary for vegetables, 28 permanent for marine fishes, 12 permanent & 2 temporary for fresh water fishes vendors respectively. A total of 279, 138 & 30 vendors are involved in vegetable, marine and fresh water business as livelihood (Fig.38) . It was found that the net profit in percentage was more from sale of marine fishes i,e (54%) followed by vegetables (37%) and fresh water fishes (9%) per vendor in a month. The market efficiency ranged from 0.47 to 0.75 for vegetables, 0.64 to 0.74 for marine fishes and 0.69 to 0.71 for fresh water fishes. This indicates that though the market is unregulated the marketing processes are stabilized (Fig. 39).

Fig.38: Enterprise share towards livelihood

Fig. 39: Market efficiency of vegetables & fishes in Bathu Basti & Junglighat market, South Andaman

Legends

Fruits and tubers: Group I (Rs.>100) Drumstick, dolicus, beans , bitter gourd, group II (Rs.50-100) Ribbed gourd, potal, cauliflower, lady finger, cowpea, snake gourd, kakroll, cabbage, tomato, pumpkin, brinjal, coccinia and group III (Rs.<50) Cucumber, bottle gourd, banana, yam, guniea aloo, sweet potato, colocasia, nicobari aloo, tapioca ,radish.

Leafy vegetables: (average Rs.10 to 39.44) Palak, kumda bhaji mendak bhaji, madras bahji, jai bengala, mitha bhaji, helancha, poi,guniya bhaji, shanti bhaji khari bhaji ,deki bhaji, dumoor bhaji, lal marsha , nali bhaji & green marsha

Leaf & tuber spice: (average Rs 133.44 to 302.50) Coriander, board dhaniya, mint, ginger & green chilli.

Marine fishes: Group I (Rs.>200) *Penaeus monodon*(jinga big), *Carangoids sp.*(kokari), *Scylla serrata*(kekda), *Scomberomorus guttatus*(surmai), *Penaeus monodon/ Metapenaeus sp.l* (jinga small), group II (Rs.100-200) *Plectorhynchus sp.*(katla), *Liza tade*(farsha big), *Mugil cephalus*(farsha small), *Stolephorus sp.*(maya), *Sphyraena jello*(dandus), and group III (Rs.<100) *Trachurus sp.*(topi), *Skate and Rays*(shankar), *Leiognathus sp.* (chanda), *Sardinella sp.*(tarni), *Rastrelliger kanagurta*(bangdi).

Fresh water fishes: Group I (Rs.>200), *Heteropneustes fossilis*(singhi) *Penaeus monodon* (jinga), *Labio rohita*(rohu), *Clarias batrachus(magur)*, and group II (Rs. 100-200), *Oreochromis sp.*(telapiya).

Junglighat market

Vegetables market

Bathu Basti market

Vegetables market

Fish market

Fish market

Plate 173: Glimpses of market under study

KRISHI VIGYAN KENDRAs of ICAR-CIARI

In Andaman and Nicobar Islands under the administrative control of ICAR - Central Island Agricultural Research Institute (CIARI), Port Blair three Krishi Vigyan Kendras(KVK) were established in three Districts (South Andaman ,North and Middle Andaman and Nicobar) (Plate 174) . The first Krishi Vigyan Kendra of A&N Group of Islands under Zone-II, Kolkata was established in 1993. It is situated adjacent to Andaman Trunk Road (ATR) at Sippighat, which is about 7 kms away from the host Institute (Central Island Agricultural Research Institute) and 16 kms from the Port Blair city. The second Krishi Vigyan Kendra of A&N Group of Islands was established on 20th May, 2010 at Car Nicobar. The KVK Car Nicobar is functioning from the Headquarter, Car Nicobar covering the entire Nicobar district. The third Krishi Vigyan Kendra of A&N Group of Islands was established on 7th February, 2012 at Nimbudera. All the staff of KVK Nimbudera were recruited since December 2014. The KVK is functioning from the Headquarter, Nimbudera covering the entire North & Middle Andaman District.

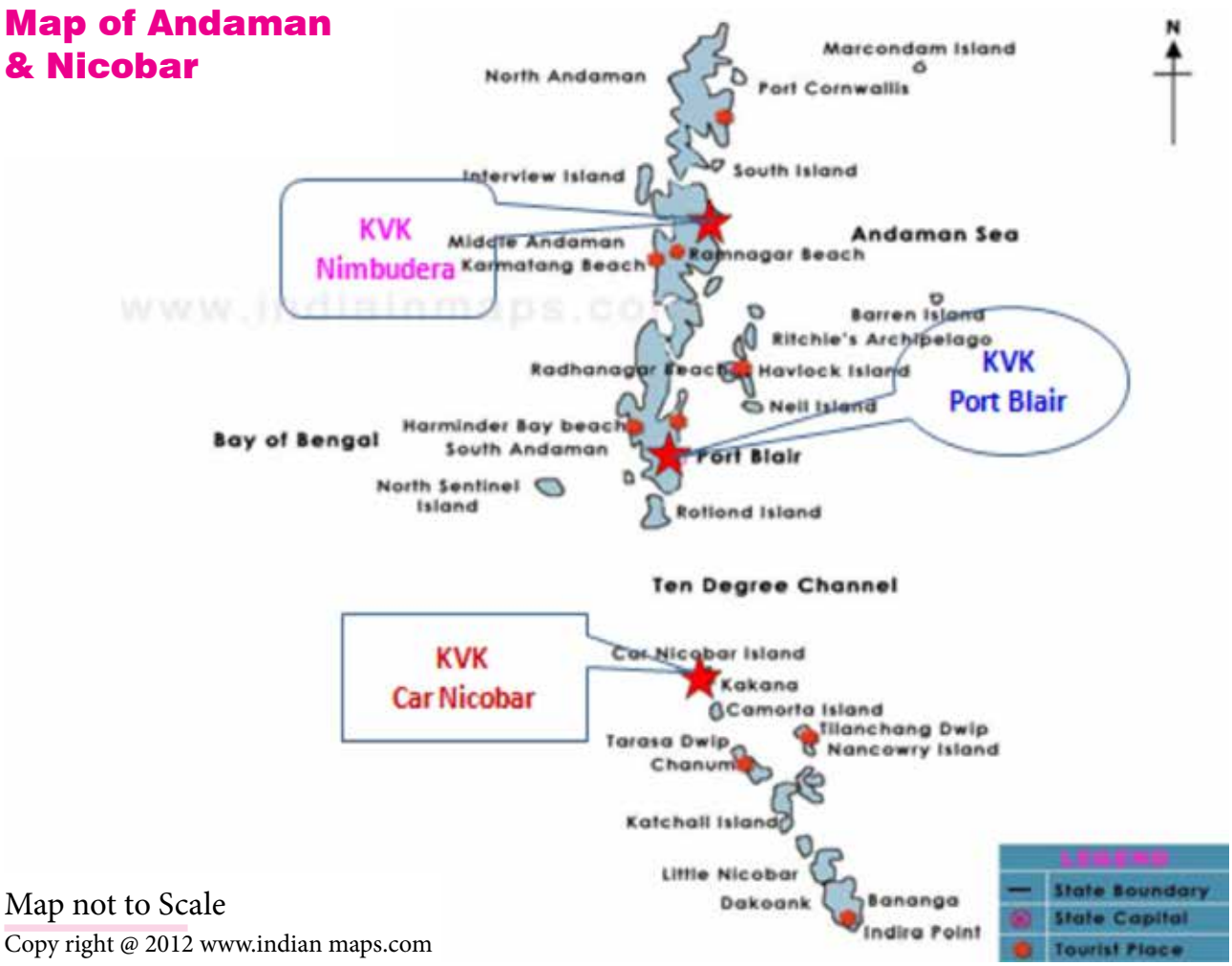


Plate 174: Locations of KVK's

KVK is one of the innovative institutions with the mandate of imparting vocational training to the practicing farmers, farmwomen, rural youth and extension functionaries in improved technologies in the field of agriculture, horticulture, animal husbandry, fisheries and other allied enterprises. It has additional responsibilities of testing and refining the developed technologies and also conducts front line demonstrations of new technologies in the farmers' field.

ICAR-Krishi Vighyan Kendra-South Andaman

Training Programme

Krishi Vigyan Kendra, South Andaman has conducted 26 training during the year 2015-16 covering South Andaman and Little Andaman for the benefit of practicing farmers/ farmwomen, rural youth and extension functionaries. The details of the training are given below in Table 45.The participation of male and female is given in Fig.40.

Table 45: Details of training programme

Discipline	No. of training	Male	Female	Total
Agronomy	2	35	15	50
Horticulture	6	61	112	173
Animal Science	6	83	55	138
Agriculture Engineering	1	17	8	25
Fisheries	4	58	8	66
Home Science	2	7	50	57
Plant Protection	5	63	38	101
Total	26	324	286	610

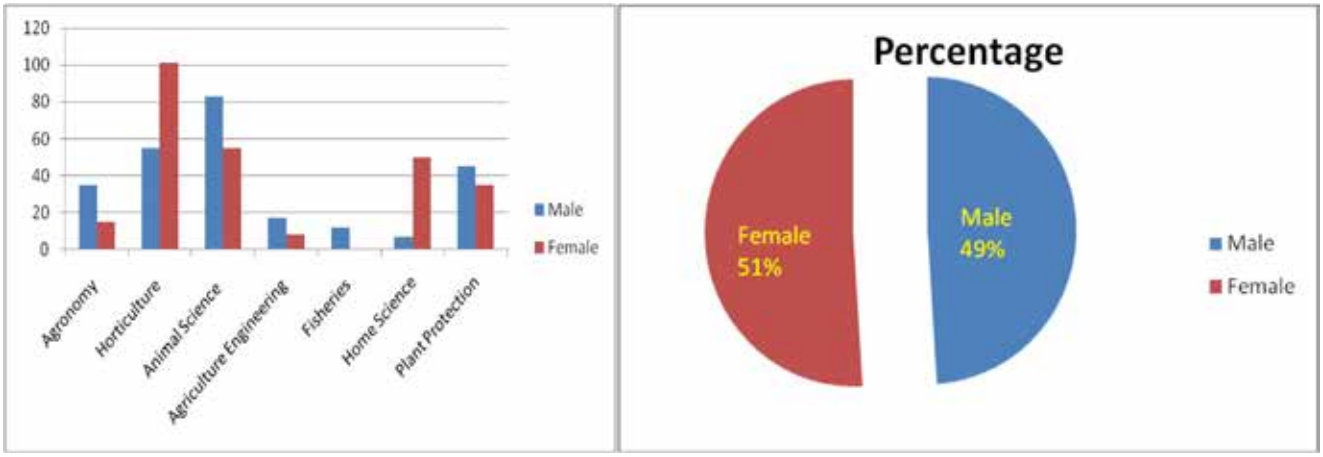


Fig.40: Participation of male and female during training

Training on sustainable organic agriculture

Training on microbial bio-control agents for pest and disease

Training on scientific pig farming

Training on scientific poultry farming

Hand on to trainees on mushroom

Training on mushroom cultivation

Plate 175: Glimpses of training programmes

Front Line Demonstration [FLD]

Ten Front Line Demonstrations on the proven technologies *viz*. paddy, elephant foot yam, zinger, cucumber, brinjal, duck, green fodder, fish culture and IFS model were conducted.

- **Paddy (CARI Dhan 5):** Recorded 28.0 % higher grain yield as compared to local check.
- **Duck farming:** Khaki Campbell laid 180 eggs per annum compared to the local desi duck of 110 eggs per year.
- **Poultry (Cross Nicobari fowl):** Cross Nicobari fowl laid 147 eggs per annum compared to the local desi hen of 80 eggs per annum.
- **Fodder cowpea (Co FC-8):** Recorded an average yield of 280q/ha green matter as compared to the local check of 180q/ha.
- **Development of IFS model:** Development of IFS model with the component (Fish+ Duck+ Seasonal vegetables + Banana) was conducted at three farmer's field. Fish (Catla, Rohu and Mrigal) production was 974 Kg Fish /ha + 145 Eggs + 1.9 t/ha Vegetable + 19.7 t/ha Banana as compared to local check 122 Kg Fish/ha + 0.8t/ha Vegetables + 8.3 t/ha Fruit crops.
- **Integrated pest management in cucumber:** Disease incidence of powdery mildew (10.5%), downy mildew (30.5%) and root rot (5.5%) were recorded as compared to check powdery mildew (40.6%), downy mildew (85.4%) and root rot (20.5%) respectively.

FLD on cucumber

FLD on backyard poultry

Plate 176: Glimpses of FLD

On Farm Trials [OFT]

Four On Farm Trials at farmers' field were conducted for assessment and refinement of the selected technology on agriculture and allied fields. The result is presented below:

- Growth characters and yield of elephant foot yam in coconut gardens as influenced by integrated nutrient management practices: The result revealed that *Tech. Option 4.(*50%NPK + vermicompost + neem cake (each @1kg plant^{-1}) recorded higher yield 1.603 kg /plant as compared to local check 1.202 kg /plant.

Plate 177: Elephant foot yam

- Integrated disease management for bacterial leaf blight on Paddy: The result revealed that maximum disease control were observed 66.35% in *Technical Option 2* (soil treatment with *Pseudomonas fluorescence*) followed by 50.06 % (*Technical Option 4:* Agrimycin @200 ppm) and 47.50 (*Technical Option 3:* soil treatment with *Trichoderma harzianum*) as compared to local check 19.18%.

Plate 178: Integrated disease management for bacterial leaf blight on paddy

- Performance evaluation of milk production through mineral supplementation and probiotics in desi cattle was conducted and results revealed that the average milk yield (lit.) recorded highest in the group fed with normal feeding + probiotics followed by group fed with normal feeding + mineral supplemenation. The lowest milk yield was recorded in the group fed with normal feeding + probiotics. However, on average the milk yield characteristic is recorded as 2.30 litres/day /animal, which is quite low to their potential yield which might be due to non supply of feed and any additives even during the lactation period. Hence, it is suggested that, exogenous source of feed additives in the form of mineral / probiotics supplementation is very essential in lactating cows during the peak lactation phase for improving the milk yield as per the genetic potential of desi cattle (Plate 179).

- Evaluation of growth performance of IMC were conducted in seven locations with three treatments. The treatments were – Farmer practices (Fish fingerlings + RCD), Technical Option 1 – Fish fingerling+ Rice bran+ Lime, Technical Option 2 – Fish fingerling + Rice bran+ Groundnut oil cake + lime + RCD (Plate 180).

Plate 179: Desi cattle in field

Plate 180: Interacting with farmers

Special Day Celebration by KVK, South Andaman

ICAR-Foundation Day on 16th July, 2015

International Year of Soil on 26th Sept., 2015

World Soil Heath Day on 5th Dec., 2015

BNPIC, Ferrargunj on 2nd&5th Jan., 2016

National Initiative on Climate Resilient Agriculture (NICRA)

Nagesh Ram, L.B. Singh, A. K. Singh, B.K. Nanda, N. Bommayasamy and *N.C. Choudhuri*

Objectives

- To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies.
- To demonstrate site specific technology packages on farmer's fields for adapting to current climate risks.
- To enhance the capacity of scientists and other stakeholders in climatic resilient agricultural research and its application.

Significant achievement

[A] Natural Resource Management

- Water harvesting and recycling
- Desilting of farm ponds and bund raising of BBF
- Intervention of cost effective rain shelters

[B] Crop Production

- **Drought tolerant paddy (Sahbhagi dhan) :** Higher grain (5428 kg/ha) was recorded with Sahbhagi dhan followed by farmers variety which led to 30.8 % higher yield than other cultivar. Higher yield under sahbhagi dhan was mainly due to more number of productive tillers/hill and no of grains/ panicle consequently higher uptake of nutrients from soil. Higher gross return (Rs. 54280 ha^{-1}) and net return (Rs. 27430 ha^{-1}) with B: C ratio of 2.02 was recorded in Sahbhagi dhan which is mainly due to numerically higher grain and straw yield. Performance of sahbhagi dhan is more acceptable to the farmers.
- **Drought tolerant paddy (Naveen dhan):** Naveen recorded more grain yield of 3280 kg/ha which was 27.6 % higher yield as compared to local check. Even though, Naveen dhan faced moisture stress (48.6% deficit rainfall) during early stage of crop growth. 46.7 % higher rainfall was received as compared to Normal rainfall during October, 2014. At the same time, field was fully covered by eroded soil. It was suggested to remove the excess soil and at the same time was applied (25 % of excess nitrogen) for quick establishment. Naveen dhan gave highest net return and B:C ratio (Rs. 11300 and 1.55), while Swarna was least profitable (net return was Rs.4200 and B:C ratio was 1.20).
- **CIARI Poi selection for saline soil:** CIARI Poi selection recorded yield of 5.4t/ha which was 32% higher yield as compared to local check (green pole type).
- **CIARI AMA-Green and CIARI-AMA-Red drought tolerant leafy vegetables:** CIARI AMA-Green recorded yield of 7.2t/ha followed by CIARI-AMA-Red 7.0t/ha which was 21% higher yield as compared to local check.

[C] Livestock and Fisheries

- **Fodder cultivation for sustainable livestock production**: To meet the requirement during acute shortage of green fodder; fodder cowpea, maize and Hybrid Napier grass were promoted in the area. The fodder enhances milk production of livestock by meeting its nutritional requirement. Fodder tree (Agathi) has been demonstrated in the Port Mout village for availability of green fodder during summer season for the goat.

- **Improved shelter management practices with well ventilated system as a means to resist extreme climatic variables for poultry, goatry and dairy animal:** Improved Poultry shed with well ventilated system resumed in low mortality rate. Developing improved sheds in shady area reduces heat stress. Adequate space in improved shed results better performance in poultry and dairy animals.

- **Backyard poultry production with improved Nicobari and Vanraja birds:** The Nicobari birds regarded as one, which possess resistant to common diseases of the birds, are suitable under backyard condition. The production characteristics revealed that the bird can well thrives in this condition and performed better in terms of egg production, compared to other indigenous bird. The rearing of Vanraja was also initiated to provide more profitability to the farmers. The Vanraja birds are of dual purpose and can also attain higher bodyweight, when they are provided with the supplemental feed, apart from the feed they intake by scavenging during daytime.

- **Awareness on status and control of FMD and animal health camp in Badmaspahad Village:** A total of two numbers of animal health camp were organized with the collaboration of AH&VS of A&N Administration. During the camp a total of 65 animals including cow, goat and 168 poultry birds were thoroughly diagnosed and treated.

- **Integrated fish farming** Six ponds were taken for demonstration of Integrated fish farming wherein Fish+ seasonal vegetables + duck (Khaki Campbell) were reared. The total area of 6 Nos. farm ponds was 0.48 ha. In each pond 265 fish fingerlings (40-50gm.), 25 Nos. Khaki Campbell duck and on the bunds seasonal vegetables were raised. For the demonstration Rs. 23700 was incurred towards the culture operation and net return obtained was Rs. 48670 with B:C 3.05, as against the control with net return of Rs.9450 and B:C 1.90.

ICAR-Krishi Vigyan Kendra – Nicobar

Ever since it's established on 20th May, 2010 under the administrative control of ICAR - Central Island Agricultural Research Institute (CIARI), Port Blair, the ICAR- Krishi Vigyan Kendra - Nicobar, Car Nicobar is working for the socio-economic development of tribal community of Nicobar district. Presently, the KVK Office is functioning from the Headquarter, Car Nicobar covering entire Nicobar district. The KVK has a 5 ha farm at Auckchung, Car Nicobar.

The KVK's approach is to work for organic, self-sufficient and sustainable agriculture for nutritional and livelihood security of the Islanders. The KVK is one of the innovative institutions with a mandate of imparting vocational training to the practicing farmers, farmwomen, rural youth and extension functionaries with the principles of '**Teaching by doing'** and **'Learning by doing'**. It conducts Front Line Demonstration (FLD) and has got an additional responsibility of testing and refining the developed technologies in the farmers' field through On Farm Trials (OFT). The KVK-Nicobar is also looking after different External and Institute funded projects for socio-economic development of the tribal community.

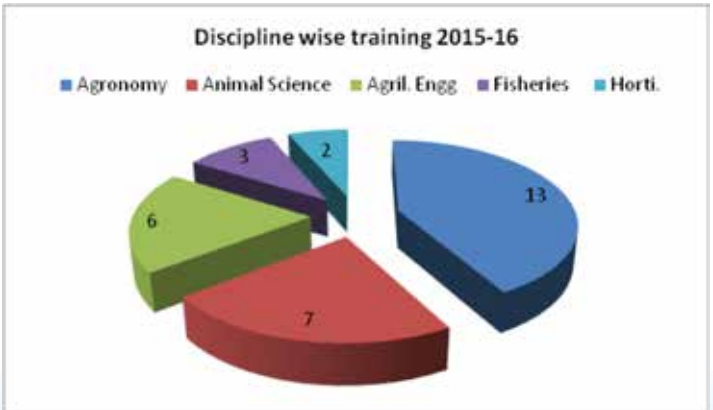
In Nicobar Islands, where the available cultivable area and the local resources are limited, there is need for disseminating innovative and highly productive technologies with due care for sustainability and eco-friendliness. The KVK – Nicobar functions as Change Agent to bring about desirable improvement in the production from agriculture, animal husbandry and fisheries and enhance the income of farmers apart from creating additional employment opportunities. To achieve its mandates, the KVK – Nicobar started as one of the methodologies i.e. adoption of a village for its all-round development. Transfer of Technology (TOT) programme in an integrated manner was implemented so that holistic development could be ushered in with an overall upliftment in socio-economic status of farming community through production of more food and profitability as well.

Trainings

During this year (2015-16) a total of 31 trainings were conducted in different disciplines of Agriculture viz. Agronomy, Animal Science, Horticulture, Agriculture Engineering, Fisheries. A total of 1099 farmers including 450 female got benefited from the trainings. This involved 70 days and 2289 trainee days (Table 46 & Fig.41).

Table 46: Discipline wise detail of training done by KVK-Nicobar during 2015-16

Discipline	No. of training	Male	Female	Total
Agronomy	13	319	216	535
Horticulture	2	38	44	82
Animal Science	7	120	112	232
Agriculture Engineering	6	96	42	138
Fisheries	3	76	36	112
Total	31	649	450	1099



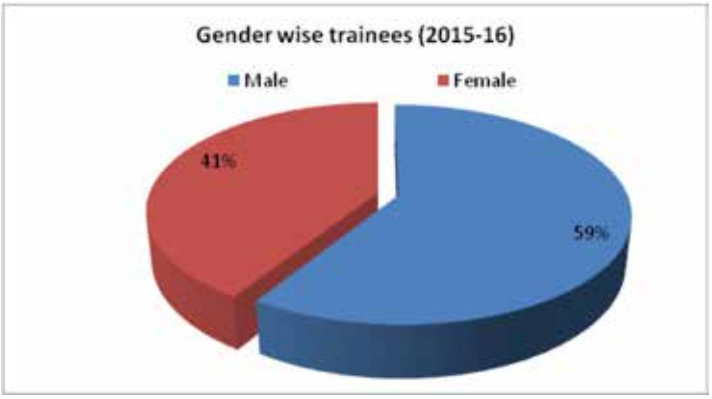


Fig.41: Discipline wise and gender wise training details

On Farm Trials (OFTs)

i. Evaluation and assessment of maize varieties

OFT on Evaluation and assessment of Maize variety was conducted in Randomized Block Design with 10 replication and three varieties Hybrid Maize-4, HM-99 and HM-306. The result revealed that, the variety HM-306 yielded significantly higher grain yield 33.44q/ha followed by HM-4 (29.89q/ha) and HM-99 (26.60q/ha) (Plate 181) .

Plate 181: OFT on evaluation and assessment of maize varieties

ii. Evaluation of rain shelter for high value vegetable and leafy vegetable cultivation

The tropical climate of Nicobar group of islands favour cultivation of wide variety of vegetables but high rainfall contributes to high disease incidence and physiological stresses which reduces quality & productivity of vegetables as well as reduces input use efficiency. The on farm trial (OFT) was conducted at farmers field area of each plot is 24 m^2 for growing the crops.

Plate 182: Protected cultivation under rain shelter

Plate 183: UV sheet roofing with IP net

The maximum average yield was recorded in UV sheet roofing with IP net for the leafy vegetable of Spinach (7.8 Kg/plot), tomato (11.5 kg/ plot) and raddish (25.7 kg/ plot) as compared to traditional practice and other rain shelter in production of the leafy vegetable. The quality and appearance of produce were better than traditional and both rain shelter (Plate 182 & 183).

iii. Evaluation of virgin coconut oil extraction technology.

The Car Nicobar is one of the prominent producers of coconut in the Andaman and Nicobar Islands. Virgin coconut oil is gaining popularity as functional food oil and the public awareness of it is increasing. For above circumferences the study was conducted in randomized block de sign with 4 treatments *viz.* T0: Natural fermentation method (NFM), T1: Low pressure oil extraction method (LPOEM), T2: Modified kitchen method (MKM) and T3: High pressure oil extractor method (HPOEM) on 7 farmer field. The process was repeated three times at each replication. The result reviled that, the oil recovery from T0: 25.3 liter per 100 kg fresh grated coconut kernel, T1: 29.5 l/ 100 kg fresh grated coconut kernel, T2: 33.9 liter per 100 kg fresh grated coconut kernel and T3: 37.8 liter per 100 kg fresh grated coconut kernel. Hence, it can be concluded from the above study that, the High pressure oil extractor method is suitable for home consumption, oil have transparent colour with low moisture content (Table 47 & Plate 184).

Table 47: Participatory technological evaluation of virgin coconut oil extraction technology

Technology option	No. of trials	Yield of oil (L/q grated coconut kernel)	Operational cost of oil (Rs.)	Gross return (Rs.)	Net return (Rs.)	BC ratio
T_0 (NFM)	7	25.3	1500	2530	1130	1.6
T_1 (LPOEM)	7	29.5	1500	5900	4400	3.9
T_2 (MKM)	7	33.5	1500	6700	5000	4.4
T_3 (HPOEM)	7	37.8	1500	7560	6060	5.0

Grating of coconut using traditional tools

Milk extraction and filtration

Milk and oil separation with hydraulic press

Oil separation with modified kitchen method

Oil separation with traditional method

Virgin coconut oil

Plate 184: Value addition of Coconut

iv. Evaluation of iron supplementation for reduction of pre-weaning piglet mortality in Nicobar

The Nicobarese rear pigs in extensive system (free range). The furrowing takes place in jungle and after five days the sow bring its litters back at owners dwellings. 40% of the piglets die before weaning. It is widely known that piglet anemia is a major cause of pre-weaning piglet mortality. Hence, supplementation of Iron (Fe) may be potential solution for this problem. This study was a step to identify the potential solution of this problem. Three treatments were selected T_0**:** Sow's milk, T_1**:** Sow's milk + Injection of 100mg of Iron Dextran between 3 to 5 days of age and T_2**:** Sow's milk+ Oral Iron (100mg) supplementation.

The result revealed that, the mortality percentage was to the tune of 50% in T_0 whereas T_2 and T_1 had 37.5% and 25% mortality at 3 months of age respectively. The body weight at 3 months of age revealed that T_1 had better body weight gain (16.42kg) followed by T_2 (16.3kg) and T_0 (16.13kg) with respective B:C ratio of 3.67, 3.39 and 3.02 . The OFT has to repeated again next year for confirmation of the results and providing final recommendation (Plate 185).

Plate 185: FLD on iron supplementation

A. Front Line Demonstrations

Title of the FLD	Results
Promotion and popularization of pulse crop in Nicobar Island	FLD was conducted at 2 farmers' field of Car Nicobar *viz.* Small Lapathi and Kinmai Village in the area of 0.03 ha. The result has showed that the black gram cv. Bovan gave an average yield of 7.0 q/ha with B:C ratio 4.8.
Sweet potato cv. CARI SP-1	Sweet potato cv. CARI SP-1 was demonstrated at Small Lapathi village Car Nicobar in an area of 100 m2. Yield: 88q/ha with B:C ratio 3.2.
Composting	FLD on composting were demonstrated at different farmers' field of Car Nicobar. Yield: 4q/unit.
Rainwater harvesting structure	One rain water harvesting tank has been constructed at farmers' field and the study is under progress.

Preparation of underutilized fruit pickle	Package and practices of pickle preparation of underutilized fruits (Amara, jack fruit, bilimbi) were provided to the farmers of four tribal villages of Car Nicobar *viz.* Kinmai, Small Lapathi, Big Lapathy and Tapoiming village to popularize the available scientific method over the poor traditional method practiced by the tribal people of Car Nicobar. The technology was better than traditional practice with respect to the taste and long shelf life. The cost of preparation Rs. 40/-, Gross return Rs. 100/ and net return Rs. 60/- with B:C ratio 2.5.
Green Fodder (Hybrid Napier)	Reduction of drudgery to harvest fodder from wild, encouraging women for livestock farming. Hybrid Napier yield: 2270q/ha (First year) B:C ratio 3.42.

FLD on CARI SP 1

FLD on pulse

FLD on composting

FLD on pickle of underutilized fruits

FLD on hybrid napier

Plate 186: Glimpse of Front Line Demonstrations

Survey of Teressa goat & Nicobari pig

Conducted survey at Nicobar in collaboration with Division of Animal Science, ICAR-CIARI, Port Blair for collecting data pertaining to body measurement, body weight, reproductive characteristics, carcass quality etc. of Teressa goats and Nicobari pigs for registration of these breeds in NBAGR (Plate 187).

Plate 187: Survey of Teressa goat & Nicobari pig

Survey of elite coconut germplasm

Conducted survey, identified, collected and transported elite germplasm of Coconut from different villages of Car Nicobar in collaboration with ICAR-CIARI, Port Blair and ICAR-CPCRI, Kassargod, Kerala during 18th – 21st January, 2016.

Saansad adarsh gram yojana: Kinyuka, Car Nicobar

During 2015-16, conducted different activities for the development of agriculture and allied sector in the Kinyuka village, Car Nicobar adopted under Sansad adarsha gram yojana for improving livelihood and nutritional security of the tribal community.

A total of 38 visits were made by the experts to monitor the progress of different interventions made through KVK as well as line departments.A total of five (5) farmers have been selected from Kinyuka village as beneficiaries under the project AICRP on IFS (TSP) for promoting the concept of Integrated farming System (IFS). Through this project integrated farming system will be developed in the field of adopted farmers in a participatory mode. These 5 farmers will act as model farmers and change agents for rest of the villagers.

Training was conducted on Household Food and Nutritional Security through IFS from 30th Sept., 1st, 3rd and 4th October, 2015 at Kinyuka in which 31 farmers benefitted. The Jai Kisan – Jai -Vigyan Diwas was celebrated in the village on 14th January, 2016 in which 27 farmers benefitted. 50 nos. Soil Health Cards were distributed to the farmers in a programme organized in Kinyuka village on 25th February, 2016. For improving the production performance of indigenous Nicobari pigs a male and a female LWY pig was provided to 2 beneficiaries of Kinyuka village on 4th July, 2015 along with 75kg and 100kg pig feed respectively.

Innovation: Improved broad-fork

Car Nicobar is a coral island. The soil of Car Nicobar is sandy humus rich calcareous sandy soil and depth ranges from 5cm to 30 cm depend on the distance from seashore. Car Nicobar receive rain from both, North-East and South-West monsoon, with average annual rainfall in the range of 3000 to 3500 mm. Generally the average rainfall is received during May to December i.e. 2250 mm in May to September during South-West monsoon and 685 mm in October-December during North-East monsoon and remaining occurs during January to April. Tribal community very much dependent on *tuhet* gardens for meeting their foods, vegetables and fruits requirement. Therefore, they develop every year one *tuhet* garden and cultivated *Dioscorea* (*Nicobari aloo*), *Xanthosoma*, *Alocasia*, cassava, sweet potato, *Colocasia*, banana, pineapple, etc. The process continued year after year. They select new area in jungle (forest), clear it and do the planting/ sowing and after harvesting of horticultural crops leave first one for enriching the soil with nutrients and moisture. After six to eight year, they come back to the previous one, which has become jungle (forest) by this time and clear it for new garden. This is typical shifting cultivation but has the scientific way of thinking by tribal. They said we leave piece of land empty for some time to become soil strong. Mechanization of traditional home garden of Nicobars are very poor especially soil preparation. Nicobarese used *sabbal*, *dav*, *spade*, *picaus* and *Sa-läh* for field preparation and inter-culture operation in homegardens. *Sa-läh* is a traditional tool used by Nicobarese to pulverise soil for planting of tuber crops, pineapple, banana, vegetable, etc. in *tuhet* gardens from the generation to generation. Sakala is working on principle of lever and fulcrum. It's made by hard wood having two hard wood levers and one hard wood fulcrum with handle. For the operation of *Sa-läh*at at a time two man powers required. Traditional methods of operation had several limitations. It also involved huge man power and long working hours for a particular job. As the population and technology increased exponentially, the demand for quicker and easier to operate equipment increased. On the above circumstances, to overcome the drudgery, increase working efficiency and reduce man power in mechanization of farm KVK Nicobar designing and fabrication broad-fork. Broad-fork is firm tough and designed for comfortable all day use (Plate 188 & 189).

Salient features of broad-fork

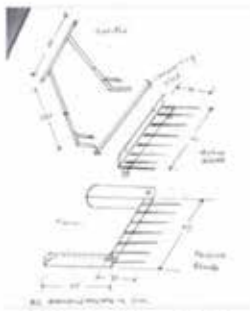
- Deeply aerate soil (aerates 12" deep increase water and nutrient uptake and proper root/tuber growth).

- Offer an alternative to double digging (broad forking deeply loosens the soil, removing the need to double dig beds).
- Increase water percolation for less wasted water.
- Preserve soil structure for root development and earthworm habitat which means bigger, more vibrant plants.
- It is eco-friendly (no need for the noise, gas, fumes, and shaking hands).
- Require no expensive maintenance (just wash away any soil and store it in a dry place).
- Balanced design, stout handles, reinforced tines and a wider tread bar (make a tool that is simple to use, extremely durable, totally reliable, and easy on body.
- No assembly required.

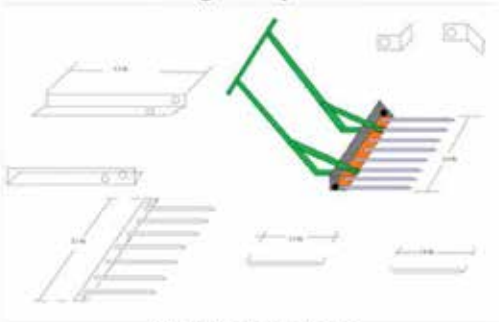
Plate 188: Demonstration of broad fork at farmers field

Sakala: Traditional ploughing implement

Soil preaparation for planting of tuber crops in Tuhet garden by Sakala



Scktech of Broad Fork



Model of Broad Fork

Plate 189: Improved broad-fork

ICAR- Krishi Vigyan Kendra – North & Middle Andaman

Training

During this year (2015-16) a total of 35 trainings were conducted in different disciplines of Agriculture *viz.* Agronomy, Horticulture, Animal Science, Fisheries, Agriculture Engineering and Home science. A total of 1092 farmers including 429 female got benefited from the trainings (Table 48, Fig.42 and Plate 190).

Table 48: Training details

Discipline	No. of training	Male	Female	Total
Agronomy	05	76	64	140
Horticulture	08	215	70	285
Animal Science	06	93	68	161
Agricultural Engineering	05	143	25	168
Fisheries	05	107	51	158
Home Science	06	19	161	180
Total	35	653	439	1092

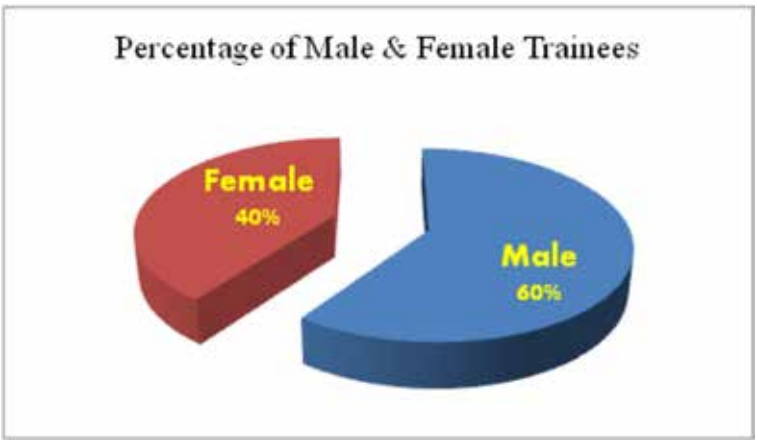


Fig. 42: Percentage of male & female

Integrated crop management for paddy

Plant propagation techniques in fruits

Water management techniques for plantation crops

Infertility management in livestock

Pre and post stocking management in fingerlings production

Value addition in milk, egg & fish

Plate 190: Glimpses of training activities

Front Line Demonstration [FLD]

Nine Front Line Demonstrations (FLD) were conducted in agriculture and allied disciplines (Plate 191) and the salient results are given below:

- **CARI Dhan-5** conducted at 03 farmers field with an average area of 0.4 ha. gave average production of 5.5t/ha which was 24 % higher than local variety.
- **Sahbhagi rice variety** conducted at 02 farmer's field with an average area of 0.5 ha. gave average production of 5.45t/ha which was 24 % higher than local variety.
- **Ginger (Cv.Jorahat.)** conducted on two locations of Middle Andaman showed good performance. Demand for ginger variety was high among farmers and yield in comparison to other traditional variety of ginger was higher.
- **Tuberose flower (Calcutta single)** cultivation was conducted at four locations of Middle & North Andaman district to popularize the cultivation of flower commercially.
- **Coconut climber** was demonstrated in farmer's field, where it was found that climbing is easy with minimum risk. Coconut climber can be used by any farmers or farm women for plucking coconut.
- **Backyard poultry farming** with Vanraja chickens gained an average weight of 1.3 kg in 4 months with an overall mortality of 13 % compared to traditional practice in which the average weight gain and mortality rate of chicken were usually in the range of 860- 920 g and 40-46 %, respectively.

- **Improved pig farming practices** with crossbred piglets of Large white yorkshire was conducted at 4 fields. The crossbred piglets attained an average body weight of about 60 kg in 6 months over the local check (non descript) of 37 kg.
- **Promotion of value added products from excess farm produce -** Over production of fruits and vegetables can lead to wastages, depressed prices and lower returns to farmers/ farmwomen. Processing is a means of preserving quality product and providing opportunities for value addition and income generation from marketing produce in local, regional and international markets. Consumption of value added products at household levels also leads to nutritional security. Three SHG'S from N & M Andaman were selected and value added products from mango and lemon were demonstrated before them. Different products like pickles, aam pana, khatta metha murabba, squashes were prepared. The products were later sold by SHG in the retail market at par with the market prices. The cost benefit ratio recorded after selling the products was 3.12.The benefit gained has motivated them to take this venture to a higher level in the near future.

Rice var. CIARI-5

Rice var. Sahbhagi

Tuberose (Calcutta Single)

Coconut climber

Ginger (Cv.Jorahat.)

Backyard poultry farming

Improved pig farming

Value added products

Plate 191: Glimpses of FLD activities

ON FARM TRIALS [OFT]

- Evaluation of high yielding medium duration paddy was carried out in farmer fields. Four technical options including farmers practice with 05 replications were tested and performance of each variety was analyzed. Technical option 3 (CSR-36) was recorded to yield significantly higher than Technical option 1 (CARI Dhan 1) and Technical option 2 (CARI Dhan 3). Rice production in Technical option 1, and 2 was non-significant with each other, whereas significant in production in comparison to farmers practice (Swarnjaya dhan). Infestation of bacterial leaf blight was recorded in all treatment, however lowest in Technical option 3 followed by farmer variety, CARI 1 and CARI 3. The highest gross and net return of Rs. 66,000 and Rs. 28,500 respectively were recorded with B: C ratio of 1.76. (Plate 192)

Plate 192: High yielding medium duration rice

- Evaluation of medium duration high yielding varietal trial of mustard was carried out in farmer fields. Five technical options with 04 replications were being tested for finding out the suitability of mustard in local conditions. Initial plant growth and number of branches demonstrates that Maya variety is best among all 05 varieties *viz.* Pusa Tarak, NRCSB-101, Urbashi, Pusa Agrani and Maya respectively. (Plate 193)

- **Assessment and evaluation of intercrops in old arecanut plantations** was conducted in farmers field of Middle Andaman. The planting of intercrops (pineapple, ginger, turmeric and crossandra flower) was performed in ten year old and above areca nut orchard. Evaluation and final result was recorded in some crops like turmeric (4.5t/ha.) and ginger (9.0 t/ha.). (Plate 194)

Plate 193: High yielding varietal trial of mustard

Plate 194: Assessment and evaluation of intercrops in old arecanut plantations

- Performance evaluation of different type of cono weeders was carried out in farmer's field (Plate 195) with different technical options *viz*. Manual weeding (Technical Option 1), CARI weeder (Technical Option 2), Cono weeder (TNAU) (Technical Option 3) in 05 replications. Performance of weeders was also compared with manual weeding for drudgery reduction, weeding index and B/C ratio. Cono weeder used during weeding of paddy field showed that drudgery was reduced in weeding paddy fields. The weeding index of CARI cono

weeder and TNAU cono weeder was comparable when length of weeds was smaller (8-12 days). Weeding index reduces for weeds of more than 2 weeks in TNAU cono weeder however remains same in CARI Cono weeder upto weeds of 3 weeks in N&M Andaman conditions. The amount of Rs. 9,240/- was saved in weeding operation of 1 ha. of paddy field as compared to manual weeding.

Plate 195: Performance evaluation of different type of conoweeders

- **Rain water conservation measures** on arecanut cultivation were carried out in farmer's field with 04 technical options in 05 replications (Plate 196). Technical option 3 (conservation trench + paddy straw mulch) showed significantly higher production than rained treatment. Production level in Technical option 1 (conservation trench only) and Technical option 2 (paddy straw mulching only) was non- significant with rained treatment.

Plate 196: Rain water conservation measures on arecanut cultivation

- **Rearing of fish fry in rice field** under mono and poly culture condition was evaluated in farmer's field (Plate 197). Four technical options including farmers practice was evaluated in five replications. Total area for paddy field trials was 0.40 ha. Technical option 1 (Rearing of rohu fry in rice field) was found to be significantly higher in fish production followed by Technical option 3 (Rearing of catla + rohu fry in rice field) and Technical option 2 (Rearing of catla fry in rice field). Rice production in Technical option 1, 2 and 3 was similar and non-significant whereas significantly, higher than farmers practice. During the culture practice no rodent infestation was recorded in fish cum rice field, whereas rodent problem was recorded in rice fields without fish cultivation. During the OFT trials Rs 21700.00 cost incurred towards the farming operation and net return obtained was Rs 44730.00 with B: C ratio 2.06, as against the control with net return of Rs 5520.00 and B: C ratio 1.6.

Plate 197: Rearing of fish fry in rice field under mono and poly culture

- **Rearing of *Macrobrachium lar*** in poly culture condition is being evaluated in farmer's field (Plate 198). Four technical options including farmers practice in five replications were carried out at different locations. Total area of trials was 0.30 ha. Technical option 3 (100% replacement of bottom dweller with *M. lar*) is found to be performing better than technical option 2 (75% replacement of bottom dweller with *M. lar*) and technical option 1 (50% replacement of bottom dweller with *M. lar*) in first sampling.

Plate 198: Rearing of *Macrobrachium lar* in poly culture condition

- **Balancing of dairy ration** was conducted to balance the dietary ration of dairy cattle and evaluate production performance (Plate 199).It was observed that compared to farmers practice (To) supplementation of dairy ration with mineral mixture @ 80 gm/day (T1) led to an improvement of 0.3-0.4 lit.in milk production, whereas supplementation of locally available coconut cake @ 150 gm/ lit.(T2) increased the production upto 0.5–0.6 lit. Further more, strategic supplementation of coconut cake along with mineral mixture was found to improve the milk yield up to 1.1-1.2 Kg (T3), thereby increased cost-benefit (BC) ratio.

Plate 199: Balancing of dairy ration

It was also observed that some of the cattle which do not come to estrus after pasturition returned to estrus after supplementation of dietary ration. This suggests that supplementation of dairy ration with mineral mixture and coconut cake not only improves the production but also help reduce incidence of infertility in cattle.

- **Impact of nutrition and health awareness on rural women of child bearing age** for prevention of anemia was conducted at Primary Health Centre, Billyground. A total of 30 women (Control group -10, Technical option-1-10, Technical Option-2-10) between the age group of 18 to 45 years with hemoglobin levels 9 mg/dl and below were selected (Plate 200). Nutrition education & awareness were created through audio visual aids like lectures, pamphlets, slide shows and demonstration of low cost iron rich recipes from local produce.

  A pre & post evaluation was conducted before & after imparting nutrition education to determine the level of increase in awareness and knowledge of the women about anemia, its causes, symptoms, prevention, treatment etc. The result indicates an increase of awareness from 10% to 87%. Anthropometric measurements were taken and BMI was calculated which revealed that 20 % of the women were underweight and 10% of women were overweight & 70% of the women belonged to normal weight category.

Plate 200: Nutrition and health awareness on rural women of child bearing age for prevention of anemia

Hb levels of subjects were recorded with the help of ANM before imparting NE & and again after imparting NE at an interval of one month for three consecutive months. The data showed mean increase in Hb level from 6.9mg/dl to 8.0 mg /dl in technical option 1 & from 7.6 mg/dl to 10.9 mg/dl in technical option 2, whereas no increase was reflected in control group. Nutrition education resulted in improvement of nutritional knowledge as well as increase in consumption of iron rich foods.

Table 49: Extension Activities

Extension Activities	Number	Farmers			Extension Official			Total		
		M	F	Total	M	F	Total	M	F	Total
Field day	04	39	51	90	-	-	-	39	51	90
Kisan ghosthi	02	67	12	79				67	12	79
Kisan mela	01	241	104	345	-	-	-	241	104	345
World soil health day	01	31	42	73				31	42	73
Women in agriculture	01	-	42	42				-	42	42

Jai kisan Jai vigyan	01	43	14	57	1	-	1	44	14	58
Method demonstration	11	15	20	35	3	-	3	18	20	38
Group meetings	06	59	36	95				59	36	95
Lecture delivered as resource persons	15	278	97	375				278	97	375
Advisory services	13	11	2	13	-	-	-	11	2	13
Scientific visit to farmers field	624	1364	57	1421				1364	57	1421
Farmers visits to KVK	115	98	17	115				98	17	115
Diagnostic visits	21	18	3	21	-	-	-	18	3	21
SHGs conveners meeting	04	-	40	40	-	-	-	-	40	40
Total	819	2264	537	2801	4		4	2268	537	2805

Plate201: Glimpses of field activities

Field day on paddy cultivation

Field day ginger (Cv.Jorahat.)

Field day on backyard poultry and improved pig farming practices

Ghosthi at RKC, Nimbudera and Panchayat office, Urmilapur

Group meeting

Hands on fish seed production

CARI rice varietal demonstrations

Film show on scientific prawn farming

World soil health day at Harinagar

Women in agriculture day

Plate 202: KVK Nimbudera Farm Activities

Before

After

Jungle clearance and development of KVK land

Peripheral road of KVK farm

Production of bhendi, french beans and brinjal on dykes of pond

Paddy seed production plot

Bhendi seed production plot

Low cost shade net house for production of planting materials

Exposure visit of students at KVK

Success Story

1. Backyard pig farming for livelihood security

Background

- Pig production is considered as one of the most lucrative livestock business throughout the globe.
- Pigs are also the most efficient and prolific producer of meat and can survive on wide variety of feeds. Moreover, capital invested can be realized and returned in a relatively short time of 6-7 months.
- Backyard Pig Farming system can prove to be a boon for farmers as it can be used as a source of food, income, and an asset to weather down the negative effects of unexp ected agriculture losses.
- The wind of change came in the region, when Shri. Binay Mondal along with some farmers contacted Krishi Vigyan Kendra for information on Pig farming practices.

Intervention of KVK

- Based on the needs of farmers, in March 2015, KVK, Nimbudera conducted training on "Scientific Pig Farming Practices" at Govindpur village. In this programme the farmers were informed about the different aspects of pig farming. An exposure visit of Government Pig Farm, Webi was also arranged to acquaint the farmers about routine pig farm activities.

- In the same year, KVK selected Shri Binay Mondal and three other farmers of Basantipur Panchayat for demonstration of "Improved practices in Pig farming". The farmers were supplied with a pair of a month old crossbred piglets each and were provided with all necessary technical supports to raise the piglets during the period of demonstration.
- KVK, demonstrated the construction of low cost housing for pigs and provided the financial assistance for the construction of same to Shri Binay Mondal. The farmers were guided to utilize the hollowed out pieces of timber as wooden troughs and used tyres as water trough.
- The farmers were advised regarding the preparation of low cost balanced feed using locally and cheaply available ingredients like broken rice, rice bran, colla-cassia, banana stem, sweet potato, vegetables and damaged fruits, coconut cake, kitchen waste, slaughter house offal's etc. Farmers were suggested to supplement the feed with charcoal @ 1 % to improve weight gain and reduce the offensive smell of pig waste.
- Subject Matter specialists (SMSs) of KVK adopted the villages of Basantipur Panchayat under the Government of India scheme "Mere Gaon, Mera Garv". Under this programme, KVK has constantly motivated the farmers for adoption of pig farming as a backyard enterprise to improve their livelihood.

- KVK also provided assistance to the interested farmers in procurement of improved variety of crossbred piglets from Department of Animal Husbandry and Veterinary Services at nominal charge of Rs 600/ piglet.

Impact

The training programme imparted requisite skill and knowledge related to housing, feeding, and management of pigs to the farmers. Thus the farmers were equipped with the necessary information and self-confidence to start the enterprise on their own.

- Shri Binay Mondal like other three farmers succeeded in pig farming under the technical support and guidance of KVK and had set an example for others to follow.
- The pigs attained an average weight of 60 kg at the age of 6 month. He sold the pigs for Rs. 12000/-, whereas the cost of rearing the pig was Rs.2400/-. Now, He is interested to raise the pigs for the purpose of breeding.
- The farmers are satisfied with the technology provided by KVK and are serving as the catalyst for the adoption of these technologies among other farmers.
- The success of farmers and efforts of KVK have motivated other farmers of the area for backyard pig farming.

2. Rearing of fish fry to fingerlings in paddy field by Shri Laxman Das, Kalipur, Diglipur

Background

- More than 1655 ponds (121 ha area), 01 reservoir and few river & canals forms major freshwater resources in N&M Andaman.
- These water bodies have good potential for fish farming and there is a ready demand for fish seeds by farmers.
- High market demand and high price for freshwater fishes escalates demand for fish seeds in the region. Present demands of freshwater fish seeds is more than 7 lakhs fingerlings/ yearlings (> 10cm).
- Due to seasonal nature of fish nursery pond, people prefer to construct perennial pond with greater depth which make it unsuitable for rearing of fish fry. Unavailability of nursery pond in the region is the major problem in fish fingerlings production.
- Smaller size seeds (fish fry) hamper survival and growth of fish seed in ponds and results in poor productivity.

Interventions of ICAR-KVK, N&M Andaman

KVK-CIARI, N&M Andaman made several attempts to motivate fish seed producers and fish farmers to rear fish fry in their rice field for supply of fingerling size seeds in the area. Through individual contact, scientific and advisory visits at farmer's field, trainings and video films on fish farming & fish seed production, some farmers were motivated to practice fish seed rearing in paddy fields and ShriLaxman Das has done well in rice cum fish culture.

- Previous year, KVK, N&M Andaman adopted a practicing fish farmer Shri. Laxman Das of Kalipur village, Diglipur to culture fish in paddy field. The entire programme focused on training and advisory services to rural youth and practicing farmers which gave knowledge and confidence to start fish rearing in paddy field.

- Scientific advisory and other inputs from KVK-CIARI included layout and construction of peripheral trench, preparation of paddy field, manuring initial fertilization, seed treatment of paddy, breeding and initial rearing of fish seeds, fencing of paddy field, water management in paddy field, feeding and water quality management etc. Further fish seeds, fencing net and fish feeds were provided for improving their interest in paddy cum fish farming.

Impact

- Technological interventions by the KVK in the field of fisheries science impacted adoption of paddy cum fish culture for fish fingerlings production. It provided additional income to farmer Shri Laxman Das and gave avenues for better livelihood and employment opportuni ties. His problem of rodents in paddy field was eliminated by rearing of fish. Yield of paddy was also improved due to weed control by fishes and control of rodents. Furthermore it also helped improving the status of scientific fish farming in the region through stocking of standard size fish seedlings by villagers.

- Intervention of rearing of fish fry in paddy field gave ideal size fish fingerlings to Shri Laxman Das for stocking in his pond. There was good demand for fish seeds produced from paddy field due to their optimum size for stocking in pond for table size fish production. He earned additional Rs 6,000 from an area of 400 m^2within 03 month of culture and 27 % higher production of paddy than paddy field without fish.

MERA GAON MERA GAURAV (MY VILLAGE MY PRIDE)

Mera Gaon Mera Gaurav (MGMG) was launched by Hon'ble, Prime Minister on 25th July , 2015 during the 87th foundation day of the ICAR and KVK conference at Patna ,to promote direct interface of scientists with the farmers to hasten the lab to land process. The objective of this scheme is to provide farmers with required information, knowledge and advisories on regular basis by adopting villages.

On the behest, Dr. S. Dam Roy, Director of ICAR-CIARI, Port Blair has initiated the programme by constituting 13 team covering 57 villages in all the three Districts of Andaman & Nicobar Islands ie (37 in South Andaman, 15 in North & Middle Andaman & 05 at Nicobar), involving 64 scientists representing multi disciplinary expertise. In addition 02 team were constituted for giving technology and back support at Institute level. The details of the team, villages adopted is given in the table.

Nodal Officer: Dr. S.K. Zamir Ahmed,Principal Scientist (Agrl. Extn)				
Group Number	**Name**	**Designation**	**Villages**	**Area**
GROUP 1	Dr. R.K. Gautam (Team Leader)	Principal Scientist & Head, Field Crop Improvement and Protection	Hubdipur, Manpur, Collinpur, Temple meyo, Herpertabad	South Andaman
	Dr. V. Bhaskaran (Member)	Senior Scientist (Horticulture)		
	Miss. T. Bharathimeena (Member)	Scientist (Entomology)		
	Mr. Arun Kumar Oppoottil Ratheesh (Member)	Scientist (FRM)		
GROUP 2	Dr. A. Kundu (Team Leader)	Principal Scientist (LP&M) & Head, Animal Science Division	Manjeri, Dhanikhari, Guptapara, Nayasahar	South Andaman
	Dr. Awnindra Kumar Singh (Member)	Senior Scientist (Plant Breeding)		
	Dr. T.P. Swarnam (Member)	Sr. Scientist (Agronomy)		
	Mr. Praveenraj (Member)	Scientist (Fish Health)		
GROUP 3	Dr. B. Gangaiah (Team Leader)	Principal Scientist & Head, Natural Resource Management	Manarghat, Wrigthmeyo, Malapuram, Shore point	South Andaman
	Dr. K. Abirami (Member)	Scientist (Fruit Science)		
	Dr. Sophia Inbaraj (Member)	Scientist (Vet. Microbiology)		
	Dr. Venkatesh R. Thakur (Member)	Scientist (Aquaculture)		
GROUP 4	Dr. A. Velmurugan (Team Leader)	Senior Scientist (Soil Science: CF&M)	Shoal Bay, Kalatang, Stewartgunj, Govindpuram	South Andaman
	Mr. K. Shaktivel (Member)	Scientist (Plant Pathology)		
	Dr. (Ms) Pooja Bohra (Member)	Scientist (Fruit Science)		
	Dr. A. Anuraj (Member)	Scientist (Aquaculture)		

GROUP 5	Dr. Madhu Sudan Kundu (Team Leader)	Principal Scientist (Animal Nutrition)	Wimberlygunj, Kanyapuram, Bambooflat, Hopetown	South Andaman
	Dr. T. Subramani (Member)	Scientist (Agronomy)		
	Mr. Sivaramakrishnan (Member)	Scientist (Fish Nutrition)		
	Dr. Ajit A. Waman (Member)	Scientist (Spice, Plantation, Medicinal & Aromatic Plants)		
GROUP 6	Dr. Jai Sunder (Team Leader)	Principal Scientist (Veterinary Microbiology)	Mithakhari, Ograbranj, Muslim Basthi, Namunaghar	South Andaman
	Dr. Sachchidanand Swain (Member)	Scientist (ASPE)		
	Miss Divya Parisa (Member)	Scientist (Vegetable Science)		
	Mr. Arun Jyoti Baruah (Member)	Scientist (Fish Health)		
	Shri Benny Varghese (Member)	Senior Technical Officer		
GROUP 7	Dr. S.K. Zamir Ahmed (Team Leader)	Principal Scientist, (Agril. Extn.) & I/c Social Science Section	Chouldari, Badmaspahad, Creekabad, Port Mout	South Andaman
	Dr. Pankaj Kumar Singh (Member)	Senior Scientist (Plant Breeding)		
	Dr. J. Raymond Jani Angel (Member)	Scientist (Aquaculture)		
	Dr. V. Damodaran (Member)	Senior Technical Officer		
	Mrs. Archana Sharma (Member)	Technical Officer		
GROUP 8	Dr. R. Kiruba Sankar (Team Leader)	Scientist (Fish & Fishery Science) & Head I/c Fisheries Science Division	Humphrygunj, Mameyo, Hasmatabad, Wandoor	South Andaman
	Dr. I. Jaisankar (Member)	Scientist (Forestry)		
	Dr. T. Sujatha(Member)	Scientist (Poultry Science)		
	Mr. A.K. Tripathi (Member)	Senior Technical Officer		
GROUP 9	Dr. Nagesh Ram (Team Leader)	Sr. Scientist & Head, Krishi Vigyan Kendra	Ferrargunj, Caddlegunj, Aniket, Miletilak	South Andaman
	Mr. L.B. Singh (Member)	Subject Matter Specialist (Horticulture)		
	Dr. Vivek Kr. Pandey (Member)	Subject Matter Specialist (PP)		
	Dr. N.C. Choudhuri (Member)	Asstt. Chief Technical Officer		
	Dr. S. Monalisha Devi (Member)	Scientist (F RM)		

GROUP 10	Dr. Zachariah George (Team Leader)	Subject Matter Specialist (Animal Science)	Kinyuka, Malacca, Mus , Small Lapati, Big Lapati	Car Nicobar
	Mr. Sanjay Kumar Pandey (Member)	Subject Matter Specialist (Agronomy)		
	Dr. Viveka Nand Singh (Member)	Subject Matter Specialist (Horticulture)		
	Er. Chandrika Ram (Member)	Subject Matter Specialist (Agri. Engineering)		
	Mr. Ajay Kumar Pandey (Member)	Sr. Technician		
GROUP 11	Dr. B.L. Kasinath (Team Leader)	Sr. Scientist & Head	Webi, Pahalgaon, Tugapur, Pudumadurai, Chainpur	N & M Andaman
	Dr. PoojaKapoor (Member)	Subject Matter Specialist (Home Science)		
	Er. Manoj Kumar (Member)	Subject Matter Specialist (Agrl. Eng.)		
	Mr.Debabrata Basantia (Member)	Subject Matter Specialist (Horticulture)		
	Mr. Prasanta Pradhan (Member)	Programme Assistant		
GROUP 12	Dr. Shailesh Kumar (Team Leader)	Subject Matter Specialist (Fisheries)	Profullya Nagar, Basantipur, Paresh Nagar, Jaipur, Hari Nagar	N & M Andaman
	Mr. Batti Lal Meena (Member)	Subject Matter Specialist (Agronomy)		
	Dr. Shardul Vikram Lal (Member)	Subject Matter Specialist (An. Science)		
	Mr. Tanmoy Paul (Member)	Sr. Technician/ Farm Manager		
GROUP 13	Mr. K. Lohit Kumar (Team Leader)	Scientist (FRM)	Ramnagar, Kerlapuram, Madhupur, Khudirampur, Sitanagar	N & M Andaman
	Dr. K. Saravanan(Member)	Scientist (Fish Health)		
	Dr. V.B. Pandey (Member)	Chief Technical Officer		
In addition two teams have been made at Institute level				
Group A	Er. S.L. Paik, ACTO	Team Leader	Farm machinery/water harvesting/ watershed management	
	Dr. S.Murgesan, STO	Member		
	Er. M. Arul Selvam,STO	Member		
	Shri S.Murgesan ,TO	Member		
Group B	Shri Amit Srivastava,STO	Team Leader	Report preparation	
	Mrs. Ani Dath, STO	Member		
	Shri Dibakar Khan,STA	Member		
	Shri A.K. Srivastava, STA	Member		
	Mrs. Rina Saha, Jr.Stenographer	Member		

As per the plan, baseline survey was conducted and thereafter the respective team members carried out the activities at the adopted villages from October, 2015 to March, 2016. The gist of the interventions and the problems identified are given below:

A total of 206 visits covering 1382 farmers, 54 Kisan gostis on technological intervention benefiting 3471 participants and 359 mobile advisories were disseminated for proper crop management & fish health at the adopted villages. Beside 129 demonstrations involving KVKs to showcase the technologies in HYV of rice, ginger, tuber crop, pulses, fodder, fish health management, seed production, spices and aromatic plants, floriculture, goatery, mushroom, arecanut and coconut, vegetables, were conducted. 313 literature were provided with a view to act as a ready reckoner. Beside a total of 295 Soil Health Card were also distributed comprising of 194 at South Andaman and 101 at North & Middle Andaman.

For the tribal farmers of Car Nicobar *viz.* Mus, Small lapathy, Big Lapathy, Kinyuka and Malacca 124 field visits were made by experts benefiting 172 farmers .6 Kisan gosthis were conducted in which 136 farmers participated and benefitted. 12 trainings on different disciplines were conducted for the tribal farmers. Different critical inputs were also provided for enrichment of the tribal farmers of the selected village *viz.* 1000 nos. vegetable seed kits, 300 banana suckers, 300 pineapple suckers, 50 kg CIARI Bio-consortia, 200kg pulse seeds, 200kg maize seeds, 200 Nos. Anthurium, 4 IFS models etc.

The feedback received from the farmers after conducting base line survey, identified the problems both in agricultural and general category which are pooled and presented below with respect to MGMG.

Agriculture problem

At South Andaman

- Lack of knowledge on plant protection.
- Lack of availability of quality seeds, fertilizer, pesticides in time .
- In fresh water fishes, pin head disease, dropsy, unscientific pond management, Low feeding rate & non availability of quality fish fingerlings .
- Stem borer infestation & yellowing of leaf in rice
- In coconut, rhinoceros beetles attack, nutritional disorder, low organic matter in soil and no regular spray schedule, rodents attack, & micronutrient deficiencies.
- Wilt & weevil attack in arecanut.
- Viral diseases, wilt, flower dropping in brinjal, okra, dolicus, pumpkin, beans & tomato.
- In buffalo & cattle foot lesions were reported.
- In cattle, lack of fodder, local desi cow and buffalo with very low milk production, ectoparasite problem in cow, leech infestation in rainy season, infertility problems in cow, low rate of AI retention.
- Lack of grazing land, unavailability of fodder.
- Pneumonia, FMD,& viral disease in goat.
- Viral disease in poultry.
- In poultry, lack of improved breed, disease in local bird during onset and end of rainy season, attack by wild cat in night hours.

- Blood sucking black insect on cow- on biting the area turns reddish.
- Majority of the cows have slurry type of dung.
- In arecanut, bud rot, nutritional disorder, nut dropping, unable to follow regular spray schedule, very close spacing, old plantation and very low production.
- In banana, bunchy top, Sigatoka leaf spot disease, root weevil, dense farming, low organic matter, no regular spray schedule, non- availability of pesticides, marketing problem of farm produce.
- In vegetables and fruits**,** bacterial wilt, powdery & downy mildew, anthracnose, fruit borers, fruit flies, mealy bugs, bacterial leaf spot, non-availability of good variety, low organic matter in soil, nutritional disorder and non-availability of biocontrol agents, water scarcity during summer season, marketing problem of farm produce
- In C-14-8, cultivar bacterial leaf blight, gundhi bugs, sheath blight and stem borer infestation.
- Encroachment of grazing land resulting to stray cattle menace.
- Lack of technical knows how and awareness on scientific farming, lack of quality inputs, pesticides and insecticides, fertilizers in time.
- Lack of awareness on bio control agents, no marketing facilities.
- In pulses, poor yield, crop failure due to uncertain rain, pod borer attack & , absence of Dal Mill.
- Tenant farming, non-scientific farming, farming is least important (part time avocation).
- Water logging , soil erosion & soil salinity problem.

At North Andaman

- Non availability of certified seed .
- Indiscriminate use of chemicals & fertilizers.
- Non availability of soil, water testing laboratory, storage, transport, processing& marketing.
- Loss of agri. produce due to rodents and frogs.

At Car Nicobar

- In coconut ,less productivity due to rat, rhinoceros beetle, dense planting, nutrient deficiency etc.
- In tuber crops, pineapple, banana, papaya less productivity due to dense planting, nutrient deficiency etc.
- In kitchen garden (vegetables, banana etc) lack of land, nutrient deficiency, pest and disease problem,& fencing problem.
- In livestock extensive system, disease outbreaks, unavailability of balanced feed, high mortality in pigs and poultry.
- Stray animal, no irrigation facility during summer season, non-availability of manures and bio-pesticides, limited land availability for vegetable cultivation.
- Disease out breaks, non-availability of balanced ration for livestock.

General problem

At South Andaman

- Non - availability of inputs and infrastructure
- Lack of better road, transportation facilities, medical services, poor electricity , lack of water for irrigation during summer months, absence of high schools and colleges.
- Joint property inhibits cultivation of lands due to family problems.
- Poor marketing facilities, minimum transport and communication, , less opportunity of financial assistance, high labour cost & consumption of local liquor.
- Entry of Jarawa aboriginals in the villages at night to take away the fruits and other plantation produce.
- Wild cat, eagle and monitor lizard attack the local fowl, fruits damage by parrot .

At North Andaman

- Poor connectivity, storage & market facility.
- Lack of interest of rural youth in agriculture & allied activities.

At Car Nicobar

- Un-employment, non availability of proper drinking water, electricity, damaged road, poor telecom network, no fencing, irrigation during dry spell, erratic ship & flight schedule for inter Islands, & fluctuation of copra rate.

Glimpses of activities under MGMG

Visit to fish pond and interaction with farmers at Hubdipur, South Andaman

Demonstrations of CIARI Dhan 8 & 9 at farmers field Chouldari, South Andaman

Interacting with farmer at Khudirampur and Sitanagar village at Diglipur, North Andaman

Kisan goshti at Ramnagar Village, Diglipur, North Andaman

Farmers field visit at Madhupur, Diglipur, North Andaman

Farmer's participatory variety selection at Creekabad, South Andaman

Farmers Sensitized during Seed day at Chouldari, South Andaman

TRIBAL SUB PLAN (TSP)

Under Tribal Sub Plan (TSP) empowerment of tribal population through training cum technology dissemination was carried out. It was aimed to improve the existing practices of agriculture and allied sectors, dissemination of need based improved production technologies through training, demonstration of technologies, supply of inputs, providing community assets and exposure visits.

A total of 31 training programmes representing field of agriculture, horticulture, animal husbandry, fisheries, field crops, land resource management, post harvest, crop protection and value addition technologies were conducted for the benefit of the tribals in Nicobar District and Little Andaman. The effort has benefited a total of 1678 (981 males and 697 females) farmers spread across different villages of Little Andaman and Nicobar Islands. Tribal farmers have been provided with OBM engine, seeds and planting materials of improved varieties, livestock, farm tools, bio-control agents, sprayer, fencing materials for effective utilization and improving the productivity of the agri-horti-animal and fisheries sector. Besides community assets *viz*. hatchery for poultry egg incubator, community based fencing of homestead area, roofing materials for construction of pig shed, water storage tank, poultry shed and vermi-composting units were also established for the benefit of the tribal farming community (table 1).

Table 1: Details of the capacity building programmes

Sl No	Name of the training	Place	Date	Male	Female	Total
1.	Scientific goat farming	Small Lapathy, Car Nicobar	2nd to 4th June, 2015	19	12	31
2.	Maintenance and upkeep of fishing inputs	Big Lapathy village, Car Nicobar	3rd to 5th July, 2015	50	06	56
3.	CIARI Bio-consortia for bacterial wilt management in solanaceous crops	Harminder Bay, Little Andaman	23rd July, 2015	22	08	30
4.	Nursery and weed management in rice	Harminder Bay, Little Andaman	23rd July, 2015	57	36	83
5.	Parthenium awareness programme and weed management	Harminder Bay, Little Andaman	17th to 19th August, 2015	32	22	54
6.	Scientific cultivation of pot anthurium, tuberose and banana as livelihood option for tribal farmers	Harminder Bay, Little Andaman	29th to 30th Sept., 2015	20	34	54
7.	Household food and nutritional security through integrated farming Systems	Car Nicobar	30th Sept. to 4th Oct., 2015	18	12	30
8.	Conservation of nicobari fowl	Tamaloo, Car Nicobar	21st to 23rd Oct., 2015	42	80	122
9.	Production technology of anthurium and banana as livelihood option for tribal farmers	Mus village, Car Nicobar	3rd Nov., 2015	44	6	50
10.	Production technology of anthurium and banana as livelihood option for tribal farmers	Malacca, Car Nicobar	4th Nov., 2015	35	15	50
11.	Post harvest processing and value addition of coconut for enhancing tribal farmer's income	Harminder Bay, Little Andaman	20th to 22nd Nov., 2015	24	35	59
12.	Application of CIARI bio-consortia for pant disease management under Islands conditions	Small Lapathy, Car Nicobar	27th Nov., 2015	31	21	52

13.	Integrated farming and agri- silvi pastoral systems for livelihood security in tribal areas	Harminder Bay, Little Andaman	10th to 12th Oct., 2015	25	35	60
14.	Kisan ghosti on tuber crops	Harminder Bay , Little Andaman	28th to 29th Oct., 2015	20	22	42
15.	Diversification of pulse crops and maize in traditional farming systems for increasing nutritional security and income per unit area	Mus, Car Nicobar	6th Nov., 2015	36	14	50
16.	Diversification of pulse crops and maize in traditional farming systems for increasing nutritional security and income per unit area	Tapoiming, Car Nicobar	7th Nov., 2015	28	38	66
17.	Diversification of pulse crops and maize in traditional farming systems for increasing nutritional security and income per unit area	Small Lapathy, Car Nicobar	8th Nov., 2015	40	37	77
18.	Diversification of pulse crops and maize in traditional farming systems for increasing nutritional security and income per unit area	Malacca, Car Nicobar	9th Nov., 2015	42	03	45
19.	Diversification of pulse crops and maize in traditional farming systems for increasing nutritional security and income per unit area	Kinmai, Car Nicobar	10th Nov.,2015	20	25	45
20.	Diversification of pulse crops and maize in traditional farming systems for increasing nutritional security and income per unit area	Big Lapathy, Car Nicobar	12th Nov., 2015	45	19	64
21.	Banana fibre extraction	KVK, Sippighat	23rd to 26th Nov., 2015	27	13	40
22.	Promoting livelihood and nutritional security among tribal farmers through introduction of pulse crops and maize cultivation	Harmindar Bay, Little Andaman	3rd to 5th Dec., 2015	35	26	61
23.	Improve scientific practices for nutritious kitchen garden	Harminder Bay, Little Andaman	15th to 16th Jan., 2016	35	24	59
24.	Maintenance and upkeep of fishing inputs	Tapoiming, Car Nicobar	19th to 21st Jan., 2016	25	17	42
25.	Modern technologies in marine fisheries	Big Lapathy, Car Nicobar	21st to 23rd Jan.,2016	32	3	35
26.	Importance of tuber crops for food and nutritional security of tribal areas in Nicobar Island	Car Nicobar	8th to 11th Feb., 2016	12	18	30
27.	Poultry and pig farming	Harminder Bay, Little Andaman	15th to 17th Feb., 2016	27	16	43
28.	Horticulture based cropping system for the Island ecosystem	Kamorta	17th to 18th Feb.,, 2016	32	23	55

29.	Importance of quality seed in agriculture	Gandhi Nagar, Great Nicobar	19th Feb., 2016	56	25	81
30.	Intensive pig farming	Car Nicobar	19th to 22nd Feb., 2016	10	20	30
31.	Importance of quality seed in agriculture	Govind Nagar, Great Nicobar	20th Feb., 2016	40	32	72
Total				**981**	**697**	**1678**

Input distribution

For the first time, the remote tribal villages under Great Nicobar jurisdiction, like Makachua, Afra Bay, Pulo Panja, Pulo Patia, Pulo Bha, Pulo Bhabi, Polu Olu were covered for distribution of fishing inputs under the TSP Programme and distributed 15 numbers of 4 HP Out Board Motor engines to the tribal fishers of Little Nicobar Islands. Inputs like OBM engine, seeds and planting materials of improved varieties, livestock, farm tools, bio-control agents, sprayer, coconut climbing device, beetle traps, fencing materials for effective utilization and improving the productivity of the agri-horti-animal and fisheries sector (Table 2)

Table 2 : Details of inputs provided to the tribal farmers

Sl. No	Inputs	Place	Qty./Unit
1.	CIARI- bio consortia bio-control agents	Harminder Bay, Little Andaman	200 kg
2.	Elephant foot yam	Car Nicobar	1 ton
3.	Tannia	Harminder Bay, Little Andaman	300 kg
4.	Ginger	Kamorta	250 kg
5.	GI fencing sheet for community based fencing	Tapoinming and Big Lapathy villages, Car Nicobar	250 Nos.
6.	Piglets	Car Nicobar & Vikas Nagar, Kamorta	42 Nos.
7.	Nicobari fowl	Car Nicobar	50 Nos.
8.	Vegetable seed kits	Harminder Bay & Car Nicobar	3515 Nos.
9.	Farm implements	Car Nicobar	82 Nos.
10.	Pig feed	Car Nicobar & Vikas Nagar, Kamorta	9.17 tonnes
11.	Goats	Small Lapathy, Car Nicobar	50 Nos.
12.	Seed of salt tolerant rice varieties	Little Andaman & Campbell Bay	20.0 q
13.	CARI brinjal 1- seed	Campbell Bay & Little Andaman	1.0 kg
14.	Sprayer machine	Campbell Bay & Little Andaman	15 Nos.
15.	Insect traps	Little Andaman & Great Nicobar	100 Nos.
16.	Cono-weeder	Little Andaman & Great Nicobar	43 Nos.
17.	Herbicide	Little Andaman & Great Nicobar	42 litre
18.	Coconut climbing device	Car Nicobar	30 Nos.
19.	Beetle traps	Car Nicobar	30 Nos.
20.	Tuberose bulbs	Harminder Bay & Little Andaman	250 kg
21.	Banana plants	Harminder Bay, Little Andaman, Car Nicobar & Kamorta	3000 Nos.
22.	Anthurium plants	Harminder Bay, Little Andaman , Car Nicobar & Kamorta	1800 Nos.

23.	Coir compost	Harminder Bay, Little Andaman , Car Nicobar & Kamorta	375 Kg
24.	Black polythene mulch film	Harminder Bay , Little Andaman	20 Kg
25.	Grow bags	Harminder Bay, Little Andaman , Car Nicobar & Kamorta	2000 Nos.
26.	Rose cans	Harminder Bay, Little Andaman and Car Nicobar	45 Nos.
27.	Mungbean seeds	Mus, Tapoiming, Small Lapathy, Malacca, Kinmai, Big Lapathy & Harmindar Bay	170 kg
28.	Urdbean seeds	Mus, Tapoiming, Small Lapathy, Malacca, Kinmai, Big Lapathy & Harmindar Bay	210 kg
29.	Maize seeds	Mus, Tapoiming, Small Lapathy, Malacca, Kinmai, Big Lapathy & Harmindar Bay	270 kg
30.	Minor farm implements	Tapoiming, Small Lapathy, Malacca, Kinmai, Big Lapathy & Harmindar Bay	50 Nos. each of Spade, Kudal, Khurpi, Talwar, Dao
31.	Grass / Bush cutter	Harmindar Bay , Little Andaman	1 No.
32.	Seed sowing machine	Tapoiming, Small Lapathy, Big Lapathy & Harmindar Bay	4 Nos.
33.	Manual coconut grater for Virgin oil extraction.	Harminder Bay, Little Andaman	40 Nos.

Table 3: Details of the community assets created

Sl No	Type of asset	Place	Qty/ Unit
1.	4 HP OBM Engine for deep sea fishing	Little Nicobar	15 Nos.
2.	Community based fencing of homestead area for cultivation of tuber crops	Harminder Bay, Little Andaman	5 Nos.
3.	Roofing materials for construction of pig shed	Harminder Bay, Little Andaman	2 Nos.
4.	GI fencing sheet for community based fencing at	Car Nicobar	250 Nos.
5.	Community based Home garden	Car Nicobar	20 Nos.
6.	Vermi-composting unit	Car Nicobar	20 Nos.
7.	Water storage tank	Car Nicobar	10 Nos.
8.	Lined ponds for water harvesting	Car Nicobar	10 Nos.
9.	Poultry shed	Car Nicobar	10 Nos.
10.	Poultry hatchery shed	Car Nicobar	1 No.
11.	Development of model tribal farm at Harmindar Bay, Little Andaman & Car Nicobar in an area of 2000 & 3000m^2 respectively for the promotion of pulse and maize cultivation with other crops commodity.	Car Nicobar & Little Andaman	2 Nos.

Technological Demonstration

- Homestead based IFS models were demonstrated in 10 farmer's field at Car Nicobar. Farmers were trained on backyard poultry farming, composting, pig farming, organic input production and vegetable cultivation.

- Tuber crops based farming system were demonstrated in 20 farm families at Harminder Bay, Little Andaman. Organic cultivation of tuber crops on community basis at Car Nicobar and Kamorta was also demonstrated.
- Mungbean and urdbean cultivation agro-technology through high yielding varieties were demonstrated at Big Lapathy, Kinmai, Tapoiming, Kinmai, Harmindar Bay, Small Lapathy villages of Car Nicobar.
- Maize cultivation agro-technology were demonstrated through high yielding varieties at Big Lapathy, Tapoiming, Kinmai & Harmindar Bay villages.
- Cultivation of tuberose in polythene film technology, anthurium in grow bag using different substrate and media were demonstrated in community basis at Harminder Bay, Car Nicobar and Kamorta.
- Demonstration on lined ponds were done in ten homestead IFS for water harvesting at Hut Bay, Little Andaman.

Outcome

- From the tuber crop based farming system the tribal farmers generated an amount of Rs. 9160.00 to Rs. 18220.00 from crop component and from pigs they generated approximately Rs. 9000.00 to Rs. 85000. The total income generated from the system ranged from Rs. 281800.00 to Rs. 95920.00. With the intervention of tuber crops based farming system, at present they work 2-3 hours per day and employment generation in the system has increased to 91- 140 days/year while the farm revenue(net income) has increased to Rs 33,225 per annum (average of 15 farm families) as compared to their traditional system.
- Out of 51 piglets distributed at Harminder Bay during the past two years, the population of pigs has increased to 127. With the success of intervention made, more tribal youths has come forward to adopt the tuber crops based farming system as their livelihood options.
- With the adoption of "Nutritious Kitchen Garden' in backyard with vegetables *viz.,* brinjal, onion, chilli, tomato, amaranthus, cowpea, french bean and okra, the tribal farmers could harvest the produce and introduce in their dietary intake thus ensuring addition to the nutrition for their family. Feedback conducted during January 2016, revealed appreciation by the tribal farmers on introduction of vegetable kits.
- Community Garden practised by the Nicobari at Car Nicobar was also found to be abandoned by Nicobari tribals at Harminder Bay since 2004. Seeing the feasibility Captain was urged by the team to reactivate the same. He realized the importance of practising community garden and assured that very soon they will be finalizing the area for the same involving the community people.
- Impact on the various technological interventions of fisheries technologies was studied. The interaction with tribal communities reveals that efforts are bringing positive changes in their lives. Based on the feedback received from the tribal beneficiaries and tribal leaders, a technical bulletin titled "Livelihood Improvement of Tribal Fishers through TSP-An appraisal of activities of FSD under TSP" has been published. The success story of Big Lapathy village, Car Nicobar in the field of community fishing was also recorded and included in the technical bulletin.

Publication

Technical bulletins

- अवनीन्द्र कुमार सिंह, उत्पल बिस्वास, आर. राहुल कुमार, टी. भारतिमीना, सच्चिदानंदा स्वेन, पी. के. सिंह, यस. के. जमीर अहमद, आर. के. गौतम एवं यस. दाम रॉय (2016). अंडमान एवं निकोबार द्वीप समूह में मूंग एवं उडद की खेती (उत्पादन एवं प्रबंधन तकनीक). तकनिकी बुलेटीन, प्रकौंक – निर्दौक, केन्द्रीय द्वीपीय कृ-ि अनुसंधान संस्थान, पोर्ट ब्लेयर, पृठ 1–32.
- Awnindra K Singh, T. Bharathimeena, Vivek K Pandey, T.P. Swarnam, Sachchidananda Swain, P.K. Singh, A. Velmurugan, S.K. Zamir Ahmed, R.K. Gautam and S. Dam Roy (2016). Technologies for increasing

Mungbean and Urdbean Production in Andaman & Nicobar Islands. Published by Director, ICAR- Central Island Agricultural Research Institute, Port Blair. Pp. 1-32.

- Bohra P., Waman, A. A., Sakthivel, K., Gautam, R.K. & Roy, S.D. (2016). Plant Tissue Culture: A viable technique for augmenting the productivity of banana in Andaman and Nicobar Islands. Published by CIARI. (in Hindi also)

Folders

- CIARI- Bio consortia for the control of bacterial wilt of vegetables in A&N Islands
- *Trichoderma viride*: A potential bio control agent for soil borne diseases.

Glimpses of activities under TSP

Plate: Training and distribution of OBM engine

Plate: Piglets, vegetable kits distribution and training at Nancowry & Little Andaman

Plate: Training and distribution of bio-control agents at Harminder Bay and Small Lapathy

Plate: Awareness on parthenium weed control at Harminder Bay and tuber crops at Big Lapathy

Plate: Training on post harvest processing and value addition of coconut at Harminder Bay, Hut Bay

Plate: Training cum awareness on nursery and weed management in rice at Hut Bay

Plate: Training on goat rearing and distribution of goats at Small Lapathy

Plate: Training on floriculture at Harminder Bay & Kamorta

Plate: Providing of planting materials at Nicobar Islands

Plate: Demonstration on cultivation of anthurium

Plate: Demonstration on pulse cultivation technology at Nicobar and Hutbay

Plate: Training on pulse and maize cultivation and seeds distribution

Plate: Training and demonstration on banana fibre extraction for tribals

Women Participation (SC/ST)

Empowering women specially the SC/ST beneficiaries through various capacity building and a need based technological demonstration in agriculture and allied fields were undertaken by the Institute. The women folks participated with lots of enthusiasm to harness the benefit of latest knowledge and skill in the field of scientific goat farming, maintenance of fishing inputs, nursery and weeds management of rice, scientific cultivation of ornamental plants in pots, IFS, conservation of Nicobari fowl, production and post harvest processing of coconut, application of bio-consortia for control of plant disease, agri-silvi pastoral system, pulses, maize production technology, banana fibre extraction, nutritious kitchen garden, tuber crops, poultry, pig farming, parthenium weed management, horticulture based cropping system, importance of quality seeds, community based home garden, vermicomposting, line pond for water harvesting, poultry shed and hatchery management. The participation of women were 1147 in the category of ST comprising from Nicobar District and Little Andaman, beside 649 from South Andaman & 541 from North & Middle Andaman District belong to other than SC& ST category.

Plate: Women participants imparted knowledge and skill on livelihood options

Technologies Tested, Demonstrated & Transferred

- Homestead IFS model for household nutritional security at Car Nicobar.
- Use of bioconsortia for enhancing vegetable production at Harminder Bay and Car Nicobar.
- Evaluated and transferred green manure cultivation technology through seed distribution and demonstrations at Little Andaman.
- Standardized technology for development of value added products from mango and pine apple.
- Standardized technology for development of spice based ready-to-serve (RTS) products of tender coconut water and ginger.
- Integrated farming system for lowland areas of Andaman Islands.
- Mungbean, urdbean, pigeonpea varietal demonstration at Tapoiming, Kinmai and Big Lapathy tribal village.
- Maize crop demonstration at Kinmai, Tapoiming and Small Lapathy tribal village.
- Technologies on method of application of bioagents for plant disease control to tribals farmers of Hut Bay and Nicobar Islands.
- Potential fishing zone advisory based fishing for improving net income of fishers.
- Pekin duck for small farmers under backyard at Diglipur, North Andaman.
- High Yielding Varieties of rice namely Gayatri, CARI 5, CSR 36,CARI 4, CARI 3 and Ranjit at Diglipur , North Andaman.
- Seed village concept for production of truthfully labelled rice seed in participatory mode.
- Composite fish culture of IMC as per Island condition.
- Talc based Bio consortia demonstrated for management of bacterial wilt disease of solanaceous vegetables.
- Pure Nicobari fowls under backyard.
- Preparation of local feed suitable for rural poultry.
- Low cost poultry feeder and waterer.
- Artificial hatching using mini incubator .

PLANT GERMPLASM REGISTRATION

Certificate of Plant Germplasm Registration Committee (PRC)- ICAR, for Germplasm ANR 38 of Rice (INGR15014) developed by R. Gautam, P.K. Singh, S.K. Zamir Ahmed, Naresh Kumar, A.K. Singh, K. Sakthivel and S.D. Roy, ICAR-CIARI, Port Blair on 17th August, 2015.

Seed and Planting Material Produced

SI. No.	Particulars	Crops	Quantity (Kgs. /Nos.)
1.	Breeder seeds of vegetable & other crops etc.	Paddy	445 kgs.
		Green gram	37 Kgs.
		Paddy	6453 Kgs.
		Green gram	189 kgs.
		Black gram	90 Kgs.
		Brinjal (Var. CARI Brinjal 1, Bacterial wilt resistant)	3.5 Kgs.
2.	Rooted cuttings of different tuber Crops	Sweet Potato (Var. CARI SP1 & SP2)	300 Nos.
3.	Breeder seeds of potato/other tuber crops	Nil	Nil
4.	Saplings/seedlings/grafted plants of different fruits/plantation crops or other horticultural crops	Black pepper	30,000 Nos.
		Clove	6000 Nos.
		Cinnamon	8000 Nos.
		Nutmeg	3800 Nos.
		Coconut	2513 Nos.
		Elephant foot yam (Var. Gajendra)	1750 Kgs.
		Colocasia	150 Kgs.
		Greater Yam	50 Kgs.
		Ginger	630 Kgs.
		Turmeric	800 Kgs.
		Arecanut	11778 Nos.
5.	Tissues cultured plants of different Horticultural crops	Nil	Nil
6.	Fish seeds	Fresh water fish fry	28980 Nos.

Information on other Section

Prioritization, Monitoring and Evaluation (PME) Cell

The Institute Research Council (IRC) meeting of the Institute for the year 2015 was held from 5th to 6th May, 2015 at the Conference Hall of Library building under the Chairmanship of Dr. S. Dam Roy, Director, CIARI.

At the outset Dr. S. Dam Roy, Director, CIARI and Chairman, IRC-2015, introduced to visiting experts on the contribution made by the Institute during last three and half decades in the field of research, development and extension activities. He appreciated the presence of Dr. T.N. Balamohan, Dean, I/c, HCRI, Periyakulam, Tamil Nadu and Dr. T. Narendrappa, Professor, DPPCA,UAS, GKVK, Bangalore, being the experts in the field of post harvest, value chain and plant pathology which is the important area to be addressed.

Dr. T.N. Balamohan, Dean, I/c, HCRI, Periyakulam, Tamil Nadu expressed his thanks in inviting him as an expert for Institute Research Council meeting and shared his views with young team of scientist. He enjoyed over here and learnt from the deliberations.

Dr. T. Narendrappa, Professor, DPPCA, UAS, GKVK, Bangalore said that it was really a wonderful experience to share ideas with the learned researchers in the IRC meeting. He was fascinated to visit CIARI and happy to note the progress and achievements made through the years by the scientists. The presentations and findings by scientists and Flagship programmes of the institute were really good and great.

Director and Chairman of the IRC-2015, Dr. S. Dam Roy expressed happiness over the newly proposed projects which are in line with the recommendations made by the previous RAC. Further he said that the scientists could get benefit from the vast experience and fine tune their research programmes based on the valuable suggestions given by the experts. He also informed that the idea of formation of Schools was mooted by Dr. Krishna Kumar, DDG (Horticultural Science), ICAR, New Delhi in his earlier visit and thereafter, RAC, Chairman, Prof. R.B. Singh also suggested on the same line. Hence, four different schools i.e., School of Biodiversity and Conservation, Climate change, Island ecosystem and Social Science has been formed to conduct interdisciplinary research both in basic and applied aspects.

It was recommended for NRM Division by the experts that there is need to introduce small machineries like power weeders, transplanters, reapers etc. In this the KVK engineers working at Sippighat and Nimbudera may come in handy. Director suggested to bring more machinery through RKVY and other Centrally Sponsored Schemes.

Lastly the Member-secretary Dr S. K. Zamir Ahmed , Principal Scientist & Incharge PME , summed up that a total of 18 institute funded , 38 external and 15 new projects totalling to 71 were presented during the IRC- 2015, which was reviewed thoroughly and appropriate suggestions were given by the house and experts.

Sensitization on PME activities, RPP, HYPM, was given to the scientist. Important documents of the Institute *viz.*, annual report, Cabinet, PMO, QPR, HPR and DARE, along with publishing of research articles, technical bulletins, folders, books, farmer's data base was completed in time frame. Showcasing of activities and achievement of the institute both at Island and National level has been done successfully. The cell also maintains repository of RPFs of the Institute funded projects along with the annual report, bulletins, folders, books and other related publication for ready reference. Beside National Science Day under the theme "**Make in India: S & T driven Innovations"**, Jai Jawan Jai Kisan, Sadbhavana diwas was conducted and quality and procedure manual document for implementing ISO-9001-2008 was completed.

Library

ICAR-CIARI library plays an important role by housing Island related informations. It is the knowledge centre of the institute having an exclusive section on Island literature. It serves to fulfil the need of the scientists, research workers, students from local research and educational institutes of these Island and mainland. Library has the facilities for on and off line information retrieval, networking and other accessories. The existing collection of books has extensive collection of resource materials in the fields of horticulture, field crops, natural resource management, animal sciences, biotechnology, fisheries science, social science and many other related areas which are regularly enriched by adding more current, important scientific and technical books, journal through subscription gifts and on exchange basis. The library has been enriched with 6969 books, 2534 miscellaneous publications in addition to journals by subscription, gratis, on exchange basis and technical books. During the report year 47 books were procured and 39 Indian and three foreign journals were subscribed. Gratis publications such as Annual Report, Newsletter and Research Bulletin received from India and Foreign Institutes as exchange relationship is also maintained. Internet services via VSAT connection are available for easy access to this information. Hindi books along with reprographic facility is also available. Efforts have been made to acquire non-conventional literatures such as technical reports, reports on socio-economic study and annual reports from various sources to be kept as a ready reckoner for the users. School student and farmers have visited regularly. It is having a well furnished conference rooms, wherein 32 meeting were organised which includes IRC meeting also. The visiting delegates both from Island and Mainland have appreciated the Institute Library as one of the best in the Island.

Official Language Cell

For the successful implementation of the official language policy and the targets fixed in annual programme, efforts were made for doing maximum work in official language. Various steps were taken to popularize official language among the officers and staff and to promote the use of hindi in the official work of the institute. The highlight of the activities are:

- Hindi fortnight was conducted from 16thSeptember to 1st October, 2015 for extension and maximum use of hindi in official works. Various programmes like quiz, extempore, essay, letter writing, noting drafting, vocabulary, best division/section/unit, overall participant and speech competition for scientist/technical, administrative staff and farm ladies were organized to bring awareness about the importance of increasing use of hindi.
- One day Rajbhasha seminar was held on 28th September, 2015 under the chairmanship of Dr. S. Dam Roy, Director, ICAR-CIARI, Dr. N. Lakshmi, Associate Professor, JNRM and Shri Vijay Pandey, Administrative Officer, BRO, Port Blair attended as main speaker on the occasion.

- With a view to accelerate the pace of implementation 14 bilingual scientific bulletins/folder in hindi were made for the benefit of the local farmers of these islands.
- For the extension of new technologies developed by the Institute, Doordarshan & All India Radio, Port Blair have broadcasted/telecasted agricultural article/programme for the island farmers during the period.
- Regular display of word in bilingual for knowledge was carried out.
- Achieved the targets of using hindi fully in the field of transfer of technology and extension.
- Half yearly meetings of Town Official Language Implementation Committee, Port Blair was conducted on 26th August, 2015 and 2nd February,2016. On the basis of quarterly report received from different member offices the *Chal Vaijanti Shield* and Cup were awarded to offices on annual basis.
- Thirteen officers and staff of TOLIC members were awarded with memento and certificates for their contribution and co-operation in implementation of the official language programme for the year 2014-2015 in the half yearly meeting held on 2nd February, 2016.

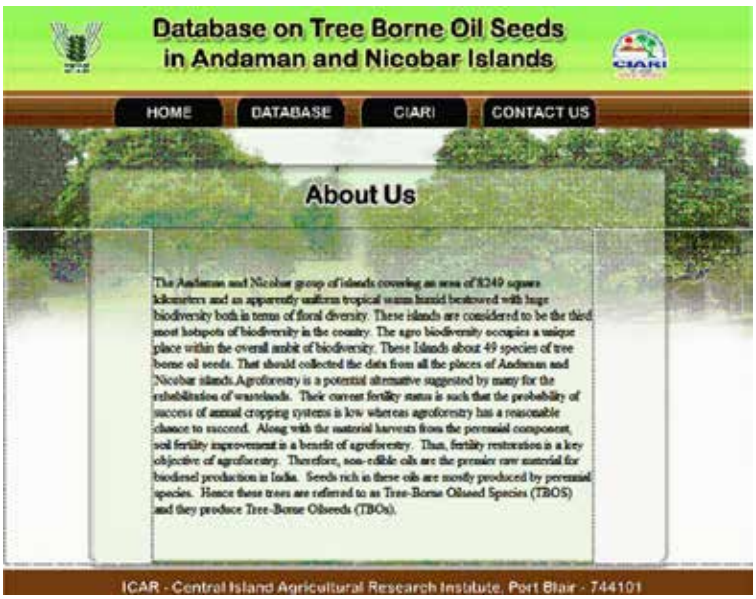
- Mrs. Sulochana, Asstt. Director [OL] A.D (OL) and Secretary, Town Official Language Implementation Committee, Port Blair was awarded merit certificate for excellence in the work in 2014-2015 and also Dr. Kundanlal Jain Smriti Sahitya Samman by Antarashtriya Sahitya Kala Manch, Muradabad at JNRM auditorium, Port Blair on 12th January, 2016.

Sub-Distributed Information Center (Sub-DIC)

Bioinformatics center of CIARI serves as an active site for bioinformatics research (mainly documentation of island biodiversity) and development in the remote union territory of Andaman and Nicobar Islands, India. It provides computational support and training to the scientist and students & also offers traineeships and studentship to deserving bioinformatics students. The databases were developed using PHP, MySql and Xampp server which provides information on all bioresearches available in the islands and is user friendly. Training on basic of bioinformatics was conducted from 22nd to 24th February, 2016 wherein 44 participants from different colleges got benefited.

Database developed

Database on 49 oil yielding trees and fodder trees of the islands was developed during the period.



Institute Technology Management Unit (ITMU)

During XII Plan scheme ITMU has been entitled with a new name "National Agriculture Innovation Fund (NAIF)". It has facilitated Trademark for Nicorock by the Trade Mark Registry under No. 2625166 Class 31 Published in ImJ No. 1679 Dt. 02 February, 2015. CIARI Bio Consortia, a talc based bioformulation with consortium of antagonistic

Bacillus sp enriched with FYM was released during 09th April, 2015. Institute Technology Management Committee (ITMC) meeting was held on 20th July, 2015 to discuss about the Commercializable technologies developed by the Institute. Six bacterial strains of *Bacillus sps* were submitted on 25th February, 2015 and released on 6 August, 2015 in Gen bank. Unique rice germplasm "ANR 38 (INGR-15014)" was registered with ICAR-NBPGR, New Delhi in August, 2015. Four varieties of *Morinda citrifolia* (Noni) namely CARI Sampada, CARI Rakshak, CARI Samridhi and CARI Sanjivini were registered in NBPGR. A meeting was held on 4th November, 2015 at ICAR-CIARI in connection to the meeting of Andaman and Nicobar Innovative Council, convened under the chairmanship of Chief Secretary at Secretariat, to discuss about the actionable points related to CIARI, Port Blair. Status report was prepared regarding the success stories and case studies in the field of agriculture, fisheries and animal husbandry sector for motivating the farmers and was submitted on 30th December, 2015 to Dr. B.R. Ambedkar Institute of Technology, Port Blair. One day training on "Technological options for enhancing farm income" was conducted at Kanniyapuram, South Andaman on 4th February, 2016, wherein 25 farmers got benefitted.

Post Graduate Cell

It has been established to facilitate the post graduate research work undertaken at CIARI in collaboration with the other research Institutes. During the year a total of four students of M.Sc Biotechnology from Loyola College & Alagappa University, Chennai have registered for undertaking M.Sc Dissertation work. Besides, 10 students have also undergone implant training for a period of 2 weeks to one month. The PG cell is also facilitating the PhD work related to the students who have registered with the PRIST University, Thanjavur.

Estate Section

The Estate Section consists of Estate, Workshop and Instrumentation centre. It takes up works related to infrastructure development and repair & maintenance to support research activities. The power supply plays an important role for laboratory research works. Three diesel generator Sets are kept as standby for restoration of power supply during power cuts and exigencies. The electricity and water supply system to residential & non-residential buildings is also operated and maintained .

Repair and infrastructure development

Estimates have been prepared for about Rs.76.00 lakhs, of which about Rs.52.50 lakhs have been executed for repair and maintenance of residential and non-residential buildings and development of new infrastructures. Under the infrastructure development one scooter shed and two generator sheds have been constructed. Old duck shed was renovated for fish breeding activity. One room of phase-I office building was renovated to facilitate ITMU Cell. Footpath /approach roads have been constructed for pig shed type-V/1, V/2 quarters and magur hatchery tanks. The existing footpath near zero point to main gate was renovated. Contour surveying and maping were done for an area of 1.50 hectare area for establishment of Bio-security laboratory and other facilities. The drip irrigation system has been laid for an area of 600 Sq m for banana and dragon fruit block at Garacharma Farm. A pandal covering an area of about 650 Sq m area was constructed for accommodating about 500 farmers during Island Kisan Mela-2015. 20 Kisan mela stalls were also constructed in the pandal for display of divisional exihibits. The embankment of the ponds at Garacharma and Bloomsdale farm are repaired/ strengthened.

Workshop

Workshop plays an important role for arranging transportation for Scientists and other staff to carry out that research activities. It also plies regular school trips and arrange vehicles during major events of the Institute. The routine and major repairs of staff car, jeep and staff/school bus were also carried out in stipulated time.

Instrumentation Cell

The repairs and maintenance of scientific equipments, refrigerators and air conditioners installed in the Central Laboratory and other building were carried out to keep it in good condition to facilitate research activities of the

Institute. Un-interrupted power supply was also provided through standby generators during important meetings and functions of the Institute to cater to the need of the Scientists and the Institute as a whole.

ARIS Cell

Agricultural Research Information System (ARIS) envisages providing online interconnectivity between the different research institutes, national centres and state agricultural universities. This cell is responsible for the creation and updating of the Institute bilingual web site and for the conduct of ARS-NET online examination through ASRB, New Delhi. It is equipped with 2 servers, switches, router, modem, 20 desktop/terminals and one UPS. The combined ARS-2015 (Preliminary) examination and NET 2015 was conducted from 4th to 10th December, 2015, wherein 36 candidates appeared for the exam.

Management Information System and Financial Management System

ICAR-ERP developed under NAIP project "Implementation of Management Information System (MIS) including Financial Management System (FMS) in ICAR" is regularly updated. There are five modules of MIS-FMS which are: financial management (bill creation, payment etc. Users- DDO, Asst, Audit Section), stores, purchase and inventory management (item receiving/issuing, indent/PO creation- Users-Store), human resource management (leave, personal data, income tax- Users- establishment and all employees), project management (project monitoring, budget Users-Scientist), pension and payroll (Users – centralised with payroll team).

Main activities

- Providing internet connectivity to all Scientists & Officers .
- Maintenance of VSAT of 2 Mbps for browsing and downloading information, networking & DAMA VSAT.
- Computer upkeep, purchase of computers, softwares, cartridges and its maintenance.
- R-governance, office automation, software for the preparation of salary of TSM staff.
- Downloading the circulars and other information from ICAR website.
- Installation of Statistical analysis software for data compilation for scientists.
- Providing visual aids for different programmes.
- PERMISNET - updating of personal records of staff through online.

Institute Website

- http://icar-ciari.res.in - Institute bilingual website is updated regularly by uploading the latest Institute progress in terms of research, technologies developed, tender notifications, recruitment notifications and other information.

Award and Recognition

Scientist	Award/ Recognition	Awarding Agency/ Organizing society
B. Gangaiah	Fellow of Andaman Science Association	Andaman Science Association, CIARI, Port Blair
A.Velmurugan	Fellow of Andaman Science Association	Andaman Science Association, CIARI, Port Blair
	Hon'ble Lt. Governors' Commendation	A&N Administration, Port Blair
Sachidananda Swain	Member of Technical Scrutiny Committee (TSC) under NMFP Programme	Directorate of Industries, Port Blair
Swarnam, T.P.	Women Scientist Award	Society for Plant Research, Meerut
Sachidananda Swain, Gautam, R K., Laxmi, M. N.V., Subramani, T., Swarnam T P., Velmurugan, A., Gangaiah, B.& Roy, S. Dam	Best Poster Award	Andaman Science Association. National seminar on "Harmonizing biodiversity and climate change: Challenges and opportunity" at ICAR-CIARI during 17-19 April, 2016.
Singh, Shrawan, Swain, S., Singh, D.R., Salil, K M., Nayak Deepak and Roy, S Dam	Best Publication Award	37th Institute foundation day of CIARI
Pooja Bohra	Jawaharlal Nehru Award for P.G. Outstanding Doctoral Thesis Research in Horticulture for the Year 2014	ICAR, New Delhi
Ajit Waman and Pooja Bohra	Member of the Editorial Board	• African Journal of Biotechnology • African Journal of Agricultural Research
	Peer Reviewer	• Open Access Journal of Medicinal and Aromatic Plants (ICAR) • African Journal of Microbiological Research
	Expert Member of Committee for Tissue Culture Banana Cultivation in A & N Islands	Department of Agriculture, Andaman and Nicobar Administration
V. Damodaran	Best Poster Award	National seminar on harmonizing bio-diversity & climate Change: challenges and opportunity, at CIARI, Port Blair.
	Best Technical Staff Award for 2014-15	ICAR-CIARI, Port Blair
I. Jaisankar	Fellow Of Andaman Science Association	Andaman Science Association, Port Blair
	Peer Reviewer	• International Journal of Agricultural Policy and Research, Nigeria • Karnataka Journal of Agricultural Sciences, Dharwad • Journal of Forestry Research, Springer

Field Crop Improvement & Protection Division	Best Stall Award	Island Kisan Mela-2015
P K Singh, R K Gautam, A K Singh, K Sakthivel, T. Bharathimeena, S. K. Zamir Ahmed and S. Dam Roy	Best Poster Award (1st Prize)	National seminar on Harmonizing biodiversity and climate change: challenges and opportunities, April 17th -19th , 2015.
Awnindra K. Singh	Fellow of the Andaman Science Association	Andaman Science Association, Port Blair
	Scientist of the Year Award	Society for Plant Research, Meerut during National Seminar NSBC-2015 at ICAR-CIARI, Port Blair.
	Best Paper Award	National Seminar NSBC-2015 at ICAR-CIARI, Port Blair.
	Fellow Award	Association for the Advancement of Biodiversity Sciences, during International Conference of AABS at Ooty, Tamilnadu.
T. Bharathimeena and A.K. Singh	Best Oral Presentation Award (1st Prize)	National seminar on Harmonizing biodiversity and climate change: challenges and opportunities, 17th -19th April, 2015
Animal Science Division	Second Best Stall Award	Island Kisan Mela-2015
A.Kundu, M.S.Kundu, Jai Sunder, T.Sujatha	Best Division Award, 2015	37th Foundation Day of ICAR-CIARI, Port Blair
A.Kundu	Fellow of Andaman Science Association	Andaman Science Association, Port Blair
M.S.Kundu	Fellow of Andaman Science Association	Andaman Science Association, Port Blair
Jai Sunder	Fellow of Andaman Science Association	Andaman Science Association, Port Blair
	Best Scientist Award	ICAR-CIARI, Port Blair 2014-15
	Best Institute Building Award	ICAR-CIARI, Port Blair 2014-15
KVK, Nicobar	Best Stall in Carnic / Tribal Festival- 2016 (2nd Prize)	A & N Administration for displaying IFS and agricultural technologies relevant for Nicobar district on 10th January, 2016
	Letter of Appreciation	Secretary, Tribal Council, Car Nicobar, Nicobar, A&N Islands for the efforts of developing livestock, horticulture, post harvest and farm mechanization in Nicobar on 19th June, 2015
Z. George, Nagesh Ram, A. Kundu, M.S. Kundu, Jaisunder, T. Sujatha, Viveka Nand Singh, A.K. Pandey, C. Ram and S. Dam Roy	Best Poster Award	Andaman Science Association and ICAR-CIARI, Port Blair.

Z. George	Best Extension Scientist 2014 -15	37th Institute Foundation Day at ICAR-CIARI, Port Blair.
S.K. Zamir Ahmed	Certificate of Appreciation - 2016	Directorate of Arecanut & Spices Development Board, Calicut, Kerala conducted by CIARI in association with KVK and Department of Agriculture, A&N Administration from 2012-2016.
	Baraj Gopal Sharma Memorial All India Best Agricultural Extension Worker	Society for Advancement of Human and Nature, Dr. YS Parmar University of Horticulture and Forestry, Solan, HP
	Letter of Appreciation-2015	For contribution as coordinator for vigilance awareness week -2015
S.K. Zamir Ahmed, P.Krishnan, S. Dam Roy, Nagesh Ram, R.Kiruba Sankar, T.Ravi Kumar, Amit Srivastava Siba Mahato, T.R.G.Babu, V Harish and A.K.Pandey	Best Research Paper Award (Poster Presentation)	National seminar on harmonizing biodiversity and climate changes: challenge & opportunity at CIARI, Port Blair from17th -19th April, 2015
S.K. Zamir Ahmed	Fellow of Andaman Science Association	Andaman Science Association, ICAR-CIARI, Port Blair
	Member, Task Force on Biotech Based Programme for SC/ST Population and Rural Development	DBT, Govt. of India, New Delhi
V. Baskaran	Appreciation Letter	GE(I) (P) South ,MES, for finalizing arboriculture plan at Diglipur
	Judge	Flower arrangement show held at DIET, Garacharma
	Chairman	Selection of best floriculture farmer in A & N Administration.
	Judge	Evaluation of flower arrangements and agriculture projects in the state level exhibition Gyanodaya 2015-16, Port Blair on 14th January, 2016
	Judge	Flower show held at ITF ground on 13-01-2016
	Best Oral Paper Presentation	National seminar on Harmonizing biodiversity and climate change: challenges and opportunities held during 17th - 19th April, 2015.
	Member	Formation of block technology team under Prothrapur and Ferrargunj block, UT, ATMA, South Andaman district.
	Reviewer	Journal of Horticultural Sciences

V. Baskaran and K. Abirami	Certificate of Appreciation	For exemplary work in transfer and popularization of spices cultivation among in A & N Islands
Ram, Nagesh., Singh, L.B., Choudhuri, N.C., Pandey, V.K. and Roy, S.Dam	Best Poster Award	Faculty Center of IRDM in association with APBI, University of Calcutta at Kolkata - 2016.

Ongoing Research Project

External Funded Project

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
PPV & FRA, Govt. of India						
1.	Collection, Characterization and Utilization of Farmers Variety, Landraces and Wild Relatives of Indigenous Pulses of Andaman & Nicobar Islands Agro-Ecosystem	Awnindra K. Singh	S. Swain, R.K. Gautam and T.P. Swarnam	20.00	2014	2017
DASD, Calicut						
2.	CSS- MIDH (NHM) on Spices	K. Abirami	V. Damodaran	5.16	2002	Continued
NABARD						
3.	Establishment of Out Reach Centre for North & Middle Andaman	S.K.Zamir Ahmed	-	79.69	2009	2017
4.	Sustainable Rural Livelihood through Improved Rural Poultry Farming Techniques in Andaman Islands	T.Sujatha	A.Kundu, M.S. Kundu and N.C. Choudhuri	8.99	2013	2016
5.	Floriculture Based Sustainable Livelihood Model for Island Farmers	V.Baskaran	K. Abirami, A. Velmurugan and N. Bommayasamy	17.06	2015	2016
6.	Production Technology of Mushroom for Nutritional and Livelihood Security of Island Farmers	N. C. Choudhuri	Hari Priya Nayak, Nagesh Ram, L.B.Singh and V.K.Pandey	9.95	2015	2017
ICAR						
7.	AICRP on Management of Salt Affected Soils and Use of Saline Water in Agriculture	A.Velmurugan	T.P. Swarnam and T. Subramani	11.5	2014	2017
8.	Institute Technology Management Unit	T. Subramani	-	55.6	2008	2017

9.	AICRP on Integrated Farming Systems	T.P.Swarnam	A. Velmurugan, T. Subramani, S. Swain, M.S. Kundu, R. Kiruba Sankar, B.K. Nanda, I. Jaisankar, S.K. Pandey and Zacharia George	85.0	2010	2017
10.	AICRP on Palms	Ajit Waman	T.P. Swarnam	34.30	2015	2017
11.	AICRP on Tuber Crops	V. Damodaran	L.B. Singh, K.Sakthivel and T.Bharati Meena		2012	2017
12.	AICRP on Vegetable Crops	I. Jaisankar	Divya Parisa	0.6	2008	Continued
13.	ICAR Seed Project: Seed Production in Agricultural Crops	P. K. Singh	A. K. Singh and R. K. Gautam	66.50	2006	2016
14.	All India Coordinated Research Project on MULLaRP	Awnindra K. Singh	-	-	2011	2019
15.	All India Coordinated Research Network Project on Potential Crops on *Vigna marina*	Awnindra K. Singh	A. Velmurugan and T. Sujatha	-	2015	2019
16.	All India Network Project on Vertebrate Pest Management	T. Bharathimeena	-	25.0	2009	2017
17.	Consortium Research Platform on Borers in Network mode	T. Bharathimeena	I. Jaisankar	25.5	2014	2017
18.	Outreach Programme on Management of Sucking Pests in Horticultural Crops	T. Bharathimeena	-	25.5	2014	2017
19.	Exploring Antimicrobial Peptide Genes in Bacillus strains to Develop Bioformulations for the Management of Plant Diseases of Andaman and Nicobar Islands (AMAAS)	K. Sakthivel	R.K. Gautam	19.60	2015	2017

20.	ORP on Fungal Foliar Diseases	K. Sakthivel	R.K.Gautam and V.K. Pandey	21.48	2015	2017
21.	AICRP on Mushroom	K. Sakthivel	N.C. Choudhuri, V.K. Pandey, Pooja Kapoor, R.K. Gautam and S. Dam Roy	8.5	2015	2017
22.	Sero-surveillance of FMD in Andaman and Nicobar Island	Jai Sunder	Arun Kumar De	3.0	2011	Contd.
23.	AICRP on Goat Improvement	Jai Sunder	M.S.Kundu and A.Kundu	57.0	2014	Contd.
24.	AICRP on ADMAS	Jai Sunder	T. Sujatha	-	2014	Contd.
25.	Poultry Seed Project	A.Kundu	T.Sujatha	190.68	2014	Contd.
26.	AICRP on Pig	M.S.Kundu	Jai Sunder and A. Kundu	142.06	2015	Contd.
27.	AICRP on Flowers	V.Baskaran	-	1.50	2015-16	Contd.
28.	Collection, Cataloguing and Conservation of Native Ornamental Plant Biodiversity in Andaman, Nicobar and Lakshsdweep Islands	V.Baskaran	-	55.24	2016	2017
29.	AICRP on Fruit Crops	K. Abirami	-	3.10	2015-16	Contd.
30.	Economic Impact Studies on Crop Diversification and Technology Adoption in Horticulture	S. K. Zamir Ahmed (CCPI)	Nagesh Ram	21.70	2015	2017
31.	National Initiative on Climate Resilient Agriculture	Nagesh Ram	L.B. Singh, A. K. Singh, B.K. Nanda, N. Bommayasamy and N.C. Choudhuri	30.35	2010	2015
32.	AICRP on Weed Management (Voluntary)	B. Gangaiah	-	-	2015	Contd.

33.	AICRP on Agronomy (Voluntary)	B. Gangaiah	-	-	2015	Contd.
34.	Consortia Research Platform on Agro biodiversity	S. Dam Roy	Jai Sunder, R.K. Gautam, V. Baskaran, R. Kirubasankar M.S.Kundu, P.K. Singh, A.K. Singh, T. Subramani, K. Abirami, J. Raymond Jani Angel, Ajit Arun Waman and Pooja Bohra	13.5	2015	2017
DBT, Govt. of India						
35.	Establishment of Sub-Distributed Information Centre	T. Subramani	-	60.0	2008	2017
36.	Development and Standardization of DUS Characteristics Procedures for Noni (*Morinda citrifolia* L.)	I. Jaisankar	A.K.Singh	22.8	2013	2016
37.	Marker Assisted Introgression of Bacterial Blight Resistance in Popular Rice Cultivars of Andaman and Nicobar Islands	R. K. Gautam	P. K. Singh and K. Sakthivel	69.00	2013	2017
IMD (MoES)						
38.	Integrated Agromet Advisory Services for A&N Islands	A.Velmurugan	T. Subramani, S. Dam Roy, T.P. Swarnam, P.K. Singh, A. Kundu, R.Kiruba Sankar, Nagesh Ram and S.K. Zamir Ahmed	60.0	2008	2017
DAC (MoA)						
39.	FASAL (Forecasting Agricultural Output Using Space, Agro-Meteorology and Land Based Observations)	A.Velmurugan	A.Velmurugan and T.Subramani	17.0	2011	2017

40.	Monitoring of Pesticides Residue Analysis at National Level	Awnindra K. Singh	-	10.50	2011	2017
IRRI, Philippines						
41.	Stress Tolerant Rice for Africa and South Asia (STRASA)	R. K. Gautam	P.K. Singh, A. K. Singh, S. K. Zamir Ahmed and A. Velmurugan	7.00	2011	2017
MOFPI, A & N Administration						
42.	Food Processing Training Centre (FPTC).	S. Swain	-	20.0	2014	2023
INCOIS, Hyderabad						
43.	Location Specific Augmentation of PFZ Advisories Using Satellite Altimetry and Fishing Ground Database	S. Dam Roy	R.Kiruba Sankar, P. Krishnan, A. Anand and K. Lohith Kumar	75.00	2013	2017
SAC, Ahmedabad						
44.	Integrated Coastal Zone Management	K. Lohith Kumar	R.Kiruba Sankar	20.0	2013	2017
45.	Biophysical Characterization and Site Suitability Analysis of Indian Mangroves	S. Dam Roy	J. Raymond Jani Angel, K. Lohith Kumar and R.Kiruba Sankar	16.08	2014	2017
NFDB, Hyderabad						
46.	National surveillance Programme for Aquatic Animal Diseases (NSPAAD) of Andaman and Nicobar Islands	K. Saravanan	Arunjyoti Baruah, J. Praveenraj, A. Anuraj, Venkatesh R Thakur and J. Raymond Jani Angel	51.35	2015	2018
Department of Agriculture, Andaman & Nicobar Administration						
47.	Baseline Survey to Ascertain the Status of Chemical Residues in Soil, Water and Agricultural Products and its Regular Monitoring in Andaman Islands	T.P.Swarnam	A. Velmurugan and S.K. Zamir Ahmed	26.14	2012	2016

Institute Funded Project – 2015-2016

Sl. No.	Project Title	PI	CO-PIs	Year of Start	Year of Completion
Horticulture & Forestry					
1.	Collection, Characterization, Evaluation and Mass Multiplication of Unconventional Native and Exotic Fruit Crops for Bay Islands	Pooja Bohra	Ajit Arun Waman, T. Bharathimeena and S.K. Zamir Ahmed	2015	2021
2.	Development of Protocols for Micropropagation of selected Fruit Crops for Bay Islands	Pooja Bohra	Ajit Arun Waman and L.B. Singh	2015	2019
3.	Collection, Characterization and Utilization of Natural Diversity of Important Spice Crops from Bay Islands and Evaluation of their Improved Varieties	Ajit Waman	Pooja Bohra, T. Sujatha, L.B. Singh and V. Damodaran	2015	2021
4.	Exploration, Characterization, Micropropagation and Agro-Technique Standardization of an Important Rhizomatous Species-Mango Ginger from Bay Islands	Ajit Waman	Pooja Bohra, I. Jaisankar, D. Basantia and V. Damodaran	2015	2019
5.	Development and Evaluation of Silvipasture System under Coconut Plantation in Tropical Island Condition	I. Jaisankar	T. P. Swarnam and V. Damodaran	2015	2018
6.	Development of Production Technology for Ornamental Crops in Bay Islands	V.Baskaran	K. Abirami and A.Velmurugan	2011	2016
7.	Collection and Evaluation of Medicinal Plants of Bay Islands	K. Abirami	V. Baskaran and V.Damodaran	2011	2014
8.	Collection, Characterization and Standardization of Agrotechniques of Fruit Crops in A & N Islands	K. Abirami	V. Baskaran, V. Damodaran and T. Subramani	2011	2016
9.	Development of Dwarf and High Yielding Varieties in Coconut for Andaman & Nicobar Islands	V. Damodaran	K. Abirami	2011	2019
Field Crop Improvement & Protection					
10.	Augmenting Rice Productivity through Varietal Purification of Popular Land Races	R. K. Gautam	P. K. Singh, S. K. Zamir Ahmed, A.K. Singh, K. Sakthivel and S. Swain	2012	2016

11.	Development of Biotic Stress Resistant Lines in Brinjal (*S. Melongena* L.)	P. K. Singh	K. Sakthivel	2010	2016
12.	Genetic Improvement of Pulse Crops for Andaman & Nicobar Islands Conditions	Awnindra K. Singh	P.K. Singh, R.K. Gautam, K. Sakthivel, T. Subramani and S. K. Zamir Ahmed	2011	2015
13.	Insect Pests of Legumes in the Andaman and Nicobar Islands : Bioecology and Management	T. Bharathimeena	A.K. Singh	2014	2017
14.	Induction of Systemic Resistance through Application of Potential Antagonistic Microorganisms against *Ralstonia Solanacearum* causing Bacterial Wilt of Solanaceous Crops	K. Sakthivel	-	2012	2015
Natural Resource Management					
15.	Vulnerability Assessment and Adaptation Led Mitigation Strategies of Andaman and Nicobar Islands Farming to Climate Change	B. Gangaiah	T. Subramani, S. Swain, A. Velmurugan, B.K. Nanda, V. Damodaran, K. Lohit Kumar and M.S. Kundu	2015	2019
16.	Assessment and Utilization of Soil Biodiversity for Improving Soil Health under Tropical Island Condition	A.Velmurugan	T.P.Swarnam and K. Sakthivel	2013	2017
17.	Assessing the Status of Pesticide Residues in Sediments and Aquatic Biota in Neil Island	S. Dam Roy	T.P. Swarnam, A. Velmurugan and Kiruba Sankar R	2014	2017
18.	Feasibility Evaluation of Pulses Cultivation and Resource Optimization under Coconut Plantation	T.Subramani	A. Velmurugan, B. Gangaiah, A.K. Singh, V. Damodaran, B.K. Nanda and T. Bharathimeena	2013	2016
19.	Assessment of Post Harvest Losses in Fruits and Vegetables and Strategies for their Reduction in the Islands	S. Swain	S. K. Zamir Ahmed, L. B Singh, Chandrika Ram and Manoj Kumar	2015	2017

20.	Development of Nutraceutical Beverages from Potential Underutilized Fruits and Medicinal Herbs of Andaman and Nicobar Islands	S. Swain	K Abirami, Pooja Bohra and Pooja Kapoor	2015	2018
Animal Science					
21.	Rejuvenation and Improvement of Endangered Nicobari Fowl through Collection, Propagation, Selection and Conservation	A. Kundu	T.Sujatha, Zachariah George and N.C.Choudhuri	2012	2015
22.	Augmentation of Fodder Resources to Improve Livestock Productivity in Andaman & Nicobar Islands	M.S. Kundu	B. Gangaiah, T. Sujatha and A. Kundu	2015	2018
Fisheries Science					
23.	Mariculture of Selected Marine Fin Fishes and Shell Fishes of Andaman Waters	R. Kiruba Sankar	Raymond Jani Angel, Venkatesh R Thakur, Anuraj A and Benny Varghese	2013	2017
24.	Studies on Stock Assessment and Biology of *Pristipomoides Filamentosus* (Valenciennes, 1830) from Andaman Water	S. Monalisha Devi	S. Dam Roy, K. Lohith Kumar and R. Kiruba Sankar	2014	2018
25.	Capture Based Aquaculture of Economically Important Marine Finfishes of Andaman	J. Raymond Jani Angel	Anuraj A, Venkatesh R. Thakur, K. Saravanan and R.Kiruba Sankar	2015	2018
26.	Cataloguing Inland Aquatic Diversity and Breeding of Indigenous Freshwater Fishes of Andaman And Nicobar Islands	Venkatesh R. Thakur	J. Praveenraj, J .Raymond Jani Angel, Anuraj A and R. Kiruba Sankar	2015	2018
27.	Characterization of *Bacillus Spp.* from Andaman Mangroves and Evaluation of its Antagonistic Effect on Fish Pathogens	K. Saravanan	Arunjyoti Baruah, J. Praveenraj, J. Raymond Jani Angel, T. Sivaramakrishnan and R. Kiruba Sankar	2015	2018

28.	Seaweed Diversity and its Culture Prospects in *In-Situ* Conditions of Andaman	A. Anuraj	Venkatesh R Thakur, J Raymond Jani Angel, K. Lohith Kumar and R. Kiruba Sankar	2015	2019
29.	Assessment of Stock of Neritic Sharks from Andaman Waters	R. Kiruba Sankar	S. Monalisha Devi, K . Lohith Kumar and A K O Ratheesh	2015	2018
30.	Study on Biology and Stock Assessment of Selected Tuna Species from Andaman Waters	K. Lohith Kumar	R.Kiruba Sankar, S. Monalisha Devi, A K O Ratheesh and S. Dam Roy	2015	2018

Flagship Programme : Integrated Agriculture System for Eco Regions

Period: 2014-17

Project Leader : S. Dam Roy
Co-ordinator : A.Velmurugan

SI.No.	Technical Programme	Team Leader	Associates
1.	Crop improvement	R.K. Gautam	V. Bhaskaran, K. Abirami, I. Jaisankar, Sachidananda Swain, K. Sakthivel, T. Bharathimeena, Pooja Bohra, Divya Parisa, T.Damodaran and Chandrika Ram
2.	Livestock component	A.Kundu	M.S. Kundu, Jai Sunder, T. Sujatha, Sophia Inbaraj, Zachariah George and N.C. Choudhuri
3.	Fisheries component	R. Kiruba Sankar	A. Anuraj, K. Saravanan, T. Sivaramakrishnan and Shailesh Kumar
4.	Natural resource management	B. Gangaiah	A. Velmurgan, T.P. Swarnam, T. Subramani, B.K. Nanda, V.N.Singh, S.K. Pandey, Manoj Kumar and B. L. Meena
5.	Socio-economic and impact assessment	S.K. Zamir Ahmed	Nagesh Ram, Amit Srivastava, Pooja Kapoor, Haripriya Nayak, Ani Dath and Dibakar Khan

Publication

Research Article

Abirami, K., V. S. Rana., K. A. Geetha and Satyabrata Maiti (2014). Good agricultural practices of *Enicostema axillare. Open Access Journal of Medicinal and Aromatic Plants,* 5(2): 23-25.

Anuraj, A., Kiruba Sankar, R and Dam Roy, S (2015). On the Occurrence of pedunculate barnacles of the symbiotic genus *Octolasmis* on shovel nosed lobster. *Journal of Andaman Science Association*, 20(1): 130-131.

Anuraj, A., Tiwari, V.K., Suresh Babu, P.P., Sreekanth, G.B. and Srinivas Rao, P (2015). Portals of entry for gram negative bacteria in a freshwater prawn hatchery. *Journal of Applied Aquaculture,* 27(2): 150-159.

Anuraj, A., Venkatesh Thakur., J Raymond Jani Angel., R Kiruba Sankar., K. Lohith Kumar and S Dam Roy (2016). Macroalgal diversity, abundance and prospects in Andaman and Nicobar Islands. *Vegetos,* 29:71-77. (NAAS Rating: 6.0)

Babu, Prasad., M.B.B., Gangaiah, B and Latha, P.C (2015). Enhancement of rice productivity and nitrogen use efficiency through Bioactivator™ treated nitrogen fertilization. *Oryza,* 52(1):34-40. (NAAS Rating: 4.12)

Babu, Prasad, M.B.B., Gangaiah, B. and Latha, P.C (2015). Mitigation of nitrous oxide emissions in paddy through use of nitrification inhibitors. *Journal of the Andaman Science Association* 20(1):33-35.

Bainsla, Naresh Kumar., Singh, Shrawan., Singh, Pankaj Kumar., Kumar, Krishna., Singh, Awanindra Kumar., Gautam, Raj Kumar (2016). Genetic behaviour of bacterial wilt resistance in brinjal (*Solanum melongena* L.) in tropics of Andaman and Nicobar Islands of India. *American Journal of Plant Sciences*, 7:333-338.

Baskaran, V and K. Abirami (2016). Effect of growth substances on growth, flowering and corm production in gladiolus (*Gladiolus grandiflorus*) cv White Prosperity under Bay Island conditions. *Indian journal of Agricultural Sciences*. 86(2): 216-219. (NAAS Rating: 6.14)

Baskaran, V., K. Abirami and Dam Roy, S (2014). Effect of plant growth regulators on yield and quality in gladiolus under Bay Island conditions. *J. Hort. Sci.,* 9(2): 213-216.

Birah, Ajanta., Shrawan Singh., P.K. Singh and S. Dam Roy (2015). Evaluation and efficacy of pest management modules for cucurbits against fruit fly, *Bactrocera cucurbitae* (Coquillett) in Andaman. *Vegetos,* 28 (4): 62-66. (NAAS Rating: 6.0)

Bohra, P and Sreenivas, K.N (2016). Development of nectar from pummelo (*Citrus grandis*), anunderutilized fruit crop, by blending with kokum (*Garcinia indica*) and mango ginger (*Curcuma amada*). *Journal of the Andaman Science Association*, 20(1): 70-74.

Dam Roy, S., Sivaramakrishnan, T., Kiruba Sankar, R and Saravanan, K (2015). Nutritional significance of small freshwater fishes of Andaman Islands. *Journal of Andaman science association.* 20(2).

Dam Roy, S., T V R Murthy., J R Angel., K Lohith Kumar., R. KirubaSankar, P. Raghavan and V Sajin (2016). Analysis of structural variability of mangrove paches in downstream and upstream areas of Porlob-Jig Creek, Andaman and Nicobar Islands, India. *Vegetos,* 29: 96-103. (NAAS Rating: 6.0)

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In addition to above 104 papers were presented in the Conference/Symposium/Workshop.

Peer Recognition to Director

Honour's to the Institute and the Island for implementation of Official Language under the Chairmanship of Director, CIARI

- Town Official Language Implementation Committee, Port Blair has been awarded THIRD prize (2014-2015) for best implementation of official language policy in Andaman and Nicobar Islands by Govt. of India, Ministry of Home Affairs, Deptt. of Official Language. The award function was organized by Regional Implementation Office (Eastern Region), Kolkata at Ranchi on 21st January, 2016.

- ICAR-Central Island Agricultural Research Institute, Port Blair has been awarded "Vishistha Puraskar" in Shrestha Hindi Patrika category by Rajbhasha Seva Sansthan, New Delhi at Goa on 07th October, 2015.

Honour's to Director for Research, Development & Extension

- Life time achievement award by Andaman Science Association, Port Blair.
- Distinguished scientist award by Plant Society, Meerut.

Peer recognition

- Member, State Board for Wildlife, Union Territory of Andaman and Nicobar Islands, Port Blair
- Member, Price Stabilization Fund Management Committee, Andaman and Nicobar Administration, Directorate of Civil Supplies & Consumer Affairs, Port Blair
- Member, Task Force on Agriculture Development for the UT of A&N Islands
- Expert Member, State Level Executive Committee for implementation of RKVY, A&N Islands
- Chairman, Independent Third Party Monitoring and Evaluation Committee for evaluation of works carried out under State CAMPA, A & N Islands, Port Blair
- Member, UT Coordination Committee between A&N Administration & CIARI, Port Blair
- Member, Society for Science Centre, A&N Islands, Port Blair
- Member, State Level Environment Council, A&N Islands, Port Blair
- Member, Executive Committee of SOC, Andaman Nature Club, Port Blair
- Member, State Level Water Quality Review Committee, A&N Islands, Port Blair
- Member, Andaman& Nicobar Science and Technology Council, A&N Island

- Member, State Level Sanction Committee for Rashtriya KrishiVikas Yojana, A&N Island
- Member, State Level Advisory Committee for Narrow Casting Project under the scheme "Mass Media Support for Agril. Extension" A&N Island
- Member, State Seed Sub-Committee for Agricultural & Horticultural Crops, A&N Island
- Member, Inter Departmental Working Group to Monitor and Oversee the Functioning of Kisan Call Centre of A&N Island
- UT level Monitoring Committee to Monitor the Implementation of programme relating to Rehabilitation of Animal Husbandry
- Member, State Level Watershed Development Committee under Watershed Development Project for rainfed areas in A&N Island
- Member, High Value Agriculture Development Agency for the UT of A&N Island
- Member, Governing Council of Andaman & Nicobar Coconut Mission
- Member UT level Task Force Committee for A&N Island
- Member, Agriculture Technology Management Agency Governing Body of A&N Island
- Member of Scientific Advisory Committee at UT Level
- Member, Steering Committee at the UT Level for Documentation of Traditional Knowledge of Ethno Medicine used by the Tribal People of A&N Island
- Member, Interdepartmental Committee on Encouraging Investments in Supply Chains including Provisions for Cold Storage for more efficient distribution of farm produce
- Chairman, Town Official Language Implementation Committee, Port Blair
- Member, Project Appraisal Committee of A&N Administration, Directorate of Industries, Port Blair
- Member, Panel for Fish and Fisheries Products, Food Safety & Standards Authority of India, Ministry of Health & Family Welfare, New Delhi
- Member, State Level Monitoring Committee (SLMC) for UT of A&N Islands to monitor periodically the Operationalization of National Policy for Farmers

Participation in Important Meeting, Symposium and Workshop

14th to 16th May, 2015	Interactive meeting of Vice Chancellors of AUs and ICAR Directors' held at NASC Complex, Pusa, New Delhi
16th June, 2015	Selection committee meetings for Programme Coordinator, KVK, Car Nicobar and Nimbudera of CIARI, Port Blair held at ASRB, KAB-1, Pusa, New Delhi
25th and 26th July, 2015	87th Foundation day of ICAR & award giving ceremony and 9th National conference on KVK-2015 at Shri Krishna Memorial Hall, Patna (ICAR Research Complex for Eastern Region, Patna
7th and 8th August, 2015	Minicoy Island and CPCRI Farm at Minicoy
26th to 28th August, 2015	NDDB officials at NDDB, Anand and Visited AMUL to discuss nitty-gritty regarding the establishment of biosecurity and quarantine facility at CIARI, Port Blair
11th September, 2015	Workshop on CRP-agro-biodiversity project at NASC, New Delhi on 8th and 9th September, 2015 & attended selection committee meeting for Head of Division of Fisheries Science of CIARI, Port Blair held at ASRB

14th and 15th September, 2015	RGCA, MPEDA Fish quarantine station at Chennai and Plant biosecurity quarantine facility at NBAIR and NIVEDI, Bangalore
19th September, 2015	Mid-term review of action taken on the recommendation of XXII meeting of ICAR Regional Committee-II at CIFRI, Barrackpore
14th October, 2015	Workshop on CRP-agrobiodiversity at ICAR-NBPGR, New Delhi
27th November 2015	Golden Jubilee of green revolution in India held at A.P. Shinde Symposium Hall, NASC Complex, New Delhi
15th December, 2015	Review meeting of settlement of outstanding advances and para of local audit reports of CIARI, Port Blair held at AS&FA, DARE's Chamber of ICAR, New Delhi
17th& 22nd Dec.,, 2015	Assessment committee of CAS at KAB-I, Pusa, New Delhi
23rd and 24th January, 2016	Interactive meeting of the Vice Chancellors of AUs and ICAR Directors' followed by ICAR Directors' Conference at NASC Complex, Pusa, New Delhi
18th to 20th February, 2016	Indian Ecological Society: International conference on Natural resource management: ecological perspectives, held at Jammu Kashmir.
14th March, 2016	Selection committee meeting for HoD (H&F), ICAR-CIARI, Port Blair held at ASRB, KAB-I, New Delhi

Workshop / Seminar /Training Organized

- National Seminar on "Harmonizing Biodiversity and Climate Change : Challenges and Opportunities conducted by Andaman science Association Collaboration of Plant Society Association, Meerut from 17th to 19th April, 2016
- Island Agro Climate Zone Workshop on "Strategies for Development of Agriculture and its Allied Sectors of Island Region" on 18th November, 2015
- Model Training Course (MTC) on "Integrated Farming System (IFS) for Tropical Islands" sponsored by Directorate of Extension, Ministry of Agriculture (Department of Agriculture and Cooperation), Krishi Vistar Bhavan, Pusa, New Delhi at CIARI, Port Blair from 27th January to 3rd February, 2016
- District Level Seminar on "Production and Value Addition of Spices" at CIARI, Port Blair on 26th February, 2016
- National Seminar on "Strategies for the Development of Food Processing Sector in the Islands" at CIARI, Port Blair on 29th March, 2016

New initiatives

- Status of resource support agency (RSA) and producer organization promoting institutions (POPI) was accorded by NABARD, Port Blair to ICAR-CIARI and three KVKs functioning under Administrative Control of Director, CIARI
- District contingency plan for three district of A&N Islands is being developed in collaboration with CRIDA, Hyderabad
- Registration of indigenous germplasm such as Teressa Goat, Nicobari Pig with NBAGR, Karnal
- Institute has been renamed as Central Island Agricultural Research Institute to act as a model for tropical Island agriculture research to the South East Asian Countries
- Revisited mandate of the Institute after 39 years
- Land for establishment of bio security laboratory for conservation of flora and fauna and bio diversity park were identified

- Pesticide residue laboratory and mushroom spawn production unit has been established.
- Taking over of KVK, located at Kiltan, Lakshdweep
- Kisan Portal and Aap Ke Sawal with DDK, Port Blair.

Administration/ Management/Coordination

As the Director of the Institute has been engaged in day to day administration, monitoring the progress of research by interacting with the Head of Divisions, Scientists and KVK personnel, conducting visit to experimental plots, visiting farmer's field and getting their feedback. Coordinating functional linkages with offices of Andaman & Nicobar Administration and mainland for ensuring technology sharing for the benefit of the stakeholders of the Islanders.

For the period , thirty one institute & forty eight external funded projects were monitored, beside seven State Interface meeting, one farmers fair, validation of eighteen technologies at farmers field, one hundred sixty eight training (5989 trainees got benefitted) and fourty seven skill upgradtion / updating knowledge for scientific staff, was conducted. The research outcome was thirty eight National and forty five International paper of which twenty seven research article were of more than six NAAS rating. In addition fifty four technological bulletins, many success stories and Institute profile in ICAR news, Inflight magazine (Subh Yatra) and Andaman chronicle was published.

Resource generation

- From externally funded projects an amount of Rs. 1459 lakhs were approved during the period from different funding agencies.
- Revenue of Rs.18,57,891.00 was obtained from farm produce of Animal Science, Sipighat, Bloomsdale and Garacharma farm and Laboratory analysis, beside Rs. 22,82,812.00 was generated from guest houses.
- From KVK, South Andaman, through sale of farm produce (coconut /arecanut/eggs/fish fingerlings/vegetable and fruits) an amount Rs. 46, 473/- and from farmer's hostel Rs. 6,000/- was generated.

Budget utilization

- Out of allotted Rs. 6,50,00,000 of Plan budget, Rs.5,97,66,528 lakh was utilized (91.95%) and in Non-Plan of Rs. 13,79,00,000 , Rs. 13,75,40,242 lakh was utilized (99.74%).

Participation of Scientist in Conference/ Seminar/ Symposium/ Meetings & Training

Scientist	Program	Venue	Date / Duration
V. Baskaran	Annual Group Meeting Of AICRP On Floriculture	SKUAST-K Srinagar, J& K	April 2015
A. Kundu, B. Gangaiah R.K.Gautam, S.K. Zamir Ahmed Jai Sunder, M.S.Kundu, P.K.Singh, A. Velmurgan, Awnindra K Singh, T.P. Swarnam, Kiruba Sankar, R, T. Subramnai and S. Swain, T.Sujatha K.Sakthivel, T.Bharathimeena, K. Abirami, S. Monalisha Devi, K. Lohith Kumar , A. Anuraj , J. Raymond Jani Angel, K. Saravanan, Venkatesh R. Thakur, T. Sivaramakrishnan, A.K.O. Ratheesh, Arunjyoti Baruah, J. Praveenraj, Pooja Bohra & Ajit Waman	National Seminar on Harmonizing Biodiversity and Climate Change: Challenges and Opportunity	CIARI, Port Blair	17th - 19th April, 2015
Jai Sunder & S.K. Zamir Ahmed	RAC Meeting	ICAR-CIARI, Port Blair	20th – 21st April, 2015
V. Damodaran	15th Annual Group Meeting of AICRP on Tuber Crops	YSR Horticultural University, V.R. Gudeum	23rd - 25th April, 2015
I. Jaisankar	Second Meeting of the Task Force for PPVFRA – Noni	NASC Complex, New Delhi	8th May, 2015
Awnindra K Singh	Annual Kharif/ Rabi Group Meet of Pulses	Birsa Agricultural University, Kanke, Ranchi (Jharkhand)	22nd -24th May, 2015
Ajit Waman	Annual General Meeting of AICRP on Palms	ICAR-CCARI, Goa	26th - 29th May, 2015
Awnindra K Singh	9th Annual Workshop of CSS on Monitoring of Pesticides Residue at National Level	Kerala Agricultural University, Vellayani (Kerala)	28th -29th May, 2015

S.K. Zamir Ahmed	2nd Meeting Of The Task Force Committee On "Biotechnology Based Programme For SC/ ST Population And Rural Development"	New Delhi	1st to 2nd June, 2015
A. Velmurgan	XXIV Biennial Workshop of AICRP on Management of Salt Affected Soils and use of Saline Water in Agriculture	AICROP Centre, Agra at CIRG, Makhdoom, Agra	5th - 6th June 2015
S. Swain	National Conference on Sustainability Issues in Food Processing Sector (SIFPROS) "Greening of Food Processing Industries"	NIFTEM, Haryana	18th -19th June, 2015
K. Abirami	9th Annual Review Meeting of CSS-NHM Project on Spices	Horticultural College and Research Institute, Venkataramannagudem, Tadepalligudem	19th to 20th June, 2016
K. Sakthivel	XVII Annual Workshop of All India Coordinated Research Project on Mushroom	ICAR- DMR, Solan	29th -30th June, 2015
Nagesh Ram	National Conference of KVK organised by ATARI, Kolkata	Patna	25th to 26th July, 2015
A. Velmurgan	Workshop on Research Data Management in ICAR	NASC Complex, New Delhi	04th -05th August,2015
V. Baskaran	3rd International Symposium on Underutilized Plant Species: Exploration and Conservation for Future Generation.	TNAU, Madurai, Tamil Nadu	5th -8th August,2015
P. K. Singh	X Annual Review Meeting of ICAR Seed Project- Seed Production in Agricultural Crops	ICAR Central Coastal Agricultural Research Institute, Goa.	24th - 25th August, 2015
Jai Sunder	Meeting with Official of NDDB regarding Construction of BSL and Quarantine Facilities	NDDB, Anand	26th August, 2015
K.Sakthivel	Annual Group Meet of ORP-Fungal Foliar Diseases	ICAR- IIHR, Bengaluru	07th Sept., 2015
Nagesh Ram	National Seminar on Resource Based Inclusive Agriculture & Rural Development: Opportunities & Challenges	Faculty Center of Integrated Rural Development and Management (IRDM), Kolkata	15th -16th January, 2016
K.Sakthivel	Rapid Diagnostic Tools for *Phytophthora* on Horticultural Crops	ICAR- IIHR, Bengaluru	08th Sept., 2015

Jai Sunder	Annual Review Meeting of AICRP- Goat	ICAR-CIRG, Makdhom	07th – 08th Sept., 2015
L.B.Singh & N.C. Choudhuri	Training on Spawn Production Technology on Mushroom	Directorate of Mushroom Research, Solan,Himachal Pradesh	7th to 9th Sept., 2015
Jai Sunder	Workshop Under the Consortia Research Platform on Agro Biodiversity	ICAR-NBPGR, New Delhi	09th Sept., 2015
	Meeting With Officials of MPEDA, ICAR-NBAIR, ICAR-NIVEDI Regarding Construction of BSL and Quarantine Facilities	Chennai & Bengaluru	14th -15th Sept., 2015
K. Saravanan	International Seminar on FAO Reducing and Managing the Risk of Acute Hepatopancreatic Necrosis Disease (AHPND) of Cultured Shrimp: Re-Echo Seminar on AHPND	NBFGR, Lucknow	14th -15th Sept., 2015
A. Kundu	Annual Review Meet on Poultry Seed Project	Delhi	15th & 16th Sept., 2015
Jai Sunder	Midterm Review Meeting of RCM	ICAR-CIFRI, Barrackpore	19th Sept., 2015
V. Damodaran	2nd Midterm Review Meeting of AICRP on Tuber Crops	ICAR- CTCRI, Thiruvananthapuram	24th -25th Sept., 2015
Sophia Inbaraj	6th World Congress on Biotechnology	New Delhi	5th -7th , Oct., 2015
Sulochana	Rajbhasha Sammelan	Rajbhasha Seva Sansthan, New Delhi at Goa.	7th -9th October, 2015
Jai Sunder	Annual Review Meeting of AICRP-ADMAS	Trivandrum	8th – 9th Oct., 2015
S.K. Zamir Ahmed	Interaction with DDG(AE), On MGMG at ICAR ATARI, Kolkata	ICAR -ATARI, Zone II, Kolkata	1st Nov., 2015
P. K. Singh	Training on Quantitative Techniques for Analysis of Breeding Experiments	ICAR-NAARM, Hyderabad	2nd -7th Nov., 2015.
Chandrika Ram	Winter School on Recent Advances in Development of Automatic System / Machines for Secondary Agriculture	ICAR-CIPHET, Ludhiana (Punjab)	18th Nov., to 8th Dec., 2015
Jai Sunder, S.K. Zamir Ahmed, V. Baskaran, K. Abirami & Ajit Waman	Island Region Workshop on Strategies for Development of Agriculture and its Allied Sectors of Island Region	ICAR-CIARI, Port Blair	18th Nov., 2015

T.Sujatha	IPSACON- 2015	Kerala Veterinary and Animal Sciences University, Palakkad, Kerala.	19th – 21st Nov., 2015
A.Kundu M.S.Kundu	XXIII International Grasslands Congress 2015	Delhi NCR	20th – 24th Nov., 2015
Jai Sunder, S.K. Zamir Ahmed & Ajit Waman	Quarterly Review Meeting of the A & N Administration and CIARI Coordination Committee	ICAR-CIARI, Port Blair	20th Nov., 2015
V. Damodaran	Tuber Crops Food Festival-2015	ICAR- CTCRI at Kanakakunnu Palace, Thiruvananthapuram	24th -25th Nov., 2015
Jai Sunder	Region Workshop on Dairy Entrepreneurship Organized by NABARD	Port Blair	24th Nov.,2015
K. Lohith Kumar A. Anuraj & J. Raymond Jani Angel	International Conference on cage aquaculture in Asia CAA5	CMFRI, Cochin	25th -28th Nov., 2015
B. Gangaiah, T.P. Swarnam and T. Subramnai	Workshop on Water Conservation, Water Security and Water Quality	ICAR-CIARI, Port Blair	27th Nov., 2015
S.K. Zamir Ahmed	3rd Meeting of The Task Force Committee on Biotechnology Based Programme for SC/ ST Population and Rural Development	New Delhi	1st- 2nd Dec., 2015
Awnindra K. Singh & V.Baskaran	Advancement of Agrobiodiversity Sciences: International Conference on Biodiversity, Agriculture, Environment and Forestry	Ooty, Tamil Nadu	11th -12th Dec., 2015
B. Gangaiah and T.P. Swarnam	Coordination meeting between ICAR-CIARI and Andaman Administration	ICAR-CIARI, Port Blair	4th Jan., 2016
Sulochana	International Seminar	Antarashtriya Sahitya Kala Manch, JNRM, Port Blair	12th Jan.,2016
A. Velmurgan & A. K. O. Ratheesh	National Symposium on "Innovations in Coastal Agriculture- Current Status and Potentials Under Changing Environment"	IIWM, Bhubaneswar	14th -17th Jan., 2016
K. Saravanan	National Consultation on Managing EHP Infections in Brackishwater Aquaculture in India	CIBA, Chennai	19th Jan., 2016

S. Swain	National Symposium on Agricultural Engineering in Nation Building: Challenges and Opportunities	OUAT, Bhubaneswar	19th -21st Jan., 2016
Arunjyoti Baruah and Nagesh Ram	National Seminar on Fisheries and Aquaculture: Livelihood Security, Sustainability and Conservation	COF, Tripura	21st -22nd , Jan., 2016
Pooja Bohra	CRP- AB Southern Cluster Review Meeting	ICAR- IISR, Kozhikode	27th Jan., 2016
S.K. Zamir Ahmed	Workshop on Farmers Producer Group	NABARD at Diglipur, North & Middle Andaman	3rd Feb., 2016
	Kisan Sameelan	Nimbudera	4th Feb., 2016
R.K. Gautam	Competency Development for Human Resource Development of Nodal Officers of ICAR	NAARM, Hyderabad	10th -12th Feb., 2016
Divya Parisa	National Symposium of Vegetable Legumes for Soil and Human Health	ICAR- IIVR Varanasi	12th -14th Feb., 2016
T. Bharathimeena	Annual Review Meeting on the ORP on Management of Sucking Pests of Horticultural Crops	ICAR-IIHR, Port Blair	13th Feb., 2016
A. Anuraj	International Conference on Aquatic Resources and Sustainable Management	Science City, Kolkata	Feb 17-19, 2016
Awnindra K Singh	IES: International Conference on Natural Resource Management: Ecological Perspectives	SKUAST-Jammu (J & K)	18th - 20th Feb., 2016
A. Velmurgan	National Seminar on Geopolitics and Maritime Security in the Indian Ocean	A&N Command, Port Blair	19th -20th Feb., 2016
B. Gangaiah and S. Swain	District Level Seminar on Production and Value Addition in Spices	ICAR-CIARI	26th - 27th February, 2016
T. Subramani	BTISnet Annual Bioinformatics Coordinators Meeting Organized by DBT, New Delhi	Nainital, UK	03rd - 04th March, 2016
K. Abirami	Third Annual Group Meeting of AICRP on Fruits	PAU, Ludhiana	3rd – 6th March, 2016
T. Subramani	Workshop on Patinformatics Organized by DBT, New Delhi	Nainital, UK	5th March, 2016

Nagesh Ram, S.K. Zamir Ahmed, L. B. Singh, Z. George, Amit Srivastava, Shailesh Kumar	Training Programme On Farmers Producers Organisations (FPO)	Bankers'Institute of Rural Development, Mangalore and NABARD, Port Blair	14 to 16th March, 2016
Ajit Waman	International Symposium on Sustainable Horticulture- 2016	Mizoram University, Aizawl	14th -16th March, 2016
V. Baskaran & K. Abirami	Strategies for the Development of Food Processing Sector in the Islands	ICAR-CIARI, Port Blair	23rd March, 2016

Human Resources Development of Stakeholders

Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
Training to stakeholders					
National seminar on harmonizing biodiversity and climate change – challenges and opportunity	17th – 19th April, 2015	146	Scientists, Farmers Representative, Officials, Policy Makers	ICAR-CIARI, Port Blair	ASA, ICAR-CIARI, Port Blair
Post harvest processing and value addition in fruits and vegetables	26th May, 2015	82	SHG women	Swadesh Nagar, Nimbudera	NRM & ORC
Captive breeding and larviculture of anemone fishes	18th-20th June, 2015	4	Fishers	MRL, Marine Hill	FSD
HYV of rice and nursery management	11th June, 2015	21	Farmers	Kerelapuram, North Andaman	FCI&P & ORC
High yielding varieties of rice and their nursery management	11th June, 2015	45	Farmers	Diglipur, North Andaman	FCI&P & ORC
CIARI bio-consortia for bacterial wilt management in solanaceous crops	23rd July, 2015	30	Farmers	Harminder Bay, Little Andaman.	FCI&P
Induced breeding and culture of carps	21st-23rd July, 2015	16	Fishers	ATIC, CIARI	FSD
Changing weather and plant protection	28th July, 2015	20	Farmers	Collinpur, S. Andaman	NRM
Pulse crops & varietal intervention and resource management for enhancing pulse productivity in the Islands	31st July, 2015	28	Farmers	Mameyo, South Andaman	FCI&P & NRM
Post harvest processing and value addition of mango, pineapple and Jamun	3rd - 5th Aug., 2015	48	SHG women	ATIC, CIARI	NRM
Skill development and capacity building for marine capture fishers	7th Oct- 5th Nov, 2015	35	Fishers	Directorate of Industries, Port Blair	Directorate of Industries, Port Blair
Farmers participatory seed production	8th Oct., 2015	61	Farmers	Diglipur, North Andaman	FCI&P & ORC
Kisano ki sahbhagita se bhij utpadhan	8th Oct. 2015	62	Farmers	Kerelapuram, North Andaman	FCI&P & ORC

Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
Cultivation of non traditional vegetables	12th to 14th Oct. 2015	58	Farmers	Kerelapuram, North Andaman	KVK Nimbudera
Household food and nutritional security through integrated farming systems in Nicobar Islands	8th - 11th Nov., 2015	30	Farmers	Car Nicobar	NRM & KVK-Nicobar
Fish feed preparation for IMC and Magur	21st -23rd Dec., 2015	10	Fishers	ATIC, CIARI	ICAR-CIARI
Development of value added products from coconut: a venture for rural youths in the Islands	28th - 30th Dec., 2015	60	Farmers and farm women	ATIC, CIARI	NRM
Seed production and culture of Indian major carps	28th-30th Dec., 2015	14	Fishers	KVK, Sippighat	ICAR-CIARI
Enhancing the productivity of arecanut and coconut plantations through incorporation of suitable intercrops	11th Jan., 2016	24	Farmers	Sibapuram, Middle Andaman	ICAR-CIARI
Skill development and capacity building on entrepreneurship in fisheries and aquaculture	18th Jan. – 16th Feb., 2016	17	Farmers	Directorate of Industries, Port Blair	Directorate of Industries, Port Blair
Agricultural technologies for enhancing farm income	4th Feb., 2016	25	Farmers	Kanniyapuram, South Andaman	NRM
Demonstration on coconut climbing device	4th Feb., 2016	21	Farmers	Kanyapuram, South Andaman	ICAR-CIARI
Organic farming and safe use of pesticides	5th Feb.,2016	33	Farmers	Kerelapuram	NRM Division.
Farming and weather relation	5th Feb., 2016	55	Farmers	ORC, Diglipur	NRM and ORC
Importance of tuber crops for food and nutritional security of tribal areas in Nicobar Island	8th to 11th Feb., 2016	30	Farmers	Car Nicobar	NRM & KVK-Nicobar
Intensive pig farming	19th -22nd Feb., 2016	28	Farmers	Car Nicobar	NRM & KVK-Nicobar

Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
Organic farming for sustainable agricultural production	22nd -25th Feb., 2016	40	Farmers	Car Nicobar	NRM & KVK-Nicobar
Basics of Bioinformatics	22nd - 24th Feb., 2016	43	Students	CIARI, Port Blair	NRM
Fish health management in island aquaculture	24th – 26th Feb., 2016	25	Farmers	ATIC, CIARI	NFDB
Scientific goat farming	16th Dec.,2015	44	Farmers	Namunaghar, South Andaman	ASD & KVK
Scientific rearing of goat for improving productivity	17th Dec.,2015	17	Farmers	Indiranagar, South Andaman	ASD & KVK
Scientific rearing of goat for improving productivity	23rd Dec., 2015	28	Farmers	Mithakhari, South Andaman	ASD & KVK
Scientific rearing of goat for improving productivity	30th Dec., 2015	18	Farmers	Mithakhari, South Andaman	ASD & KVK
Scientific rearing of goat for improving productivity	9th Jan., 2016	43	Farmers	Baratang, Middle Andaman	ASD

Extension Activities

Title	Period	Participants (Nos.)	Type of participants	Venue	Conducted by
Awareness on National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) of Andaman and Nicobar Islands	10th June, 2015	13	Farmers	Billy Ground, Middle Andaman	ICAR-CIARI
	11th June, 2015	32	Farmers	Diglipur, North Andaman	ICAR-CIARI
	14th June, 2015	42	Farmers	Rangat, Middle Andaman	ICAR-CIARI
	29th July, 2015	23	Farmers	Havelock, South Andaman	ICAR-CIARI
	30th July, 2015	27	Farmers	Neil, South Andaman	ICAR-CIARI

Title	Period	Participants (Nos.)	Type of participants	Venue	Conducted by
Sensitization workshop on national surveillance programme for aquatic animal diseases (NSPAAD) of Andaman and Nicobar Islands	31st Aug, 2015	53	Farmers	CIARI	NFDB
Awareness on FMD in cattle	17th Oct., 2015	32	Farmers	Badmashpahar, South Andaman	ASD & KVK
	19th Oct., 2015	23	Farmers	Calicut, South Andaman	ASD & KVK
	27th Oct., 2015	18	Farmers	Boednabad, South Andaman	ASD , DAHVS & KVK, South Andaman
Awareness on national surveillance programme for aquatic animal diseases (NSPAAD) of Andaman and Nicobar Islands	11th Dec., 2015	36	Farmers	Mayabunder, Middle Andaman	ICAR-CIARI
Awareness on mera gaon mera gaurav	16th Dec., 2015	31	Farmers	Namunaghar, South Andaman	KVK, South Andaman
	23rd Dec., 2015	28	Farmers	Mithakhari, South Andaman	KVK, South Andaman

Field day conducted

- Farmers participatory seed production at Diglipur, North Andaman on 9th October 2015 under ICAR seed project seed production of agricultural crops. Total of 25 farmers (23 Male and 02 Female) participated.
- Farmers participatory variety selection under STRASA project at farmers field Creakabad, Chouldari, South Andaman on 17th October 2015. A total of 49 farmers (34 Male and 15 Female) participated.
- Production and value addition of spices in the island at farmers' field at Mameyo and Manglutan, South Andaman on 27.02.2016.

Seed day

- Seed day at CIARI Bloomsdale Research Farm, Chouldari on 29th September 2015 under ICAR Seed Project. Total of 70 farmers (44 Male and 26 Female) participated. CARI Brinjal seed, technical bulletin on brinjal and rice seeds were distributed to the farmers.

Radio Talks

Title	Date of broadcast	Expert
Vaigyanik paddati se bakri palan	09th June, 2015	Jai Sunder
Family poultry production system for A&N Islands	9th June, 2015	A. Kundu
High yielding rice varieties for the islands	10th June, 2015	R.K. Gautam
Machliyon main projanan	22nd June, 2015	Nagesh Ram
Planting technique on arecanut	22nd June, 2015	L.Brojendra Singh
Barsat main murgi palan	22nd June, 2015	N.C.Choudhuri
Backyard poultry	28th June, 2015	
धान की किस्में व नर्सरी प्रवंधन	3rd July, 2015	P. K. Singh
Changing weather and need for agro-advisories	31st July, 2015	A.Velmurugan
Samanvit krishi pranali	19th Aug., 2015	Nagesh Ram
Culture of IMC	17th Aug, 2015	Venkatesh R Thakur
Better management practices in fish culture	3rd Oct., 2015	K. Saravanan
Potential fishing zone (PFZ) advisories and its benefits for increasing fish catch in Andaman and Nicobar Islands	10th Oct., 2015	R. Kiruba Sankar
Scope for development of fisheries sector in Andaman Islands	2nd Dec., 2015	
Disease management in freshwater aquaculture	2nd Dec., 2015	K. Saravanan
Feed preparation and its management	2nd Dec., 2015	T. Sivaramakrishnan
Scientific cultivation of mungbean in the islands	8th Dec., 2015	Awnindra K Singh
Bakriyon me rog prabhandan	09th Dec., 2015	Jai Sunder
Kisano ke leya CIARI ka Out Reach Centre	9th Dec., 2015	S.K. Zamir Ahmed
Post harvest processing and value addition in spices	10th Dec., 2015	Sachidananda Swain
Fodder tree cultivation under coconut plantation (Tamil)	10th Dec., 2015	I. Jaisankar
Mera Gaon Mera Gaurav	11th Dec., 2015	S. Dam Roy
Benefits of potential fishing zone advisories	14th Dec., 2015	K. Lohith Kumar
Bakriyon me rog prabhandan	17th Dec., 2015	Jai Sunder
Integrated weed management	9th March, 2016	B. Gangaiah
Role of KVK s in Andaman	14th March, 2016	Nagesh Ram
Planting technique on fruit crops	15th March, 2016	L Brojendra Singh
Utilization of solar energy for the drying of agricultural produce	25th March, 2016	Sachidananda Swain

Farm School (in Tamil)

Title	Date of broadcast	Expert
Weather based farming	Weekly program (April 2015 to February 2016)	A.Velmurugan
Enhancing food production and organic farming in the coastal areas	8 weeks (Oct., 15 to Dec., 15)	A.Velmurugan, T.P.Swarnam, I. Jaisankar, K.Sakthivel
IFS for prosperity and stability	4 weeks (Nov.-Dec., 15)	A.Velmurugan, T.P.Swarnam, I.Jaisankar, Saravanan and Sivaramakrishnan

Doordarshan Interview

Title	Date of broadcast	Expert
Technologies of CIARI for the benefit of island farmers	1st April, 2015	S.K. Zamir Ahmed
Island Kisan Mela	4th April, 2015	S. Dam Roy & S.K. Zamir Ahmed
Dweep mein phal aur phoolon ka utpadhan	15th April, 2015	L.B.Singh
Live stock farming and employment generation	8th April 2015	A.Kundu
Nicobari fowl	04th May, 2015	N.C.Choudhuri
Dairy farming in the Islands	20th May,2015	Dr.A.Kundu
Balance diet for rural women and children	06th June, 2015	Harapriya Nayak
Alternate poultry in the Islands	10th June 2015	A.Kundu
Teressa goat farming	3rd July, 2015	Jai Sunder
Diseases of cattle during rainy season	15th July, 2015	
Coconut based cropping systems in A&N Islands	10th Aug, 2015	V. Damodaran
Integrated farming system	19th Aug., 2015	Nagesh Ram
Scientific cultivation technique on nutmeg	3rd Sept., 2015	L.B.Singh
Scientific cultivation of banana	3rd Sept., 2015	K. Abirami
Prospectus of tuber crops cultivation in A&N Islands	9th Sept., 2015	V. Damodaran
द्वीपों में अरहर की खेती की संभावनाएँ	1st Oct.,2015	Awnindra K Singh
Production of veg. in A & N Island	07th Oct., 2015	L.B.Singh
Herbicides for weed management in rice	13th Oct., 2015	B. Gangaiah
द्वीपों में मूंग एवं उरद की खेती (*On-farm*)	17th Oct.,2015	Awnindra K Singh
Mushroom spawn prodn. & cultivation technique	20th Oct.,2015	N.C.Choudhuri
Weed management in *rabi* food crops and vegetables	4th Nov., 2015	B. Gangaiah

Foot and mouth disease in cattle	4th Nov., 2015	Jai Sunder
Prospects in agricultural & allied sectors	17th Nov., 2015	S. Dam Roy
Diseases of cattle and its prevention	25th Nov.,2015	Jai Sunder
Development of value added products from pine apple	26th Nov., 2015	Sachidananda Swain
New high yielding rice varieties, seed production and its and dissemination.	27th Nov., 2015	P. K. Singh
Weed management in horticultural crops	30th Nov., 2015	B. Gangaiah
Cultivation of golden rod as a filler in bouquets	1st Dec., 2015	V. Baskaran
Induced breeding of Indian major carps	4th Dec., 2015	A. Anuraj
Importance of SHC	03rd Dec., 2015	Nagesh Ram
Intensive broiler farming	05th Dec.,2015	N.C.Choudhuri
Tribal Sub Plan	07th Dec., 2015	Jai Sunder
Protected cultivation of high value crops	10th Dec., 2015	T. Subramani
Scientific cultivation of turmeric in A&N Islands	17th Dec, 2015	V. Damodaran
द्वीपों में मूंग एवं उरद की खेती (*in studio live*)	23rd Dec.,2015	Awnindra K Singh
Fish feed preparation	5th Jan, 2016	T. Sivaramakrishnan
Importance of soil health	18th Feb., 2016	Nagesh Ram
Mitti evam jal sanrakshan ke upay	18th Feb., 2016	Manoj Kumar
Seed production technology of IMC	11th Aug., 2014	S. Monalisha Devi

Training and Capacity Building

A. Physical targets and achievements

S. No.	Category	Total No. of Employees	No. of trainings planned for 2015-16 as per ATP	No. of employees undergone training during		
				April-September 2015	Oct., 2015 – March, 2016	April, 2015 – March, 2016
1.	Scientists including KVK Heads	40	13	6	7	13
2.	Technical + KVK SMS	49	6	Nil	6	6
3.	Administrative & Finance	19	4	Nil	4	4
4.	SSS & TSM	95	Nil	Nil	Nil	Nil
	Total	**183**				

B: Category-wise training attended by employees during 2015-16

Category: Scientific staff						
S. No.	**Name of employee**	**Designation**	**Discipline/ Section**	**Name of training programme attended**	**Duration (days)**	**Organizing Institution**
1.	R.K. Gautam	Pr. Scientist & Head	FCIP	Competency development for human resources development Nodal Officers of ICAR	03	NAARM, Hyderabad
2.	Jai Sunder	Pr. Scientist	Animal Science	Outbreak response in Anthrax	04	ICAR-NIVEDI Bangalore
				FMD DSS Soft ware training	02	ICAR-FMD Mukeshwar
3.	P. K Singh	Senior Scientist	FCIP	Quantitative techniques for analysis of breeding experiments	05	ICAR-NAARM, Hyderabad
4.	K. Muniswamy	Scientist	Animal Science	Orientation for veterinarian-radiology and ultrasonography	02	Andaman and Nicobar veterinary council
5.	Soobedar Yadav	Scientist	Horticulture & Forestry	Professional attachment training	03	ICAR- IISR Kozhikode, Kerela
6.	A. K. O. Ratheesh	Scientist	Division of Fisheries Science	Fish ageing using hard parts for fish stock assessment	05	CMFRI, Kochi

7.	Anuraj. A	Scientist	Division of Fisheries Science	Micro-propagation of Seaweeds	06	CSMCRI, Bhavnagar, Gujarat
8.	T. Sivaramakrishnan	Scientist	Division of Fisheries Science	Professional attachment training	90	CIBA, Chennai
9.	Arunjyoti Baruah	Scientist	Division of Fisheries Science	Professional attachment training	91	CIFA, Bhubaneswar
10.	A. K. O. Ratheesh	Scientist	Division of Fisheries Science	Professional attachment training	113	CMFRI, Kochi
11.	J. Praveenraj	Scientist	Division of Fisheries Science	Professional attachment training	90	CIBA, Chennai

Category: Technical staff

S. No.	Name of employee	Designation	Discipline/ Section	Name of training programme attended	Duration (days)	Organizing Institution
1.	Ani Dath	Sr. Technical Officer	Computer Cell	Competence enhancement training programme for technical officer of ICAR	10	NAARM, Hyderabad
2.	L.B. Singh	SMS (Hort)	KVK, South Andaman	Mushroom spawn production technology	03	Directorate of Mushroom, Solan, H.P.
3.	N.C. Choudhuri	ACTO (A.Sc.)	KVK, South Andaman	Mushroom spawn production technology	03	Directorate of Mushroom, Solan, H.P.
4.	Pooja Kapoor	SMS	KVK, Nimbudera	A total value chain for processing of vegetable crops for nutritional security	12	IIVR, Varanasi
5.	T.P. Swapna	Sr. Technician	Animal Science Division	Orientation for veterinarian-radiology and ultrasonography	02	Andaman and Nicobar veterinary council
6.	M. Naga Venkat Laxmi	Technician	NRM	XII advanced level training in soil testing, plant analysis and water quality assessment	21	IARI, PUSA New Delhi

Category: Administrative staff

S. No.	Name of employee	Designation	Discipline/ Section	Name of training programme attended	Duration (days)	Organizing Institution
1.	R.N. Mozumdar	AAO	DDO	Office procedures and tax laws	04	RGCMI, Port Blair
2.	P.K. Roy	Assistant	Bill & Cash	Office procedures and tax laws	04	RGCMI, Port Blair
3.	Nehru Ram	Sr. Clerk	Bill & Cash	Office procedures and tax laws	04	RGCMI, Port Blair
4.	P Kakesh Rao	Jr. Clerk	Central store	Office procedures and tax laws	04	RGCMI, Port Blair

Round Up of Institute Main Activities

Island Kisan Mela

Island Kisan Mela (IKM)-2015 under the theme "Island Agriculture" was conducted on 9th April 2015 at the Central Island Agriculture Research Institute (CIARI) Mela Ground. The Member of Parliament, Shri Bishnu Pada Ray inaugurated the Mela as the chief guest.

Addressing the gathering, the Member of Parliament highlighted the Government's commitment for the welfare of the people of the country, especially the farming community. Various schemes have been implemented for the benefit of the farmers to help them improve the productivity in agriculture, he said.

Referring to CIARI activities, Shri Ray said that CIARI had achieved success in preparing seedlings for different agriculture products which would be made available to the farmers. He urged the CIARI scientists to assist the Islands' farmers by providing high yielding breeds and seedling of brinjal, Andaman papaya, broiler ducks, Nicobare fowl, Teressa goats, Andaman sapota etc. which will add more income to the farmers, he said.

Earlier, the Member of Parliament visited the exhibition stalls, put up by the famers and different departments as part of the kisan mela and interacted with farmers.

In his presidential address, Dr. S Dam Roy, Director ICAR-CIARI highlighted the activities of CIARI and said that the Islands are hot bio-diverse spot and CIARI is making all efforts to provide modern agriculture technology not only to improve agriculture productivity but also to preserve those varieties available only in the Islands. This kisan mela is a platform for sensitizing the farmers of the new technology, he added.

About 400 farmers from different parts of the Islands participated in the mela. The Departments of Industry, Agriculture, Fisheries, AH&VS besides NGOs, SHGs and National Research Center for Banana (NRCB) Tiruchirrapally of Tamil Nadu have put up their stalls in the Mela. Later, a programme 'ek mulakat vaigyanik evam kisano ke saath', was conducted in the afternoon in which scientists and farmers interacted and exchanged knowledge on agricultural activities.

Farm Innovators Meet (FIM)

Farm Innovators Meet was conducted on 10th April, 2015 which was inaugurated by the Chief Guest, Shri J B Singh, Secretary (Agriculture, AH&VS & Fisheries), A&N Administration at Mela Ground.

Speaking on the occasion the Chief guest lauded the efforts of the Institute for conducting such a big event for the benefit of the farmers from far-flung areas . He was also happy to note the participation of the farmers and also the school students in the event. The Institute represents itself to be of National level offering technologies in agriculture & allied fields for the benefit of the Island farmers. A good synergy is there between the line departments and the Institute and we have to think to deliver integrated technologies to the farmers representing all the sectors. Initially he had a complete view of the stalls, the innovative product and the process displayed and also the technological demonstration and exposition.

Dr.S.Dam Roy, Director, ICAR-CIARI gave a brief outline on the importance of the conservation of biodiversity, custodian farmers and farmers right. He expressed his happiness on the display of the innovative products/ process by farmers during the event, which was very informative and learning of the farmers wisdom. He gave certificates

and prizes to the successful farmers who had adopted technologies in various fields as livelihood with the technical support of Division of Horticulture and Forestry, Animal Science, Field Crops, Fisheries, Natural Resource Management, KVK and Out Reach Centre along with the innovative farmers. Among the outside participants, Department of Animal Husbandry got the First position amongst the stall followed by Agriculture and RAIDCO the 2nd and 3rd position and amongst the Institute, Division of Field Crop Improvement and Protection bagged the First prize followed by Division of Animal Science and Division of Fisheries 2nd and 3rd position respectively. The other participating department namely Industries, NCUI, NRC Banana, Trichy and the Divisional stalls also received the appreciation for participation. The Kisano Ke Liye Quiz was appreciated by one and all.

37th Foundation Day Celebration

ICAR-Central Island Agricultural Research Institute (CIARI) celebrated its 37th Foundation Day at its conference Hall on 23rd June, 2015. The Chairman, Agricultural Scientists Recruitment Board, New Delhi, Dr. Gurbachan Singh was the Chief Guest and Dr. C. Raghunathan, Officer I/c ZSI, Port Blair Dr. H. R. Ranganath, Pr. Scientist, IIHR, Bangalore and Shri Phalguni Gangopadhya, Ex-Librarian of the host Institute were the guests of honours on the occasion.

At the outset Dr. S. Dam Roy, Director, ICAR-CIARI welcomed the gathering on the 37th foundation day and spoke on the sojourn of the CARI to CIARI. During his speech he remembered the earlier Directors, who had given their vision in shaping the Institute. He also highlighted on the mission, vision and the significant accomplishment achieved by the Institute, benefitting the farmers, women, youth and other stakeholders of the Islands over the year.

The Chief guest, Dr. Gurbachan Singh, Chairman, ASRB, New Delhi in his address lauded the efforts and achievements of the Institute and also the contributions of the Scientists and others for taking the Institute this far. He expressed his happiness on remembering the earlier Directors and their contribution on this occasion. He shared his experiences while, serving in different capacity for bringing out desirable outcome in the field of research, development and extension for the benefit of the farmers and country as a whole. He said agriculture is an engine for the economic growth of the country and called upon the scientists and policy makers to develop technologies and policies which will not only be beneficial for the farming families, but will also ease the means to earn their livelihood.

Dr. Singh also dwelt at length on the agricultural system of the country and its present scenario at National level and touched upon the Islands' agricultural scenario. He said the Islands are a hotspot for biodiversity, hence conservation of the Islands' biodiversity is very important. He suggested measures in which the Islands' Agricultural sector can be taken forward. He also stressed on the need for exploitation of green energies such as solar, wind and water, multiple use of resources (integrated farming system), organic farming, introduction of climate resilient, crops/ animals and also on the importance of rainwater harvesting both *ex* and *in situ* in these Islands. He concluded his speech by giving on the major programmes like More Drop per Crop, Lab to Land, Digital India, Swatch Bharat and Kisan Channel as suggested by our honourable Prime Minister, which should be followed in principle. He also released publications like Journal of Andaman Science Association, Indigenous

Animal Genetic Resources of A & N Islands, Agriculture Production guide for Nicobar Islands and Multipurpose Fodder Trees in IFS. On the occasion, scientists, officers and division were felicitated by the chief guest and other dignitaries for their meritorious contributions and commendable service, which was coordinated by Dr. R.K. Gautam, HoD, FCI&P and Chairman, Award Committee. Beside former employees were also honoured. A 'Fellow Award' of Andaman Science Association was conferred upon Dr. H.R. Ranganath. List of awardees is given below:

S.No.	Name of the Award	Name of the Awardees
1.	Best Scientist	Dr. Jai Sunder
2.	Best Extension Scientist	Dr.M.S.Kundu
3.	Best Extension Scientist (KVK)	Dr. Zacharia George
4.	Best Division	Animal Science
5.	Best Technical staff (T1 –T3)	Mr.K.Babu Rao, Mr. Abhay K. Srivastava
6.	Best Technical staff (T4 –T9)	Dr. V. Damodaran
7.	Best Administrative staff	Mrs. Shibani Sengupta
8.	Institution Building	Dr. Jai Sunder
9.	Best Hindi work	Dr. T.P. Swarnam
10.	Best Research paper	Dr. A.Velmurugan, Dr. Shrawan Singh

Independence and Republic day at Institute and its KVK's

Independence Day and Republic Day were celebrated in the institute with high spirits and fervour. Dr. S. Dam Roy, Director, CIARI hoisted the National flag on the occasion of Independence Day and Republic Day and thereafter addressed the staff members of the CIARI. In his address, he applauded the hard work, dedication and devotion of all the staff members of the Institute in accomplishing the targets set for research, development and extension activities. Various events and functions *viz*. quiz, drawing competition for children's, fun games for ladies staff members, children's and their family members. On the occasion of Republic Day Director, CIARI gave away the Best worker award in the Technical, Supporting, Administrative and TSM staff category.

Independence and Republic Day was also celebrated at KVK-Nicobar on 15th August, 2015 and 26th January, 2016 respectively in a befitting manner with tribal farmers.

Independence Day was celebrated at KVK, Nimbudera in a befitting manner with Staff, KVK, Pradhan, Basantipur, local farmers and others. Republic Day of India was also celebrated in befitting manner with local farmers, staff, family members and others.

Celebration of Independence & Republic Day at KVKs

Swachh Bharat Abhiyan

On the occasion of first anniversary of the Swachh Bharat Abhiyan various functions were organised during the month of September to October, 2015 in the Institute.

Activities conducted

- Cleaning of offices, lab, rooms, premises, farm and KVKs.
- Cleaning of rooms, labs, records, furniture's, removal of debris and garbage's, etc
- Displaying of banners/posters to promote cleanliness drive for the staff members.
- Marine Hill premises and laboratories were cleaned and the wastes were disposed.
- Office premises, museum and laboratories of Fisheries Science Division at Garacharma were cleaned.
- Freshwater ponds and hatchery at Garacharma were cleaned.

Swachhta Pledge on 2nd October 2015

Swachhta Pledge was taken by all the staff members of CIARI in the conference hall on 2nd October 2015. Director paid homage to Mahatma Gandhi and Lal Bahadur Shastri, two great sons of mother India on the occasion. Later, cleaning of CIARI campus premises was done by the staff members. All the staff members (including project staff) participated in the cleaning activity which covered the areas from entry gate to the residential campus. The Swachhta Abhiyan was also launched in the other campuses of CIARI *viz*. Marine hill campus, Sippighat farm, Bloomsdale farm, KVK-Sippighat, Nimbudera and Nicobar, wherein, the staff members participated in the cleaning activity of their respective campuses and farm premises.

Planting of sampling (tree) on 5th October 2015

On the occasion, tree planting was done in the boundaries of the sports play ground. Director along with all the staff members planted the trees *viz.* ashoka, guava, bael, karanj etc. Later, all the staff members participated in the clearing of bushes and grasses in the playground.

Cleaning in the Office/Lab premises on 8th October 2015

On 8th October 2015, staff members participated in cleaning drive in their respective division /section premises including the office and lab premises.

Other activities

Solar power led light: steps have been initiated by the office to replace the existing incandescent/CFL bulb with LED bulbs/lights.

Displaying of Posters etc: In order to pay respect and remembrance of the major contribution of the great Scientists of all times, photo frame depicting the Scientists with their major contribution have been displayed in the library, conference hall and in the corridor of the Central Lab.

Replacement of Dustbins: Old dustbins of the institute have been replaced with the new dustbins.

Notice board: All the notice boards in the office is being updated regularly time to time.

Signage: All the doors of the toilets in the institute have been provided with signage of toilet for both man and women to give uniform and aesthetic look.

Use of un-conventional energy sources: As per the instruction of the Council, proposal has been submitted for installation of solar power based water heater system in guest house and lab.

Adoption of village: A village namely Lal Pahar under the Chouldari Gram Panchayat, South Andaman has been adopted by the Institute to implement the Swachh Bharat Abhiyan.

Observation of Swacha Bharat Mission at KVK Nicobar

The KVK-Nicobar staff observed Swacha Bharat Mission for making the KVK premises clean on every Saturday. On 2nd October, 2015their participated in the fortnight long cleanliness drive organized by Nicobar Administration.

Swachh Bharat Abhiyan at KVK, Nimbudera

Swachh bharat abhiyan is being observed by staff of KVK, N&M Andaman by cleaning office premises of KVK on every Saturday.

Carnic/Tribal Festival – 2016

Participated in Carnic Festival 2016 at CWC Campus, HQ, Car Nicobar organized by Nicobar District Administration from 8th to 10th January, 2016 in which KVK-Nicobar exhibited different traditional and modern technologies to the general public, students and tribal farmers and got second prize for best stall from the organizers.

Mrs. Neha Bansal, IAS, DC, Nicobar and Shri Akhil Kumar, AC, Car Nicobar at KVK stall during Carninc Festival 2016 distributing seed kit to farmer

ICAR-KVK-Nicobar Team with 2nd prize for best stall in Carninc Festival 2016.

Jai Kisan Jai Vigyan Week at Institute and its KVK's

ICAR-CIARI, Port Blair celebrated "JAI KISAN JAI VIGYAN WEEK" at its campus on 28th and 29th December, 2015 to mark the birth anniversary of Shri Atal Bihari Vajpayee and Late Shri Chaudhary Charan Singh, two former Prime Ministers of India, keeping in view of their immense contribution for promoting use of science for the welfare of farmers.

On 28th December, 2015 mini quiz competition conducted was appreciated by the participants as they could learn lot of new things in the field of agriculture and allied through visuals. On 29th December, visit to Dweep Krishi Darpan was conducted, wherein technologies displayed in agri, horticulture, fisheries, field crops, natural resource management, biodiversity conservation, innovative tools and techniques were shown to the women participants coming from different background. The highlight of the programme was scientists-farmers-interaction on the crop varieties, soil health management, fish rearing techniques, avenues in agriculture and role of CIARI, its ToT programme and International Year of Soil.

More than sixty women participants representing SHGs, NCUI belonging to Telyarabad, Tusnabad, Wandoor and Sippighat of South Andaman attended.

KVK, Nicobar celebrated Jai Kisan Jai Vigyan Diwas at Kinyuka village (Sansad Adarsh Gram Yojana/MGMG village) by organizing Kisan Ghosti / awareness programme on 14th January, 2016 in which 27 farmers benefitted.

Jai Kisan Jai Vigyan Diwas was also celebrated by ICAR- KVK, N&M Andaman at Saansad Gram, Ramanagar on 29th December 2015, wherein more than 59 farmers participated. During the programme the KVK

personnel explained to farmers about significance of celebration of Jai Kisan Jai Vigyan week. Lectures were delivered on soil health management, crop management, poultry management, scientific fish farming practices in addition video films on different topics were shown.

Kisan Sammelan-2016

ICAR-KrishiVigyan Kendra, N & M Andaman organized Kisan Sammelan-2016, at Nimbudera Vegetable Market on 4th February, 2016. The sammelan was inaugurated by the chief guest Shri. Bisnu Pada Ray, Hon'ble M. P., A & N. Islands in presence of Smt. Prabhawati Biswas, Adhyaksha Zila Parishad, Mayabunder as the guest of honour. This programme was also attended by Dr. S Dam Roy, Director, CIARI; General Manager NABARD, Heads and Officials of line Departments, NGOs, SHGs, Up-Adhyakash Zila Parishad, Pramukh Panchayat Samiti; Panchayat Samiti Members, Pradhans, PRI-members and farmers from more than 19 Gram Panchayats.A total of about 338 farmers and farm womens participated in the programme. During the technical session lectures and interactive session was held to inform farmers about recent technologies of CIARI and ICAR institutes.

National Science Day

ICAR-Central Agricultural Research Institute (CIARI), Port Blair conducted National Science Day under the theme "Make in India: S & T driven innovations" in honour of Nobel laureate and great Indian Physicist Sir C.V. Raman for his discovery of Raman Effect from from 22nd 29th February, 2016.

A week long programme on "Make in India: S & T Driven Innovations", innovative programme for farm women, home makers and ladies staff, lecture on "Make in India: S & T driven innovations in field of agriculture and allied sectors and elocution competition. A series of trainings *viz.,* "Basic of Bioinformatics for students of Life Science, Fish health management for farmers and district level seminar on Spices was also conducted. The highlight of the NSD-2016 was conduct of open day, mini science quiz and poster display competition. Wherein farmers, youths and other stakeholders visited the Institute and interacted with

the scientists. The programme was coordinated by Dr.S.K.Zamir Ahmed, Principal Scientist and Shri Amit Srivastava under the guidance of Dr.S.Dam Roy, Director, CIARI.

Central Island Agricultural Research Institute Employees Welfare Association (CIARIEWA)

CIARIEWA, the welfare arms of the institute was engaged in organizing various welfare activities for the employees of the institute. During the year the following activities were organized by the association:

- CIARIEWA awarded scholarship to the wards of the members who excelled in the higher secondary (10+2) board examination. Miss Y. Kusum. D/O Mr. Y. Vijay Rao, Sri Krishna Kant Tewari S/O Mr. R.N. Tewari and Sri Mohit Tirkey S/O Mr. Milred Tirkey were awarded the scholarship on 15th August 2015.
- Association was involved in selecting the best workers of CIARI for the year 2015 among the staff from T.S.M up to technical category T-5. The award was given on 26th January 2016. Shri S. Murugesan, Division of Animal Science under technical category; Shri K. Gopi from Bloomsdale farm and Shri Sebesteen Tirkey, Division of Animal Science under skill supporting staff category and Shri Somra Uraun, Bloomsdale farm from T.S.M category received best worker award.
- Coordinated different social activities like blood donation camp, stress management lecture by Prajapati Brahma Kumari Ishwariya Viswa Vidyalaya, , Port Blair Unit, de-addiction camp with the help of Directorate of Health Services, A & N Administration. Raksha Bandhan function was also celebrated in the institute with a spirit to make the healthy working environment at the institute.
- Organized eye screening camp for the benefit of the members with the help of renowned eye hospital (Dr Agarwal Eye Hospital, Port Blair branch) at free of cost.
- Coordinated the meeting of the Central Government Employee Welfare association (CGEWA) at CIARI in which all the heads of the Central Government offices at Port Blair were present and discussed on the welfare issues.
- Facilitated to organize the cultural programme by the wards of CIARIEWA members on the eve of celebrating the annual day of Central Government Employees' Welfare Associations at ALHW campus and also during the Island Kishan Mela 2015 held at CIARI.
- Farewell function in honours of the members during their transfer or superannuation (7 Nos.) and welcoming the new members joining CIARI and KVK was conducted. Members participated and contributed in the marriage ceremony and funeral of the staff / family members.
- CIARI canteen was run with the satisfaction of CIARI staff by the association.
- Drawing and painting competition were organized among the wards of the staff on the eve of Independence Day and Republic day.

Blood donation & de- addiction camp by CIARIEWA

- Besides CIARIEWA members did the philanthropic activities by donating generously to the members of the CIARIEA, whenever they face any problems.

Games and Sports

The annual sport meet of the Institute was conducted on 7th to 8th May 2015. During the meet various indoor and outdoor events were conducted for the staff members, family members and children's. The staff members representing various houses *viz.* Shompen, Jarawa, Onge and Sentinalese participated in various track & field events in large numbers. The house championship was won by Shompen House, whereas Sentinel, Jarawa and Onge houses stood 2nd 3rd and 4th respectively. Shri J. Raymond Jani Angel of Sentinal House was declared as the best athlete in the track and field events for the year. Institute participated in the ICAR Zonal meet for Eastern region held at ICAR-IVRI, Bareilly, UP held from 28th October to 1st November, 2015. The team bagged 11 medals including 4 gold, 4 silver and 3 bronze which is the best performance by ICAR-CIARI till date. The Institute also participated in the Annual sports meet conducted by CGEWCC, Port Blair and won maximum number of prizes in different events. The facilities for outdoor sports and indoor sports like TT, multi gym have been upgraded and well maintained for staff and family members.

Events in brief

Sl. No.	Events	Date
1.	Island Kisan Mela on the theme Island Agriculture	9th April, 2015
2.	Farm Innovators Meet	10th April, 2015
3.	National Seminar on "Harmonizing Biodiversity and Climate Change : Challenges and Opportunities" by ASA, Port Blair	17th – 19th April, 2015
4.	First meeting of VII RAC	20th to 21st April, 2015
5.	IRC-2015	5th to 6th May, 2015
6.	Institute Annual Sports meet	7th May, 2015 onward
7.	Hon'ble Minister of State for Agriculture, Govt. of India, Dr. Sanjeev Kumar Balyan accompanied by the Member of Parliament, Alighar, Shri Satish Gautam, Member of Parliament, Bulandshehar, Shri Bhola Singh and Member of Parliament, A & N Islands, Shri Bishnu Pada Ray visited the Institute and interacted with the Director, scientists and staff	9th May, 2015
8.	Blood donation camp by CIARIEWA	28th May, 2015
9.	37th foundation day of the Institute	23rd June, 2015
10.	Variety Released Meeting	21st July,2015
11.	Meeting orientation on J-Gate @CeRA	22nd July,.2015

12.	Meeting with NABARD	28th July, 2015
13.	Meeting on State Variety Release Committee	29th July, 2015
14.	Meeting on Outstanding advance	03rd August, 2015
15.	Observation of Sadbhavana Diwas	20th August, 2015
16.	75th Half Yearly meeting of Town Official Language Implementation Committee	26th August, 2015
17.	Prize distribution ceremony of Annual Sports meet	5th September, 2015
18.	Hindi Fortnight	14th to 28th September,2015
19.	Sadbhavana Diwas observed	20th September, 2015
20.	Vigilance Awareness Week-2015 under the theme "Preventive Vigilance as a tool of good governance"	26th to 31st October, 2015
21.	Workshop on Strategies for Development of agriculture and its allied sectors of Island Region	18th November, 2015
22.	Communal Harmony Campaign week	19th to 25th November, 2015
23.	Biannual Co-ordination Meeting between the UT Administration, Port Blair and ICAR-CIARI, Port lair	20th November, 2015
24.	Workshop under Jal Kranti Abhiyan 2015-2016 in association with Central Ground Water Board, MoWR, GoI, Kolkata.	27th November, 2015
25.	Soil Health Card distribution	5th December, 2015
26.	Jai Kisan Jai Vigyan Week	28th & 29th December, 2015
27.	Eye screening camp by CIARIEWA	30th December, 2015
28.	Public Information Campaign (PIC) at Ferrargunj, South Andaman	3rd to 6th January, 2016
29.	Assessment Committee meeting of Scientist	22nd January, 2016
30.	Institute Management Committee Meeting	28th January, 2016.
31.	KISAN Sammelan-2016 at Nimbudera	4th February, 2016
32.	National Voters Day	25th January, 2016
33.	Model Training Course on Integrated Farming System for Tropical Islands, sponsored by Directorate of Extension, Ministry of Agriculture (Department of Agriculture and Cooperation), Krishi Vistar Bhavan, Pusa, New Delhi.	27th Jan., to 3rd Feb., 2016
34.	National Science Day (NSD- 2016), under the theme " Make in India:S&T Driven Innovations"	23rd to 29th February, 2016
35.	District level seminar on Production and value addition of spices	26th February, 2016
36.	Scientific Advisory Committee (SAC) Meeting of all three KVKs	19th March, 2016
37.	National Seminar on Strategies for the Development of Food Processing Sector in the Islands	23rd March, 2016
38.	International Year of Pulses - 2016	29th March, 2016

Impression of Degegates

A memorable visit to the outstanding and prestigious institute contributing for the Island agriculture. Happy to go around the museum and congratulate Dr. Dam Roy and his dedicated team for significant contribution. I wish to see this institute to be upgraded as Deemed University for Island Agriculture. Wishing all success.

Dr. T. Janakiram,
ADG (HS), ICAR, New Delhi on 19th November, 2015

Impression of Degegates

Delegates	Impression
Dr. K.K. Gaur, Rtd., HoD Zool, R.B.S. College, Agra	Very informative and impressing
Dr.C. Vasydevppa, Vice Chancellor, UAHS, Shivamrgga	Technologies have been well documented as the scientists are very enthusiastic in addressing issues of the region. Some latest information and live models will definitely add to the value of the museum. All the best and good luck.
Dr. B.K. Joshi, Member RAC, CIARI, Former Director, NBAGR, Karnal	Excellent work is being done at the Institute by a dedicated team of energetic scientists under a leadership of the HoDs and dynamic Director. Congratulations.
Dr. Madam Mohan, ADG (Marine Fisheries) ICAR HQ, New Delhi	Excellent team work done by the very sincere group of Scientists here. I wish them all the Best Success in their future work.
Dr. Gurbachan Singh, Chairman, ASRB	Excellent museum depicting all technologies developed by the Institute for welfare of farmers of A & N Islands. Some historical events of institute are also displayed which are praise worthy. Congratulates to the Director, Scientists and other staff for maintaining the museum in an excellent manner. Keep it up!
Mr. H.B. Songadker, GM /OIC, NABARD, Port Blair	Excellent museum displaying the technologies that can be transferred from lab to land so as to benefit the farmers with a view to ensuring rural prosperity in A & N Islands. My best wishes and complements to Director, CIARI and his team.
Dr. Jitendra Kumar, Director, ICAR, DMAPR, Anand	It provide full panorama of Integrated farming system and spectrum of activities of CIARI in Island. I do not hesitate to say that is a mini module of ICAR addressing all mandates. CIARI has played a significant role in improving the livelihood of farmers. It contribution certainly go a long way for sustainable agriculture. All the best and appreciate the endeavour of scientists and Director.
Dr. J.S. Samra, Ex-DDG (NRM), ICAR & Ex-CEO, VRAA	I have revisited after a gap of about 10 years and is a lot of progress, better facilities and dedicated workers /scientist. Congratulation
Dr. Mrs. Archana Mukherjee, PS & Head, ICAR-CTCRI, Regional Centre Bhubaneswar	Excellent, I congratulate the Directors and staff of CIARI to represent the whole of diversity of A & N Islands with amalgamation of science and nature in this museum of ICAR-CIARI.
Prof. S. Thilaga, VC, TANVAS, Chennai	Museum is very well maintained charts were self explanatory of this Institute activity. The contribution of the scientists to be appreciated.

Linkage and Collaboration with other Departments

- ICAR Institutes; IVRI, PD_ADMAS, CIRG, CSWRI, DPR.
- TANUVAS, Chennai
- NABARD, Port Blair
- Department of Agriculture & Cooperation, Ministry of Agriculture & Farmers Welfare, Govt. of India, New Delhi
- Department of Nuclear Agriculture, BARC, Trombey, Mumbai
- Protection of Plant Varieties and Farmers Right Authority, New Delhi
- Indian Institute of Pulses Research, Kanpur
- ANGRAU (RARS, Lam Centre), Hyderabad (AP)
- TNAU (NPRC, Vamban), Coimbatore
- Banaras Hindu University, Varanasi
- Directorate of Maize Research, New Delhi
- National Seed Corporation (Regional Office Kolkata), New Delhi
- NBPGR, New Delhi
- DMR, Solan
- IIHR, Bengaluru
- IARI, New Delhi
- NBAIM, Mau, UP
- National Bureau of Agricultural Insect Resources, Bengaluru, India
- Space Applications Centre, Ahmedabad
- Indian National Centre for Ocean Information Services, Hyderabad
- Regional Remote Sensing Centre (ISRO), Nagpur
- CMLRE, Ministry of Earth Science, Cochin
- National Fisheries Development Board, Hyderabad
- National Bureau of Fish Genetic Resources, Lucknow
- RMRC, ICMR, Port Blair
- A & N Administration
- Tribal Council, Nicobar District, A & N Islands
- Department of Agriculture, Animal Husbandry & Veterinary Sciences and Fisheries of Andaman & Nicobar Administration.

Personnel

Director	**Dr. S. Dam Roy**

Head / Incharge Divisions / Section/ KVK

Head, Division of Animal Science	Dr. A. Kundu
Head, Division of Natural Resource Management	Dr. B. Gangaiah
Head I/c, Division of Horticulture & Forestry	Dr. R.K. Gautam
Head I/c, Division of Field Crop Improvement & Protection	Dr. R.K. Gautam
Head i/c, Division of Fisheries	Dr. Kiruba Sankar R.
Incharge, Social Science Section	Dr. S.K. Zamir Ahmed
Senior Scientist & Head, KVK (South Andaman & Nicobar)	Dr. Nagesh Ram
Senior Scientist & Head, KVK N & M Andaman	Dr. B.L. Kashinath (w.e.f. 7th Sept.,2015)
Head of Office	Dr. M.S. Kundu (w.e.f. 16th Nov., 2015)
Chief Administrative Officer	Mr. Debasis Moitra (upto 29th Sept.,2015)
Sr. Finance & Accounts Officer	Shri Joseph George(w.e.f. 1st June, 2015)
Administrative Officer I/c	Shri R.N. Mozumder
Incharge, Prioritization, Monitoring & Evaluation Cell	Dr. S.K. Zamir Ahmed
Incharge, Computer Cell	Dr. T. Subramani
Incharge, Library	Dr. M.S. Kundu
Incharge, Central Instrumentation Facility	Dr. Jai Sunder
Incharge, Legal Cell	Dr. S.K. Zamir Ahmed
Incharge, Estate Section	Er. S.L. Paik
Incharge, Workshop &Instrumentation Cell	Er. M. Arul Selvam
Incharge, Guest House	Dr. V.B. Pandey
Incharge, Security Officer	Dr. S. Murugesan upto 29th Oct., 2015 Mr. A.K. Betal w.e.f. 30th Oct., 2015
Incharge, Sippigaht Farm	Dr. V. Bhaskaran
Incharge, Bloomsdale Farm	Dr. P.K. Singh
Coordinator, Bio-Informatics Centre	Dr. T. Subramani
Incharge, ITMU	Dr. T. Subramani
Coordinator, Out Reach Centre	Dr. S.K. Zamir Ahmed
Incharge PG Cell	Dr. Jai Sunder
Assistant Director (OL)	Mrs. Sulochna

Farm Managers

Garacharma	Dr. V.B. Pandey
Sippighat	Dr. V. Damodaran
Bloomsdale Farm	Mr. A.K. Tripathi
Vigilance Officer	Dr. R.K. Gautam
Transparency Officer	Dr. R.K. Gautam
Nodal Officer, HRD	Dr. R.K. Gautam

Central Public Information Officer	Dr. Kirubasankar
Nodal Officer online HYPM & RFD	Dr.S.K.Zamir Ahmed
Nodal Officer, PIMS, PERMISnet & ASRB Online	Dr. T. Subramani
Nodal Officer, Biometric Attendance System	Mr. R.N. Mozumdar
Nodal Officer, FMS/MTS (ERP)	Mr.Debasis Moitra (upto 29th Sept.,2015)
Nodal Officer, Court Case Monitoring System	Mr. Amit Srivastava
Nodal Officer, Swachh Bharat Abhiyan	Dr. Jai Sunder
Nodal Officer, MGMG	Dr. S.K. Zamir Ahmed
Nodal Officer, TSP	Dr. A. Kundu
ISO 9001:2008 Management Representative	Dr. S.K. Zamir Ahmed
ISO 9001:2008 Asstt. Management Representative	Mr. Amit Srivastava
RFD Co-Nodal Officer	Mr. Amit Srivastava

Division of Natural Resource Management

Dr. B. Gangaiah, Head (Agronomy)
Dr. A. Velmurgan, Senior Scientist (Soil Science :CF&M)
Dr. T.P. Swarnam, Senior Scientist (Agronomy)
Dr. T. Subramani, Scientist (Agronomy)
Dr. Sachidananda Swain, Scientist (Ag. Structure & Process Engineering)

Division of Field Crops Improvement & Protection

Dr. R.K. Gautam, Principal Scientist & Head I/c
Dr. Pankaj Kumar Singh, Senior Scientist (Plant Breeding)
Dr. Awnindra Kumar Singh, Senior Scientist (Plant Breeding)
Mr. K. Sakthivel, Scientist (Plant Pathology)
Miss. T. Bharathimeena, Scientist (Entomology)

Division of Horticulture & Forestry

Dr. R.K. Gautam, Principal Scientist & Head I/c
Dr. V. Bhaskaran, Senior Scientist (Horticulture)
Dr. I. Jaisankar, Scientist (Forestry)
Dr. K. Abirami, Scientist (Fruit Science)
Dr. (Ms) Pooja Bohra, Scientist (Fruit Science)
Dr. Ajit A. Waman, Scientist (Spice, Plantation, Medicinal & Aromatic Plants)
Mrs. Divya Parisa, Scientist (Vegetable Science) w.e.f. 10th April, 2015
Mr. Soobedar Yadav, Scientist (Spices, Plantation & Medicinal & Aromatic Plants) w.e.f. 13th October, 2015

Division of Animal Science

Dr. A. Kundu, Principal Scientist (LP&M) & Head
Dr. Jai Sunder, Principal Scientist (Veterinary Microbiology)
Dr. Madhu Sudan Kundu, Principal Scientist (Animal Nutrition)
Dr. T. Sujatha, Scientist (Poultry Science)
Dr. Arun Kumar De, Scientist (Animal Biotechnology) on study leave

Ms. Sophia Inbaraj, Scientist (Veterinary Microbiology) w.e.f. 10th April, 2015
Dr. K. Muniswamy, Scientist (Animal Biotechnology) w.e.f. 28th Dec., 2015

Division of Fisheries Science

Dr. R. Kiruba Sankar, Scientist (Fish & Fishery Science) & Head I/c
Mrs. S. Monalisha Devi, Scientist (Fisheries Resource Management)
Mr. K. Lohit Kumar, Scientist (Fisheries Resource Management)
Dr. J. Raymond Jani Angel, Scientist (Aquaculture)
Dr. A. Anuraj, Scientist (Aquaculture)
Dr. K. Saravanan, Scientist (Fish Health)
Dr. Venkatesh R. Thakur, Scientist (Aquaculture)
Mr. Arunjyoti Baruah, Scientist (Fish Health)
Mr. T. Sivaramakrishnan, Scientist (Fish Nutrition)
Mr. J. Praveen Raj, Scientist (Fish Health)
Mr. Arun Kumar Oppoottil Ratheesh, Scientist (Fisheries Resource Management)

Social Science Section

Dr. S.K. Zamir Ahmed, Principal Scientist, (Agriculture Extension) & Section I/c

Krishi Vigyan Kendra, Port Blair

Dr. Nagesh Ram, Sr. Scientist & Head
Mr. L.B. Singh, Subject Matter Specialist (Horticulture)
Er. Bijaya Kumar Nanda, Subject Matter Specialist (Agri. Engineering) on study leave
Mrs. Haripriya Nayak, Subject Matter Specialist (Home Science) on study leave
Mr. N. Bommayswamy, Subject Matter Specialist (Horticulture) on study leave
Dr. Vivek Kr. Pandey, Subject Matter Specialist (Plant Protection)
Dr. N.C. Choudhuri, Asstt. Chief Technical Officer (Animal Science)

Krishi Vigyan Kendra, Nicobar

Dr. Nagesh Ram, Sr. Scientist & Head I/c
Mr. Sanjay Kumar Pandey, Subject Matter Specialist (Agronomy) on study leave
Dr. Zachariah George, Subject Matter Specialist (Animal Science)
Er. Chandrika Ram, Subject Matter Specialist (Agri. Engineering)

Krishi Vigyan Kendra, North & Middle Andaman

Dr. Nagesh Ram, Sr. Scientist & Head I/c upto 6th September, 2015
Dr. B.L. Kashinath, Senior Scientist & Head w.e.f. 7th September, 2015
Dr.Pooja Kapoor, Subject Matter Specialist (Home Science)
Er. Manoj Kumar, Subject Matter Specialist, (Agricultural Engineering)
Mr. Debabrata Basantia, Subject Matter Specialist (Horticulture)
Mr. Batti Lal Meena, Subject Matter Specialist (Agronomy)
Dr. Shardul Vikram Lal, Subject Matter Specialist (Animal Science)
Dr. Shailesh Kumar, Subject Matter Specialist (Fisheries)

Committee of the Institute

Foreign Deputation Committee

	Director	:	Chairman
	Dr. R.K. Gautam	:	Member
	Dr. A. Kundu	:	Member
	Dr. A. Velmurugan	:	Member
	A.O I/c	:	Member Secretary

Award Screening Committee

1.	Dr. R.K. Gautam	:	Chairman
2.	Dr. A. Kundu	:	Member
3.	Dr. A. Velmurugan	:	Member
4.	Dr. Kiruba Sankar	:	Member
5.	I/c PME Cell	:	Member Secretary

Works Committee

1.	Dr. M.S. Kundu	:	Chairman
2.	Mr. R.N. Mozumder	:	Member
3.	Er. S.L. Paik	:	Member
4.	SFAO	:	Member
5.	Dr. S. Jaisunder	:	Member
6.	Mr. M.A. Selvam	:	Member Secretary

Purchase Advisory Committee

1.	Dr. A. Kundu	:	Chairman
2.	Dr. M.S. Kundu	:	Member
3.	Dr. T.P. Swarnam	:	Member
4.	Dr. Kiruba Sankar	:	Member
5.	SFAO	:	Member
6.	Shri R.N. Mozumder,AAO	:	Member Secretary

Tender Opening Committee

1.	Dr. P.K. Singh	:	Member
2.	Dr. T. Sujatha	:	Member
3.	SFAO	:	Member
4.	Shri R.N. Mozumder, AO I/c	:	Member Secretary

Local Purchase Committee

1.	Dr. Jaisunder	:	Chairman
2.	Er. S.L. Paik	:	Member
3.	Dr. Shaktivel	:	Member
4.	SFAO/ Representative	:	Member
5.	Shri R.N. Mozumder, AO I/c	:	Member Secretary

Library Management Committee

1.	Dr. M.S. Kundu	:	Chairman
2.	Dr. T. Sujatha	:	Member
3.	(Mrs.) T.P. Swarnam	:	Member
4.	Dr. Kiruba Sankar	:	Member
5.	Librarian	:	Member Secretary

Condemnation & Auction Committe

1.	Dr. Jaisunder	:	Chairman
2.	Dr. A.K. Singh	:	Member
3.	Dr. T. Subramani	:	Member
4.	Er. S.L. Paik	:	Member
5.	SFAO	:	Member
6.	Shri R.N. Mozumder AO I/c	:	Member Secretary

House Allotment Committee

1.	Dr. R.K. Gautam	:	Chairman
2.	Dr. I. Jaisankar	:	Member
3.	Dr. A.K. Singh	:	Member
4.	Secretary, IJSC	:	Member

Price Fixation Committee

1.	Dr. B. Gangaiah	:	Chairman
2.	Dr. P.K. Singh	:	Member
3.	SFAO/ Representative	:	Member
4.	Dr. V. Damodaran	:	Member

5.	SFAO/ Representative	:	Member	5.	Mr. A.K. Tripathi	:	Member
6.	Er. S.L. Paik	:	Member Secretary	6.	Secretary, IJSC	:	Member
				7.	Dr. V.B. Pandey	:	Member Secretary

Internal Complaints Committee				Landscape & Beautification Committee			
1.	Dr. K. Abirami	:	Chairperson	1.	Dr. V. Bhaskaran	:	Chairman
2.	Mrs. Ratna Kannan	:	Member (Ex-Chairperson of A & N State Social Welfare Board)	2.	Dr. V. Damodaran	:	Member
				3.	Mr.Venkatesh RamraoThakur	:	Member
				4.	Mr. A.K. Tripathi	:	Member
				5.	Mr. Shyam Sunder Rao	:	Member
				6.	Dr. V.B. Pandey	:	Member Secretary
3.	Smt. Sibani Sengupta	:	Member				
4.	Dr. M.S. Kundu	:	Member				
5.	Dr. A.K. Singh	:	Member				
6.	Dr.(Mrs.) T. Sujatha	:	Member Secretary				

Cultural Programme Committee				Sports Committee			
1.	Dr. M.S. Kundu	:	Chairman	1.	Dr. Jaisunder	:	Chairman
2.	Dr. K. Abirami	:	Member	2.	Shri Kiruba Sankar	:	Member
3.	Dr. V. Bhaskaran	:	Member	3.	Mr. K. Lohith Kumar	:	Member
4.	Smti Harapriya Naik	:	Member	4.	Dr. N.C. Choudhury	:	Member
5.	Mr. Amit Srivastava	:	Member	5.	Dr. S. Monalisa Devi	:	Member
6.	Secretary, IJSC		Member	6.	Smt. Shibani Sengupta	:	Member
7.	Smt. Monalisa Devi	:	Member	7.	Dr. K. Saravanan	:	Member
8.	Shri Praveenraj	:	Member	8.	Mr. A. Babuswamy	:	Member
9.	Shri Sivaramakrishnan	:	Member	9.	Secretary, IJSC	:	Member
10.	Shri Arun Kumar O.R.	:	Member	10.	Dr. A. Anuraj	:	Member
11.	Dr. Jai Sunder	:	Member Secretary	11.	Shri Arunjyothi Baruah	:	Member
				12.	Dr. J. Raymond Jani Angel	:	Member Secretary

Technical Evaluation Committee				Website Management Committee			
1.	Dr. B. Gangaiah	:	Chairman	1.	Dr. A. Velmurugan	:	Chairman
2.	Dr. A.K. Singh	:	Member	2.	Dr. T. Subramani	:	Member
3.	Dr. Kiruba Sankar	:	Member	3.	Dr. Kiruba Sankar	:	Member
4.	Shri Sakthivel	:	Member	4.	Smt. Ani Dath	:	Member

5.	Shri R.N. Mozumder: AAO	:	Member Secretary	5.	Shri Dibakar Khan	:	Member Secretary

Official Language Committee

Director	:	Chairman
Dr. R.K. Gautam	:	Member
Dr. M.S. Kundu	:	Member
Dr. S.K. Zamir Ahmed	:	Member
Dr. A.K. Singh	:	Member
Dr. A. Velmurugan	:	Member
Mr. Abhay Srivastava	:	Member
Shri Lohit Kumar	:	Member
Mr. Amit Srivastava	:	Member
Dr. Venkatesh Ramrao Thakur	:	Member
Mr. Shyam Sunder Rao	:	Member
Smt. Sulochana	:	Member Secretary

New Entrants/ Transfer / Promotion/ Retirement/ Death

New Entrants

- Shri Sivaramakrishnan Thirugnanamurth, Scientist on 07.04.2015
- Shri. Praveen Raj. J, Scientist, on 09.04.2015
- Shri. Arunjyoti Baruah, Scientist, on 09.04.2015
- Shri Arun Kumar O.R, Scientist, on 10.04.2015
- Ms. Sophia Inbaraj, Scientist, on 10.04.2015
- Ms. Divya Parisa, Scientist, on 10.04.2015
- Shri. Soobedar Yadav, Scientist, on 13.10.2015

Transfer to CIARI

- Shri Joseph George, Sr. FAO, transferred from NIANP, Adugodi, Bengaluru on 01.06.2015
- Dr. K. Muniswamy, Scientist, transferred from ICAR-CCARI, Ela Old Goa on 28.12.2015
- Shri Kashinathan, SSS, transferred from NRC for Banana, Tiruchirapalli on 14.01.2016

Transferred from CIARI

- Dr. Shrawn Singh, Scientist, transferred to ICAR-IARI, New Delhi on 01.04.2015.
- Shri Gourango Ghosh, F&ACO – transferred to NEH Region, Barapani on 09.06.2015.
- Shri Kashinathan, SSS, transferred to ICAR-NRC for Banana, Tiruchirapalli on 11.09.2015.
- Shri Debasis Moitra, CAO transferred to IVRI on 29.09.2015.

Retired

- Shri Anjan Sengupta, Technical Officer on 30.04.2015
- Shri Theophil Gidth, Sr. Technical Assistant on 31.07.2015
- Shri William Kerketta, SSS on 31.07.2015
- Shri P. Soneyan, SSS on 30.11.2015
- Shri A.Muthu, SSS on 30.11.2015
- Smti Valsamma Kunjumon, P.S. on 30.11.2015

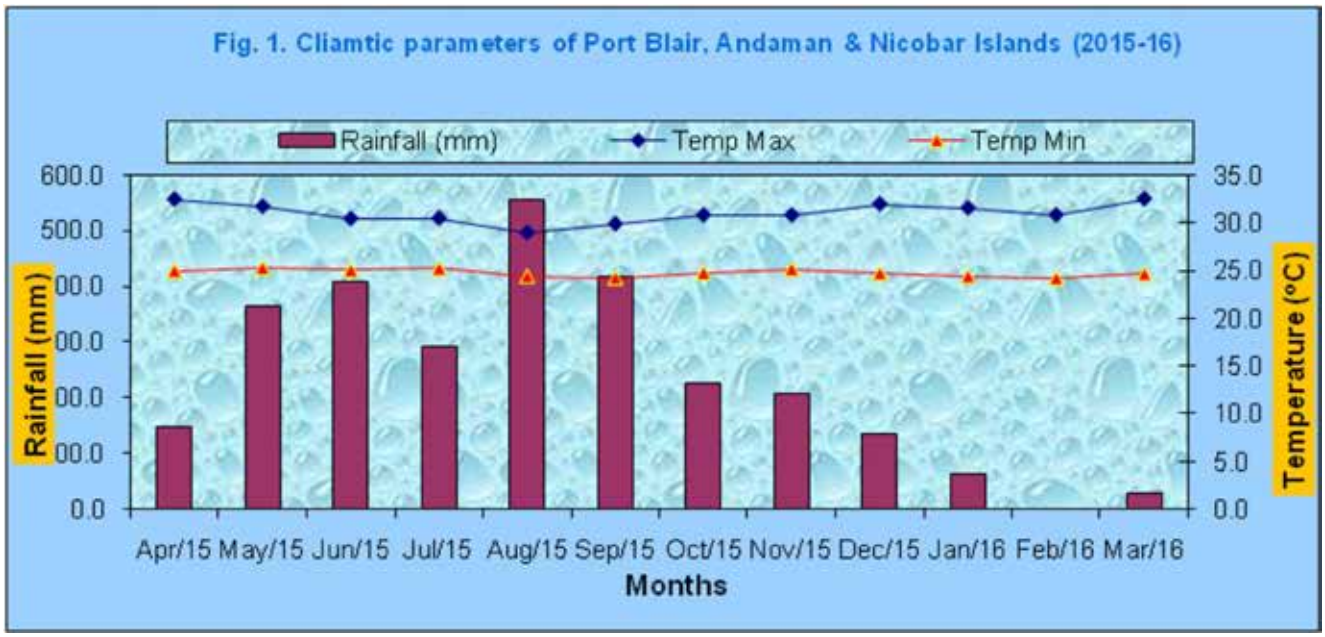
Left to heavenly abode

- Shri Jonh Chrisostom, on 26.04.2015

CIARI IN NEWS

Climate and Climatic Parameters of Andaman and Nicobar Islands an Overview

Port Blair, Andaman & Nicobar Islands (ANI) has received a rainfall of 2848.5 mm during the year (April 2015-March 2016) in 133 rainy days. Of this rainfall, 1674.1 and 569.5 and 641 mm were received during South-West (June-September), North-East (October-December) and post monsoon period. Rainfall received was highest in the month of August (557.3 mm) with February month recording no rainfall. The overall performance of the monsoon during the year was rated as normal though it has received 132 mm less rainfall than the mean normal rainfall of 3180 mm. The year recorded a mean annual temperature of 27.96°C with a mean maximum and minimum temperatures of 31.1 and 24.8 °C. Mean monthly temperatures were highest during April, 2015 and March, 2016 (32.5 °C) and lowest during February, 2016 (24.2 °C). The climatic parameters are depicted in the figure below:



Results- Framework Document (RFD)

for

Central Island Agricultural Research Institute

(2014 –2015)

Address: Garacharma, P.O. Box No. 181,
Port Blair – 744 101, A& N Islands, India
Website ID: http://cari.res.in

Section 1: Vision, Mission, Objectives and Functions

Vision

Sustainable development in agri-horticulture, livestock and fisheries sector in the changing climatic scenario to ensure decent livelihood in the fragile island ecosystem.

Mission

Providing decent livelihood to farm youth in a fragile island ecosystem on sustainable basis.

Objectives

1. Conservation of germplasm / genetic resources.
2. Natural resource management for island ecosystem and transfer of technology for dissemination and adoption.

Functions

- Development of technologies to fulfill above mentioned objectives.
- Bio-prospecting.
- Transfer of technologies to stakeholders.
- Promote public private partnership.
- Capacity building for entrepreneurship of stakeholders.

Section –2 :*Inter se* priorities among Key Objectives, Success Indicators and Targets

SI. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target/Criteria value				
							Excellent	Very Good	Good	Fair	Poor
							100%	90%	80%	70%	60%
1.	Conservation of germplasm / genetic resources	45	Collection, characterization and conservation of plant and animal genetic resource	Germplasm of plant and animal collected and characterized	No.	28	150	125	100	75	50
			Evolving high yielding lines of agriculture, horticulture and allied crop	Development of improved varieties for higher yields and other traits	No.	17	08	07	06	05	04
2.	Natural resource management for island ecosystem and transfer of technology for dissemination and adoption	35	Development of production/ management technology	Development of technology for increasing production	No.	06	07	06	05	04	03
			Production of seeds, planting materials and value added products	Production of quality planting materials of spices	No.	02	10200	8500	6800	5100	3400
				Production of quality planting materials of coconut &arecanut	No.	02	1320	1100	880	660	440
				Production of quality planting materials of elephant foot yam	Kg.	02	840	700	560	420	280

SI. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target/Criteria value				
							Excellent	Very Good	Good	Fair	Poor
							100%	90%	80%	70%	60%
				Production of quality planting materials of ginger	Kg.	02	500	400	300	200	100
				Production of TLS of rice	Tons	02	5.5	4.5	3.5	2.5	1.5
				Production of quality fresh water fish fry	No.	02	31200	26000	20800	15600	10400
			Development of technologies for natural resource management	Number of technologies developed/ tested/ validated	No.	04	03	02	01	0	0
			Animal health management	Disease surveillance surveys and health management practices	No.	02	12	10	08	06	04
			Dissemination of Potential Fishing Zone (PFZ) advisories for enhancing marine fish catch	Number of awareness campaign	No.	02	08	07	06	05	04
			Dissemination of Agro advisory for minimizing production losses	Number of Agro advisories	No.	02	108	90	72	54	36
			Organizing training and demonstration	Number of trainings	No.	04	114	95	76	57	38

SI. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target/Criteria value				
							Excellent	Very Good	Good	Fair	Poor
							100%	90%	80%	70%	60%
				Number of demonstrations	No.	03	66	55	44	33	22
3	* Publication/ Documentation	5	Publication of the research articles in the journals having the NAAS rating of 6.0 and above	Research articles published	No.	3	37	35	33	31	29
			Timely publication of the Institute Annual Report (2013-2014)	Annual Report published	Date	2	30.06. 2014	02.07. 2014	04.07. 2014	07.07. 2014	09.07. 2014
4	* Fiscal resource management	2	Utilization of released plan fund	Plan fund utilized	%	2	98	96	94	92	90
5	* Efficient Functioning of the RFDSystem	3	Timely submission of Draft RFD for 2014-2015 for Approval	On-time submission	Date	2	May 15, 2014	May 16, 2014	May 19, 2014	May 20, 2014	May 21, 2014
			Timely submission of Results for 2013-2014	On-time submission	Date	1	May 1 2014	May 2 2014	May 5 2014	May 6 2014	May 7 2014
6	* Enhanced Transparency / Improved Service delivery of Ministry/ Department	3	Rating from Independent Audit of implementation of Citizens' / Clients' Charter (CCC)	Degree of implementation of commitments in CCC	%	2	100	95	90	85	80

SI. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target/Criteria value				
							Excellent	Very Good	Good	Fair	Poor
							100%	90%	80%	70%	60%
			Independent Audit of implementation of Grievance Redress Management (GRM) system	Degree of success in implementing GRM	%	1	100	95	90	85	80
7	* Administrative Reforms	7	Update organizational strategy to align with revised priorities	Date	Date	2	Nov.1 2014	Nov.2 2014	Nov.3 2014	Nov.4 2014	Nov.5 2014
			Implementation of agreed milestones of approved Mitigating Strategies for Reduction of potential risk of corruption (MSC)	% of implementation	%	1	100	90	80	70	60
			Implementation of agreed milestones for ISO 9001	% of implementation	%	2	100	95	90	85	80
			Implementation of milestones of approved Innovation Action Plans (IAPs)	% of implementation	%	2	100	90	80	70	60

* Mandatory Objectives (s)

Section – 3: Trend Values of the Success Indicators

SI. No.	Objectives	Actions	Success indicators	Unit	Actual Value for FY 12/13	Actual Value for FY 13/14	Target Value for FY 14/15	Projected Value for FY 15/16	Projected Value for FY 16/17
1.	Conservation of germplasm / genetic resources	Collection, characterization and conservation of plant and animal genetic resource	Germplasm of plant and animal collected and characterized	No.	127	132	125	130	135
		Evolving high yielding lines of agriculture, horticulture and allied crops	Development of improved varieties for higher yields and other traits	No.	05	07	07	07	08
2.	Natural resource Management for island ecosystem and transfer of technology for dissemination and adoption	Development of production/ management technology	Development of technology for increasing production	No.	05	06	06	06	07
		Production of seeds, planting materials and value added products	Production of quality planting materials of spices	No.	5000	8000	8500	8700	9000
			Production of quality planting materials of coconut/arecanut	No.	1100	1000	1100	1150	1200
			Production of quality planting materials of elephant foot yam	Kg.	*	680	700	750	800
			Production of quality planting materials of ginger	Kg.	*	475	400	450	475
			Production of TLS of rice	Tons	04	04	4.5	4.6	4.7
			Production of quality fresh water fish fry	No.	19500	25621	26000	26500	27000

SI. No.	Objectives	Actions	Success indicators	Unit	Actual Value for FY 12/13	Actual Value for FY 13/14	Target Value for FY 14/15	Projected Value for FY 15/16	Projected Value for FY 16/17
* Production of quality planting materials of elephant foot yam & ginger was introduced in 2013-14 onwards.									
		Development of technologies for natural resource management	Number of technologies developed/tested/ validated	No.	02	01	02	02	02
		Animal health management	Disease surveillance surveys and health management practices	No.	06	10	10	11	12
		Dissemination of Potential Fishing Zone (PFZ) advisories for enhancing marine fish catch	Number of awareness campaign	No.	22	05	07	07	08
		Dissemination of Agro advisory for minimizing production losses	Number of Agro advisories	No.	100	80	90	92	95
		Organizing training and demonstration	Number of trainings	No.	62	104	95	97	100
			Number of demonstration s	No.	55	58	55	57	60
		Publication of the research articles in the journals having the NAAS rating of 6.0 and above	Research articles published	No.	18	34	35	36	37
		Timely publication of the Institute Annual Report (2013-2014)	Annual Report published	Date	-	-	02.07.2014	-	-
		Utilization of released plan fund	Plan fund utilized	%	99.90	98.88	96	97	98
		Timely submission of Draft RFD for 2014-2015 for Approval	On-time submission	Date	-	-	May 16, 2014	-	-

SI. No.	Objectives	Actions	Success indicators	Unit	Actual Value for FY 12/13	Actual Value for FY 13/14	Target Value for FY 14/15	Projected Value for FY 15/16	Projected Value for FY 16/17
		Timely submission of Results for 2013-2014	On-time submission	Date	-	-	May 2, 2014	-	-
		Rating from Independent Audit of implementation of Citizens' / Clients' Charter (CCC)	Degree of implementation of commitments in CCC	%	-	-	95	-	-
		Independent Audit of implementation of Grievance Redress Management (GRM) system	Degree of success in implementing GRM	%	-	-	95	-	-
		Update organizational strategy to align with revised priorities	Date	Date	-	-	Nov.2, 2014	-	-
		Implementation of agreed milestones of approved Mitigating Strategies for Reduction of potential risk of corruption (MSC)	% of implementation	%	-	-	90	-	-
		Implementation of agreed milestones for ISO 9001	% of implementation	%	-	-	95	-	-
		Implementation of milestones of approved Innovation Action Plans (IAPs)	% of implementation	%	-	-	90	-	-

Section 4 (a): Acronyms

SI.No.	Acronym	Description
1.	KVK	KrishiVigyan Kendra
2.	NGO	Non Government Organization
3.	ICT	Information and Communication Technologies
4.	INM	Integrated Nutrient Management
5.	TLS	Truthfully Labelled Seed
6.	MoA	Ministry of Agriculture
7.	A&N	Andaman & Nicobar
8.	CDB	Coconut Development Board
9.	NABARD	National Bank on Agriculture and Rural Development
10.	PFZ	Potential Fishing Zone

Section 4 (b): Description and definition of success indicators and proposed measurement methodology

SI.No.	Success Indicator	Description	Definition	Measurement	General Comments
1.	Germplasm of plant and animal collected and characterized	Germplasm is the basic requirement to develop improved variety	Basic genetic resource for crop improvement	Number of germplasm accessions collected	Germplasm of Rice, Paddy, Pulses, Brinjal Indigenous Vegetables, Tuber Crops, Medicinal, Ornamental crops, Microbes, Livestock,Nicobari fowl, Nicobari pig, Marine fin & shell fishes collected to improve the diversity and germplasm repository
2.	Development of improved varieties for higher yields and other traits	The experimental material developed through selection/ hybridization using selected germplasm is evaluated	Germplasm / improved breeding lines/hybrids are evaluated in field trials for development of improved varieties	Number of improved varieties developed (Rice/Noni)	Evaluation is done for agronomics(yield attributes), quality or stress (biotic/abiotic) tolerance/resistance to support development of improved varieties for different agro-ecological zones and for specific purpose

SI.No.	Success Indicator	Description	Definition	Measurement	General Comments
3.	Development of technology for increasing production	Cropping system/INM/ cultivation packages are evaluated for improving productivity & profitability	Cropping system/INM/ cultivation packages refers to the maintenance of soil/plant, ecosystem at an optimum level for enhancing productivity/ profitability/sustaining productivity through optimization of the resources	Number of production technologies for crop & livestock farming system developed	To ensure higher productivity/ profitability and sustainability of production system
4.	Production of quality planting materials of spices	Production of quality planting materials for distribution to development agencies/ farmers and other stakeholders	Production of planting material in the form of spices	Number of planting material produced	Planting material includes seedlings of spices
5.	Production of quality planting materials of coconut/arecanut	Production of quality planting materials for distribution to development agencies/ farmers and other stakeholders	Production of planting material in the form of coconut/arecanut	Number of planting material produced	Planting material includes seedlings of coconut/arecanut
6.	Production of quality planting materials of elephant foot yam	Production of quality planting materials for distribution to development agencies/ farmers and other stakeholders	Production of planting material in the form of rhizomes of elephant foot yam	Number of planting material produced	Planting material includes rhizomes of elephant foot yam
7.	Production of quality planting materials of ginger	Production of quality planting materials for distribution to development agencies/ farmers and other stakeholders	Production of planting material in the form of rhizomes of ginger	Number of planting material produced	Planting material includes rhizomes of ginger

Sl.No.	Success Indicator	Description	Definition	Measurement	General Comments
8.	Production of TLS of rice	Production of quality planting materials for distribution to development agencies/ farmers and other stakeholders	Production of planting material in the form of TLS of rice	Number of planting material produced	Planting material includes truthfully labelled seeds (TLS) of rice
9.	Production of quality fresh water fish fry	Production of quality fresh water fish fry for distribution to development agencies/ farmers and other stakeholders	Production of fresh water fish fry	Number of fresh water fish fry produced	Seeds of fresh water fish fry
10.	Number of technologies developed/ tested/ validated	The nutrient use efficiency in the country is very low and fertilizer is costly input, this has to be increased to reduce the use of fertilizer via-a-vis coat of fertilizer	Nutrient efficiency can be defined in agronomic, economic or environmental terms with an aim to get maximum benefit	Nutrient use efficiency is measured in terms of kg crop yield/kg nutrient applied	For augmenting nutrient use efficiency technology will be standardized
11.	Disease surveillance surveys and health management practices	Plant health management technologies encompass conjunctive use of chemicals/ environmental health and sustaining higher productivity	Plant health management technologies refers to maintenance of optimum plant/ ecosystem, health and control of pest/disease for sustaining the desired productivity	Number of technologies developed for plant health management in coconut/arecanut based farming system	To ensure balance fertilizer/ control of biotic stress and sound soil/plant/environmental health management pest and disease
12.	Number of awareness campaign	Organize awareness campaign involving KVKs, NGOs and fishers	To sensitize on technology for enhancing adoption	Number of awareness campaign conducted	To enhance technology adoption through dissemination of technology for wider adoption
13.	Number of agro-advisories	To issue weather based agro-advisories through print and electronic media	To provide information on forecasted weather to minimize losses	Number of agro-advisories issued	To enhance technology adoption through print and electronic media

SI.No.	Success Indicator	Description	Definition	Measurement	General Comments
14.	Number of trainings	Organize trainings involving ICT,KVK/ NGOs and other stakeholders	To enable dissemination of technology for enhancing technology adoption	Number of training conducted	To enhance technology adoption through dissemination of technologies for wider audience of stakeholders
15.	Number of demonstrations	Organize demonstrations in participatory mode	To enable dissemination of technology for enhancing technology adoption and acceptance for profitability	Number of demonstrations conducted	To enhance technology adoption through demonstrations in participatory mode in agriculture and allied field in different cluster of villages

Section 5: Specific performance requirement for other departments that are critical of delivering agreed results

Location Type	State	Organisation Type	Organization Name	Relevant Success Indicator	What is your requirement for this organization	Justification for this requirement	Please quantify your requirement from this organization	What happens if your requirement is not met
State Government	Andaman and Nicobar Islands	Departments	State Biodiversity Authority/ Forest Department/ Tribal Council	Germplasm of plant and animal collected and characterized	Permission to survey/ collection	Without permission it is illegal to enter the reserved forest for collection	Number of permission letters issued	Less number of germplasm accessions collected
State Government	All States	Departments	Directorate of Extension/ MOA/ Development Departments/ NGOs	Number of trainings	Sponsoring farmers/ extension personnel for training	If trainees are not deputed, they cannot be imparted training	Number of candidates sponsored	Less number of training will be conducted

Section 6: Outcome / Impact of activities of Department/Ministry

SI. No.	Outcome / Impact	Jointly responsible for influencing this outcome/ impact with the following Department(s)/organization(s)/ Ministry(ies)	Success Indicator (s)	Unit	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
1.	Increase in productivity of coconut	Ministry of Agriculture , A & N Administration, NGOs, Private partners/ planters, CDB, NABARD and Lead Bank	Increase in productivity of coconut	%	2.0	3.0	3.2	3.6	3.7
2.	Increase in productivity of rice & fresh water fish	Ministry of Agriculture , A & N Administration, NGOs, Private partners/ planters, NABARD and Lead Bank	Increase in productivity of rice	%	10.0	15.0	17.0	20.0	20.5
			Increase in productivity of fresh water fish	%	15.0	20.0	25.0	30.0	30.5

Annual (April, 2014 to March 31, 2015) Performance Evaluation Report in respect of RFD 2014-2015 of RSCs i.e. Institutes

Name of the Division : Horticultural Science , Name of the Institution : ICAR-Central Island Agricultural Research Institute

RFD Nodal Officer : Dr. S. K. Zamir Ahmed

S. No.	Objectives	Weight (%)	Actions	Success Indicators	Unit	Weight (%)	Target/Criteria value					Achievements	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent	Very Good	Good	Fair	Poor		Raw Score	Weighted Score		
							100%	90%	80%	70%	60%					
1.	Conservation of germplasm / genetic resources	45	Collection, characterization and conservation of plant and animal genetic resource	Germplasm of plant and animal collected and characterized	No.	28	150	125	100	75	50	**190**	**100**	**28**	**152.0**	Due to joining of seven new scientists in the field of Horticulture and Fisheries, exploration and collection of germplasm was assigned. Hence the % achievement is more.
			Evolving high yielding lines of agriculture, horticulture and allied crop	Development of improved varieties for higher yields and other traits	No.	17	08	07	06	05	04	**12**	**100**	**17**	**171.4**	Four varieties of Noni which could not be released in the last IVRC was considered and recommended for release this year. Hence the % achievement is more.
2.	Natural resource management for island ecosystem and transfer of technology for dissemination and adoption	35	Development of production/ management technology	Development of technology for increasing production	No.	06	07	06	05	04	03	**06**	**90**	**5.4**	**100.0**	-

S. No.	Objectives	Weight (%)	Actions	Success Indicators	Unit	Weight (%)	Target/Criteria value					Achieve ments	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent	Very Good	Good	Fair	Poor		Raw Score	Weighted Score		
							100%	90%	80%	70%	60%					
			Production of seeds, planting materials and value added products	Production of quality planting materials of spices	No.	02	10200	8500	6800	5100	3400	**9500**	**95.9**	**1.92**	**111.8**	Seasonal demand by stakeholders.
				Production of quality planting materials of coconut &arecanut	No.	02	1320	1100	880	660	440	**1456**	**100**	**02**	**132.4**	Seasonal demand by stakeholders.
				Production of quality planting materials of elephant foot yam	Kg.	02	840	700	560	420	280	**1050**	**100**	**02**	**150.0**	Seasonal demand by stakeholders.
				Production of quality planting materials of ginger	Kg.	02	500	400	300	200	100	**500**	**100**	**02**	**125.0**	Seasonal demand by stakeholders.
				Production of TLS of rice	Tons	02	5.5	4.5	3.5	2.5	1.5	**4.6**	**91**	**1.82**	**102.2**	-
				Production of quality fresh water fish fry	No.	02	31200	26000	20800	15600	10400	**29900**	**97.5**	**1.95**	**115.0**	Seasonal demand by stakeholders.
			Development of technologies for natural resource management	Number of technologies developed/ tested/ validated	No.	04	03	02	01	0	0	**02**	**90**	**3.6**	**100.0**	-
			Animal health management	Disease surveillance surveys and health management practices	No.	02	12	10	08	06	04	**12**	**100**	**02**	**120.0**	Increase due to FMD surveillance jointly conducted by A & N Admn.
			Dissemination of Potential Fishing Zone (PFZ) advisories for enhancing marine fish catch	Number of awareness campaign	No.	02	08	07	06	05	04	**09**	**100**	**02**	**128.6**	Availability of more advisories due to cloud free sky.

S. No.	Objectives	Weight (%)	Actions	Success Indicators	Unit	Weight (%)	Target/Criteria value					Achieve ments	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent	Very Good	Good	Fair	Poor		Raw Score	Weighted Score		
							100%	90%	80%	70%	60%					
			Dissemination of Agro advisory for minimizing production losses	Number of Agro advisories	No.	02	108	90	72	54	36	**112**	**100**	**02**	**124.4**	Due to good weather and no cloud condition during the period advisories number got increased.
			Organizing training and demonstration	Number of trainings	No.	04	114	95	76	57	38	**109**	**97.37**	**3.89**	**114.7**	Due to demand of the tribal farmers under TSP during review meeting
				Number of demonstrations	No.	03	66	55	44	33	22	**86**	**100**	**03**	**156.4**	Due to demand of the tribal farmers under TSP during review meeting
3.	* Publication/ Documentation	5	Publication of the research articles in the journals having the NAAS rating of 6.0 and above	Research articles published	No.	03	37	35	33	31	29	**40**	**100**	**03**	**114.3**	32 articles were published having NAAS rating > 6. Beside 8 articles also got published in International journal having Global Impact
			Timely publication of the Institute Annual Report (2013-2014)	Annual Report published	Date	02	30.06. 2014	02.07. 2014	04.07. 2014	07.07. 2014	09.07. 2014	**25.06.2014**	**100**	**02**	-	-
4.	* Fiscal resource management	2	Utilization of released plan fund	Plan fund utilized	%	2	98	96	94	92	90	**99.84**	**100**	**02**	-	-
5.	* Efficient Functioning of the RFDSystem	3	Timely submission of Draft RFD for 2014-2015 for Approval	On-time submission	Date	2	May 15, 2014	May 16, 2014	May 19, 2014	May 20, 2014	May 21, 2014	**May, 09, 2014**	**100**	**02**	-	
			Timely submission of Results for 2013-2014	On-time submission	Date	1	May 1 2014	May 2 2014	May 5 2014	May 6 2014	May 7 2014	**April, 22, 2014**	**100**	**01**	-	-

S. No.	Objectives	Weight (%)	Actions	Success Indicators	Unit	Weight (%)	Target/Criteria value					Achieve ments	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent	Very Good	Good	Fair	Poor		Raw Score	Weighted Score		
							100%	90%	80%	70%	60%					
6.	* Enhanced Transparency / Improved Service delivery of Ministry/ Department	3	Rating from Independent Audit of implementation of Citizens' / Clients' Charter (CCC)	Degree of implementation of commitments in CCC	%	2	100	95	90	85	80	**100**	**100**	**02**	-	-
			Independent Audit of implementation of Grievance Redress Management (GRM) system	Degree of success in implementing GRM	%	1	100	95	90	85	80	**100**	**100**	**01**	-	-
7.	* Administrative Reforms	7	Update organizational strategy to align with revised priorities	Date	Date	2	Nov.1 2014	Nov.2 2014	Nov.3 2014	Nov.4 2014	Nov.5 2014	**Sept., 24, 2014**	**100**	**02**	-	-
			Implementation of agreed milestones of approved Mitigating Strategies for Reduction of potential risk of corruption (MSC)	% of implementation	%	1	100	90	80	70	60	**100**	**100**	**01**	-	-
			Implementation of agreed milestones for ISO 9001	% of implementation	%	2	100	95	90	85	80	**---**	-	-	**Nil**	-
			Implementation of milestones of approved Innovation Action Plans (IAPs)	% of implementation	%	2	100	90	80	70	60	**100**	**100**	**02**	-	-
Total Composite Score **Rating : Excellent**															**96.58**	

Notes

हर कदम, हर डगर
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भारतीय कृषि अनुसंधान परिषद
Agrisearch with a human touch

IS/ISO 9001: 2008 Certified

ICAR-Central Island Agricultural Research Institute

Port Blair – 744 101, Andaman & Nicobar Islands, India