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ANNUAL REPORT 2014-15

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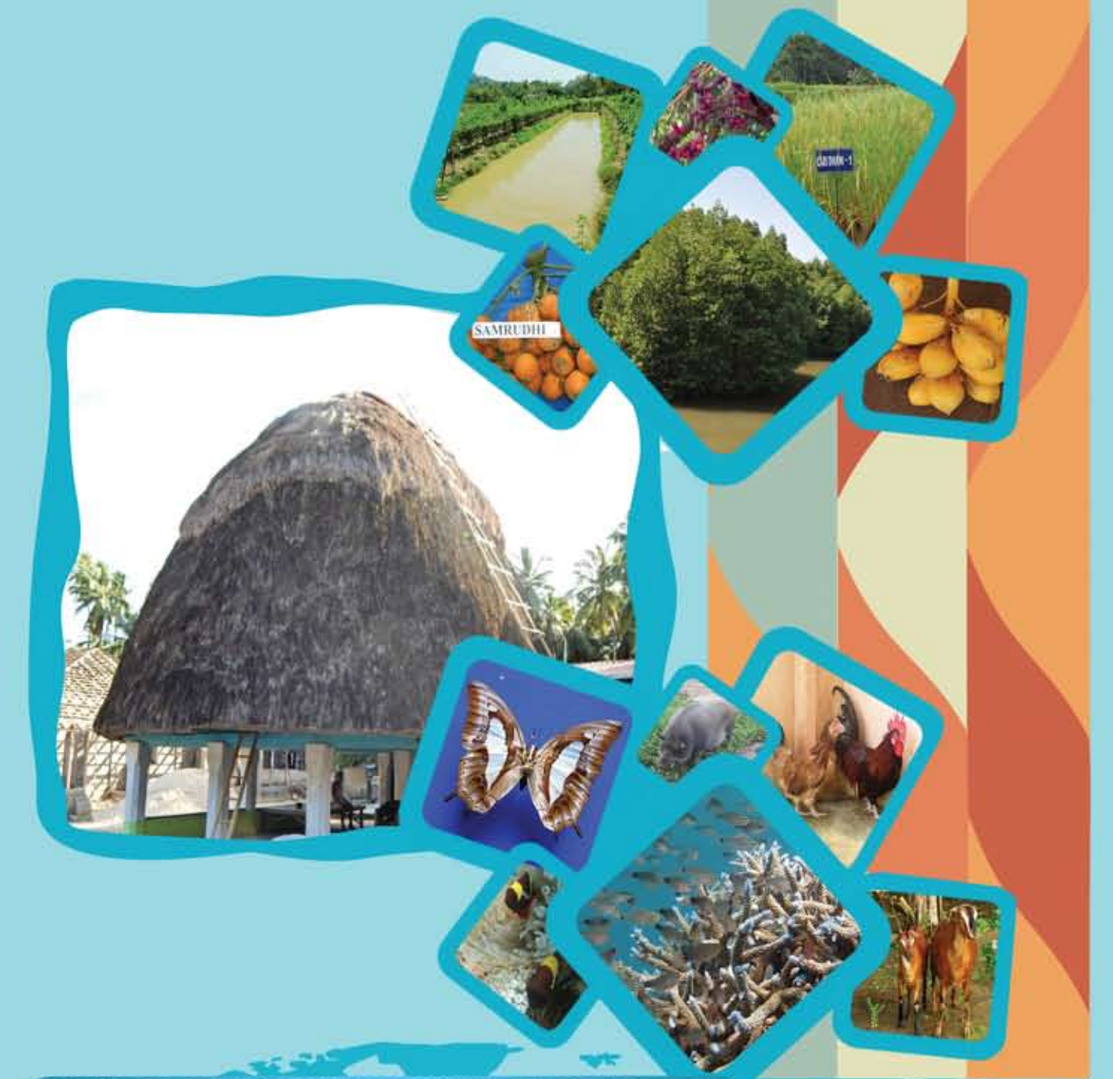

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2014-15

ICAR-CENTRAL ISLAND AGRICULTURAL RESEARCH INSTITUTE
PORT BLAIR-744 101, ANDAMAN & NICOBAR ISLANDS, INDIA
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प्राक्कथन

भा कृ अनु प - केन्द्रीय द्वीपीय **कृषि** अनुसन्धान संस्थान के **वार्षिक** प्रतिवेदन 2014-15 को आपके समक्ष प्रस्तुत करने का सौभाग्य प्राप्त होने पर मुझे गर्व की अनुभूति हो रही है। **वर्ष** 2014-15 हमारे लिए अपनी उपलब्धियों के साथ आगे बढ़ने के कारण अविस्मरणीय रहा है। इन उपलब्धियों में से एक महत्वपूर्ण उपलब्धि यह रही की इस **वर्ष** के दौरान संस्थान प्रजाति रिलीज समिति (IVRC) ने विभिन्न फसलों की कुल 12 उन्नत प्रजातियों को इस द्वीप समूह में खेती के लिए किसानों के हितार्थ संस्तुत किया है, जिनमे, धान की 2 प्रजातियाँ (सी आई ए आर आई धान 8 एवं सी आई ए आर आई धान 9), चौलाई की 2 प्रजातियाँ (सी आई ए आर आई लाल मरशा एवं सी आई ए आर आई **शान**), पोई की एक प्रजाति (सी आई ए आर आई पोई रेड), मूंग की 3 प्रजातियाँ (सीआईएआरआई मूंग 1, सी आई ए आर आई मूंग 2 एवं सी आई ए आर आई मूंग 3) तथा नोनी की 4 प्रजातियाँ (सी आई ए आर आई संजीवनी, सी आई ए आर आई रक्षक, सी आई ए आर आई सम्पदा एवं सी आई ए आर आई समृद्धि) सम्मिलित है। इन प्रजातियों के विकास के अतिरिक्त संस्थान के वैज्ञानिकों द्वारा लगभग 40 अनुसन्धान लेखो का **प्रकाशन** किया गया है, जिनमे से 32 **शोध** लेख 6 से अधिक नास श्रेणी एवं 8 लेख **वैश्विक** स्तर के है।

संस्थान के वैज्ञानिको के अनुसन्धान कार्यो को **भा.कृ.अनु.प.** द्वारा स्वीकृति प्रदान करते हुए उनके द्वारा किये हुए सराहनीय **शोध** कार्य के लिए **भा.कृ.अनु.प.** ने **वर्ष** 2013 के प्रतिष्ठित फखरुद्दीन अली अहमद सम्मान से सम्मानित किया है। साथ ही साथ निदेशक, केन्द्रीय द्वीपीय कृषि अनुसन्धान संस्थान की अध्यक्षता में नगर राजभाषा कार्यान्वयन समिति, पोर्ट ब्लेयर को गृह मंत्रालय, भारत सरकार द्वारा अंडमान एवं निकोबार द्वीप समूह में राजभाषा नीतियों के उत्कृष्ट कार्यान्वयन के लिए अनवरत तीसरे **वर्ष** भी **वर्ष** 2013–14 के लिए पूर्वी क्षेत्र में द्वितीय पुरस्कार से सम्मानित किया गया है, जो कि संस्थान के लिए गर्व की बात है।

इस **वर्ष** की अन्य महत्वपूर्ण उपलब्धियों में से एक उपलब्धि यह भी रही कि द्वीप समूह में स्थित तीन **कृषि** विज्ञान केन्द्रों के अधीन रिक्त पदों पर अधिकारियों एवं कर्मचारियों की कुल 15 पदों पर नियुक्तियॉ की गयी। इसके साथ ही संस्थान के **पशु** विज्ञान प्रभाग एवं प्राकृतिक संसाधन प्रबंधन प्रभाग के प्रभागाध्यक्षों की नियुक्ति भी भारतीय **कृषि** वैज्ञानिक चयन मंडल द्वारा की गयी। इस **वर्ष** संस्थान के अनुसन्धान कार्यो को सुदृढ़ता प्रदान करने हेतु भारतीय कृषि वैज्ञानिक चयन मंडल द्वारा चयनित 12 नए वैज्ञानिको ने अपना कार्यभार ग्रहण किया।

केन्द्रीय द्वीपीय कृषि अनुसन्धान संस्थान इस दौरान माननीय प्रधानमंत्री भारत सरकार की महत्वाकांक्षी **स्वच्छ** भारत अभियान को भी लगभग **शत**–प्रतिशत लागू करने में अग्रणी रहा, इसके साथ ही संस्थान द्वारा आई एस ओ 9001 : 2008 को लागू करने हेतु प्रलेखन, वित्त प्रबंधन प्रणाली, एवं प्रबंधन सूचना प्रणाली, किसान पोर्टल तथा दूरदर्शन **केन्द्र** पोर्ट ब्लेयर से "आपके सवाल" जैसी नई पहल की गयी।

अनुसन्धान एवं विकास कार्यक्रमों को अन्य संस्थानों के साथ परस्पर समन्वयन के द्वारा सुदृढ़ बनाने हेतु अनेक कार्यक्रमों जैसे कि, जैव विविधता अन्तराष्ट्रीय दिवस के विषयवस्तु के अनुसार द्वीपीय जैवविविधता दिवस,

राष्ट्रीय विज्ञान दिवस, संस्थान का 36वां स्थापना दिवस, ए आर एस (प्रारंभिक) परीक्षा 2014 तथा राष्ट्रीय पात्रता परीक्षा (2014), हिंदी पखवाड़ा, सतर्कता जागरूकता सप्ताह, अन्तराष्ट्रीय महिला दिवस तथा किसान मेला का आयोजन किया गया।

संस्थान में वर्ष 2014 – 15 के दौरान आने वाले प्रमुख अतिथि, डॉ. एन. के. कृष्णकुमार, उपमहानिदेशक (बागवानी), भा. कृ. अनु. प. नई दिल्ली, डॉ. के. वी. देवराज, पूर्व कुलपति, कृषि विज्ञान विश्वविद्यालय, बैंगलोर, डॉ. गया प्रसाद, सहायक महानिदेशक (पशु पालन), भा. कृ. अनु. प. नई दिल्ली, डा. एम. ए. आत्मानंद, निदेशक, एन आई ओ टी, चेन्नई एवं श्री एन. बी. सिंह, निदेशक, विस्तार शिक्षा (हिमांचल प्रदेश) रहे । इन गणमान्य अतिथियों ने संस्थान के भ्रमण के दौरान वैज्ञानिको एवं कर्मचारियों से पारस्परिक परिचर्चा की एवं संस्थान के कार्यों एवं कार्यक्रमों की भूरि–भूरि सराहना की।

इस द्वीप समूह के कृषि के क्षेत्र में भविष्य की चुनौतियों का सामना करने में डा. एस. अय्यप्पन, माननीय सचिव कृषि शोध एवं शिक्षा विभाग एवं महानिदेशक, भा. कृ. अ. प. नई दिल्ली के दूरदर्शीपूर्ण नेतृत्व, सतत समर्थन के लिए मै स्वयं तथा यह संस्थान उनके प्रति आभारी है। मै डॉ. एन. के. कृष्णकुमार, उपमहानिदेशक (बागवानी) के प्रति भी अपनी कृतज्ञता व्यक्त करता हूँ जिनके सुझाव इस संस्थान के अनुसन्धान एवं प्रसार कार्यक्रमों से सम्बन्धित समस्याओं के समाधान हेतु प्रेरणा का स्रोत रहा है। मै डॉ. टी. जानकीराम, सहायक महानिदेशक (बागवानी –1), डॉ. एस. के. मल्होत्रा, सहायक महानिदेशक (बागवानी –2) तथा विषयवस्तु प्रभाग के अन्य अधिकारियों एवं कर्मचारियों का भी आभार प्रकट करता हूँ, जिनका सहयोग संस्थान से सम्बंधित पहलुओं को सुलझाने में सदैव प्राप्त हुआ है। मै संस्थान के विभिन्न समितियों के सदस्यों के प्रति भी आभारी हूँ, जिन्होंने द्वीप की आवश्यकताओं के अनुसार हमारे अनुसन्धान कार्यक्रमों को पुनर्व्यवस्थित करने में अपना महत्वपूर्ण सुझाव दिया है।

मै, परम विशिष्ट सेवा मेडल, अति विशिष्ट सेवा मेडल, सेवा मेडल, विशिष्ट सेवा मेडल से सम्मानित माननीय उपराज्यपाल लेफ्टिनेंट जनरल (सेवा निवृत) ए. के. सिंह, श्री विष्णु पदा रे, माननीय संसद सदस्य, अंडमान एवं निकोबार द्वीप समूह, श्री आनन्द प्रकाश, मुख्य सचिव, अंडमान एवं निकोबार प्रशासन, सचिव (कृषि, पशुपालन एवं मत्सियिकी) अंडमान एवं निकोबार प्रशासन एवं अंडमान एवं निकोबार प्रशासन के दक्षिणी, उत्तरी एवं मध्य तथा निकोबार जनपदों के उपायुक्त एवं विभिन्न अनुशांगिक विभागों के निदेशकगण एवं अन्य अधिकारियों, जनजातीय परिषद् एवं नाबार्ड के अध्यक्ष एवं सदस्यों को संस्थान के विभिन्न प्रसार कार्यक्रमों के कार्यान्वयन में सहयोग के लिए धन्यवाद ज्ञापित करता हूँ।

अन्ततः मै, अपने सहकर्मियों, अधिकारियों तथा कर्मचारियों को संस्थान को नई ऊँचाइयों तक ले जाने में उनके अथक कठिन परिश्रम एवं सक्रिय सहयोग के लिए बधाई देता हूँ, और मुझे दृढ़ विश्वास है कि, वे द्वीपीय कृषि में प्राप्त अनुभव एवं विषेशज्ञता से आने वाले वर्षों में इस संस्थान को आशियान देशों में इन्सटीट्युट् ऑफ एक्सेलेंस आन ट्रॉपिकल आइलैंड एग्रीकल्चर के रूप में स्थापित करने की दिशा में महत्वपूर्ण कदम बढ़ाएंगे।

(शिबनारायण दाम रॉय)
निदेशक
भा कृ अनु प - केन्द्रीय द्वीपीय कृषि अनुसन्धान संस्थान

दिनांक : 21 मई 2015

PREFACE

It is my privilege to present annual report of ICAR- Central Island Agricultural Research Institute, Port Blair for year 2014-15, which has been has been a memorable year with release of twelve varieties in crops *viz*., two each in rice (CIARI Dhan 8 & 9) and amaranthus, (CIARI Lal Marsha & CIARI Shaan) one poi (CIARI Poi Red), three mung (CIARI Mung 1,2 & 3) and four in noni (CIARI Sanjivini, CIARI Rakshak, CIARI Sampada and CIARI Samridhi) by the Institute Variety Release Committee of the Institute for the benefit of the farmers and stakeholders of the Island. Beside, a total of 40 research papers of which 32 with NAAS rating of > 6 and eight with global impact were published.

For their commendable research work the Institute Scientists were awarded, Fakhruddin Ali Ahmed Award 2013, and it is a matter of pride to share that under the Chairmanship of Director, ICAR- CIARI, Town Official Language Implementation Committee (TOLIC), Port Blair, has been awarded Second prize for the year 2013-2014 for best implementation of official language policy in Andaman and Nicobar Islands by Govt. of India, Ministry of Home Affairs in eastern region for the third consecutive year.

In this year, major accomplishment was recruitment of the staff for three KVKs of these Islands, altogether 15 posts were filled, beside recruitment of Head of Division of Animal Science and Natural Resource Management was done. Twelve ARS Scientists joined to strengthen the Institute.

New initiatives like Swachh Bharat Mission, documentation for implementation of ISO 9001:2008, implementation of Financial Management System (FIMS) & Management Information System (MIS), KISAN Portal and "AAP ke Sawal with DDK, Port Blair " was undertaken.

To strengthen the coordination with other R&D institution, a series of important events namely International Day for Biological Diversity on the theme Islands Biodiversity, National Science Day, 36th Foundation Day of the Institute, ARS (Prelims 2014) & NET-2014, Vigilance Awareness Week, International Women Day and Kisan Mela were organized.

The important dignitaries, who visited the Institute were Dr. N.K. Krishna Kumar, Deputy Director General (Horticultural Science), Dr.K.V.Devaraj, Former Vice-chancellor, University of Agricultural Sciences, Bangalore, Dr. Gaya Prasad, ADG (AH), ICAR, New Delhi, Dr. M.A. Atmanand, Director, NIOT, Chennai, Shri N.B. Singh, Director, Extension Education, Himachal Pradesh. They interacted and appreciated the work done by the team of Scientists and staff of Institute.

I take this opportunity to express my deep sense of gratitude to Dr. S. Ayyappan, Hon'ble Secretary, DARE and Director General, ICAR for his 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), Dr. S.K. Malhotra, ADG (Hort.II) and all the officers & staff of SMD (Horticultural Science) for rendering support on various issues related to the Institute. I am also thankful to 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, Secretary (Agriculture, Animal husbandry & Fisheries), A& N Administration, Andaman & Nicobar 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 new heights and I strongly believe that with their accumulated experience and expertise on Island agriculture, we will make a major stride in coming years to emerge as the Institute of Excellence on Tropical Island Agriculture in the Asian countries.

21st May, 2015
Port Blair

(Sibnarayan Dam Roy)
Director, ICAR-CIARI

अधिशासी सार
EXECUTIVE SUMMARY

प्राकृतिक संसाधन प्रबंधन
Natural Resource Management

- Of the seven selected bacterial isolates, EM2 followed by NS2 and NPB6 resulted in higher Dehydrogenase activity (DHA) in soil. Isolates EM2 and NPB6 also recorded higher production of acid phosphatase activity in soil. Application of TA1 + NFB3, SM4 + NFB3 and NS2 isolates has resulted in higher biomass production in maize, brinjal and green gram. Among the isolates, *Bacillus subtilis*, *B. cereus* and *B. megaterium* were identified as organisms with maximum phosphate solubilization potential.
- Using the DSSAT model under FASAL project, *kharif* 2014 rice yield was forecasted as 3250 kg/ha while that of *rabi* maize was forecasted as 2800 kg/ha.
- During 2014-15, 100 agromet bulletins in English and 74 in Hindi were issued through print and electronic media.
- KISAN portal was activated on 24th June 2014 for Andaman and Nicobar Islands. The registered farmers (1200) received agro-advisories through 140 SMS both in Hindi and English.
- In Nicobar group Islands, the surface water tested was found to be fresh type with moderately hard to hard category. The water has a mean pH of 7.6; EC of 0.50 dSm^{-1} (with predominance of Ca^{2+}, Mg^{2+} and HCO_3-). In Car Nicobar, ground water was found to be neutral to alkaline in reaction and is of calcium bicarbonate type.
- Studies in Neil Island indicated presence of pesticide residues in 58 and 93% of the vegetable (total 25 samples) and fish samples (total 15 samples) collected. In vegetable samples (12.5%), pesticide residues exceeded the prescribed maximum residue limit (MRL), while in fish samples they were below MRL. Among pesticides, Imidacloprid and DDT residues were most widely found in samples.
- Similarly, in vegetable samples (115) collected from farmer's field in South Andaman, Billy ground, Diglipur, Neil Island and Hut Bay residues of 17 pesticide compounds were detected however, only nine samples contained excess concentration than the prescribed maximum residue level (MRL).
- A farm household survey conducted in Hut Bay, Little Andaman on the fertilizer use pattern in rice and vegetable crops by marginal, small, semi medium and medium farmer's revealed predominant use of N fertilizers (urea & DAP) and non use of K fertilizers.
- Rapid (110 days) vermicompost production technology (containing 1.2-0.6-0.4% N-P-K) from coconut husk (10 parts) and other organic wastes by impregnating with pig slurry manure (3 parts) was developed.
- A farm household survey made to characterize the farming systems (FS) of Little Andaman Island, indicated large family size of tribal household (6) as compared to non-tribals (4)

households. Vegetable and arecanut based FS with goat (43% households) as livestock component was followed by non-tribals, whereas coconut based FS with pig as livestock component (80% households) was predominant among tribals. The annual income of the non-tribal households was 2.07 times that of tribals (Rs. 49,470).

- The rice based cropping + dairy integrated farming system (IFS) for low land areas, diary component (2 HF cows) contributed 53% of total net income (Rs. 2.02 lakh and 302 man days year^{-1}) , whereas in coconut + pig based IFS model of hilly uplands, piggery accounted for 55% of total net income (Rs. 1.45 lakh).
- Under coconut plantations in hilly region, urd bean (ANU-11-19) & mung bean (ANM-11-12) sown at 25 cm x 10 cm and pigeon pea (ANP-12-02) sown at 75 cm x 45 cm recorded higher seed yield that was found to be about 40 -50 % of sole pulse crop yields grown in open conditions.
- Ready to serve (RTS) fruit juices (15 % each of pulp and sugar 0.26 % of preservative, citric acid) of mango, bael and pine apple fruit products were prepared with longer shelf life.
- Hydroponic fodder (maize) production technology was tested for refinement.

उद्यान विज्ञान व वानिकी
Horticulture & Forestry

- A protected structure was designed by fixing UV stabilized polysheet on all sides and roof covered with 50% green colour agro-shadenet to prevent mite infestation in sweet pepper which recorded a higher yield of 44.0 t/ha.
- Growing leafy vegetables in trench system and polytunnel structure recorded higher yield.
- Biochemical analysis of silk, baby corn and corn husk showed significant increase in xanthophyll, total carotenoid, flavonoids and total phenolics from stage-1 (5-7 cm) to stage -4 (11-13 cm).
- In the evaluation of muskmelon and parthenocarpic cucumber in polyhouse during rainy season, the artificial pollinated plants recorded more number of fruits (4.2/plant) than non-pollinated plants (1.7/plant).The yield of parthenocarpic cucumber was higher in rainy season than dry season.
- The promising varieties identified in Okra were 2013/OKHYB-9 (9.0 t/ha), 2013/OKHYB-4 (7.30 t/ha) and 2013/OKHYB-5 (7.25 t/ha) in AVT I trial and were 2012/OKHYB-8 (10.85 t/ha), 2012/OKHYB-1 (10.15 t/ha), 2012/OKHYB-7 (10.10 t/ha), HOK-152 (7.35 t/ha) in AVT II trial respectively.
- In cowpea the promising entries identified were 2012/COPBVAR-6 (8.43 t/ha) and Kashi Kanchan (8.33 t/ha) in AVT II trial.
- 28 varieties of gladiolus were evaluated for their growth and flowering performance in which maximum plant height was recorded in the variety Yellow Stone (89.2 cm). Early sprouting was observed in Arka Kesar (7 days), whereas early spike emergence, early flowering and

long duration of flowering was observed in Pusa Kiran (33, 37 and 20.9 days) respectively.

- In evaluation of twelve tuberose varieties, early spike emergence (36.4 days), early flowering (46.5 days) and maximum longevity of spike (20 days) were observed in the variety GKTC-4. Maximum number of florets was observed in the variety Suvasini (37.2), whereas maximum spike length was observed in Phule Rajani (108.7 cm).
- Vaselife studies on tuberose cv. Prajwal recorded maximum vaselife in 3% sugar as holding solution, in gerbera, 10.3 days was observed in 5% sugar as holding solution and in gladiolus, variety Plumtrat recorded highest vase life (15 days) in the holding solution of salicylic acid 1.5 mM.
- 38 different genotypes of Anthurium having variations in size, shape and colour of spathe and spadix have been collected and conserved. Maximum length of the spathe (18.6 cm) and spadix (7.2 cm) was observed in Acc. Tropical Red.
- Arachnis orchid performed well as an intercrop with tuberose in open condition.
- In African marigold cultivars Pusa Basanti Gainda recorded maximum plant height (75 cm), number of flowers per plant (43.7) and maximum yield per plant (113.4 g/plant) in high foliar treatment.
- Modified approach grafting has been standardized in the wild species of mango *Mangifera griffithi* with 60.3% success rate.
- Physico-chemical characterization of seventeen accessions of papaya collected from different parts of the Island showed significant diversity for individual fruit weight, fruit length, fruit girth, pulp thickness and TSS.
- A new species of citrus namely *C. pennivesiculata* and four different types of dragon fruits like pink fleshed, white fleshed, red fleshed and an unknown type were collected and conserved.
- The phytochemical analysis during fruit maturity stage of Malay rose apple (*Syzygium malaccence*) showed increase in phenols, flavonoids and antioxidant activity. The anthocyanin content of the fruits decreased during fruit maturity (0.057 mg/100 g) whereas the ascorbic acid increased during fruit maturity (5.6 mg/100 g). The shelf life of the fruits increased upto 10 days under refrigerated storage, when compared to ambient storage temperature (03 days).
- The treatment combination of FYM, vermicompost, coir compost and bio fertilizers recorded maximum plant height (2.12 m), girth (71.63 cm) and leaf area index (6.26) in Nendran variety of banana.
- The roots of the medicinal plant (*Cheilocostus speciosus*) recorded higher diosgenin content (1.45 mg/ml) than the tubers (0.98 mg/ml).
- Tirur accession of *Piper sarmentosum* showed appreciable amount of phytochemicals like flavonoids (56.5 mg/g), chlorophyll (47.86 mg/g) and antioxidants (43%) with minimum quantity of carotenoids (0.52 mg/100 g). The spikes of Tirur accession had higher piperine content (3.27%), when compared with the roots (1.06%).

- Quantification of colchicine was done by HPLC in both tubers and seeds of four different accessions of *Gloriosa superba.* Among the tuber samples, Chidiyatapu accession recorded highest colchicine content, whereas the Andhra Pradesh accession recorded highest colchicine content among the seed samples analyzed.
- AGD x AOD recorded the highest setting percentage (25.9), followed by AYD x AGD. Among the CARI varieties the cross between CARI-Surya x CARI-Annapurna recorded the highest setting percentage of 24.2. In DxT cross combinations overall setting percentage of 23.2 % was observed and in inter se mating of selected Pacific Ocean accessions an overall setting percentage of 22.6% was observed.
- 25 accessions of different tuber crops were collected from different parts of the Island and submitted to NAG center of CTCRI for conservation.
- Among 12 varieties evaluated in colacasia, maximum yield was recorded in Sree Kiran (24.1 t/ha).
- Among two varieties of cassava evaluated, Cv. H 226 recorded maximum mean tuber yield (2.56 Kg/plant) when compared to Sree Vijaya (1.84 kg/plant).
- Seven morphological plant characters were recorded from 33 accessions of *Morinda citrifolia* and released four varieties as CIARI Samridhi, CIARI Sanjivini, CIARI Sampada and CIARI Rakshak.
- Quality planting materials of Black pepper (8000), clove (2000), nutmeg (500) and ginger (600 kg) were produced and about 300 kg of seed rhizome of ginger have been distributed to the farmers.
- In the four FLDs conducted on organic production of ginger in farmers' fields, an average yield of 0.3 to 0.40 tonnes was recorded from an area of 0.02 ha.

क्षेत्रीय फसलें सुधार एवं सुरक्षा

Field Crop Improvement & Protection

- Two long duration rice varieties *viz.* CIARI Dhan 8 and CIARI Dhan 9 derived from local popular landrace C14-8 have been developed and released.
- In Mungbean three new varieties *viz.* CIARI Mung 1, CIARI Mung 2 and CIARI Mung 3 derived from local indigenous material have been developed and released.
- A total of 35 kg Nucleus, 396 kg Breeder and 3514 kg Truthfully Labelled seeds of 9 rice varieties was produced.
- A total of 220 Kg breeder seed and 1760 kg Truthfully Labelled seed of high yielding and salt tolerant rice varieties have been supplied to the Department of Agriculture, Port Blair.
- About 1200 kg Truthfully Labelled seed has been distributed to the tribal farmers of Nicobar Island during the period.
- The intra-varietal diversity of C14-8 rice lines was corroborated by molecular diversity using SSR markers.

- Three bacterial wilt resistant brinjal lines CIARI Brinjal 2, CARI Brinjal 3 and CIARI Brinjal 4 have been developed and being evaluated for yield and quality characters in the field.
- The genotypes namely, ANM-12-02, ANM-11-12, ANM-11-05, ANM-12-01, ANM-11-07-2, ANM-11-08 and ANM-11-15 in mungbean and ANU-11-19, ANU-11-10, ANU-11-29 and ANU-11-09 in urdbean, were found promising across famers' fields in the Islands.
- In pigeonpea, five promising lines have been promoted for evaluation in replicated advanced varietal trial (AVT-II).
- Genotypes of mungbean *viz.* ANM-12-02, ANM-11-08 and ANM-11-15 and urdbean namely, ANU-11-19 and ANU-11-10 are selected for evaluation in the AICRP MULLaRP Rabi trials.
- The genetic variability and evolutionary biology of solanaceous bacterial wilt pathogen (*Ralstonia solanacearum*) isolates were thoroughly studied using polyphasic approaches and confirmed that the disease outbreaks in different locations in Andaman Islands were mostly caused by one genetic lineage (the clonal complex composed of ST1, 2, and 3) derived from a single ancestor that spread throughout the Islands recently from mainland India and not by a diverse endemic pathogen population nor from nearer South Eastern countries.
- A talc based bioformulation (CIARI- Bio-Consortia) has been developed for the management of brinjal bacterial wilt. The methodology of application along with FYM has been standardized through field experiments for the effective management of Brinjal wilt.
- Coccinellid beetles and spiders were the commonly observed predators in legume ecosystem. Parasitised larvae of notodontidae and pyralidae leaf feeder pests of red gram were collected.
- Biological studies were conducted in fruit and nut borer pests of jamun and wild jamun. Cashew and jamun were infested with pyralid fruit borers. The specimens of all insect pests and natural enemies were collected, preserved and documented.
- Post natal developmental observations were recorded for *Rattus sp*. It was found that on an average each animal consumed about 11.21 to 15.54 g of rice grains per day.

पशु विज्ञान

Animal Science

- A total of 1500 Nicobari fowl (Black, White and Brown) having short shank length have been produced based on the mass segregation and selection.
- Nicobari pigs showed higher litter weight at birth and better survivability rate.
- Supplementation of Noni and Kalmegh (10 ml + 20 mg) per bird per day induces TLR-3, TLR-4, TLR-5 and decrease TLR-7 gene expression in Nicobari fowl, which is an indicator of antibacterial and antiviral responses.
- Animal disease monitoring and surveillance revealed that parasitism is the major diseases in A&N Islands.
- Based on the sdLPB-ELISA, it is inferred that the level of immunity for the serotype O, A and Asia-1 has increased manifold over the years.

- A total of 2628 Andaman local goats were registered for monitoring the morphometric and reproductive performance.
- Feeding of *Andrographis panniculata* extract @10 ml per bird per day significantly increased the levels of iron, copper and zinc in serum by 3.5, 1.2 and 2 times respectively and showed hepatoprotective and hypocholesterlemic effect in Nicobari fowl.
- HPLC based method was standardized and developed for extraction and estimation of andrographolide in serum collected from birds treated with *A.panniculata*.
- By adopting the improved rural poultry farming technologies, farm women were empowered to meet out the ICMR recommendations of egg consumption (180 eggs per year per person.)

मत्स्य विज्ञान
Fisheries Science

- Successful captive breeding of Sebae anemone fish, *Amphiprion sebae*, Skunk anemone fish, *Amphiprion akallopisos*, Red Saddle anemone fish, *Amphiprion ephippium* has been achieved for the first time in ANI. Initial breeding of all the three fishes in captivity were observed within 36 days of brood stock management. Incubation period was observed to be 8±1 days at 28±1p C. Captive breeding technology of Skunk anemone fish and *Amphiprion akallopisos* was standardized.
- Altogether, 72 species of true mangroves and mangrove associates distributed among 37 families and 68 genera were reported from the identified contiguous patches.*Pemphis acidula* Forst. (Lythraceae) has been rediscovered after a lapse of 91 years from Andaman and Nicobar Islands. Further, *Rhizophora* (Rhizophoraceae) hybrids were reported for the first time from Hut Bay (Little Andaman).
- 79 contiguous patches of mangroves were surveyed and mapped in Andaman Islands for determination of their conservation and protection.
- Presence of biological indicator sponge of Oligotrophic waters *Carteriospongia foliascens* was recorded depth wise in 12 study sites of Andaman revealing the supporting evidence of pristine Andaman waters.

सामाजिक विज्ञान
Social Science

- Out Reach Centre has taken technological intervention in Diglipur cluster of villages following group and participatory approach. Thirty Five trainings beside demonstrations on high yielding varieties of rice, maize, brinjal, pulses and seed village were conducted. Horizontal spread of technology i.e. HYV's of rice of CIARI and pekin duck was reflected in the operational areas.
- Based on the secondary data on area and production of major agricultural crops of ANI from for the period 2005 to 2014, the productivity trends has been analyzed. The average productivity /ha in coconut was found to be 4470 nuts, in arecanut 1.38Mt, in paddy 2.82Mt,

in pulses 0.55Mt, in oilseeds 0.60Mt, in vegetables 7.20Mt and in fruits it was 8.50Mt respectively. The productivity trend over the years has been found to be in increasing trends, but at marginal level.

कृषि विज्ञान केन्द्र, दक्षिणी अंडमान
Krishi Vigyan Kendra, South Andaman

- KVK has conducted thirty nine training, thirteen Front Line Demonstration (FLD) and ten On Farm Trial(OFT) at farmers field to assess and refine the selected technology in agriculture and allied fields. Extension activities including TV, Radio talk, Kisan Mela, Women in Agriculture Day and National Science Day was conducted to popularized the technologies among the farmers of South Andaman.

कृषि विज्ञान केन्द्र, निकोबार
Krishi Vigyan Kendra, Nicobar

- Twenty eight trainings were conducted in the disciplines of Agronomy, Animal Science, Horticulture, Agriculture Engineering, Fisheries and Social Science Section, wherein a total of 849 farmers including 338 female got benefited. This involved 68 man days and 1771 trainee days.
- For assessment and refinement of technology relevant to Nicobar, a total of seven, On Farm Trial (OFT) were successfully undertaken with participation of 40 tribal farmers. Further, 6 nos. of Front Line Demonstrations (FLDs) were also done at Nicobar with the active participation of 16 tribal farmers. A total of 620 extension activities were carried-out benefiting 4591 tribal farmers, students and general public for agricultural development in Nicobar district.
- Dissemination of agricultural technology relevant to Nicobar was done through Kisan Mela, National Science Day and in Carnic/Tribal Festival.
- Several programmes under Tribal Sub Plan were carried out with host Institute to enrich the tribal farmers with skill, knowledge and critical inputs for community development.

कृषि विज्ञान केन्द्र, उत्तरी एवं मध्य अंडमान
Krishi Vigyan Kendra, North & Middle Andaman

- During December, 2014 to March, 2015, sixteen training programme for farmers, farmwomen and rural youth were conducted to create awareness on selected technologies in agriculture and allied fields. KVK also conducted Kisan Mela and National Science Day for the benefit of the stakeholder of North and Middle Andaman.

INTRODUCTION

ICAR -Central Island Agricultural Research Institute (CIARI)

The ICAR- Central Island Agricultural Research Institute (ICAR-CIARI) for A & N Islands, established on 23rd June 1978, is unique in ICAR system which is engaged in multidisciplinary research, benefiting island ecosystem. It has several accomplishments during the last thirty six years of its service despite various insurmountable constraints. The research activities are carried out under five divisions *viz.,* Natural Resource Management, Horticulture & Forestry, Field Crops, Fisheries Science, Animal Science and one Social Science Section. The Institute has its main campus located at Garacharma farm and is spread over 62 ha of land, wherein research work related to field crops, horticulture, animal sciences and fresh water fisheries are being carried out. In addition, it has three Krishi Vigyan Kendras located one each at Sippighat, Car Nicobar and Nimbudera covering all the three districts of the Island, besides an Out Reach Centre supported by NABARD at Diglipur, North Andaman.

Our primary focus for the 12th plan is to enhance productivity through characterization and conservation of Island genetic resources, development of genetically superior varieties/breeds, systems approach in Island farming, development of climate resilient agricultural technologies suitable for the agro-ecological conditions of these Islands and effective management of post-harvest losses. The effective transfer of technologies would help to achieve self sufficiency in major food items, particularly the perishable commodities and to ensure nutritional and livelihood security to the Island farmers/fishers/farm women especially the tribal farmers of the Nicobar group of Islands. For socio-economic amelioration of the tribal communities and the farm women it is envisioned to provide livelihood opportunity through sustainable technological intervention and capacity building under Tribal Sub Plan.

In order to utilize the financial resources optimally and in the light of the fact that CIARI is the only ICAR Research Institute in this region, it is planned to strengthen the state of the art centralized research facilities for conducting research on impact of climate change, bio-prospecting of Island genetic resources, post harvest and pre-harvest, animal and fish health, research on soil, water and tissue culture research. Integrated Agriculture System for Eco-regions is being taken up as the flagship programme of this Institute to enhance the adaptive capacity of the Island farmers and fishers in order to build disaster and climate resilient Islands through frontier research. The integrated approach will be promoted by developing location-specific farming system models, including the wealth of the vast coastal and marine resources in the Islands, which can serve as unique models for Tropical Island ecosystems. The geographical location of Island confers freedom from various diseases, insect, pest, however, the unrestricted entry of unwanted bio-organisms pose a continual threat to the crop-animal-fish component of the Islands. In order to protect the precious flora and faunal diversity of the Islands, it is envisioned to develop facilities for Composite Bio-security and Quarantine Facility during the plan period.

With the accumulated experience and expertise in Island agriculture, it 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 important agri-horticulture, livestock and fisheries of A&N Islands through adaptive and basic research for attaining economic self sufficiency.
- ✓ To develop appropriate plans for conservation of natural resources and their sustainable use.
- ✓ To standardize technologies for animal health coverage and livestock production.
- ✓ To standardize techniques for capture and culture fishers including coastal aquaculture.
- ✓ First line transfer of technology and training to the relevant state departments.

THRUST AREAS FOR XII PLAN

Broad research programmes for the XII Plan are as under:

- Characterization and bioprospecting 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

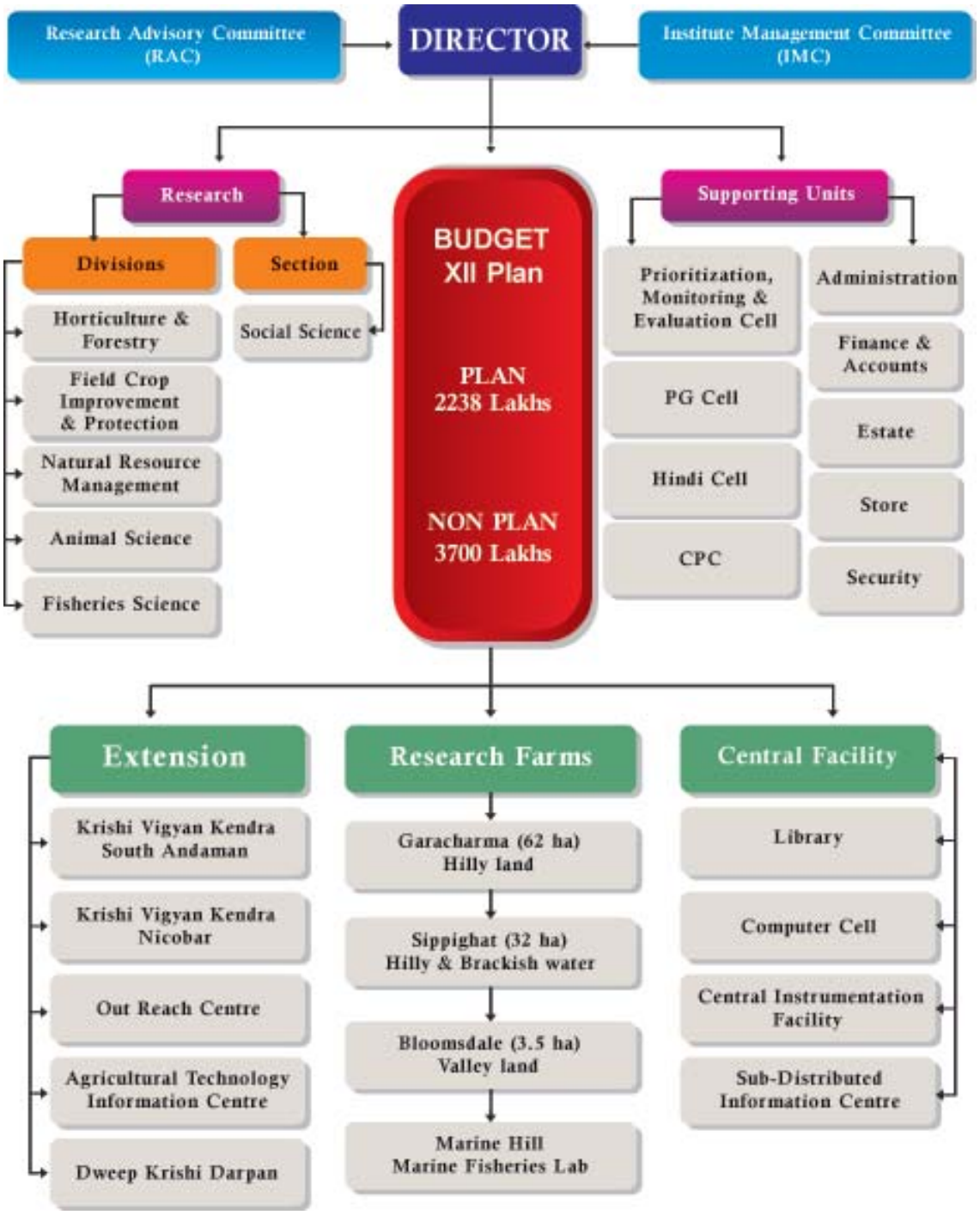
Beside three other programmes are:

- 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
Section
Horticulture & Forestry
Field Crop Improvement & Protection
Natural Resource Management
Animal Science
Fisheries Science
Social Science
BUDGET XII Plan
PLAN 2238 Lakhs
NON PLAN 3700 Lakhs
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
Out Reach Centre
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

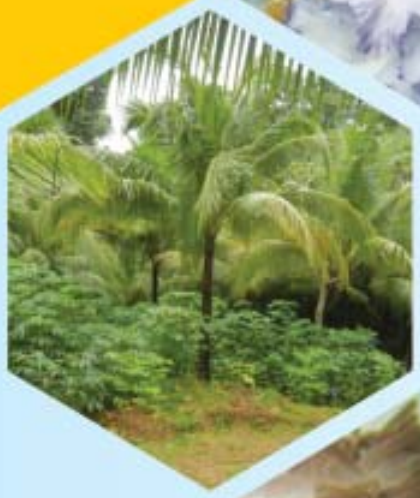
STAFF POSITION

Sl. No.	Category	Sanctioned	Filled
1.	Scientific	50+1	32+1
2.	Technical	43	36
3.	Administrative	27	25
4.	Skilled Supporting Staff	78	70
	Total	198+ 1	164

BUDGET UTILIZATION DURING 2014-2015

Head of Account	**Plan (In Lakhs)**		**Non-Plan (In Lakhs)**	
Particulars	**Sanction**	**Expenditure**	**Sanction**	**Expenditure**
Establishment Charges	-	-	1200.20	1144.88
Travelling Allowances	35.00	34.99	27.00	26.80
Recurring Contingencies	145.00	144.95	206.45	206.92
Works (Main)	16.00	15.84	42.30	41.08
Equipment, furniture & livestock	112.00	111.63	-	-
Books (Library)	10.00	10.00	-	-
HRD/Fellowships	12.00	11.88	-	-
TSP	150.00	149.94	-	-
Pension	-	-	132.00	131.95
Total	**480.00**	**479.23**	**1607.95**	**1551.63**
P. Loans & Advances	**-**	**-**	**22.28**	**18.95**

अनुसंधान कार्यक्रम
Research Programmes




प्राकृतिक संसाधन प्रबंधन प्रभाग
Division of Natural Resource Management

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

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

The information on the potential beneficial organisms of this island and their role in nutrient cycling is very essential for enhancing the productivity of agro-ecosystem and soil health. During 2014-15, a field survey was carried out to collect soil samples along a selected transect covering different land uses. The soil samples were used for isolation of different microbes and identified through 16S rDNA and BLAST search.

The effect of seven selected isolates in improving the soil enzyme activities were studied in an incubation experiment of 30 days. Dehydrogenase activity (DHA) has increased immediately after the inoculation, and over the period it decreased, but at different rates for different treatments (Fig. 1a & b). However, among the treatments EM 2 followed by NS2 and NPB6 resulted in higher DHA in soil. In contrast, the treatments have slowly increased acid phosphatase activity and the peak was reached at 15 DAI in all the treatments, later it decreased. Among the treatments, EM2 followed by NPB6 resulted in higher production of acid phosphatase activity in soil.

As some of these organisms are known for plant growth promotion and nutrient mobilization in soils, a pot culture experiment was carried out to study the effect of these isolates on growth of green gram, maize and brinjal. It was observed that all the treatments resulted in higher dry biomass yield in maize followed by brinjal and green gram (Fig. 2). Among the treatments TA1 + NFB3 produced highest dry biomass in maize followed by microbial consortia containing all the microbes. However, in brinjal higher biomass was observed for SM4 + NFB3 treatment while NS2 produced higher biomass yield in green gram. This indicated that all the organisms are not producing similar effect in all the crops and crop specific microbial combinations need to be used. Among the isolates, *Bacillus subtilis*, *B. cereus* and *B. megaterium* were identified as P solubilizers having maximum phosphate solubilization potential.

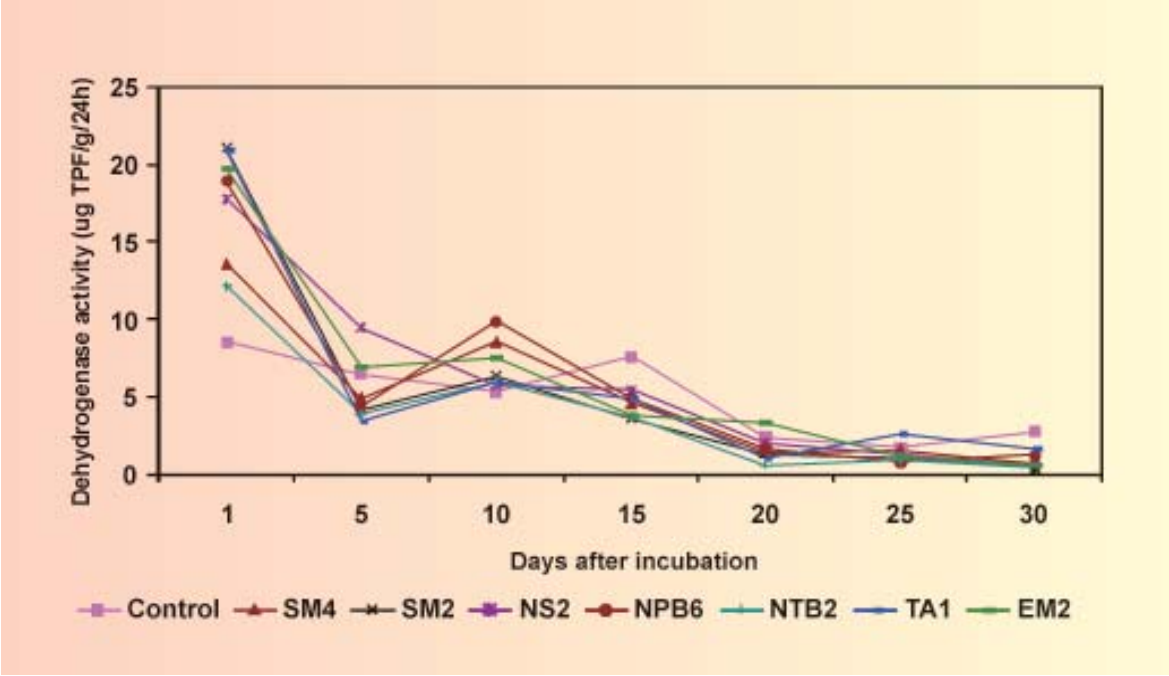


Fig. 1a: Effect of different microbial treatment on DHA and Acid Phosphatase activities

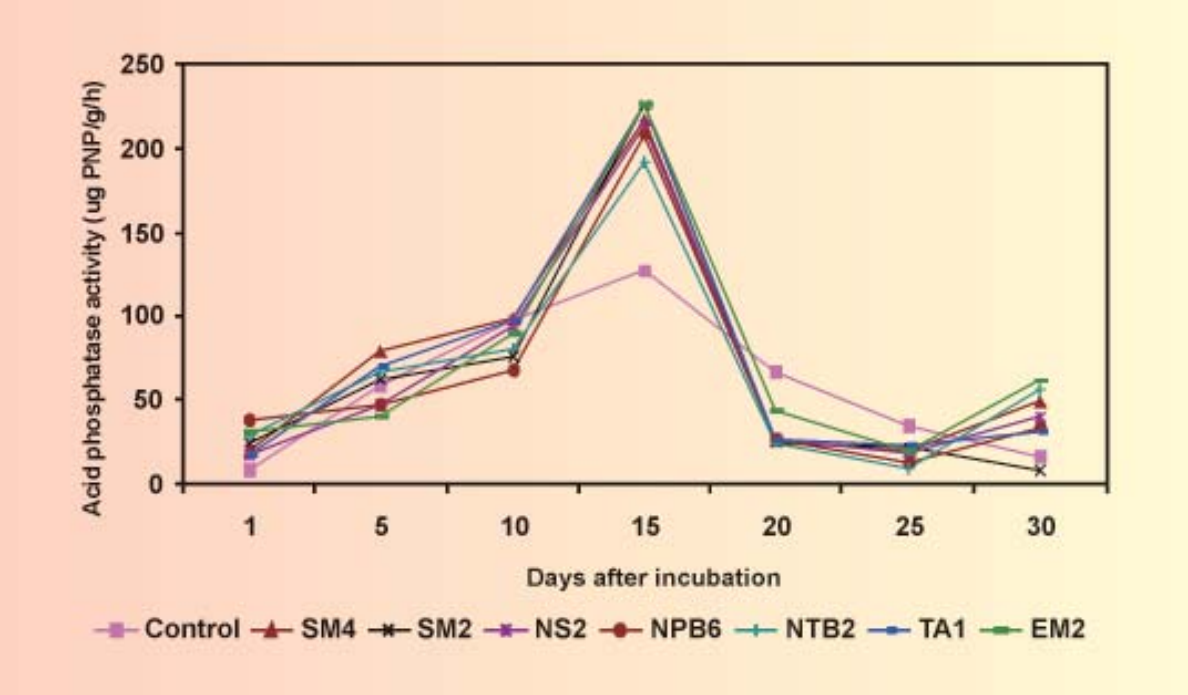


Fig. 1b: Effect of different microbial treatment on DHA and Acid Phosphatase activities

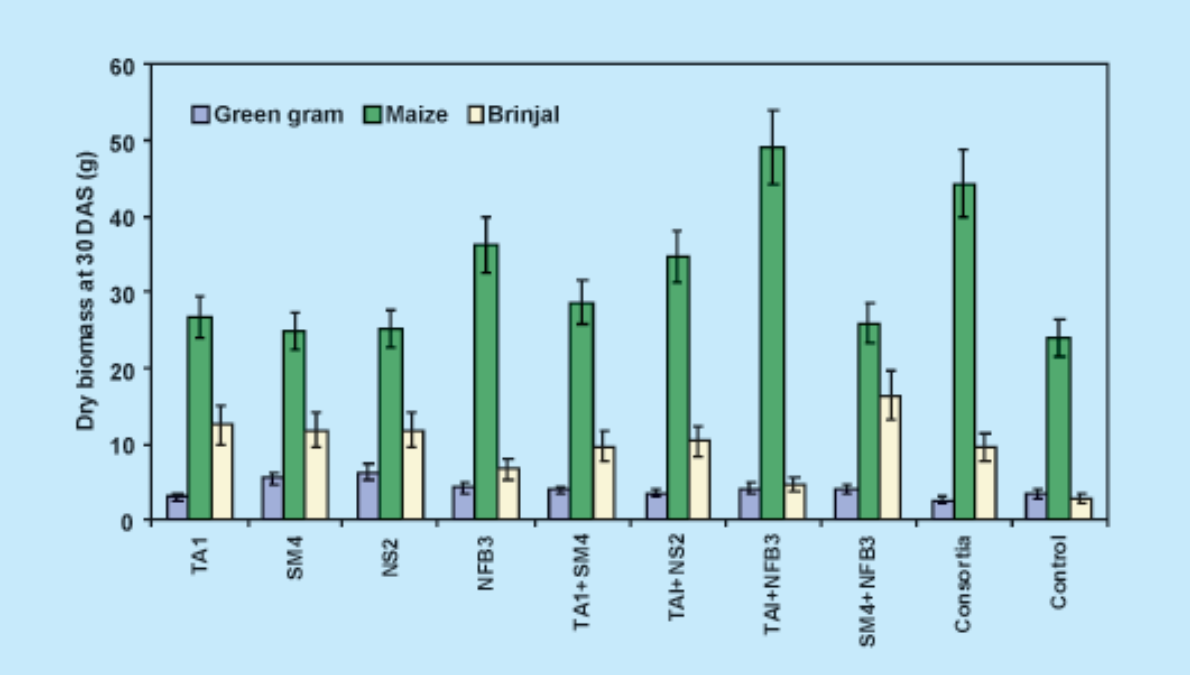


Fig. 2: Effect of different microbial treatments on biomass yield

Forecasting Agricultural Output Using Space, Agro-meteorology and Land Based Observations (FASAL)

A.Velmurugan and T.Subramani

Andaman and Nicobar Islands is highly vulnerable to inter-annual and sub-seasonal climate variability particularly of rainfall. Crop production forecast based on the weather and ground observation is essential for ensuring timely availability of production information to support policy decision at national level.

During 2014-15 the ongoing experiment on validation of crop yield models for rice and maize 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. Crop cutting experiments for yield estimation were carried out during November to January 2015 at different locations in farmers field separately for medium and long duration rice. The yield varied from 2.3 to 3.4 t/ha for medium duration rice and 1.9 to 2.8 t/ha for long duration rice varieties as given in Fig. 3. Using the DSSAT model *kharif* rice yield for 2014 (F3) was forecasted as 3250 kg/ha with the total production of 27267 MT (±1060).

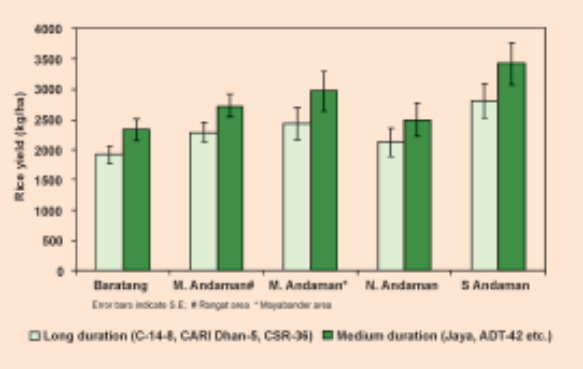


Fig. 3: Variations in rice yield (kg/ha) at farmers field in Andaman Islands

Similarly crop yield forecast for *rabi* maize was developed with regression and simulation model and field experiment was conducted to validate the DSSAT model. The maize yield forecast (F3) was reduced to 2800 kg/ha from the initial forecast (F2) of 3150 kg/ha. The yield reduction was due to the terminal drought. A glimpse of crop cutting experiment carried out at farmers field is given in Plate 1 a & b.

Plate1a: Rice at farmers field in Middle Andaman

Plate1b: Maize at farmers field in South Andaman

Plate 1a & b: Crop cutting experiments

Gramin Krishi Mousam Seva - Integrated Agromet Advisory Services

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

Andaman and Nicobar Islands experience tropical climate and receive rainfall from both southwest and northeast monsoons. As the Islands are rainfed, agricultural production and water resources are largely dependent on the performance of monsoon. Therefore, the on-going Integrated Agromet Advisory Service (IAAS) started in 23rd June, 2008 provides district wise weather based agro-advisory service twice a week for the benefit of farming community and other stakeholders.

Agro-advisory service

During the period Agro-Meteorological Field Units (AMFU) at CIARI, Port Blair has received the weather forecast from IMD, Pune, interpreted in the light of current weather and agricultural activities, prepared the integrated advisories and are issued in Hindi and English languages. It was aimed at minimizing production losses and aid in timely decision making in farm operations. During 2014-15, nearly 100 agromet bulletins in English and 74 in Hindi were issued through print and electronic media. The agromet unit effectively utilized the services of Doordarshan and All India Radio (AIR) to reach out to the farmers. During the period, a weekly advisory on every Thursday in regional language was also broadcast.

mKISAN and SMS service

AMFU Port Blair has been activated in mKISAN portal on 24th June 2014 and registered farmers from South Andaman, North and Middle Andaman and Nicobar Islands. The farmers of three districts were received SMS on every Tuesday and Friday in Hindi and English from CIARI, Port Blair. During the period, nearly 1200 farmers across the islands were registered and received agro-advisories through 140 SMS.

Verification of forecast

Verification of forecasted and observed values of rainfall was carried out for pre –monsoon, monsoon and post monsoon period (Table 1). The results revealed that on an average forecasted and observed values of rainfall were matching to the tune of 83.6% for pre monsoon, 72.7% for monsoon and 71.2% 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 1: Verification of forecast

S.No.	Particulars	Pre-monsoon (April-May, 2014)	Monsoon (June-Nov, 2014)	Post-monsoon (Dec, 2014 - March, 2015)
1	No. of days when rain was forecasted and also observed (YY)	20	96	17
2	No. of days when rain was observed but not forecasted (YN)	3	9	7
3	No. of days when rain was not observed but forecasted (NY)	7	39	27
4	No. of days when rain was not observed and also not forecasted (NN)	31	9	67
5	No. of matching cases (YY+NN)	51	133	84
6	Skill score or ratio score of rainfall	**83.6**	**72.7**	**71.2**

Farmer's awareness programme

AMFU-Port Blair has organised two farmers awareness programme on 23rd August, 2014 at Port Blair and 12th March 2015 at Harminder Bay to sensitize the farmers on weather based agricultural activities to minimize the loss and optimize the resource use (Plate 2 a & b). During the period suitable pre and post incidence agro-advisories encompassing all aspects of agriculture were issued for the benefit of all the stake holders.

Plate 2a: At a tribal village, Little Andaman

Plate 2b : At CIARI, Port Blair, distribution of rain gauge to farmers

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

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

Andaman and Nicobar Islands face the twin problems of water logging during monsoon season and water scarcity for fresh water during post-monsoon season. The coastal land becomes saline due to capillary rise of saline water and sea water intrusion which also reduces the quality of ground water. The demand for intensification of agriculture and irrigation water for vegetables during dry season has been increasing. Apart from this the land mass of South Andaman and parts of Nicobar Islands have subsided due to plate movements during the December 2004 Indian Ocean tsunami, resulting in movement of sea water into the shallow wells located along the coastline. These areas exhibit seasonal variation in water quality used both for domestic and irrigation purpose. Therefore, the present study is aimed to assess and characterize the salt affected coastal soils, the spatio-temporal variation of water quality, development of alternate land use strategies and evaluation of salinity tolerant crop varieties in the coastal areas.

The study on quality of surface water such as small ponds and streams (Plate 3 a & b) of Nicobar group showed not much variation across different islands. The EC values of the region varied from 0.25 to 0.86 dSm^{-1} with mean value of 0.50 dSm^{-1}. Among the dissolved ions, Ca^{2+} and Mg^{2+} predominates the cation concentration with values ranging from 37 to 53 ppm and 13.2 to 30.3 ppm, respectively. The cation composition was in the order of $Ca^{2+} > Mg^{2+} > Na^{+} > K^{+}$ in all the samples tested. The pH of the water samples across the islands varied from 7.4 to 7.9 with mean value of 7.6 with carbonates mainly in the form of HCO_3^-. The classification of water based on WHO and ISI standards indicated that it is fresh water type with TDS less than 500 ppm. However, temporary hardness caused by bicarbonate resulted in classification of the water as moderately hard to hard category.

The quality of ground water in Car Nicobar was studied which showed that throughout the island it is neutral to alkaline. It is generally of the calcium

bicarbonate type, and the bicarbonate content varied from 83 to 181 ppm. It greatly predominates over the chloride content varying between 18-245 ppm. The pH (Plate 3c) and EC distribution (Plate 3d) of ground water samples collected from Car Nicobar indicated that in general, the values are low in the central part of the island where forest predominates and higher values are observed in North and South-Eastern part of the island (Sawai, Tee Top, Mus, Small Lapathy and Kimios). The pH ranges from 7.4 to 8.4 and EC varies from 0.3 to 1.5 dSm^{-1}.

Several bacteria and fungi have also been isolated from soil samples collected from saline and marshy areas and being evaluated for its growth promotion and nutrient mobilization properties.

Plate3a: Mixing of sea water with fresh water stream

Plate 3b: Shallow ring well in the coastal areas

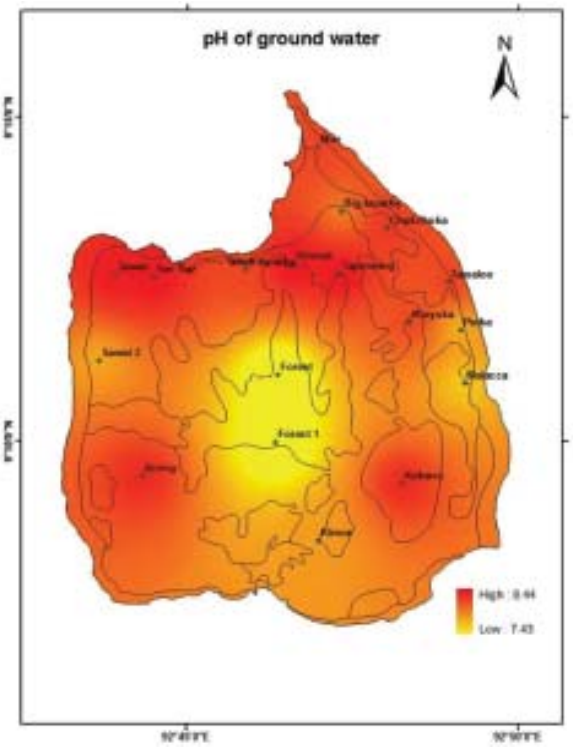


Plate 3c: Distribution of pH of ground water

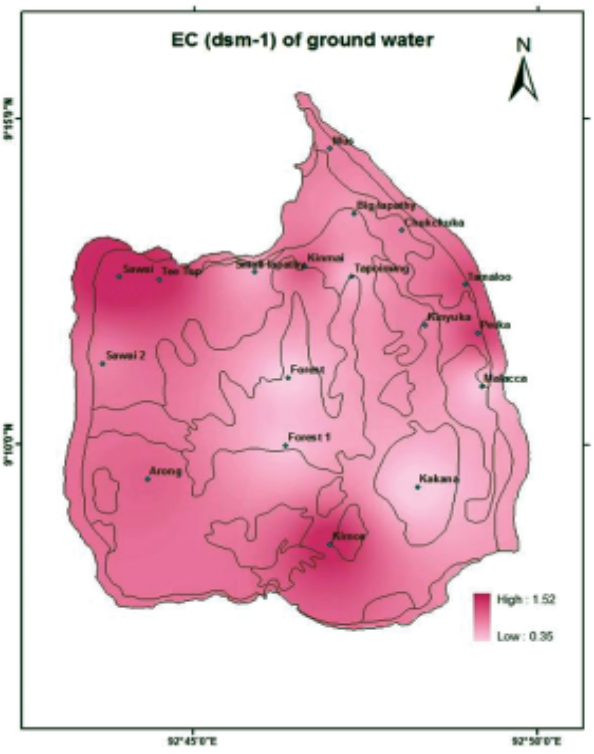


Plate 3d: Distribution of EC of ground water

Plate 3 a, b, c& d: Water resources and ground water quality of Car Nicobar Island

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 pesticide residues in aquatic ecosystems of the Neil Island for which three transects covering agricultural, fresh water and marine ecosystem were identified and vegetable (25), soil (10), water (10), sediment (10) and fish (15) samples were collected from each transect over the year. The study indicated that 58% of the vegetable and 93% of fish samples contained residues of different pesticides with varying concentration (Table 2).

The major pesticide residues found in different samples are imidacloprid, o, p' – DDT, profenophos and acetamiprid. Pesticide residues up to 9 compounds were found in vegetable samples with mean concentration of 47.5 µg kg^{-1}, while marine fish samples recorded 5 compounds with mean concentration of 3.4 µg kg^{-1} (Plate 4). Similarly 70% of the soil samples indicated the presence of o, p' – DDT, p, p' – DDT, profenophos and imidacloprid in the range of 2.0 to 5.0 µg kg^{-1} with the mean concentration of 3.7 µg kg^{-1}. Imidacloprid was most widely found followed by DDT residues in both soil and water samples. It was observed that o, p' – DDT and imidacloprid were found in all the components of the ecosystem (Table 2). Only 12.5 % of the vegetable samples exceeded the prescribed maximum residue limit (MRL) while none of the fish samples exceeded the MRL.

Table 2: Status on pesticide residues in different components of Neil ecosystem

Item	No. of residues	Major pesticide found	Range (µg kg^{-1})	Per cent samples with residues
Vegetable	9	Profenophos, o, p' – DDT, p, p' – DDT, Acetamiprid, imidacloprid	1.3 - 1308	58
Sediments	2	Imidacloprid, o, p' – DDT, p, p' – DDT	1.5 -5.0	68
Soil	4	Imidacloprid, o, p' – DDT, p, p' – DDT	2.0 – 5.0	70
Fresh water	4	Imidacloprid, acetamiprid, o, p' – DDT, p, p' – DDT	3.0 – 133	75
Fish	5	o,p DDT, imidacloprid, profenophos	1.2 – 10.0	93

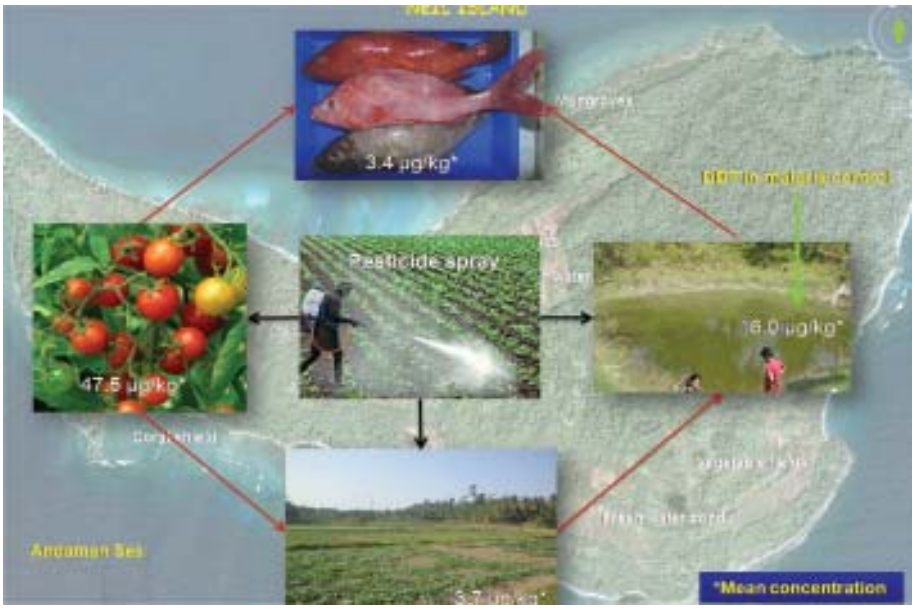


Plate 4: Status of pesticide residues in different component of Island ecosystem

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. Sankaran, Shrawan Singh, M.S. Kundu, R. Kiruba Sankar, B.K. Nanda and I. Jaisankar

Farming system characterization

A farm household survey was conducted to characterize the existing farming systems of tribal and nontribal population in Little Andaman Island. The survey indicated distinct nature of tribal and nontribal farming in terms of land use and livestock holdings. The average family size of nontribal household is only 4 compared to 6 in tribal households. Vegetable and areca nut based farming system exists among the nontribal population, while coconut based farming is predominant among the tribal households. Goat is dominant livestock of nontribal households (43.4%) as against pig in tribal households (80%). The average annual income of the tribal households is low (Rs. 49,470) which is half that of nontribal households (Rs. 1,02,406).

Evaluation of integrated farming system models

The crop + dairy based integrated farming system (IFS) for low land areas recorded Rs. 2.02 lakh of total net income from an area of 0.75 ha with employment generation of 302 man days year^{-1} (Plate 5). Rice based cropping sequence was assigned in 0.35 ha., whereas vegetables and rice-fish in broad bed and furrow system occupied 0.30 ha. The dairy component (two HF cross cows) contributed 53% of net income while generating 182 man days year^{-1} followed by crops (39%) with an employment generation of 114 man days year^{-1}. Among the rice based cropping system rice – ground nut and rice - vegetable performed better than others. Rice variety "Naveen" was evaluated for lowland condition recorded yield (3.6 t ha^{-1}) at par with CSR 36 (4.0 t ha^{-1}).

Similarly, coconut + pig based IFS model evaluated for hilly uplands (Plate 6) recorded a total income of Rs. 1.45 lakh with 55% contribution from piggery followed by crop (30%), fish (8%) and poultry (7%) components.

Plate 5: Integrated farming system model for valley areas of Andaman Islands

Composting of organic wastes

A faster composting technology for coconut husk and other organic wastes with pig manure was developed (Plate 7). The coconut husk which was cut into pieces was spread in layers along with pig slurry in 10: 3 ratio. Periodic watering is done to keep the material moist and after 30 days of decomposition, earthworms were introduced into the composting mixture. The compost got matured within 110 days which has pH 6.0 and 1.2, 0.6 and 0.4% N, P and K respectively.

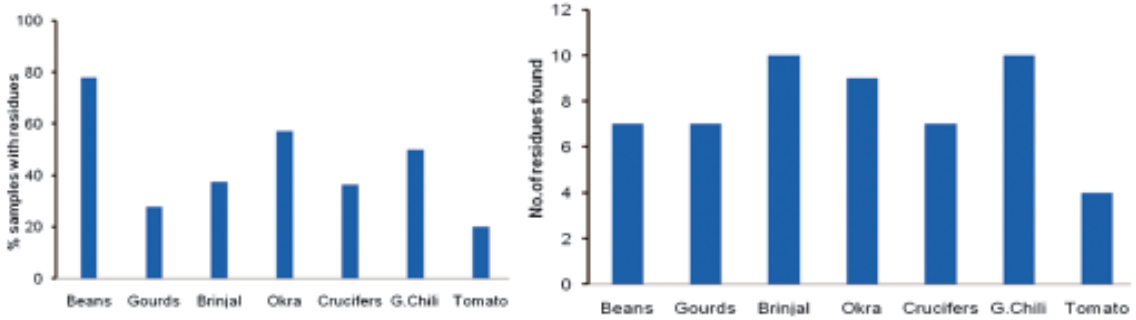
Plate 6: Coconut + tapioca

Plate 7: Composting of organic wastes

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

A farm household survey was conducted in Hut Bay, Little Andaman to study the fertilizer use pattern in crops by marginal, small, semi medium and medium farmers. The study revealed that among the respondents, 61% of the farmers used some kind of chemical fertilizers. Only 40% farmers applied nitrogen fertilizers (urea and DAP) to rice whereas 61% of the farmers used them for growing vegetables and none of the farmer used potassium fertilizers for either rice or vegetables, which is a greater concern as it may lead to nutrient imbalance in long run.



(4a) Per cent samples with pesticide residues (4b) No. of compounds found in vegetables

Fig. 4: Status of pesticide residues in vegetable samples

During the year, 115 vegetable samples were collected from farmer's field in South Andaman, Billy ground, Diglipur, Neil Island and Hut Bay. These samples were analyzed for the presence of residues of 18 common pesticides used in the Islands. Pesticide residues were found in 43.5% of the total samples analyzed and 96% of the positive samples have multiple residues (Fig 4 a & b).

A total of 17 pesticide compounds were detected in the samples. Of the positive samples, 58 to 68% samples contain residues of DDT and its derivatives with concentration ranging from 1.3 to 528 µg kg-1. This was followed by imidacloprid (40%), acetamiprid and dimethoate (30% each), profenophos (28%) and endosulfan (28%). The results indicated that among the vegetables, beans (French beans, field beans and cowpea) recorded highest number of positive samples (78%) followed by okra (57%), green chili (50%), brinjal (37%), cauliflower (36%), gourds (bitter gourd, bottle gourd, 27%) and tomato (20%). However, among the positive samples only nine samples exceeded the maximum residue level (MRL) for respective compounds prescribed by Prevention of Food Adulteration Act (1964).

Feasibility Evaluation of Pulse Cultivation and Resource Optimization under Coconut Plantation

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

The confirmatory field trial was conducted at CIARI sipighat research farm during August 2014 – March 2015, to evaluate the performance of pulse crops (green and black gram and red gram) in main plots and plant geometries in subplots in split plot design with 2 replications (Plate 8). The experimental sandy loam soil with p.H 5.4, E.C 0.26 dSm^{-1} was analyzed low for soil available N, P and K. The results revealed that all the varieties/lines of urd bean and mung bean and pigeon pea grown under hilly coconut plantation registered 35 per cent higher yield than previous year. Among the mung bean varieties/lines (Samrat, HUM-16, ML-11-65, VBN-3, ANM-11-12 and ANM-11-08), ANM-11-12 recorded higher number of pods/ plant (7.90), seed weight/ plant (3.02 g) which lead to higher seed yield (638 kg/ha). Among urd varieties/ cultivars (VBN-6, Uttara, ANU-11-10, VBN-4, VGB-10-19 and ANU-11-19), ANU-11-19 recorded significantly higher number of pods per plant (9.17) and seed weight/plant (2.67 g) and thus higher seed yield (581 kg/ha) when compared to other varieties/ lines. Among the plant geometries tried (cm x cm), (25 x 10, 25 x 15, 30 x 10 and 30 x 15), 25 cm × 10 cm recorded higher seed yield of green gram (541 kg/ha) and black gram (514 kg/ha) but was at par with 25 cm x15 cm. Among the pigeon pea varieties, ANP-12-02 recorded higher number of pods per plant (92), seed weight/plant (31 g) and seed yield (692 kg/ha) and at par with Co-6. Among the spacing adopted, 75 cm × 45 cm geometry recorded higher seed yield (641 kg/ ha). The confirmatory trial revealed that the pigeon pea (ANP-12-02) planted at 75 x45 cm, mung bean

Plate 8: Evaluation of pulses under coconut plantation

(ANM-11-12) and urd bean (AN-11-19) at 25 cm x10 cm spacing recorded comparatively higher yield under coconut plantation (Fig. 5). The yield obtained in this study under hilly coconut plantation was found to be about 40 -50 % of sole pulse crops grown at Port Blair.

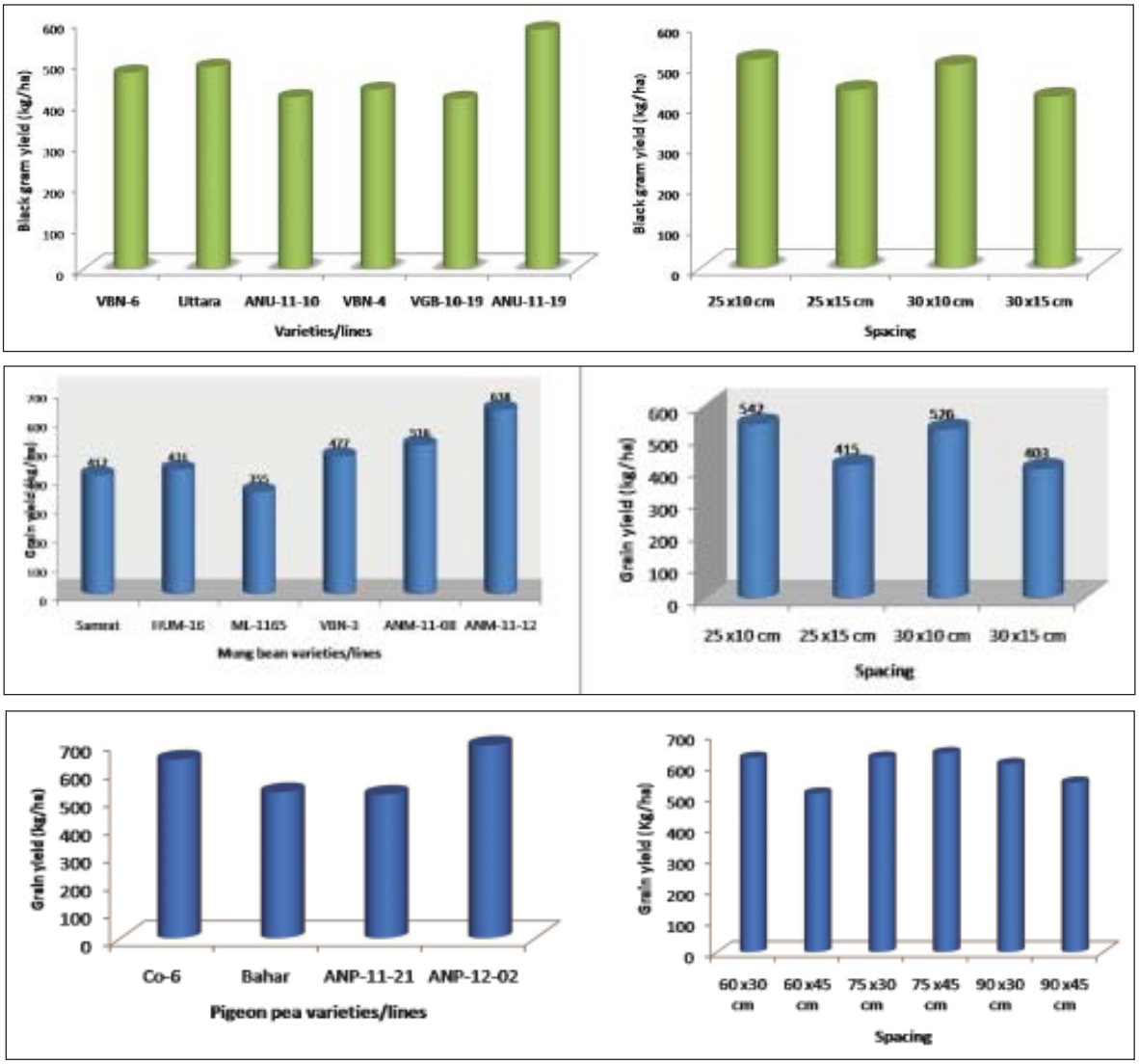


Fig.5: Seed yield (kg/ha) of urd bean, mung bean and pigeon pea as influenced by different varieties / lines and geometries under coconut plantation.

Food Processing Training Centre (FPTC): Development of Ready-to-Serve (RTS) Beverages from Mango, Pine Apple and Bael

Sachidananda Swain

Local mango (*Mangifera indica*), pine apple (*Ananas comosus)* and bael (*Aegle marmelos*) fruits were selected for the development of value added products. The fruits were washed and cut into pieces followed by juice extraction using hydraulic juice press and pulper. The total soluble solid (TSS) and titrable acidity (TA) of pulp were measured using standard procedure and the result is shown in Table 3.

Flow chart for preparation of RTS juice

Sample

↓

Soaking and washing

↓

Peeling

↓

Pulping - Pulp separation and removal of seeds and fibres

↓

Addition of 1 litre water to each 1 kg pulp (1:1)

↓

Kneading and heating at 70°C for 1 minute

↓

Straining

↓

Analysis of TSS (%) and acidity (%) in fruit pulp

↓

Preparation of sugar syrup as per treatment

↓

Mixing it with fruit pulp

↓

Pasteurization (75-80 °C for 2-3 min)

↓

Blending and mixing

↓

Filling and sealing (Crown corking)

↓

Cooling

↓

Labelling Storage (4^0C)

For preparation of "Ready-To-Serve"(RTS) juice, 15 % each of pulp and sugar and 0.26 % of preservative, (mainly citric acid) was used. After pulp separation, the juice was pasteurized (75-80 °C for 2-3 minutes) to inactivate spore forming organisms and enzymatic browning after it is added to the sugar syrup followed by filling into glass containers subjected to retorting and cooling. These products have longer shelf life and, therefore, assure year round availability of their products.

Table 3: Biochemical parameters used in preparation of RTS juice

Particulars	Total Soluble solid (TSS)	Titrable acidity (TA) (%)
Mango (ripe)	9.8-11.7	0.89
Mango (unripe)	4.4	0.096
Pine apple	14.4-16.2	0.31
Bael	18.8-25.9	0.28-0.42

Training cum demonstration on development of value added products from mango and pine apple to the SHG's was imparted for creating awareness as a mean to improve their employment generation (Plate 9).

Plate 9: Training and demonstration on preparation of mango and pine apple juice to the SHG's/farmers

Exploratory Study on Fodder Production (Adhoc Project)

B. Gangaiah

To tide over the fodder shortage during lean period (December- April / May), hydroponic cultivation of maize fodder was developed. Maize seeds (250 g/ plastic tray) were water soaked during last week of February, 2015 and watered (water or Hoagland solution) regularly up to 11th day. The maize seedlings attained a height of 30 cm in 12 days with fresh biomass production of 6 and 10 times weight of maize seeds in water and Hoagland solution application (Plate 10 a, b &c). In water only applied trays, seedlings showed leaf chlorosis from 7th day onwards. The technology is under refinement and scaling up.

Plate 10 a: Maize seeds at 4th day of watering

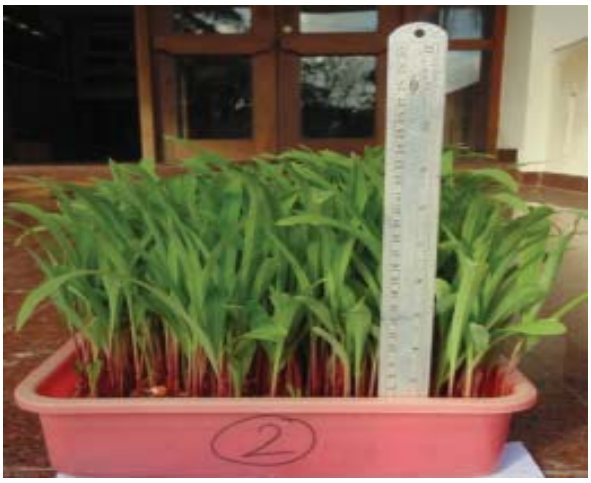


Plate 10 b: Maize seeds at 9th day of sowing

Plate 10 c: Maize seeds at 12th day of sowing

उद्यान विज्ञान एवं वानिकी प्रभाग

Division of Horticulture and Forestry

Standardization of Technologies to Ensure Supply of High Value Vegetables to Defence Forces in Nicobar Islands

Shrawan Singh and *D. R. Singh*

Structure for mites free capsicum production

The mite infestation is most serious problem in sweet pepper production in conventional polyhouse in islands. To counter this problem, a protected structure was designed by fixing UV stabilized polysheet on all sides and roof covered with green colour 50% agro-shadenet. The polysheets on the sides completely restricted entry of mites and allowed to grow crop healthy. Inside the structure the mites infestation was nil while it was 60-70% in conventional polyhouse and 70-75 % in open condition. The potential yield was recorded to be 44.0 t/ha in this structure while 28-32 t/ha in conventional polyhouse.

Evaluation of high value leafy vegetables

High value leafy vegetables i.e. palak, fenugreek, vegetable mustard and coriander were evaluated in polytunnel in trench system. Trenches of 10 m length, 50 cm width and 20 cm depth were made at 30 cm distance and filled with well decomposed farm yard manure and good quality soil in 1:1 ratio. Vermicompost @ 3 kg/sq meter and well decomposed cocopith @ 2 kg/sq meter was added to the beds and kept moist for one month. After that, the beds were ploughed to fine mix and used for the trial. The highest yield was recorded from vegetable mustard (24.0 t/ha) in trench system in polytunnel followed by shadenet (21.5 t/ha). Growing of leafy vegetables in trench system and polytunnel resulted in higher yield (Fig.6). Easy to cultivate, early to harvest and high returns make leafy vegetables as promising vegetables for low cost polyhouse cultivation. Trench system is useful for growing vegetables in problem soils like hilly terrains or sea-shore areas.

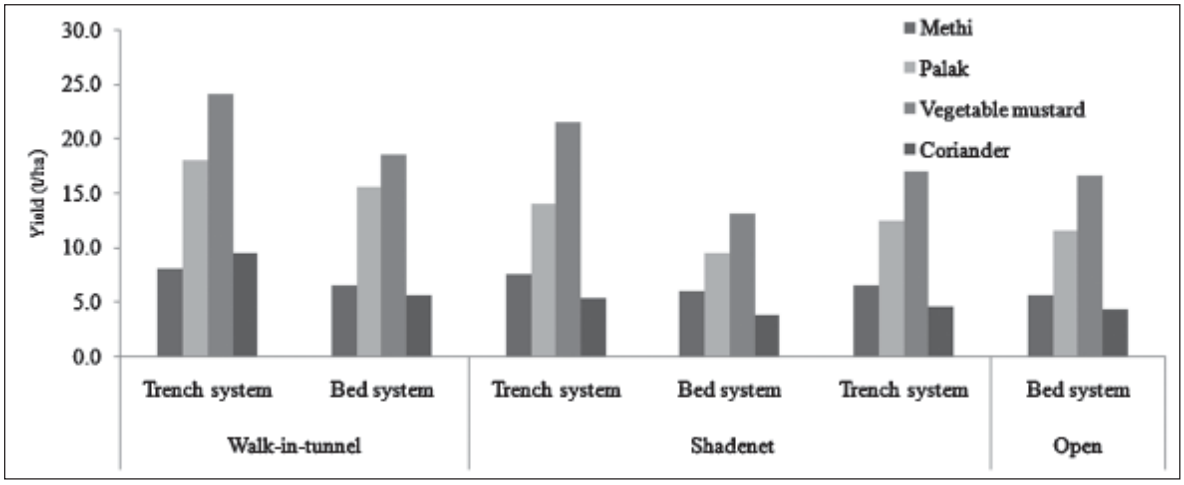


Fig. 6: Performance of leafy vegetables in different growing system in protected structures

Tomato in rainy season in open condition

Twenty six varieties were evaluated in triplicate using raised bed and plastic mulching system in rainy season (i.e. July to October 2014) at CIARI, Port Blair. The promising varieties were Ayush, Arka Rakshak and Arka Samrat. Bacterial wilt was serious disease (42-94%) followed by leaf curl (25-34%) and bud necrosis (20-24%). Fruit borer (20-22%) was major pest in rainy season. The promising varieties were found to be Ayush (16.5/ha), Arka Rakshak (16.0 t/ha) and Arka Samrat (12.8 t/ha). However, poor fruit set was observed in tested varieties which could be due to washing effect of heavy rains on pollen or stigmatic surface.

Protected cultivation facility

During the period, a 'Protected Cultivation Facility' was developed at CIARI campus by constructing two new polyhouses (300 sq m each), one old polyhouse and two net houses (25 sq m each) was repaired with rainwater storage tank (10 x 4 x 2 meter size) and complete fencing (2 m height) on all sides. Three open plots of 300 sq m, 400 sq m and 750 sq m were developed for experimental purpose.

Antioxidants in high value crop baby corn

Baby corn is high value and new crop in islands.Biochemical analysis of silk, baby corn and corn husk showed significant (p<0.05) increase in xanthophyll, total carotenoid, flavonoids and total phenolics from stage1 (5-7 cm) to stage 4 (11-13 cm) (Fig. 7). Carotenes, chlorophyll, tannin and ascorbic acid were decreased in all three parts. Ascorbic acid was maximum in baby corn at all the observed stages (105.1, 89.3, 80.8 and 65.5 mg/100g, respectively).The babycorn part showed strong antiradical activity with both DPPH (83.6%) and ABTS (75.3%) methods which decrease by 29.5% in corn silk, 42.9% in baby corn and 26.7% cornhusk over the stage1. The ABTS antiradical activity was also decreased in corn silk by 57.1%, baby corn by 39.3% and corn husk by 42.8%, respectively.

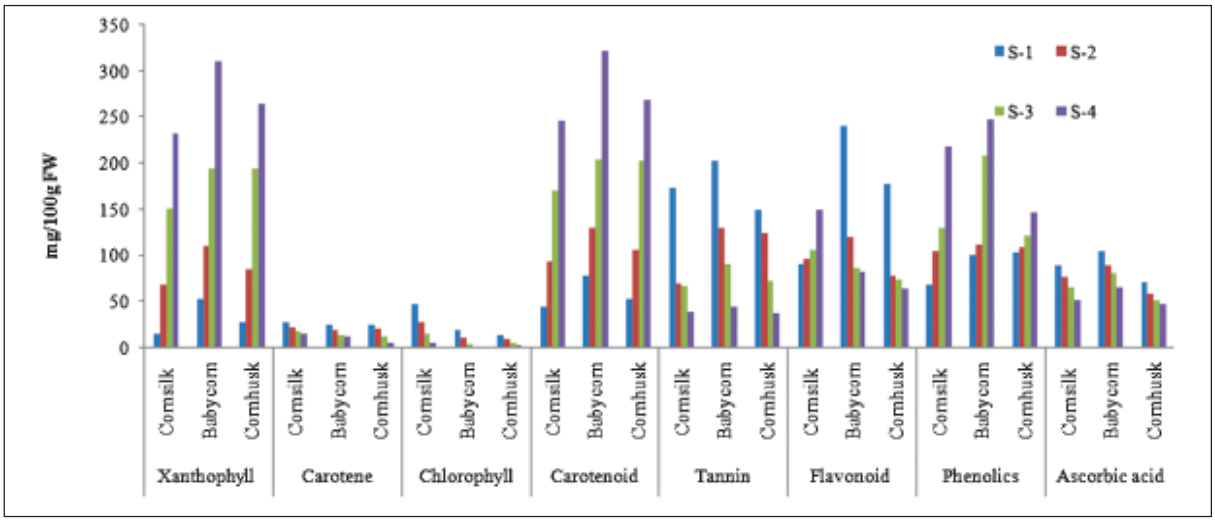


Fig. 7: Phytochemicals change in baby corn parts during maturity stages

High value cucurbits

Muskmelon and parthenocarpic cucumber were evaluated in polyhouse during rainy season. In artificial pollinated plants, average number of fruits (4.2/plant) were significantly (p<0.05) more than non-pollinated plants (1.7/plant) while fruit weight (503.7g, 510.0g) did not show such variation. Parthenocarpic cucumber evaluated in polyhouse in two dry (January – April) and rainy (August-November) seasons. Fruit yield was higher in rainy season (503.4 g/plant) than dry season (356.8 g/plant) due to more number of fruits (7.1/plant) and higher individual fruit weight (70.9g) than in dry season i.e. 5.8 fruits/plant and 62.5g, respectively. The calculated yield of parthenocarpic cucumber was higher in rainy season (12.6 t/ha) than dry season (8.9 t/ha) which could be due to heat factor in March-April months. The yield level was lower than reported yield of parthenocarpic cucumber in other places which need further improvement in technology using suitable varieties.

All India Coordinated Research Project (AICRP) on Vegetable Crops

Shrawan Singh, V.B. Pandey and *D.R. Singh*

Hybrid Okra

In 2014-15, three trials (IET, AVT-I and AVT-II) were received in Hybrid okra by the ICAR-CIARI, Port Blair centre. In IET trial, the highest yield was recorded from 2014/OKHYB-3 (10.40 t/ha) followed by 2014/OKHYB-1 (9.80 t/ha) and 2014/OKHYB-2 (9.25 t/ha). In AVT I, 2013/OKHYB-9 (9.0 t/ha), 2013/OKHYB-4 (7.30 t/ha) and 2013/OKHYB-5 (7.25 t/ha) were promising entries which outperformed National checks HOK-152 (7.0 t/ha and Arka Anamika (4.80 t/ha). In AVT-II , the promising entries were 2012/OKHYB-8 (10.85 t/ha), 2012/OKHYB-1 (10.15 t/ha), 2012/OKHYB-7 (10.10 t/ha) and HOK-152 (7.35 t/ha).

Cowpea

In cowpea, the AVT II resulted in identification of promising entries as 2012/COPBVAR-6 (8.43 t/ha), Kashi Kanchan (8.33 t/ha) while lowest yield recorded from 2012/COPBVAR-1 (4.63 t/ha).

Development of Production Technology for Ornamental Crops in Bay Islands

V. Baskaran, D. R. Singh, A. Velmurugan and *K. Abirami*

Varietal evaluation of gladiolus

28 varieties of gladiolus were evaluated for their growth and flowering performance. Maximum plant height was recorded in the variety Yellow Stone (89.2 cm). Early sprouting was observed in Arka Kesar (7 days) followed by Punjab Lemon Delight (7.3 days). Late sprouting was observed in the variety Wigs Sensation (18.2 days). Early spike emergence, early flowering and long duration of flowering was observed in Pusa Kiran (33, 37 and 20.9 days) respectively. Maximum spike (39.6 cm) and rachis length (71.3 cm) was observed in Yellow Stone. The variety Mescagami recorded maximum number of florets (19.0). Maximum floret diameter (10.8 cm) and maximum number of leaves (10.6) were observed in the variety yellow stone (Plate 11).

Arka Kesar

Pusa Kiran

Wigs Sensation

Yellow Stone

Mescagami

Plate 11: Varietal evaluation of gladiolus

Evaluation of tuberose cultivars

Twelve varieties of tuberose were evaluated for their growth and yield performance. Maximum plant height was observed in the variety Phule Rajani (49.1cm). Maximum number of leaves were observed in the variety Calcutta Double (36.3) early spike emergence (36.4 days), early flowering (46.5 days) and maximum longevity of spike (20 days) were observed in the variety GKTC 4. Maximum number of florets was observed in the variety Suvasini (37.2), maximum spike length was observed in Phule Rajani (108.7 cm), whereas maximum floret size was observed in the variety Pearl Double (4.8 cm).

Vase life studies in tuberose

Different holding solutions were used to study the vase life of cut tuberose variety Prajwal and it was found that 3% sugar solution increased the vase life up to 12 days when compared to control (8 days).

Vase life studies in gerbera

Among the different holding solutions tested, maximum shelf life was observed in the treatment 5% sugar as holding solution (10.3 days), where as minimum shelf life was observed in the holding solution 2% aluminium sulphate (5 days) of holding solution.

Vase life studies in gladiolus

Vaselife study was conducted in twenty varieties of gladiolus with different holding solutions. Among all the varieties, Plumtrat recorded highest shelf life (15 days) in the holding solution of salicylic acid 1.5 mM which was on par with citric acid 300 ppm.

Collection and evaluation of Anthurium genotypes

38 different genotypes of Anthurium having variations in size, shape and colour of spathe and spadix have been collected, conserved and evaluated. Maximum length of the spathe (18.6 cm) and spadix (7.2 cm) was observed in Acc. Tropical Red, maximum sucker production (3.2/plant) and maximum number of leaves (16) per plant was recorded in the Acc. Baby Pink (Plate 12).

Plate 12: Collection and evaluation of Anthurium genotypes

Vase life study of Anthurium

Among 19 different holding solutions tested maximum vaselife (27 days) was observed in 1.5 mM salicylic acid when compared to control (14 days) (Plate 13).

Plate 13: Vase life studies in cut flowers

Open field cultivation of Arachnis orchid

Arachnis orchid was grown as an intercrop with tuberose in open condition, flowering was observed throughout the year under open condition when compared with shade condition. The duration of flowering interval of Arachnis orchid under open condition was 12-17 days. Among three genotypes evaluated maximum spike length (54.5 cm) & maximum number of florets (8/spike) were observed in red genotype. Minimum number of days (13 days) was taken for early flowering from spike emergence in yellow genotype.

Plate 14: Field view of Arachnis orchid intercropped with tuberose

Effect of foliar nutrition on growth and yield of marigold

The African marigold cultivars Pusa Basanti Gainda and Pusa Narangi Gainda were evaluated with four different foliar nutrients. Pusa Basanti Gainda recorded maximum plant height (75 cm), maximum number of flowers per plant (43.7) & maximum yield per plant (113.4 g/plant) in high foliar treatment.

Pusa Basanti Gainda

Pusa Narangi Gainda

Plate: 15: African marigold cultivars Pusa Basanti Gainda and Pusa Narangi Gainda

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

K. Abirami, D. R. Singh, Shrawan Singh, M. Sankaran, V. Damodaran and *V. Baskaran*

Augmentation of germplasm of fruits

Mango

The fruits of *Mangifera griffithi*, a wild species of mango was collected from Mt. Harriet and germination studies were initiated. The seeds germinated in 26.3 days and germination percentage observed was 40.3% since stone weevil attack was observed in the fruits. Different grafting methods were tried for propagation of *Mangifera griffithi*, and it was found that the modified approach grafting gave 60.3% success (Plate 16 & 17).

The successful grafts maintained in the pots will be transplanted to main field after 6 months.

Plate 16: Successful grafts of *Mangifera griffithi*

Plate 17:Fruits of *Mangifera griffithi* - wild species

Papaya

Seventeen superior accessions of papaya were collected from different parts of Andaman and Nicobar Islands and the physico-chemical characteristics of the fruits were recorded. The highest fruit weight was recorded in Tushnabad collection (2.85 Kg) with maximum fruit girth 64.8 cm and maximum pulp thickness (3.5 cm) (Plate 18) . Red fleshed accessions were collected from Mannarghat and kadamtala (Plate 19 & 20). The TSS ranged from 9.2°B in Ganeshpur to 15.9°B in Tushnabad Collection. Less seeded accession was collected from Kadamtala. These accessions are planted in main field for further evaluation.

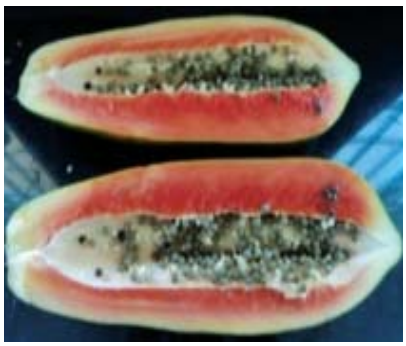


Plate 18: Accession from Tushnabad

Plate 19: Accession from Mannarghat

Plate 20: Accession from Kadamtala 1 Acc

Citrus

A new species of citrus namely *C. pennivesiculata* which is commonly known as Gajanimma was collected from South Andaman (Plate 21). The average fruit weight ranged from 450g to 500g, juice percent 50.6%, seeds per fruit ranged from 4 to 24 per fruit, TSS ranged from 5 to 5.8°B and the titrable acidity ranged from 1.23 to 1.31%.

Plate 21: Fruits of Citrus *pennivesiculata*

Dragon fruit

Four different types of dragon fruits like pink fleshed, white fleshed, red fleshed and an unknown type were collected and conserved in the germplasm block. Field planting of these different accessions of dragon fruit will be done in the monsoon.

Physico-chemical and phytochemical changes in fruits of Malay Rose Apple (*Syzygium Malaccence*)

The fruits of an accession of Malay rose apple (*Syzygium malaccence*) originated from Indo Malayan region or South East Asia was assessed for their physico-chemical and phytochemical changes during fruit development and ripening stages (Plate 22). The average fruit length was 5.8 cm with breadth of 4.5 cm and width of 15.8 cm. The fruit weight ranged from 48 g to 87.6 g. The fruits recorded an average TSS of 8.6°B. The fruits were pinkish when immature and turned white on maturity. The physico-chemical and phytochemical changes were analysed during four stages of fruit development. The moisture content of the fruits reduced from 80.86% to 75.51% during fruit development, while the ash percentage was constant during the fruit development stages. The carbohydrate content decreased from 6.89% in immature stage to 6.02% in mature stage and an increase in reducing sugars was observed during fruit maturity. The crude protein increased during fruit development stages from 0.21% in immature stage to 0.342% in mature stage. The fat content was constant during the fruit developmental stages. The phytochemical changes analyzed during the fruit developmental changes showed an increase in phenols, flavonoids and antioxidant activity during fruit maturity (Fig. 8). The anthocyanin content of the fruits decreased during fruit maturity and it was 0.057 mg/100 g at matured stage, whereas the ascorbic acid increased during fruit maturity (5.6 mg/100 g). The shelf life of the fruits increased up to 10 days under refrigerated storage, when compared to ambient storage temperature (03 days).

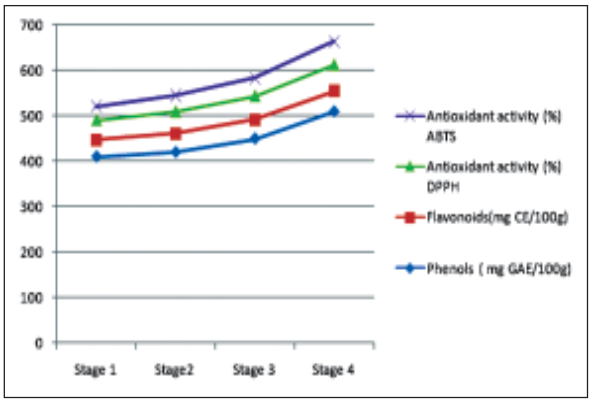


Fig 8: Phytochemical changes in fruits of Malay rose apple during fruit maturity

Plate 22: Malay rose apple- *Syzygium malaccence*

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. There were eight different combinations of treatments with organic nutrients (Plate 23). Among all the treatments the treatment combination of FYM, vermicompost, coir compost and bio fertilizers recorded maximum plant height (2.12 m), girth (71.63 cm) and leaf area index (6.26).

Plate 23: Field view of the organic nutrient trial of Nendran banana

Collection and Evaluation of Medicinal Plants of Bay Islands

K. Abirami, D. R. Singh, V. Baskaran* and *Damodaran, V.

Evaluation of diosgenin content in *Cheilocostus* speciosus

Cheilocostus speciosus known as 'Chanda' or 'Kushta' in Sanskrit and 'kebu' or 'keyu' in Hindi is a succulent rhizomatous medicinal herb found widely distributed in the Island (Plate 24). The leaves and rhizomes of *Cheilocostus speciosus* have been reported to possess steroid diosgenin, which is anti-diabetic in nature. Diosgenin content in the tuber and roots of this species was analyzed by spectrophotometric method. The roots of this species was observed to have higher diosgenin content (1.45 mg/ml) than the tubers (0.98 mg/ml). This species is abundantly distributed throughout the islands and can be exploited as an alternate source for diosgenin.

Plate 24: *Cheilocostus speciosus*

Phytochemical and micronutrient analysis in *Piper sarmentosum*

This species of piper is the most common in North East India, South China and Malaysia. It is a small shrub and flowering is observed throughout the year.

This species is used for both culinary and medicinal purposes. The roots and fruits are used to cure dysentery and is a carminative. It possesses anti-oxidant activity (Plate 25). The phytochemical anlaysis and micronutrient analysis was done in the fruits of these species and it was found that the species collected from Tirur region, South Andaman was rich in flavonoids (56.5 mg/g), chlorophyll (47.86 mg/g) and antioxidants (43%) with minimum quantity of carotenoids (0.52 mg/100 g). The spikes and roots are also a source of piperine content. The spikes of Tirur accession had higher piperine content (3.27%), when compared with the roots (1.06%) (Fig 9).

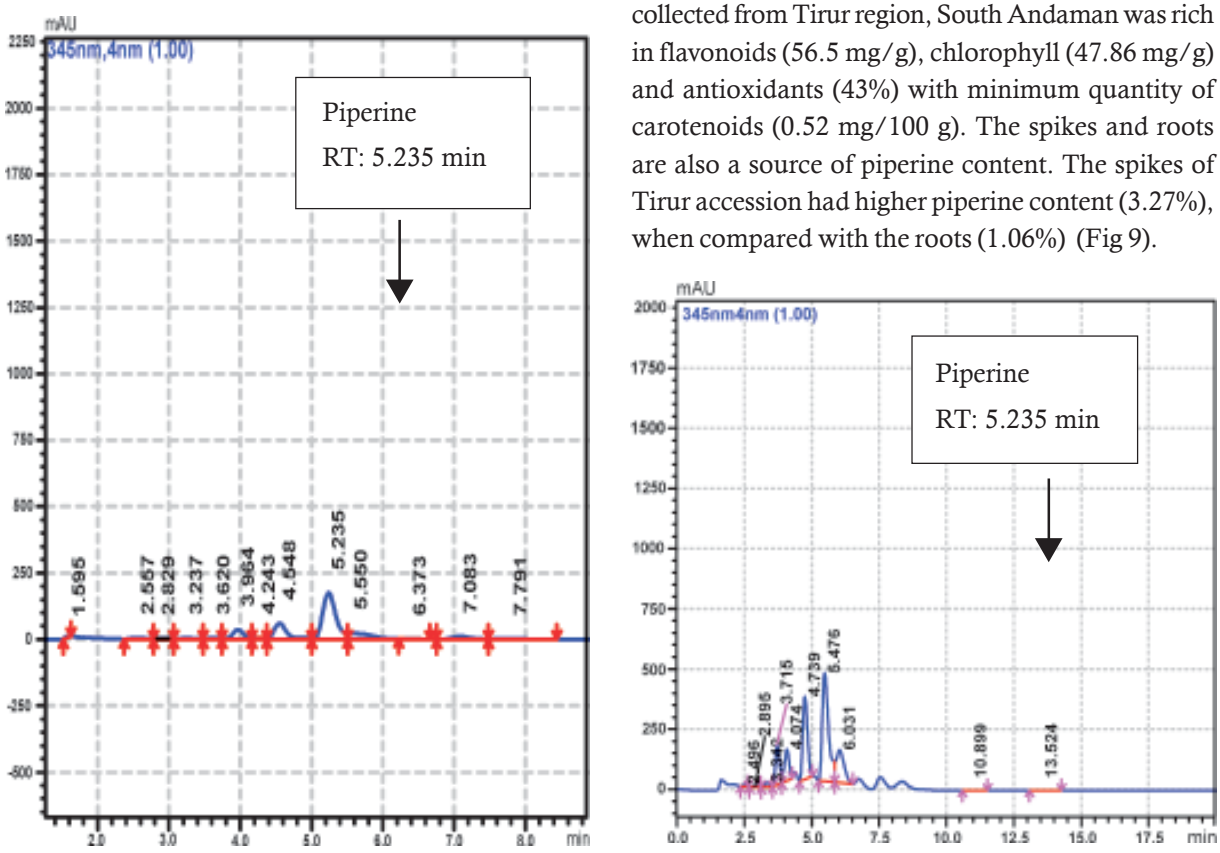


Fig. 9 : HPLC chromatogram of piperine content in spikes and roots of *Piper sarmentosum*

Plate 25: *Piper sarmentosum*

Morphological and phytochemical evaluation in *Gloriosa superba L.*

Gloriosa superba L. commonly known as glory lily or Kalihari belonging to the family Liliaceae is a herbaceous climber and is a native of Tropical Africa. It is one of the major medicinal plants in India and is found growing naturally in different parts of the Island. Seeds and tubers of this medicinal plant contain valuable alkaloids *viz.,* colchicine and colchicosides which are used to treat gout and rheumatism. Due to the action of colchicoside on spindle fibre formation during cell division the plant has been identified as a potent anti cancerous drug. About four accessions of *Gloriosa* collected from different parts of the Island like accessions from Tamilnadu, Andhra Pradesh, Chidiyatapu and Rangat were evaluated for their growth, yield and phytochemical constituents. Two years study revealed that the accession from Tamil Nadu was superior with respect to growth and yield characteristics like plant height (158.64 cm), stem girth (3.08 cm), number of leaves per plant (103.6), number of flowers per plant (16.8), number of pods per plant (14.21) and number of seeds per pod (35.2). The phytochemical evaluation was done for the different accessions and it was found that flavonoids (14.53 gCE/100g dry weight) and phenols (23.34 mg gallic acid/ 100g fresh weight) were high in the tubers of Chidiyatapu accession, whereas the alkaloids (0.38%) were high in the tubers of Tamil Nadu accession. The antioxidant activity was highest in the seeds of Tamil Nadu accession (68.7%). The major bioactive compound present in *Gloriosa superba* was colchicine and its quantification was done using HPLC (Table 4). The tubers of Chidiyatapu accession recorded highest colchicine content (1.601%) among the tubers analyzed (Fig. 10) and the seeds of Andhra Pradesh accession recorded highest colchicine content among the seed samples analyzed (Fig. 11).

Table 4: The major bioactive compound present in *Gloriosa superba*

Sample		RT (min)	Area	% Colchicine
Gloriosa superba Tubers	Chidiya tapu	3.086	16535138	1.601
	Rangat	3.075	17989046	1.186
	Tamil Nadu	3.082	15675754	1.087
	Andhra Pradesh	3.081	19905135	1.217
Gloriosa superba Seeds	Chidiya tapu	3.091	4956238	1.924
	Rangat	3.092	6539113	1.780
	Tamilnadu	3.089	5955890	1.752
	Andhra Pradesh	3.095	4994499	2.204

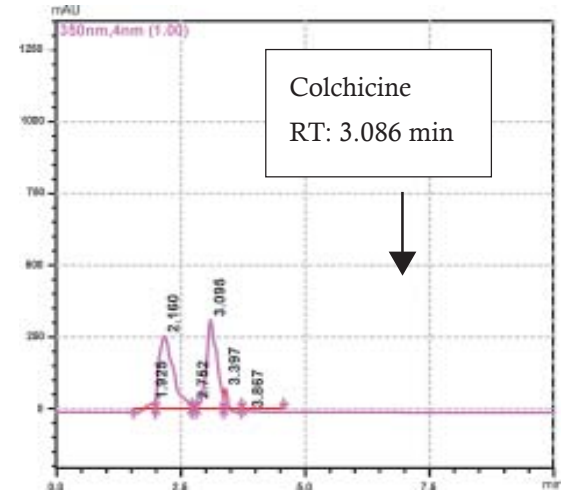


Fig. 10: HPLC chromatogram of tubers of Chidiyatapu accession

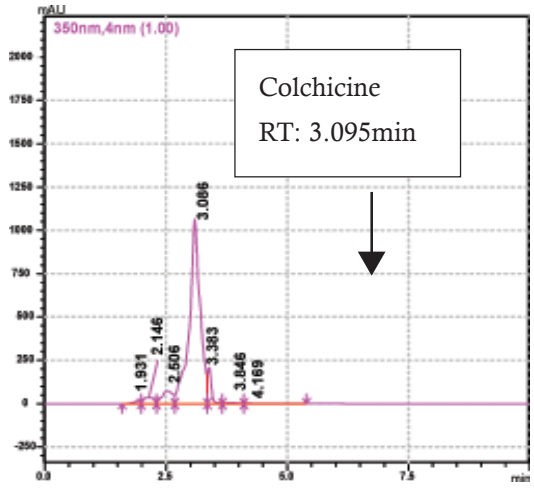


Fig. 11: HPLC chromatogram of seeds of Andhra Pradesh accession

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

V. Damodaran and *K. Abirami*

The crossing work was initiated in second fortnight of November, 2014. A total of 814 female flowers were pollinated in 9 different dwarf cross combinations in which the cross *viz* AGD x AOD recorded the highest setting percentage (25.9) followed by AYD x AGD. Among the CARI varieties the cross between CARI-Surya x CARI-Annapurna recorded the highest setting percentage of 24.2.

In DxT cross involving CARI Annapuran, CARI Surya, CARI Omkar and CARI Chandan a total of 422 female flowers were pollinated with Sanraman Tall and CCNT and recorded overall setting percentage of 23.2 % (Fig 12)

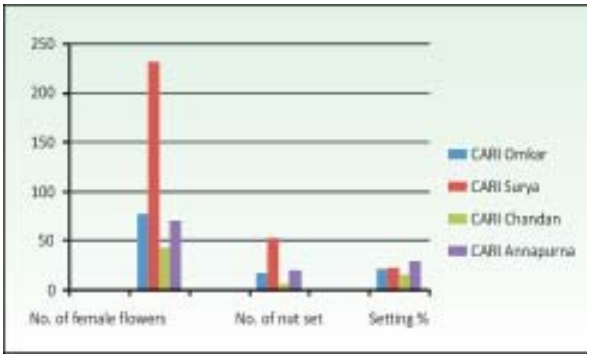


Fig 12 : DxT cross involving CARI Annapuran, CARI Surya, CARI Omkar and CARI Chandan

The *inter se* mating was carried out in 19 selected Pacific Ocean accessions and a total of 2564 female flowers were interse mated and recorded overall setting percentage of 22.6%. The highest setting percent (30.6%) was recorded in Nicobar collections followed by American Tonga (26.9%). About 27 F1 seedlings have been transplanted and maintained in the field for further evaluation of growth and yield parameters (Fig. 13).

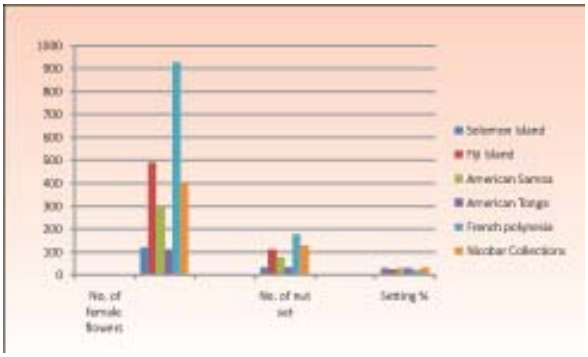


Fig. 13: Inter se mating in selected Pacific Ocean accessions

A total of 183 seed nuts of 3 dwarf coconuts varieties were collected and sent to CPCRI for characterization and conservation. In addition 339 seed nuts of Pacific Ocean collection were sent to CPCRI, Kasaragod. About 17 packets each of pollen grains from Hari papua and 14 packets of pollen grains from Niu lekha were sent to CPCRI, Kasaragod for diallel crossing.

AICRP on Tuber Crops

V. Damodaran

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

Tuber crop exploration trips were made in Car Nicobar, Kamorta (Nancowrie group of Islands), Kadamtala, Long Island and Harminder Bay and collected 24 germplasm of various tuber crops during the current year (Plate 26). Maximum number of collections (8 nos) was made in *Dioscorea alata* followed by colocasia. A total of 90 accessions are being maintained in the gene bank which includes the previous and current year collections. 25 accessions of different tuber crops collected from the Island were submitted to NAG center of CTCRI for conservation.

Greater yam collection from Car Nicobar

Collection from Hut Bay

Collection from Car Nicobar

Plate 26: Collection of Tuber crops

IET on Colocasia (2014)

Twelve entries of colocasia were evaluated for growth and yield parameters under Island conditions. Among these entries, the highest plant height (107.cm) was recorded in Sree Rashmi and highest pseudo stem girth was recorded in Sree Pallavi (14.9 cm), followed by TTr 12-8. The local cultivar produced more number of side shoot/plant as compared to others entries. The highest corm length (15.7cm) and corm girth (25.7cm) was recorded in Sree Pallavi. The individual corm weight was higher in Digilipur Local-3 (162.3g) followed by Sree Rashmi, but Sree Rashmi recorded maximum weight of cormel (516.7g). With regards to yield, Sree Kiran recorded higher yield (24.1 t/ha) followed by Sree Rashmi (21.6 t/ha) and Digilipur local-3 (20.3 t/ha).

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

1. Cassava

Two varieties of cassava *viz.,* Sree Vijaya and H 226 were studied for the phenological expressions under island condition, Sree Vijaya took 5 days for first sprouting and recorded 50 % sprouting in 11 days which was 4 days early in achieving full sprouting compared to H-226. Tuber initiation was observed in 62 days with Sree Vijaya, while it took 76 days in H 226.

Root and growth characters of cassava

The growth and yield parameters of both cultivars were recorded at monthly interval. Root length and root weight gradually progressed in both the varieties and maximum root length of 45cm was recorded in Sree Vijaya at 7 MAP and maximum root weight was recorded in H 226 at 8MAP. The growth parameters *viz*., no. of green leaves , shoot length , leaf weight and shoot weight were found rapid after 5 MAP. The leaf and shoot weight was higher in H 226 as compared to Sree Vijaya.

Yield attributes and yield

Sree Vijaya recorded maximum numbers of tubers (9.2) at the time of harvest compared to H 226 while the mean tuber yield was higher (2.56 kg/ plant)in H 226 as compared to Sree Vijaya (1.84 kg/plant

2. Taro

Three varieties of taro *Viz.,* Sree Pallavi, Local and Sree Rashmi were planted to study the phenology. Sree Pallavi took 19 days for germination, where as local cultivar took 22 days for germination (Plate 27). Tuber initiation started within 69 days in Sree Pallavi, whereas, it took 71 days in Sree Rashmi and 73 days in local.

Plate 27: Phenology of Taro (2 MAP)

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 Local variety (5.7). The cormel length was maximum (7.3cm) in Sree Rashmi followed by Local whereas cormel yield/plant was higher (207.5g) in Sree Pallavi (Table 5).

Table 5: Phenology of taro

Phenology of taro	Varieties		
	Sree Pallavi	Local	Sree Rashmi
Days to first sprouting	19	22	20
Days to 50 % sprouting	28	33	30
Days taken for tuber initiation	69	73	71

Farming system studies in tribal areas

Yield of tuber crops under farmer's field at Harminder Bay, Hut Bay, Little Andaman (Area= 0.02 ha.)

The Nicobarese tribal community mainly rely on coconut, tuber crops, pigs and marine fisheries for their livelihood. They use the virgin land for establishment of coconut plantations and they rarely practice mixed cropping involving coconut, tuber crops, spices and fruit crops due to lack of non-availability of planting materials and scientific cultivation of tuber crops based farming. Under All India Coordinated Project on Tuber Crops, funded by Indian Council of Agricultural Research, last year tuber crop based farming system was initiated at Harminder Bay. The model comprises of 200 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, ginger and piglets. From the tuber crop based farming system the tribal farmers have generated an amount of Rs. 5500.00 to Rs. 9650.00 and from Pigs they generated approximately Rs. 20,500.00 to Rs. 43,000. The total income generated from the system ranged from Rs. 29,000.00 to Rs. 52,650.00. Organic cultivation of EFY at Small Lapathy and BigLapathy villages of Car Nicobar under community planting recorded the yield of 1350 to 1850 kg in 3750m^2 and 5000m^2 respectively. The income generated from the system ranged from Rs. 54,200.00 to Rs. 74,000.00.

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

Shrawan Singh and *D. R. Singh*

Seven morphological plant characters were recorded from 33 accessions of *Morinda citrifolia* and released four varieties as CIARI Samridhi, CIARI Sanjivini, CIARI Sampada and CIARI Rakshak.

Observations on plant characters

During the period, seven morphological characters of plant were observed in 33 accessions of *Morinda citrifolia.* The plant height (at 5-6 years) ranged from 257.6 cm (HBAY-11a) to 540 cm (HD-6) (257.6 cm). Maximum values of canopy spread and plant spread were recorded in HD-6 (422.6 cm; 437.8 cm). Branch length and number of branches were maximum in HD-6a (255.3 cm; 49.4 cm) while the minimum values were recorded in WAND-4 (29.46 cm) and ABF-1 (8.6cm), respectively. Trunk diameter was recorded to be highest in HD-6 (56.0 cm) and minimum in ABF-1 (8.0 cm) (Table 6).

Table 6 : Observations on Plant height (cm) in *Morinda citrifolia* accessions

Accessions	Plant height (cm)	Canopy spread (cm)	Plant spread (cm)	Branch length (cm)	No. of branches/plant	Trunk diameter (cm)	Crown diameter (cm)
Ac-1	324.5	217.7	196.0	135.8	8.7	25.7	27.3
Ac-2	294.8	232.2	234.2	152.5	14.4	32.3	33.8
Ac-3	308.0	252.8	271.0	142.5	16.8	49.0	36.4
Ac-4	258.2	231.0	262.6	128.5	18.6	40.3	34.4
Ac-5	275.8	180.0	265.0	128.4	19.4	40.3	32.8
Ac-6	286.6	233.0	235.8	136.5	21.0	27.3	31.8
Ac-7	280.2	217.0	258.0	136.0	23.0	46.0	37.6
Ac-8	392.7	325.7	329.3	136.3	29.0	36.3	37.0
Ac-9	324.0	198.0	221.0	102.3	23.5	26.3	33.0
Ac-10	349.3	282.3	328.3	161.8	24.0	43.0	38.8
Ac-11	295.2	227.4	226.2	133.6	16.0	46.0	31.0
Ac-12	283.0	196.4	251.6	132.5	17.6	36.7	28.8
Ac-13	263.0	198.5	243.5	111.5	14.0	25.0	27.5
Ac-14	257.6	194.2	236.6	122.5	14.6	24.3	25.6
Ac-15	540.0	422.6	437.8	197.5	61.0	56.0	50.2
Ac-16	477.6	364.6	355.6	255.3	49.4	45.0	43.0
Ac-17	307.0	164.2	297.2	140.8	14.2	33.3	29.8
Ac-18	371.6	286.2	336.6	199.0	47.2	32.0	33.8
Ac-19	306.8	222.6	304.6	190.0	30.4	29.0	28.8

Accessions	Plant height (cm)	Canopy spread (cm)	Plant spread (cm)	Branch length (cm)	No. of branches/plant	Trunk diameter (cm)	Crown diameter (cm)
Ac-20	380.8	295.8	299.6	187.3	31.4	45.3	36.4
Ac-21	295.8	159.8	251.0	160.3	9.8	38.7	34.6
Ac-22	351.0	212.6	297.8	173.0	20.8	36.0	32.6
Ac-23	271.8	177.3	211.8	131.7	15.0	24.7	25.5
Ac-24	300.8	207.4	270.2	173.7	16.4	28.0	31.0
Ac-25	365.5	265.3	185.0	171.3	21.8	31.3	33.5
Ac-26	268.8	175.2	230.2	141.0	14.8	25.7	27.0
Ac-27	309.2	225.6	241.2	151.3	16.4	29.0	28.8
Ac-28	338.6	216.4	276.0	153.3	14.6	25.7	27.4
Ac-29	307.0	220.3	266.3	176.7	18.8	24.0	25.3
Ac-30	321.8	235.8	276.4	170.3	15.2	30.0	28.6
Ac-31	276.0	217.8	249.0	134.3	16.6	26.3	26.0
Ac-32	295.4	185.6	200.0	141.0	14.2	23.7	23.2
Ac-33	263.0	171.4	221.8	144.0	10.0	26.0	24.8
Range	257.6-540.0	159.8-422.0	185.0-437.8	102.3-255.3	8.6-61.0	23.6-56.0	23.2-50.2

Plate 28a: CIARI Sampada

Plate 28b: CIARI Samridhi

Plate 28c: CIARI Sanjivini

Plate 28d: CIARI Rakshak

Plate 28 a,b,c & d : Noni (*Morinda citrifolia* L.) varieties

CSS-National Horticulture Mission Scheme on Spices

K. Abirami and *V. Damodaran*

Production of quality planting material

Multiplied and produced the quality planting materials of Black pepper (8000), clove (2000), nutmeg (500) and ginger (600 kg). About 250 kg of seed rhizome of ginger, 25 kg of turmeric, 1250 Nos Black pepper, 150 Nos clove and 85 Nos nutmeg have been distributed to farmers. (Plate 29)

FLD on organic production of ginger

Four FLDs on organic production of gingers were conducted in farmers' field and an average yield of 0.3 to 0.40 tonnes was recorded from an area of 0.02 ha.

Plate 29: Demonstration of ginger and turmeric

क्षेत्रीय फसलें सुधार एवं सुरक्षा प्रभाग

Division of Field Crop Improvement & Protection

Augmenting Rice Productivity through Varietal Purification of Popular Land Race

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

Varieties released

Two long duration rice varieties (CIARI Dhan 8 and CIARI Dhan 9) purified and derived from local landrace C14-8 have been released in 2014 by IVRC, ICAR-CIARI, Port Blair for cultivation in Andaman and Nicobar Islands. The details of these varieties are given below:

CIARI Dhan 8: This is a long duration (215 days) high yielding, tall (188 cm) variety with upright leaves (Plate 30). The grains are medium bold type and yellowish and shining with moderate number of tillers, long panicles with low spikelet sterility. It is suitable for low input management conditions and also gives good straw yield for fodder purpose. It gives about 3.5 t/ha grain yield and thus exhibits more than 25 % yield advantage over mix C14-8 population.

Plate 30: CIARI Dhan 8

CIARI Dhan 9: This is a long duration (216 days) high yielding, tall (200 cm) variety with upright leaves (Plate 31). The grains are medium bold type and brown in color with moderate number of tillers, long panicles with low spikelet sterility. It is suitable for low input management conditions and also gives good straw yield for fodder purpose. It gives about 3.0 t/ha grain yield and thus exhibits more than 20% yield advantage over mix C14-8 population.

Plate 31: CIARI Dhan 9

Multi-location testing of selected C14-8 rice lines

A total of 13 selected lines of C 14-8 rice were evaluated across three locations (Bloomsdale Farm, Port Blair; Diglipur, North Andaman, and Baratang, Middle Andaman) during *Kharif* 2014-15. Data were

Plate 32: Field experiments on C14-8 lines evaluation

recorded for 8 qualitative and quantitative characters. At Port Blair, significant differences were observed among lines for all recorded traits except for 1000-grain weight. C14-8-11-91 and C14-8-11-113 gave significantly higher paddy yield than all other lines. At Baratang, significant differences were observed for all the recorded traits except for spikelet fertility and C14-8-11-117 and C14-8-11-91 gave significantly higher yield over all lines tested. Similarly, evaluation at Diglipur revealed significant differences for panicle length, spikelet fertility and grain yield and C14-8-11-91, C14-8-11-92, C14-8-11-93 and C14-8-11-31 were significantly high yielding than other lines (Plate 32).

Molecular diversity within C14-8 lines

The phenotypic variability observed in C14-8 lines was also corroborated by molecular diversity using SSR markers (Fig 14).

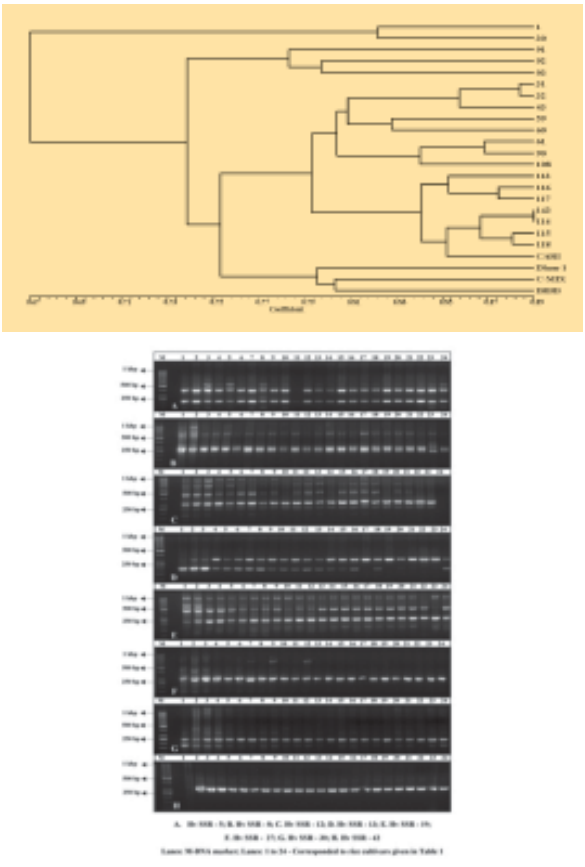


Fig 14: Dendrogram showing molecular diversity within C14-8 land race population

Evaluation of Khushbuya and Black Burma lines at Port Blair

A total of 15 lines selected during kharif 2013 from Khushbuya and Black Burma populations were evaluated at Blooomsdale Farm during kharif 2014-15. Data were recorded on days to flower, plant height, effective tillers/panicle, panicle length, filled grains/panicle, spikelet fertility, 1000 grain wt. and paddy yield.

Plate 33: Evaluation of Khushbuya and Black Burma lines

Significant variability among Khushbuya lines were observed in all the traits recorded except effective tillers and grain weight. Based upon paddy yield performance (t/ha), the lines Khushbu-4 (5.7), Khushbu-15 (5.6), Khushbu-1 (5.3), Khushbu-6 and Khushbu-7 (5.2) and Khushbu-5 and Khushbu-11 (5.1) were significantly better than other lines.

However, among Black Burma lines, significant differences were found for days to flowering, plant height and tillers only and not for grain yield. This revealed relatively less degree of intra-varietal variation within Black Burma rice land race.

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*

The scoring of 21 rice bacterial blight (BB) differentials possessing *Xa1* to *Xa21* gene(s) individually and in different combinations was performed against 14 isolates of pathogen collected from different islands and results compiled. Among individual genes tested, *Xa4, Xa7* and *Xa21* conferred resistance reaction across all isolates whereas among combinations, IRBB50 (*Xa4+xa5*), IRBB52 (*Xa4+Xa21*) and IRBB60 (*Xa4+xa5+xa13+Xa21*) conveyed effective resistance against tested isolates. The nature of genetic diversity among four isolates selected on the basis of geographical isolation in the islands was also studied through DNA finger printing.

Parental polymorphism survey was done between donor (IRBB60) and recipient varieties (C14-8 and CARI Dhan 5) using 200 HvSSR DNA markers. Out of 200 SSR markers used, 38 and 48 have exhibited parental polymorphism with C14-8 and CARI Dhan 5, respectively as compared to IRBB60. Back-crosses were attempted between F_{1s} [C14-8x IRBB 60 (*Xa* 4, *Xa* 5, *Xa* 13 and *Xa* 21) and CARI Dhan 5 x IRBB 60 (*Xa* 4, *Xa* 5, *Xa* 13 and *Xa* 21)] and the respective recurrent parents during kharif 2014-15 for obtaining adequate number of seeds of BC_1F_{1s}, and F_2 selfed progenies (Plate 34).

Plate 34: A good seed set obtained from crossing

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

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

Salt Tolerant Breeding Network Trial

Twenty eight rice genotypes from different salinity centers in India were evaluated in thrice replicated RBD at Lal Pahar village, Port Blair, under dual stress of salinity (ECiw~5.62 dS/m) and acid sulphate conditions (pH 5.5) during 2014-15.

The data were recorded for plant height, days to 50% flowering, tillers/plant, panicle length, spikelet fertility, filled grains, grain yield and phenotypic acceptability scores.

Significant variability was found in the genotypes in all traits recorded except number of tillers. The grain yield data showed that genotypes *viz*. SIT 4446, SIT 5153, SIT 5207, STBN 11-7, SIT 5157 and SIT 5160 in the descending order were found to be numerically better than National check CSR36. These genotypes

gave more than 4tha^{-1}. Therefore, evaluation study showed better performance of these identified genotypes not only under salinity but also under combined stress of acid sulphate soils of the Island agro-ecosystem.

Performance evaluation of salt tolerant rice varieties in South Andaman

A total of 11 selected and most promising salt tolerant rice varieties were evaluated at Lal Pahar, Port Blair, during 2014-15. The field was in contact with sea water and the field stagnating water with ECiw varied from 6 to 8 dS/m during various stages with soil pH around 5.6.

Data were taken on different yield and associated traits. Five genotypes *viz* CIARI Dhan 6, NDRK 11-14, NDRK 11-6, NDRK 11-7 and local check CARI Dhan 5 gave significantly higher yield of more than 3.4 t/ha. CIARI Dhan 6 and NDRK 11-14 exhibited yield of more than 5 t/ha under combined stress of salinity and acid sulphate soils.

Seed production and distribution of salt tolerant rice varieties

During 2014-15, 16.69 quintal seed of CARI Dhan 4, CARI Dhan 5 and CSR36 was provided to farmers in North and Middle Andaman District, Hut Bay (South Andaman) and Campbell Bay (Nicobar District) for increasing rice productivity, especially in salinity areas in Andaman and Nicobar Islands.

ICAR Seed Project on Seed Production in Agricultural Crops

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

A total of 41.5 kg of Nucleus Seed of 7 rice varieties (CARI Dhan 1, 2, 3, 4, 5, 6 and 7) and 397 kg of Breeder Seed of 7 varieties was produced at CIARI Farm, Port Blair. In addition, 35.15 quintal Truthfully Labelled Seeds (TLS) 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*, 2014. In addition, 5 Kg TFL seed of CARI Brinjal 1 was also produced.

Plate 35: A view of seed production plots

Trainings imparted

Four trainings were conducted on different aspects of quality seed production and management during 2014-15 in North and Middle and Andaman and Hut Bay, in which a total of 200 farmers participated.

Seed sold and distributed of various HYVs

A total of 220 Kg breeder seed and 18 quintal Truthfully Labelled (TFL) seed of rice was supplied to the Department of Agriculture, Port Blair. About 12 quintal TFL seed of rice and 3 kg of bacterial wilt resistant variety CARI Brinjal 1 was provided to the tribal farmers of Nicobar Island during Kharif 2015.


Plate 36: Providing seeds of salt tolerant rice varieties in Campbell Bay, Nicobar District

Genetic Improvement of Pulses for Andaman & Nicobar Islands Conditions

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

The naturally occurring variation among local landraces of pulse crops of these Islands was studied and utilized. The genetic relatedness of the landraces and cultivated varieties of mungbean, urdbean and pigeonpea was estimated through morphological markers. Among the minicore collections of pulse crops, promising landraces of mungbean (17), urdbean (12) and *Vigna marina* (2) were deposited in the NBPGR, New Delhi for long term conservation and IC numbers were received.

The advanced breeding lines derived from local landraces of mungbean, urdbean and pigeonpea were evaluated further for characterization w.r.t yield and yield attributing traits. In mungbean AVT II, a total of 12 promising lines along with 6 National checks were evaluated in a replicated trial. Of these, genotypes



Plate 37: Genetic Improvement of Pulses for Andaman & Nicobar Islands Conditions

namely ANM-12-02 (IC No.0611650) revealed significantly highest yielding (20.42 q/ha) followed by ANM-11-12 (IC No.0611666), ANM-12-01 (IC No.0611649), ANM-11-08 (IC No.0611664) and ANM-11-15 (IC No.0611667) genotypes over the best check VBN 3, while the genotypes namely ANM-11-05 (IC No.0611661) and ANM-11-07-2 (IC No.0611663) showed significant superiority in terms of yield over the checks (HUM 16, LGG 460, IPM 02- 3, Pusa Vishal). These accessions also showed resistance against charcoal rot, *Cercospora* leaf spot and MYMV diseases of mungbean. Under farmers'field conducted trials, the genotypes ANM-12-02, ANM-11-12 and ANM-11-05 showed significantly higher yield across the locations. The promising landraces of mungbean (ANM-11-12 & ANM-11-15) were nominated to AICRP on MULLaRP trials for Rice fallow cultivation. On the basis of *per se* performance 03 mungbean advanced entries CIARI Mung 1, CIARI Mung 2 and CIARI Mung 3 were released by the Institute Varietal Release Committee for cultivation in Andaman & Nicobar Islands conditions.

Further, the 16 advanced breeding urdbean lines derived from indigenous landraces and selections from previous years trial were evaluated for yield and yield attributing traits along with 6 standard check varieties. Out of these 16 promising advanced breeding lines namely, ANU-11-10 (IC No. 0611672) (17.11 q/ha), followed by ANU-11-19 (IC No. 0611675), ANU-12-01 (IC No. 0611655), ANU-11-09 (IC No. 0611671) and ANU-11-29 showed significantly higher seed yield (qha^{-1}) as against the standard checks VBN 7 (12.44 q/ha^{-1}), IPU-02-43, LBG 752 and ADT 3 (10.86 qha^{-1}). The genotypes namely, ANU-11-08 (IC No.0611670), ANU-11-11 (IC No.0611673) showed at par yield over the checks ADT-3, Pant U-03-11 and KUG-50. The accessions, ANU-11-10, ANU-11-19 also showed resistant 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 resistant reaction against these diseases. The genotypes ANU-12-01, followed by ANU-11-19, ANU-11-29 and ANU-11-10 showed significant yield superiority across locations. The promising landraces of urdbean (ANU-11-29 & ANU-11-19) were selected in the AICRP on MULLaRP trials for Rice fallow cultivation.

An exploratory replicated trial comprising a set of 13 advanced lines derived from local landraces along with 3 standard checks was conducted during 2014-15. Out of 13 advanced entries the accessions namely, ANP-13-01 (16.61 q/ha^{-1}), followed by ANP-11-12, ANP-13-30 and ANP-12-02 two advanced breeding lines IPAC-68 and IPAC-7-2 showed significantly higher seed yield per plant over the checks NA-1, CO 6 and Bahar. These entries also showed tolerance against insect pests and diseases with significantly better yield attributing traits in respect of plant growth parameters, number of branches per plant & pod characteristics.

AICRP on MULLaRP (Rabi Mungbean & Urdbean)

Awnindra K Singh

An Initial Varietal Trial (IVT) under AICRP on MULLaRP of mungbean was conducted during Rabi 2013-14. A total of eight entries of mungbean was tested for Rabi mungbean. The entries RM-14-102 (9.79 qha^{-1}), followed by RM-14-105 (9.74 qha^{-1}), RM-14-113 (9.58 qha^{-1}) were found better for seed yield and yield attributing traits. The entries also exhibited resistance against Charcoal rot and *Cercospora* leaf spot diseases.

In urdbean, an IVT comprising of 07 entries and AVT 1 comprising of 04 advanced entries were evaluated in a replicated trial. Among the set of 07 entries under IVT the entries namely, RU-14-206 (16.72 qha^{-1}) followed by RU-14-205 (16.46 qha^{-1})

and RU-14-202 (15.87 qha^{-1}) exhibited significantly higher seed yield. In urdbean AVT 1 genotype RU-14-306 (16.67 qha^{-1}) showed significant superiority for seed yield. During the fourth group meet of AICRP

on MULLaRP at ICAR-CIARI, Goa, two promising lines each of mungbean (ANM-11-12 & ANM-11-15) and urdbean (ANU-11-29 & ANU-11-19) derived from indigenous local landraces were nominated for AICRP MULLaRP Rice fallow mungbean and urdbean trials.

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

Awnindra K Singh, Sachidananda Swain and *R.K. Gautam*

Pulse crop genetic resources including farmers' varieties, landraces and wild relatives are the basic raw materials required to cater to current and future needs of pulse improvement. The naturally occurring **diversity** and variation existing in the farmers' varieties, indigenous landraces and their wild relatives of pulse crops is under exploited in A&N Islands. Therefore, the project was initiated to characterize the farmers' varieties, local landraces and wild relatives

of different pulse crops *viz.*, mungbean, urdbean, cowpea and pigeonpea from the islands. This was done through basic survey of the farmers having their own traditional mungbean, urdbean, pigeonpea and cowpea seeds. Traditional farmers' varieties of mungbean (45), urdbean (33), cowpea (13) and pigeonpea (16), sona mung (03), mung urpnash (01), beachpea (03), *Vigna heretiella* (01), *Vigna curcosca* (01), wild urd (01) and chakor lobia (02), kulthi (01) were collected from farmers' fields of North Andaman, Middle Andaman, South Andaman and Kamorta (Nicobar), while those of *Vigna marina* were collected from Car Nicobar. The seeds collected from farmers' fields were screened and grouped as per the guidelines of mungbean, urdbean and pigeonpea visual assessment / grouping of seeds. These indigenous varieties of mungbean (22), urdbean (28), cowpea (13) and pigeonpea (16) were sown in a replicated trial for further characterization as per the DUS guidelines.

Plate 38: Indigenous Pulses

Monitoring of Pesticides Residue Analysis at National Level

Awnindra K. Singh

Pesticide residues analysis of food, vegetables 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.

A total of 277 vegetable samples (bitter gourd, okra, brinjal, cowpea, tomato, cucumber, cauliflower and green chili), 18 samples of of pulses namely mungbean and urdbean and 15 water samples were collected from farm gate, vendors and farmer ponds at different locations in North, Middle & South Andaman and sent to Regional Plant Quarantine Station (RPQS), Chennai.

The result revealed presence of non-recommended pesticides in vegetable crops of the Islands agro-ecosystem.

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

P.K. Singh and *Shrawan Singh*

Development of bacterial wilt resistant lines

Three lines resistant to bacterial wilt have been developed *viz*., CARI Brinjal 2, CARI Brinjal 3 and CARI Brinjal 4. The lines were derived from pedigree selection of CARI Brinjal1 X Pusa Purple Long. The advance progenies of resistant plants of F_6 segregating population have been advanced to F_7 level. During the advancement to F_8 level, the selected progenies from the single fruits of resistant plants were artificially challenged by the pathogen (*Ralstonia solanecearum*) by artificial soil inoculation method. The plants were found to be surviving even after second artificial inoculation, which concluded that the selected lines have proven resistance against bacterial wilt pathogen. These lines are being tested for other yield and fruit traits.

CARI Brinjal 2 **CARI Brinjal 3** **CARI Brinjal 4**

Plate 39: Bacterial wilt resistant lines of Brinjal

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)

The fourteen isolates of bacterial wilt pathogen collected from different districts of Andaman Islands were characterized for genetic variability using five chromosomal housekeeping genes (*ppsA*, phosphoenolpyruvate synthase, *gyrB*, DNA gyrase, subunit B; *adk*, adenylate kinase; *gdhA*, glutamate dehydrogenase oxidoreductase; and *gapA*, glyceraldehyde 3-phosphate dehydrogenase oxidoreductase) and three megaplasmid borne virulence-related genes (*hrpB*, regulatory transcription regulator; *fliC*, encoding flagellin protein and *egl*, endoglucanase precursor). The MLST analysis revealed that the 14 isolates from Andaman Islands were grouped into ten sequence types (ST1 through ST10), whereby ST1 is composed of five isolates from Islands and all other STs are represented by only one isolate each. Three STs (1, 2, and 3) are part of the same clonal complex, since ST 2 and ST 3 are each single locus variants (SLVs) of ST1. Similarly ST 4 and ST 5 are SLVs of each other and form a second clonal complex and ST 6 and ST 7 are SLVs of each other and form a third clonal complex. Interestingly, ST1 is also a SLV of an isolate collected from the Mohanpur region of West Bengal (BRs-Kal) in the Mainland of India. The striking allelic similarities among many of the isolates from diverse geographical locations and host plants of Islands strongly suggests that the bacterial wilt outbreaks in different locations on the

Andaman Islands were mostly caused by one genetic lineage (the clonal complex composed of ST1, 2, and 3) derived from a single ancestor that spread throughout the Islands recently from mainland India and not by a diverse endemic pathogen population nor from nearer South Eastern countries.

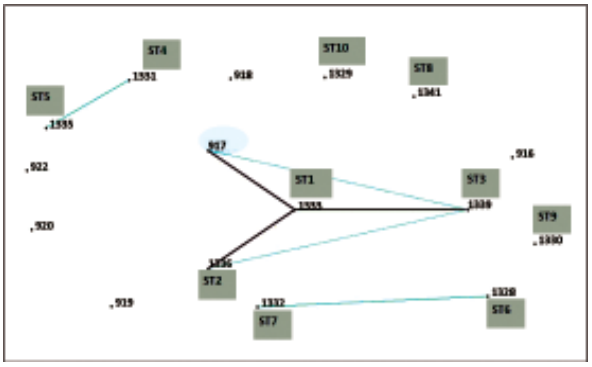


Fig. 15: Snapshot of 21 R. solanacearum isolates representing Andaman Islands and Mainland India on the basis of MLST allelic profiles using the eBURST algorithm.

Numbers and dots represent Sequence Types (ST).

Lines connect single-locus variants, which are STs that differ in sequence for only one of the eight genes. The snapshot shows all clonal complexes (connected STs), singletons (unconnected STs), and patterns of evolutionary descent. The placement of singletons as well as the length of the nodes is arbitrary.

ST1, ST2, and ST3: Clonal complex comprised of five biovar 3 isolates that shared all alleles, Single Locus Variants (SLV) and Double Locus Variants (DLV); ST4 and ST5: Clonal complex consisted of two isolates that are DLVs; ST6: Triple Locus Variant of ST10, the biovar 4 isolate; ST7: DLV of ST6; ST8 & ST9: Singletons; ST1 [CRs-Wn, CRs-Cl, BRs-Hv, BRs-Gr, BRs-Dg2; PAMDB-IDs 1333, 1337, 1338, 13401) is a clonal complex; ST2 [CRs-Ch (PAMDB ID 1336)], ST3 [BRs-Dg1 (PAMDB-ID 1339)], and BRs-Kal (PAMDB-ID 917-Isolate from main land India) are SLVs;ST4 [CRs-Gr1 (PAMDB-ID 1331)] and ST5 [CRs-Gr (PAMDB-ID 1335)] -r1/b3 are DLV of each other; ST6 [TRs-Hv (PAMDB-ID-1328)] and ST7 [CRs-Gr2 (PAMDB-ID-1332)] r1/b4 are DLVs. ST8 [BRs-Hb (PAMDB-ID-1341)] & ST9 [CRs-Sg (PAMDB-ID-1330)]: Singletons ST10: DLV of ST6

CIARI Bio - Consortia

The talc based bioformulation with consortia of antagonistic bacteria (*Bacillus cereus, Lysinibacillus sphaericus, Bacillus subtilis* and *Bacillus amyloliquifaceans*) were developed and tested in different field conditions for the management of bacterial wilt in Brinjal. The technology has been standardized for soil application of CIARI Bio Consortia enriched with Farmyard manure and also released during Island Kisan Mela 2015.

Plate 40: Beneficial effects of CIARI Bio-Consortia on brinjal plants

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

T. Bharathimeena and *A.K. Singh*

Legumes are invaded by a complex array of insect pests starting from germination till pod maturation and harvest. However, for over three decades the pest scenario of legumes in the Islands remains vaguely documented. Factual information on different pest species infesting a plant arms the cultivator with precise knowledge on taking up cost effective control measures which in turn is also environmentally safe. It was aimed to document the insect pests of legumes, their natural enemies, alternate hosts and also to study their developmental biology and seasonal occurrence.

In red gram, black gram, green gram and vegetable cowpea 19, 9, 4 and 6 species of insect pests were collected, preserved and documented. The major pests of red gram were chrysomelid leaf beetle, pyralid leaf webber, the spotted pod borer, *Maruca testulalis*, *Riptortus pedestris* found in numbers of 15-25, 3-7, 3-5, 5-10 per plant respectively. A looper caterpillar causing circular holes on leaves was the most serious pest on black gram with population counts ranging between 1-3 larvae per plant. The blue butterfly, *Euchrysops cnejus* causing irregular bore holes on pods was commonly observed in green gram @ 1- 3 larva per five plants. *M. testulalis* was the second important pest in both green gram and black gram with incidence levels of 1-3 per plant. Hymenopteran parasitoids were collected from notodontidae and pyralidae leaf feeders of red gram. Mealy bugs were also found to be parasitised and the emerging wasps were collected and preserved. Coccinellid beetles, spiders and praying mantis were the commonly observed predators in legume ecosystem in numbers of 3-5, 2-5, and 0-1 per plant respectively.

Plate 41: Helicoverpa armigera on red gram

Table 7: Insect pests of significance in legumes in the Andaman and Nicobar Islands

Crop	Defoliators	Sucking pests	Pod borers	Pod sucking bugs
Red gram	Looper, semilooper, Hairy caterpillar (*Porthesia scintillans*), Chrysomelid leaf beetle.	*Megacopta cribraria, Aphis craccivora*, mealy bugs and scales.	*M. testulalis E.cnejus, Helicoverpa* sp., *Sphenarches anisodactylus*	*Riptortus pedestris, Riptortus sp., Nezara viridula, Clavigralla sp., Cletus sp.*
Black gram	Looper, semilooper, *Spodoptera litura.*	*A. craccivora*	*M. testulalis, E. cnejus, Helicoverpa* sp.	*Piezodorus* sp.,
Green gram	Chrysomelid leaf beetle	*A. craccivora*	*M. testulalis* and *E. cnejus*	*Piezodorus* sp.
Vegetable cowpea	Chrysomelid leaf beetle	*A. craccivora* flower thrips	*Maruca* sp.	*N. viridula*

Plate 42: Eggs of *Riptortus pedestris*

Plate 43: Adult *Riptortus pedestris*

Plate 44: parasitised leaf feeder on black gram

Plate 45: Red gram mealy bug

Operational Research Programme on Management of Sucking Pests of Horticultural Crops

T. Bharathimeena

Sucking pests are severe biotic constraints in raising vegetable crops in the Andaman and Nicobar islands. Often the populations of these pests increase progressively in favourable weather conditions causing extensive crop loss. Often the population outbursts of sucking pests call for application of hazardous, contact and systemic insecticides. Documentation of major sucking pests, their natural enemies, alternate hosts can help us strengthen our defenses against these intruders which attribute for a major part of crop loss. Extensive survey was taken up in South Andaman and Neil Islands to observe study and document the occurrence of leaf hoppers, white flies, aphids, mealy bugs and heteropteran plant bugs in brinjal, okra, tomato, sweet potato and vegetable cowpea. Mirid bug incidence was noticed in tomato. Nymphs and adults were found resting on leaves in considerable numbers (1- 16 per plant). They desapped from tender buds and leaves. Infested leaves lose turgidity and droop down.

Plate 46: *Nezara viridula* on okra

Plate 47: Rearing set up for bugs

Consortium Research Platform on Borers

T. Bharathimeena and *I. Jaisankar*

Horticultural crops and forest trees suffer greatly due to stem and fruit borer pests in the Island ecosystem. These pests not only drastically reduce fruit yield but sometimes can kill the trees outright. There is scarcely documented data on cerambycid/lepidopteran stem borers and fruit borers. Only twelve borer pests have been recorded in fruits and vegetables from the Andaman and Nicobar Islands till date.

There is a need to revise the catalogue of insect borers attacking fruits, vegetables, plantation crops, forest trees and also to study the bio-ecology of the insect borers of economic importance. Knowledge on biology and life cycle of the pests with complementary information on ecological habits will help to chalk out eco-friendly, sustainable management measures. Jamun showed severe incidence of fruit and nut borer (Pyralidae: Lepidoptera) (unidentified). Around 64.5 per cent of fruits were infested, which gave off a characteristic offensive odour and dull white powdery mass was continually pushed out from the fruit by the

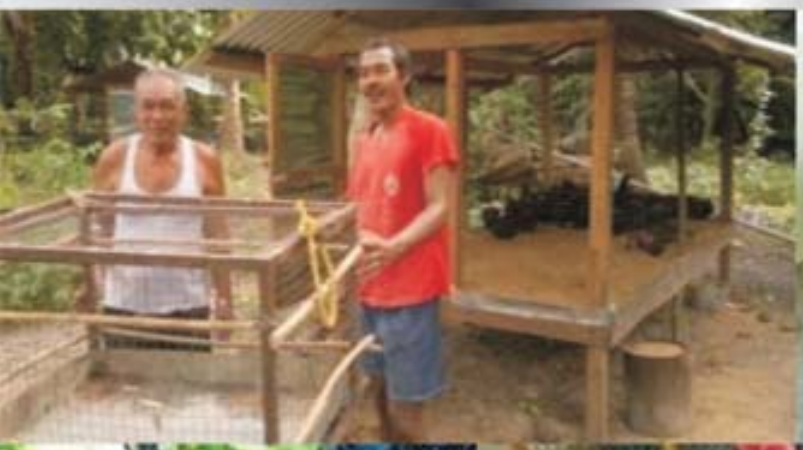
Plate 48: *Cashew infested by fruit* borer

feeding larva. One more species of a pyralid fruit borer pest was also collected from wild jamun. Cashew was attacked by a fruit borer pest. The larva tunneled into the fleshy tissues which rotted subsequently. Excretory material and frass were seen being exuded from the bore hole.

All India Network project on Vertebrate Pest Management

T. Bharathimeena

Rats and mice wreak havoc in storage godowns as in fields and they damage more than they consume. Excretory pellets, animal hairs and urine stained grains of rice can cause serious health hazards, besides critically hampering consumer preference. Studies were carried out to document different species of rodents damaging stored grains and other commodities. *Rattus* sp., and *Musbooduga* were frequently observed damaging stored rice grains and animal feed. Post natal developmental observations were recorded for *Rattus* sp. A litter consisted of 3-9 pups. The new born pups were pinkish coloured, hairless and blind. Hairs developed on the 7th day. The pups opened their eyes on 12-13th day. Pups attained weaning period by 21st - 22 nd day. Laboratory experiments were simultaneously carried out to know the grain consumption per animal. *Rattus* sp. of uniform age were selected from the trapped rats and confined in cages for assessing grain loss by this species. It was found that on an average each animal consumed about 11.21 to 15.54 g of rice grains per day.




पशु विज्ञान प्रभाग

Division of Animal Science

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 Nicobari fowl was carried out based on segregation for short shank length at sexual maturity from base population of 200. G1 (Generation1) progeny from the selected population was propagated to 1000 numbers. G2 progeny were produced from G1 population (segregated for short shank length) at sexual maturity. A total of 1500 G2 birds were evaluated for production performance. 500 G3 of Black and White Nicobari fowl and 150 G1 Brown Nicobari fowl were produced based on mass propagation, segregation and selection for short shank length at the age of sexual maturity (ASM).

From the table 8 it is evident that in all the days of measurements, the shank length reduced gradually from base population to successive generations like at G1, G2 and G3. The response to selection on shank length was also observed at ASM in both the three varieties of Nicobari fowl. The response to selection was stabilized at G3 level in Black and White Nicobari fowl. In Brown Nicobari fowl the response to selection was also positive up to G1. The response to selection for short shank length at ASM was highly significant in the first generation of Black and White Nicobari fowl at 0 day, 1, 2, 3 and 4 months of age; there was no significant difference between second and third generation in shank length at all stages in Black and White Nicobari fowl. It was also observed that among the two varieties of Nicobari fowl, the black variety showed the lowest shank length as compared to White Nicobari fowl.

Table 8a: Effect of selection for short shank length (mm) on shank length of Black and White Nicobari fowl at 0, 1 & 2 day

Age in months	0 day				1 day				2 day			
Generations	BP	G1	G2	G3	BP	G1	G2	G3	BP	G1	G2	G3
Bl N	13.56^{b} ± 0.56	9.64^{b} ± 0.56	$9.78a^{b}$± 0.85	8.86^{a} ±0.95	21.5^{b} ± 1.29	11.76^{a} ±1.50	10.43^{a} ± 0.68	10.89^{a} ± 4.65	34.65^{b}± 2.37	24.57^{a} ±2.00	21.8^{a} ±0.94	20.95^{a} ±8.79
WN	13.76^{b} ± 9.76	12.64^{b} ± 0.56	9.78^{ab} ± 0.85	8.15^{a} ±0.95	20.76^{b} ± 0.68	16.97^{b} ± 0.68	12.88^{ab} ± 1.90	10.43^{a} ± 0.68	32.29^{b}± 0.87	24.57^{a} ±2.00	22.29^{ab}± 0.87	21.8^{a} ±0.94

Table 8b: Effect of selection for short shank length (mm) on shank length of Black and White Nicobari fowl at 3, 4 & Age at sexual maturity

Age in months	3 day				4 day				At ASM			
Generations	BP	G1	G2	G3	BP	G1	G2	G3	BP	G1	G2	G3
Bl N	**50.33**^{b} ±1.75	33.85^{a} ±2.63	29.47^{a} ±1.99	28.97^{a} ±12.18	55.21^{b} ±4.18	38.71^{a} ±3.46	35.07^{a} ±2.01	35.54^{a} ±22.46	56.28^{b} ±15.23	39.12^{a}± 14.13	37.25^{a}± 11.98	36.55^{a}± 15.84
WN	52.7^{b} ±4.24	33.85^{a} ±2.63	28.57^{ab} ±2.48	29.47^{a} ±1.99	56.74^{b} ±4.59	35.71^{a} ±3.46	25.21^{ab} ±3.07	26.07^{a} ±2.01	57.28^{b} ±25.23	38.62^{a}± 20.13	36.28^{a}± 22.23	37.25^{a}± 18.28

Values within row in same day with different superscripts differ significantly (p<0.01). (BP=Base Population, before selection), Bl. N =Black Nicobari, WN= White Nicobari, ASM=Age at sexual maturity.

From the table 9 it is revealed that selection for shank length influenced body weight during the growing phase. There was gradual decrease of body weight in G1, G2 and G3 generation in all the ages of measurements of all the varieties of Nicobari fowl. 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 (Table 9).

Table 9a. Effect of selection for short shank length on growth performance (body weight in g) of Black and White Nicobari fowl at 0, 1 & 2 day

Age in months	0 day				1 day				2 day			
Generations	B.P.	G1	G2	G3	BP	G1	G2	G3	BP	G1	G2	G3
Bl N	30.96^{a}± 0.67	30.13^{a}± 2.02	28.83^{b}± 2.03	26.9^{b} ±0.65	172.0± 0.80	170.6^{a} ±40.1	165.5^{b} ± 35.7	133.2^{b} ±10.79	343.2± 41.0	323.7^{a} ±44.7	284.6^{b} ±41.7	256.9^{b} ±6.71
WN	31.46^{a} ±0.80	25.6^{b} ±0.94	24.75^{b} ±0.77	24.91^{b} ±0.64	164.46^{a} ±10.80	113.5^{b} ±9.17	110.2^{b}± 3.85	120.2^{b}± 6.39	413.2^{a} ± 13.09	356.^{1ab} ±25.5	302.1^{b} ±19.90	229.3^{b} ±8.8

Table 9b. Effect of selection for short shank length on growth performance (body weight in g) of Black and White Nicobari fowl at 3, 4 & Age at sexual maturity

Age in months	3 day				4 day				At ASM			
Generations	BP	G1	G2	G3	BP	G1	G2	G3	BP	G1	G2	G3
Bl N	612.4 ±36.2	592.6^{ab} ±55.5	632.4^{b} ±43.1	636.3^{b} ±50.11	992.6 ±45.1	880.3^{ab} ±68.5	850.5^{b} ±50.1	830.9^{b} ±53.44	1196.2 ±50.2	1001.6^{ab} ±70.2	978.9^{b} ±66.3	926.30^{b} ±60.21
WN	623.7^{a} ±35.2	586.6^{b} ±66.5	521.6^{ab} ±55.45	452.1^{b} ±19.90	677.6^{a} ±66.9	653.1^{b} ±98.4	613.5^{ab} ±67.47	530.1^{b} ±50.1	986.4^{a} ±99.58	908.^{8ab} ±95.69	859.2^{b} ±105.6	802.9^{b} ±95.4

Values within row in same day with different superscripts differ significantly (p<0.01). (BP=Base Population, before selection), Bl. N =Black Nicobari, WN= White Nicobari, ASM=Age at sexual maturity.

From the study it is evident that response to selection for short shank length was highly significant in the first generation of Brown Nicobari fowl in all ages of measurement on shank length and body weight. It was also observed that selection for shank length influenced body weight negatively. The body weight deceased at G1 as compared to before selection in all ages of measurement in Brown Nicobari fowl (Table 10).

Table 10. Effect of selection for short shank length on shank length (mm) and body weight (g) of Brown Nicobari fowl

Age in months	0 day		1 month		2 month		3 month		4 month		At ASM (month)	
	SL(mm)	BW(g)	SL(mm)	BW(g)	SL(mm)	BW(g)	SL(mm)	BW(g)	SL(mm)	BW(g)	SL(mm)	BW(g)
Before selection	16.56^{b} ± 0.56	33.2^{a} ±1.80	11.5^{b} ± 1.29	190.7^{a} ±7.7	15.57^{b} ± 2.37	497.9^{a} ±30.1	20.33^{b} ±1.75	799.1^{a} ±50.0	25.21^{b} ±4.18	1008.5^{a} ±77.2	44.28^{b} ±5.23	1215.8^{a} ±101.6
G1	13.62^{a} ±1.33	28.25^{b} ±0.75	19.03^{a} ±1.50	157.4^{b} ±10.11	26.56^{a} ±2.00	456.7^{b} ±19.87	33.85^{a} ±2.63	718.4^{b} ±66.5	38.71^{a} ±3.46	876.6^{b} ±66.5	40.32^{a} ±9.56	926.8^{b} ±92.80

SL=Shank Length, BW =Body weight, ASM=Age at sexual maturity, Values in the same column with different superscripts differ significantly (p<0.01)

Selection for short shank length had negative response on hen day egg production (HDEP) on all the ages of measurements at G3 level in both Black and White Nicobari fowl but among the selected Black and White varieties, the White Nicobari fowl showed higher egg production than the Black one. The Age at sexual maturity (ASM) was observed delayed in both Black and White Nicobari fowl than the before selection group, but among the selected groups the Black Nicobari fowl matured early(168days) than the White variety (172 days) at generation 3 (G3) level . The feed efficiency was better in Black Nicobari than White Nicobari (Table 11). The onset of sexual maturity was delayed by 15 days in G3 as compared to the groups before selection. Egg mass and feed intake was lower with G3 as compared to groups before selection.

Table 11 .Effect of selection for short shank length on Egg production performance and feed efficiency of Nicobari fowl

Traits	Before selection	Black G3	White G3
HDEP at 26 week of Age	40.87± 5.75	30.82± 2.63	36.06± 5.36
HDEP EP at 30 weeks of Age	46.55± 4.77	40.54± 9.81	44.15± 5.56
HDEP at 34 weeks of Age	54.44 ± 3.36	51.69 ± 6.92	52.01± 1.39
HDEP at 38 weeks of Age	63.33± 3.48	54.13± 2.93	56.56± 9.16
HDEP at 42 weeks of Age	67.33 ± 3.17	50.53± 1.85	52.18± 3.49
ASM (days)	154	168	172
Hatchability	54.54 ± 2.39	50.54 ± 4.90	52.19 ± 6.45
Egg weight (g)	50.56 ± 9.48	47.28 ± 0.34	48.52 ± 0.31
Egg mass (g / hen /day	27.55 ± 7.35	21.53 ± 6.56	23.38±2.76
Feed intake (g/bird/day)	123.33 ± 13.5	116.13 ± 12.9	119.54 ± 15.6
Feed efficiency per g egg mass	4.47 ± 5.27	4.96 ± 5.95	5.11 ± 3.14

Innate immune competence status in progeny (G3) of Nicobari fowl selected for short shank length revealed significantly higher($p<0.01$) antibody (HA) titer on 7^{th} ,14^{th} and 21^{st} day of post inoculation of GRBC as compared to before selection.

Dietary Supplementation of Micronutrient to Improve the Productivity of Livestock

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

Productive and reproductive performance evaluation of Nicobari Pig under intensive management

A pair of Nicobari pigs were brought from the breeding tract of Car Nicobar in the month of April 2013 and maintained at the Institute farm with normal feeding to study its adaptability for intensive management for the last two years. The pigs are well adapted in the intensive management system (Plate 49). During the 23 months, the sow farrowed thrice with a litter size of 6 in the first two farrowing and 8 in the third farrowing. On third day of 1^{st} and 3^{rd}

Plate 49: Nicobari pig under intensive system

farrowing all the litters died due to the low litter weight, which was recorded to be 4.5 Kg (avg piglet birth weight 0.75 Kg) and 6.8 Kg (avg piglet birth weight 0.85 Kg) respectively. However in the second farrowing litter weight was improved and recorded as 6.7 Kg (avg piglet birth weight 1.11 Kg) compared to the 1st farrowing as mentioned above. The piglets in second farrowing were weaned successfully at 8th weeks of age. The weaning litter size was recorded to be 6 and litter weight was 33.6 Kg. The results indicated that the Nicobari pigs are well adapted in the intensive system of rearing and showed good reproductive performances in terms of numbers of farrowing per year but weaning litter performances are poor due to low litter weight at birth. Hence, it may be concluded that higher the litter weight at birth providing better nutrition to the pregnant sow will have better survivability rate.

Comparative evaluation of growth performances of F1 generation of Nicobari pigs under intensive system of rearing with LWY crosses

Comparative growth performances were evaluated between F1 generation of Nicobari pigs with Large White Yorkshire and its crosses (with the Andaman local pigs) under similar feeding and management system. It was observed that the crosses showed better growth performances than the Nicobari Pig (Table 12).

Table 12: Body Weight gain (g) of F1 generation of Nicobari pigs and its crosses with Large White Yorkshire pigs

	Body weights (g)	
Age (days)	Cross (LWY + Andaman Local) (n=6)	F1 Generation of Nicobari pigs (n=6)
15	298.33 ^{a} ± 12.76	163.33 ^{b} ±8.82
30	307.17 ^{a} ± 15.86	160.00 ^{b} ± 8.47
45	430.83 ^{a} ± 24.64	280.00 ^{b} ± 7.19
60	481.67 ^{a} ± 23.44	290.00 ^{b} ± 7.42
75	428.33 ^{a}± 7.92	262.33 ^{b} ± 6.96
90	460.00 ^{a} ± 21.91	285.00 ^{b} ± 6.45
Overall	401.06 ^{a} ± 5.04	240.11 ^{b} ± 3.53

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

Effect of feeding green fodder and mineral mixture supplementation on the reproductive performances of heifers

A total of eight heifers were divided in two groups of 4 in each. Group 1 was kept as control and were kept on grazing for 4 hours and supplemented with 3 kg of concentrate mixture. Group 2 was fed as per the group 1 in addition 10 kg green fodders were offered daily for 4 months. The group 2, showed significantly higher onset of oestrous (100.00%), pregnancy rate (75.00%), calving rate (75.00%) than control. It is inferred that the addition of fodder had significantly improved the reproductive performance in heifers.

Performance evaluation of green fodder in different topography of A & N Island

A pilot study was conducted in three different landscape viz terrace, steep slope and on the flat land for cultivation of fodder (Plate 50 & 51). The fodder was cultivated in the terraces and sloppy land without ploughing; whereas in the flat land fodder was cultivated as per the standard cultivation practice. The bio mass production was assessed in three different conditions. The yield of fodder in the flat land was recorded to be higher followed by terrace and lowest in the steep slope. The yield of fodder recorded to be as high as 450 quintals per hectare for flat land in 4 cuts to as low as 100 tons per hectare in the sloppy

land. The regeneration of fodder was low in sloppy land than the flat land. From this observation it may be concluded that in the high rain fall area, the fodder could be grown even in the sloppy land.

Plate 50: Fodder in the terrace

Plate 51: Fodder in the steep slope

A Progressive Pig Farmer: Mr. Rakesh Saha - a success story

Mr. Rakesh Saha of Collinpur Village, South Andaman is an unemployed youth and practiced traditional methods of pig rearing.

Then change came in his way, when he came to know through scientists of CIARI, Port Blair about the scientific methods of rearing the pigs with the available resources. He actively participated in the training programme on pig farming organized by CIARI, wherein he learnt to make the balanced feed with the available resources, he also learnt to make the house for giving comfort to the pigs to get maximum return. He purchased two piglets from CIARI in the month of June 2012 and started rearing pigs as per the methods learnt during the training programme. Before attending training he mostly fed the pigs with colocasia without any supplementation, but after training, he knew that only colocasia could support to maintain the body but it never gave the return. So he started mixing the other ingredients like wheat, coconut cake, grinded whole paddy and thrash fish as well as mineral mixture to get the maximum return from the pig rearing. Within eight months of rearing one pig became pregnant and farrowed with a litter size of 7 piglets and he also able to get 7 weaning litters size. During these 3 years he has earned Rs7.5 lakhs by selling 30 adult pigs and 25 piglets in the market. At present he is having herd strength of 6 adults and 24 piglets of different ages.

Plate 52: Farmer seen making feed and feeding the pigs

The scientists of Animal Science visit his farm in regular interval to observe the different managemental condition and suggest for betterment of the farm. The performance and prospect of his pig farm is very good.

Development of Enriched Chicken Egg and Meat

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

Feeding of Kalmegh to Nicobari fowl

Thirty breeding Nicobari fowls belonging to same batch were selected at 35 weeks of age. Birds were managed under deep litter system and 16 hours light with 3 lux of intensity per sqft. All birds were fed *ad libitum* as per Bureau of Indian Standards (BIS, 2007) recommendation. Birds were assigned to each of following dietary treatments *viz.*T1: Breeder diet supplemented with Kalmegh powder @ 3g per bird per day,T2: Breeder diet was supplemented with oral administration (10 ml per bird per day) of Kalmegh extract (Plate 53) prepared by soaking 30 g of kalmegh in water and T3: Control diet without Kalmegh supplement.

Plate 53: Kalmegh powder

Biochemical and micronutrient analysis of serum

Serum was assayed for Fe, Zn and Cu content using Atomic Absorption Spectrophotometer (AAS) and was expressed as ppm and serum total cholesterol, glucose, bilirubin and SGOT was quantified using ERBA Automatic Biochemistry Analyzer (Transasia Clinical Chemistry Analyzer-Model 200) with ERBA kit.

Serum Biochemical profile upon Kalmegh herbal supplementation

The cholesterol was significantly (P<0.01) lower (105 mg/dl) on third day supplementation of kalmegh in feed; but no significant difference was observed between kalmegh supplementation in water as compared to control group. Similarly serum cholesterol was significantly (P<0.01) lower (99.5 mg/dl) in birds fed with kalmegh through feed on fifth day of supplementation as compared to water supplemented and control groups. Birds fed with kalmegh as both water and feed supplement had significantly (P<0.01) lowest serum cholesterol of 116 and 110 mg/dl respectively on seventh day of supplementation as compared to control birds. The SGOT was significantly (P<0.01) lower in kalmegh as water supplement (173 U/dl) followed by kalmegh as feed supplement (198 U/dl) which was comparable with control group. Significantly (P<0.01) lowest SGOT was observed in birds fed with kalmegh as both water and feed supplement of 182 U/dl and 178 U/dl on fifth day and 185 U/dl and 177 U/dl on seventh day as compared to control groups respectively. The level of serum glucose significantly (P<0.01) differed among kalmegh supplemented and control groups from third day of feeding. The serum bilirubin level was significantly (P<0.01) reduced on fifth and seventh day of supplementation in both water and feed as compared to control group; while there was no significant difference between kalmegh supplemented groups (Table 13).

Supplementation of *Andrographis panniculata* had significantly influenced total serum iron, copper and zinc. The level of iron, copper and zinc was significantly (P< 0.01) higher by 3.5, 1.2 and 2 times respectively with supplementation of *Andrographis panniculata* extract as compared to control (Table 14).

Processing of kalmegh powder and serum for andrographolide quantification

Sample of kalmegh leaves were analysed to assure that they contained active compounds which determine the quality and may contribute to the biological effect.

The powdered dried plant of *Andrographis paniculata* (0.5g) was weighed and diluted with 7 ml of methanol. The extract was sonicated in ultrasonic homogenizer for 10 mins. This extract was filtered with Whatman's no.1 filter paper. The volume was made upto 10 ml with methanol. The extract was again filtered using 0.2ìm syringe filter. The residue was used for HPLC analysis of andrographolide. The extracted and quantified amount of andrographolide in kalmegh powder was 339 ppm.

The blood samples were collected at three and 24 hours after feeding of Kalmegh extract prepared from two levels (30 g and 50 g) of kalmegh powder. The serum samples were processed for High Performance Liquid Chromatography (HPLC) to quantify Andrographolide. 0.5 ml serum was mixed with 0.5 ml of phosphate buffer (pH 5.8) and 1 ml methanol was added. The tubes were vortexed at 8000 g for 5 minute and the supernatant was separated.

The concentration of andrographolide in serum collected at 3 hours interval of feeding kalmegh extract prepared from 30g of kalmegh was found to be 67 ppm, where as it was 151 ppm in serum collected at 3 hours interval of feeding kalmegh extract prepared from 50g of kalmegh (Table 15). There was nil concentration of andrographolide in the serum sample collected at 24 hrs interval.

Table 13: Effect of feeding of herbal supplements on serum biochemical profile

Serum cholesterol (mg/dl)			
Day of supplementation	Kalmegh extract prepared @ 50 gm kalmegh powder per 200 ml water	In feed @ 3g per bird per day	Control
1st NS	128.28 ± 6.02	127.42 ± 7.33	126.92 ± 4.79
3rd **	126.67 ± 7.32^{b}	105.42 ± 4.03^{a}	125.50 ± 8.59^{b}
5th **	128.58± 3.52^{b}	99.50 ± 7.94^{a}	133.58 ± 6.53^{b}
7th **	116.66± 10.08^{a}	110.92 ± 8.86^{a}	151.83± 8.74^{b}
Overall mean	125	110	134
Serum SGOT (U/dl)			
1st NS	209.90 ± 11.21	189.72 ± 17.58	203.37 ± 11.36
3rd **	173.24 ± 3.74^{a}	198.84 ± 13.18^{ab}	204.8 ± 13.84^{b}
5th **	182.34 ± 10.2^{a}	178.6 ± 8.16^{a}	221.32 ± 14.49^{b}
7th **	185.85 ± 7.88^{a}	177.42 ± 6.9^{a}	246.9 ± 27.7^{b}
Overall mean	187	185	218
Serum glucose level (mg/dl)			
1st NS	226.10 ± 5.45	234.48 ± 4.11	239.24 ± 5.04
3rd **	203.47 ± 7.50^{a}	225.32 ± 10.18^{b}	242.54 ± 6.10^{b}
5thNS	228.20 ± 9.92	239.05 ± 7.18	248.77 ± 6.92
7th NS	230.36 ± 9.41	235.88 ± 6.77	240.18 ± 6.68
Overall mean	211	220	242
Serum bilirubin level (mg/dl)			
1st NS	0.066 ± 0.01	0.067 ± 0.00	0.062 ± 0.01
3rd NS	0.052 ± 0.01	0.051 ± 0.01	0.062 ± 0.01
5th **	0.054 ± 0.01^{a}	0.052 ± 0.00^{a}	0.069± 0.01^{b}
7th **	0.056 ± 0.01^{a}	0.054 ± 0.01^{a}	0.068 ± 0.01^{b}
Overall mean	0.057	0.056	0.065

Table 14 : Micronutrient profile of serum upon kalmegh feeding

Micronutrients (ppm)	Kalmegh extract @ 50 gm per 200 ml water	Control
Iron	0.270 ± 0.03^{a}	0.076 ± 0.02^{b}
Copper	0.456 ± 0.01^{a}	0.367 ± 0.01^{b}
Zinc	0.12 ± 0.01^{a}	0.053 ± 0.00^{b}

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

Table 15: Concentration (ppm) and peak areas of Andrographolide present in Kalmegh powder and its efficacy to enrich the serum with Andrographolide in Nicobari fowl

Samples	Retention Time (RT)	Peak area	Conc. (ppm)
Kalmegh powder	4.381	17355436	339 ± 3.81
Serum collected 3 hrs interval feeding of kalmegh extract prepared from 30 gm of kalmegh	4.371	7983943	67.056 ± 15.03
Serum collected 3 hrs interval feeding of kalmegh extract prepared from 50 gm of kalmegh	4.397	3790720	151.31 ± 16.73
Serum collected 24 hrs interval feeding of kalmegh extract	Not detectable amount		

*Standard peak area - 2890309 (1 ?g/ml); * - Average of three determinations*

Based on this study, it is concluded that *Andrographis panniculata* is having hepatoprotective and hypocholesterlemic effect in Nicobari fowl.

The circulation of andrographolide in the serum after feeding of *A.panniculata* in Nicobari fowl clearly indicated that it was deposited in the developing yolk.

Further, it is inferred that the HPLC based method developed in this study for the quantification of Andrographolide in serum can be the base reference for estimation of any bioactive components of medicinal plants in serum.

Development of Therapeutics & Supplements by using Indigenous Herbs and Beneficial Microorganisms for Livestock Health and Production

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

Immunomodulatory effect of *Morinda citrifolia* and *Andrographis paniculata* on expression of toll-like receptors in Nicobari fowl

A total of five groups of 15 weeks old Nicobari chicks in each group were randomly assigned to each of five dietary supplements namely, T1 - 10 ml *Morinda citrifolia* juice + 200 mg Kalmegh powder per bird per day, T2–15 ml *Morinda citrifolia* + 400 mg Kalmegh powder per bird per day, T3– Commercial tonic (Growiplex) 4 ml/bird/day and T4–Alternate days: 10 ml *Morinda citrifolia*+ 200 mg Kalmegh powder per bird per day and T5 – Control (no tonic).

Total RNA was extracted from caecal tonsil samples (n=6) of each group by using RNA isoplus (DSS Takara India P Ltd, India) and quantification of total RNA was done by using Biospectrophotometer (Eppendorf, Germany). cDNA was synthesized from 2 µg of total RNA by using high capacity cDNA synthesis kit

(Applied Biosystem, USA). Primers were synthesized from the sequences mentioned by Michailidis and others 2010 and used in PCR and real-time PCR. Real-time PCR was done 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 µl of cDNA, 5 ñmoles of each forward and reverse primers, 5 µl of SYBR green master mix and nuclease free water to make up the volume to 10 µl. Cycling parameters were as follows: an initial denaturation at 95^{0}C for 10 min; 40 cycles of 94^{0}C for 30s, 58^{0}C for 30 sec, and 72^{0}C for 30 sec.

Supplementation of Noni and Kalmegh in the present study influenced the expression levels of TLR2, TLR3, TLR4, TLR5, TLR15 and TLR21 significantly (P<0.05) as compared to control (Table 16). Analysis by Real - time PCR revealed that 15 ml *Morinda citrifolia* + 400 mg Kalmegh treatment increased (4.4 fold) TLR-5 gene expression (Plate 54) and did not show any significant effect on the expression of other genes; whereas 10 ml *Morinda citrifolia* juice + 200 mg Kalmegh significantly (P<0.05) increased (1.3 fold) TLR-4 gene expression as compared to control and commercial tonic groups and other treatment groups. There was no significant increase in the expression of TLR4 with commercial tonic as compared to control and TLR-2 gene expression levels of 10 ml *Morinda citrifolia* juice + 200 mg Kalmegh, 15 ml *Morinda citrifolia* + 400 mg Kalmegh and alternate days treatment were lower as compared to the commercial tonic. Expression of TLR-7 gene was low with all treated groups as compared to commercial tonic. The observed increased TLR-3, TLR-4 and TLR-5 gene expression and decreased TLR-7 gene expression in gut associated caecal tonsil in chickens fed dietary Noni and Kalmegh indicated that combination of herbal extracts have better immunomodulatory properties than commercial tonic.

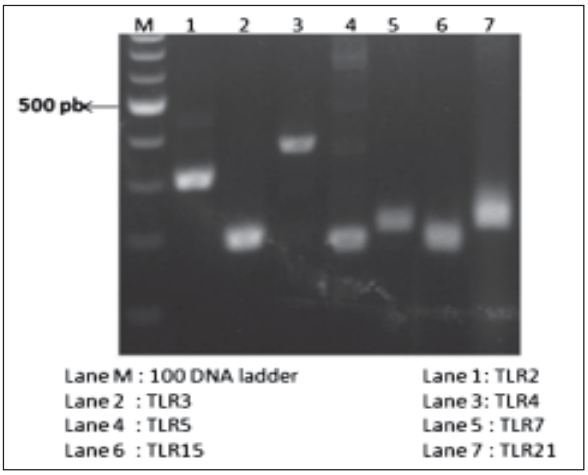


Plate 54: Amplification of different TLRs of Nicobari fowl Ceacal tonsil sample by RT-PCR

Table 16 : Fold difference in expression of different TLRs

Treatments	TLR2	TLR3	TLR4	TLR5	TLR7	TLR15	TLR21
Treatments	TLR2	TLR3	TLR4	TLR5	TLR7	TLR15	TLR21
10 ml *Morinda citrifolia* juice + 200 mg Kalmegh powder per bird per day	0.231	0.016	1.310	0.387	0.678	2.188	1.580
15 ml *Morinda citrifolia* juice + 400 mg Kalmegh powder per bird per day	0.252	0.057	0.268	4.469	0.953	1.547	2.657
Commercial tonic 4 ml/bird/day	1.165	0.0173	same	1.072	1.319	0.926	0.877

In conclusion, the selectively increased TLR-3, TLR-4 and TLR-5 and decreased TLR7 gene expression indicated that supplementing Noni fruit and kalmegh (@ 10 ml + 200 mg per day per bird) induces antiviral and antibacterial responses in chicken.

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

Jai Sunder and *Arun Kumar De*

The sero-surveillance of cattle and buffaloes were conducted and a total of 963 paired sera samples were screened for detection of antibodies against serotype O, A and Asia 1. The post vaccination percent protection for type O, A and Asia 1 were 69.16%, 80.37% and 78.19% respectively. Out of 540 cattle samples screened for DIVA, 27 (5.0%) were found % 3AB3 reactors which were from vaccinated areas and had a history of FMD outbreak. During the year a total of 6 awareness programme and one animal health camp were conducted in South Andaman (Plate 55 & 56).

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 55: Animal health camp

Plate 56: Awareness program on FMD

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*

Improved package of practices like elevated housing, rural low cost balanced feeding, feeding management using bamboo and wooden feeder, plastic waterer, artificial incubation using mini incubator and vaccination were disseminated to farm women. A total of 12 units of poultry shelter were constructed and a total of 250 Nicobari fowls were distributed to the target farm women. Mini Incubator for hatching desi eggs was installed and demonstration on the operation of incubator was conducted. Farm women adopted the scientific management of rural poultry instead of backyard farming. They could able to get 910 eggs in 9 months duration from 15 numbers of hens only (Plate 57).

Plate 57: Best farmer award during kisan mela 2015

It is inferred that by adopting the improved rural poultry farming technologies, farm women were empowered to meet out the ICMR recommendations of egg consumption 180 eggs per year per person for whole family. In addition, one of farm women was able to earn Rs. 3700 by selling eggs.

Empowerment of Women on Improved Rural Poultry farming with Nicobari fowl

Smti. Bichithra Biswas, a resident of Ferrargunj, South Andaman, is a landless house wife. She was one of the adopted farm women by ICAR-CIARI to empower her on improved rural poultry farming with Nicobari fowl. She did training on improved poultry technologies. ICAR-CIARI supported her to establish rural poultry farming during 2013 by constructing elevated poultry shelter with 25 number of Nicobari fowls (20 female and 5 male). She started giving rice, wheat, dry fish and coconut as per the specification given by scientist of ICAR-CIARI. She devised the feeder using wooden material, bamboo and used plastic cans, bottles and waste plates for making waterer. She vaccinated the birds herself. This she has done after learning the technique of vaccination in poultry. By adopting the scientific management of rural poultry instead of backyard farming, she was

able to get 910 eggs in 9 months duration from 15 numbers of hens only. She was empowered to meet out the ICMR recommendations of egg consumption 180 eggs per year per person for her whole family. In addition, she was able to earn Rs. 3700 by selling eggs. She is presently running the rural poultry farm successfully, being motivating and inspiring factors to other women folks for being empowered to strengthen the nutritional requirement of the family through improved rural poultry farming practices with Nicobari fowl. More and more farmers have approached CIARI to adopt the technology for their livelihood.

AICRP on Goat Improvement

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

Andaman local goat field unit was established. Goat clusters have been identified in Port Blair and Ferrargunj tehsils. Survey conducted and farmers were registered under the project and details of the goats were also recorded. A total of 1652 female and 976 male goats were surveyed. Data on average body weight were recorded for day old, 3, 6,9,12 month, age at puberty and age at first kidding. The average mean body weight (kg) at birth, 3, 6, 9 and 12 month of female goats was 1.71 ± 1.23, 4.9 ± 0.37, 8.49 ± 0.57, 11.15 ± 0.97 and 15.11 ± 0.73 and the respective weights of male goat was 1.99 ± 0.15, 5.55 ± 0.28, 10.19 ± 0.73, 12.28 ± 0.76 and 16.04 ± 0.72 (Plate 58).

The biometric dimensions of Andaman local goats at different ages and sex have been recorded. The overall chest girth (cm) for male goat at birth, 3, 6, 9 and 12 months was 25.9±2.18, 37.45±1.53, 47.25±3.51, 53.07±2.10, 60.12±1.89 respectively. Measurements for paunch girth (cm) at birth, 3, 6, 9 and 12 months were 26.19±3.02, 40.43±2.42, 53.42±5.01, 58.53±3.31, 64±2.62 respectively and that of body length (cm) were 25.04±3.56, 36.02±1.45, 42.92±3.64, 46.76±2.67 and 49.25±2.25 respectively. Measurements for height at withers (cm) at birth, 3, 6, 9 and 12 months were 26.19±1.68, 36.07±2.91, 43.84±2.73, 49.35±1.47 and 53±1.56 respectively.

Base line information on present status of production and reproduction traits, managemental practices, socio-economic status was also recorded. 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, 13.26±1.61kg, 101.20±11.23 days, 300.0 ± 20.0 days and 147.0± 2.0 days respectively. The kidding percentage of 245.1 per cent on the basis of does kidded and the kidding rate of 1.07 was recorded in the present stock of Andaman local goats. A total of 5 awareness programmes on "Scientific rearing of goat for improving productivity" was conducted at Sippighat, New Bimblitan, Ranchi Basti, Calicut village and one at CIARI, Port Blair and a total of 211 farmers were trained.

The registered 2628 goats are monitored for growth and reproductive performance in regular phase.

Field survey

Data recording

Andaman Local goats

Awareness program

Plate 58: Survey and establishment of goat clusters

AICRP in Animal Disease Monitoring and Surveillance

Jai Sunder and *T.Sujatha*

Based on passive surveillance, the disease profile of A&N Islands was reported. A total of 25 diseases such as Leptospirosis, Classical Swine fever, Fascioliasis, Ascariasis, Amphistomiasis, Strongyloids, Stephanofilariasis, Mastitis, Toxocara, Ancylostomiasis, Round worms, Diphulobothridium, Paraamphistome, Monizia, Salmonellosis, Erlichiosis, Haemabartonellosis, Goat pox, Coccidia, Diphyllidium, Strongyle, Trichurius, Bunostromum and Babesiosis were reported from three districts of A&N Islands.

Among the diseases, the parasitic disease is the major problem among the livestock. Out of parasitic infestation, Babesiosis prevalence was found only in cattle and caprine but not recorded in buffaloes. Average yearly cases were only 7 in cattle and 57 in caprine and the respective % prevalence were negligible. Out of 64 cases, 67% cases were recorded

in North and Middle Andaman and 33% were found in Nicobar group of Islands. No cases of Babesiosis were reported in South Andaman during the period (2014).

Facioliasis affected on an average monthly 320 cattle, 85 buffaloes and 150 caprine during the investigation period . The overall per cent prevalence was found to be high in buffalo (1.08%) and it was 0.71 % in cattle and 0.23 % in caprines. The increasing trend of facioliasis occurrence was observed during the period and it was almost static in cattle and declining trend in caprine. The peak occurrence of Fascioliasis was reported in buffalo in May 2014. South Andaman has major proportion (61%) of total Fascioliasis cases whereas 34% of cases occurred in N&M Andaman and 5% in Nicobar Islands according to the proportion of livestock population density and distribution.

The average numbers of recorded cases per month with Amphistomiasis were 142 in cattle, 29 in buffalo and 222 in caprine during the reported period, but the per cent prevalence was found to be 0.3 % across all host species. The frequency trend of Amphistomiasis was highly fluctuating among all hosts throughout the period. The peak occurrence of Amphistomiasis was reported in buffalo in May 2014. 73% of Amphistomiasis cases were recorded in South Andaman while 25% of cases occurred in N&M Andaman and 2% were in Nicobar group of Islands. A total of 663 sera samples of cattle, goat and buffalo have been collected fro serosurveillance of economically important Animal diseases (Plate 59).

Based on the surveillance report, it is inferred that parasitism is the major problem in the A & N Islands. Awareness programme on regular vaccination for livestock and backyard poultry is needed.

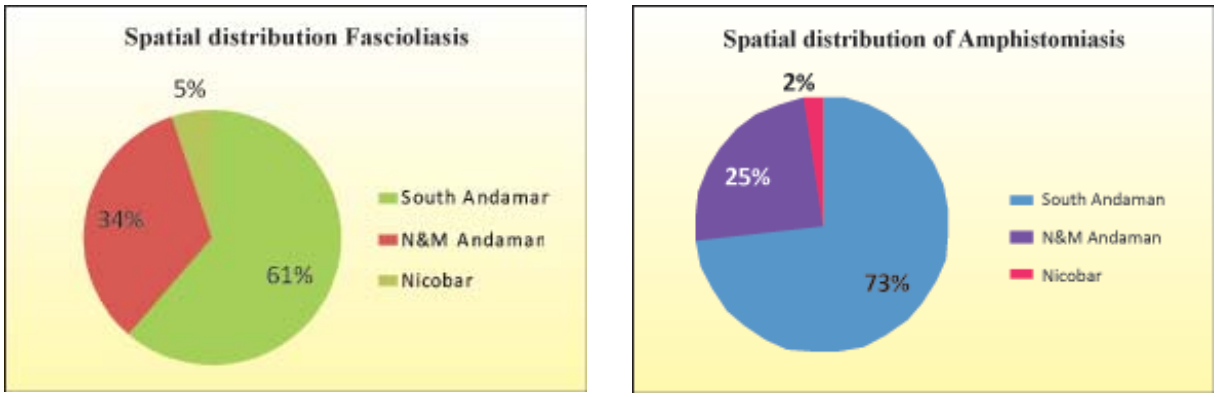


Plate 59: Spatial distribution of parasitic diseases in livestock

Poultry Seed Project

A.Kundu and *T.Sujatha*

The Poultry Seed Project was implemented in Andaman Islands with the objective to produce and supply the improved birds for rural poultry farming in Andaman Islands and to improve the socio economic status of rural population with improved birds suitable for small scale poultry farming. Vanaraja parent chicks were evaluated under Island climatic condition with the objective of diversifying the livestock farming of Andaman Islands. A total of 700 female and 300 male vanaraja breeder chicks were brought from Project Directorate on Poultry, Hyderabad. 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 and standard brooding arrangement was made. All the

chicks were provided with uniform brooding facilities using 60 W incandescent bulbs. During starting (0-8 weeks) and growing (9-13 weeks) the birds were provided with a floor space of 675 cm^2 and 1260 cm^2 respectively. The feeding (linear feed trough) and watering (trough) space provided during starter were 2.5 and 1.0 cm per bird respectively and during growing, 7.5 and 2.0 cm per bird respectively. The birds were fed *ad libitum* and provided with plentiful clean drinking water. At 14 weeks of age, during transition period pullets were provided with 310cm^2 of floor space and feeding and watering space of 6.5 cm each per bird. The following vaccination schedule as given in table below was adopted (Table 17).

Table 17: Vaccination schedule

Age	Vaccine	Route
5th day	RDVF	Eye drops
16th day	IBD (Georgia intermediate strain)	Eye drops
28th day	IBD (Georgia intermediate strain)	Eye drops
8th week	RDVK	I/M
16th week	RDVK	I/M

All the experimental birds were provided pre-weighed *ad libitum* chick, grower and pre-layer pre weighed feed during the experimental period; the left over feed was weighed at bi weekly interval. The feed intake and feed efficiency for body weight was calculated (Table 18).

Table 18 : Growth performance of Vanaraja breeders

Body weight (g)	0 day	1 month	2 month	3 month	4 month
Female	37.72 ± 2.28	412.6 ± 6.91	1038.7 ± 20.57	1423.8 ± 37.97	1719.4 ± 54.36
Male	38.44 ± 1.51	417.8 ± 5.66	1223.1 ± 21.40	1453.8 ± 27.92	1853.4 ± 55.32
Cumulative feed (g/bird) for Female		420	1200	3150	5700
Cumulative feed (g/bird) for Male		420	1200	3150	5730
FCR					
Female		1.02	1.15	2.21	3.31
Male		1	0.98	2.17	3.09

Visit of Dr. R. N. Chatterjee, Director, DPR, Hyderabad & Nodal Officer, PSP

Vanaraja birds

Plate 60: Vanaraja birds under deep litter

मत्स्य विज्ञान प्रभाग

Division of Fisheries Science

Mariculture of Selected Marine Fin Fishes and Shell Fishes from Andaman Waters

Kiruba Sankar, R, Benny Varghese, Nagesh Ram, S. Murugesan and *Raymond Jani Angel*

A total of 32 numbers of clown fishes: Spine cheek anemone fish, *Premnas biaculeatus* (20), percula anemone fish *Amphiprion percula* (4), *A. akallopisos* (2), *A. ephippium* (4) and *A. sebae* (2) and 15 numbers of anemones: *Entacmaea quadricolor* (12), *Heteractis magnifica* (2) and *Stichodactyla sp.*(1) were collected and reared along with symbiotic anemones to simulate the natural ecosystem for effective brood stock development. Fishes and anemones were collected from North Bay and Hope town, Port Blair from a depth range of 0.5-5.0 m during low tide and Fishes caught by skin diving and SCUBA diving. The collected anemone fishes and its symbiotic sea anemones were transported separately in polythene bags, with a packing density of 3-5 numbers per pack containing 5L seawater in aerated condition. 4-6 fishes of same species of different size groups were stocked together for pair formation, along with single host sea anemone in a 500L FRP tanks fitted with biological filter to reduce the aggression. The fishes and anemones were fed, two to three times a day with wet feeds such as fresh meat of shrimp, squid, mussel and clam at the rate of 15% of their body weight and live feeds like *Brachionus plicatilis,* artemia nauplii and adult artemia. Environmental parameters such as temperature 26 to 29° C, salinity 33 to 36 ppt, dissolved oxygen 4.6 to 6.2 ml/L and pH 8.1 to 8.9 were maintained in all the broodstock rearing tanks.

Successful pairing of clown fishes: (6 pairs of *Premnas biaculeatus*, one pair each of *A. akallopisos*, *A. ephippium* and *A. sebae*) was observed within 3-4 months of rearing in captivity (Plate 61).

Premnas biaculeatus

Amphiprion akallopisos

Amphiprion ephippium

Amphiprion sebae

Plate 61: Successful pairing of clown fishes

The brooders were fed with wet feeds such as meat of green mussel, shrimp and fish egg mass at the rate of 5-10% of their body weight and supplied at an interval of every 4 hrs during day time. Apart from these, the brooders were also fed with adult artemia (3 to 5 nos/ml) during evening time.

Larviculture of Skunk Anemone fish, *Amphiprion akallopisos*

Skunk anemone fish, *A. akallopisos* (1 male: 1 female) and its host sea anemone, *Heteractis magnifica* (n=1) were procured from coastal waters near Hope Town, opposite to the Marine Research Laboratory (MRL) of CIARI, Port Blair. Wild collection of brooders and anemone was done using hand nets by skin diving and transported to the Marine Research Laboratory-hatchery facility located in Marine Hills, Port Blair. Along with the sea anemones, these fishes were acclimatized to captive conditions in a Fibre Reinforced Plastic tank (capacity, 2 ton) for one and a half month. Interior of these tanks were white in colour and were initially filled with UV treated sea water. Pair formation took place during this period and tank bottom was kept clean without any substratum. Shrimp meat, squid meat and lobster eggs were used to feed the fish and sea anemones three times a day at 09:30, 12:30 and 15:30 hours. Excretory material and remnant food particles were siphoned out half an hour after the feeding. The tanks were illuminated with a 40 W fluorescent tube suspended about 1m above the water surface. Water quality parameters in the tanks were maintained as temperature 26±1 p C, salinity 34 ±1 ppt, pH 8± 0.2. Light intensity of 800 lux was maintained for 12 hours (09:00–21:00 hours). 50% water change was done once in a week. The size of male was comparatively very smaller than female. Clay tiles were provided as spawning substrates.

a.Male and female *Amphiprion akallopisos* guarding eggs

b. Broodstock maintenance tank

c. *Amphiprion akallopisos* larval rearing tank with sea anemone, Heteractis magnifica, aerator and heater

d. 3 months old *Amphiprion akallopisos* juveniles

Plate 62 a to d: Larviculture of Skunk Anemone fish, *Amphiprion akallopisos*

Fish started spawning exactly after 48 days of rearing in the spawning tank. Spawning took place during early morning hours. Immediately after spawning, the water temperature and salinity was recorded to be 25.5 p C and 34 ppt respectively. Eggs were adhesive and attached to the wall of the spawning tank near the anemone. Eggs were light orange in color at the time of spawning which gets darker with incubation and became silvery one day before hatching. Incubation of eggs was done in same tank with parents. Water temperature and salinity was maintained at 27p C and 34ppt respectively throughout the entire incubation period. Complete hatching of larvae was observed in 8±1 days at 27±1p C.

Larval rearing was done in the same hatching tank. 24:0 (light:dark) photoperiod was given for 15 days of post hatch (DPH). 24 hours mild aeration and heaters were provided to ensure optimum dissolved oxygen and temperature in the larval rearing tank. For the successful growth and survival of the larvae, 50-100 numbers ml^{-1} SS-Rotifer having size 60 to 100 ìm was given. As the larvae attain successful prey capture within two days, the density of rotifer in the larval rearing tank was reduced to 30-50 nos. ml^{-1} from 3rd to 10th dph. From 7th dph onwards the larvae were fed with 20-30 nos. ml^{-1} S-Rotifer having a size of 100-200 ìm up to 12 dph along with SS-rotifer and then reduce the density of S-rotifer to 10 nos. ml^{-1} till 15th dph. From 13th dph the larvae were weaned onto newly hatched *Artemia* nauplii (5-10 nos/ml) along with rotifer (S type, 5-10 nos/ml), whereas algal concentration was kept same till 20th dph (Plate 62 a,b,c & d).

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.

Surveys on abundance and availability of *Pristipomoides* spp. was carried out during 2014-15. Two species are abundant in South Andaman *viz.*, *Pristipomoides filamentosus* (Plate 63) and *P. Multidens* (Plate 64). The identification of species was done with morphometric and meristic counts of 20 specimens. Meristic characters namely, gill rackers, dorsal, pectoral, pelvic, anal, caudal fin counts, lateral line scale counts, branchiostegal rays, pyloric caeca and 17 morphometric counts were used for identifying species. A field level identification character has been found out for easy identification of *P. filamentosus* and differentiate from *P. multidens*. In *P. filamentosus* interorbital space is flat, with narrow yellow line and blue spots and in *P. multidens* top of head has a series of chevron-shaped yellow bands, side of snout and cheek with 2 golden stripes bordered with blue. *Pristipomoides filamentosus* is one of most preferred fish and have good market demand in South Andaman. This fish is landed throughout

Plate 63: *Pristipomoides filamentosus*

Plate 64: *Pristipomoides multidens*

the year and abundance depends on calm and favourable weather conditions since *P. filamentosus* occurs over rocky bottoms and found in deeper waters, therefore, during heavy monsoon the landing is meagre. *P. filamentosus* is locally known as Kala Mrigal. The specimen was submitted to ZSI (Zoological Survey of India) and was confirmed as *P. filamentosus*. The landing centres chosen for data collection were Junglighat, Wandoor, Dignabad and Guptapara in South Andaman.

Total catch in a day was recorded during landing visit. Gonads, otoliths, gill racker and pyloric caecae have been preserved for further study (Plate 65, 66 & 67).

Plate 65: Pyloric caecae

Plate 66: Gill racker (left side 1st Gill)

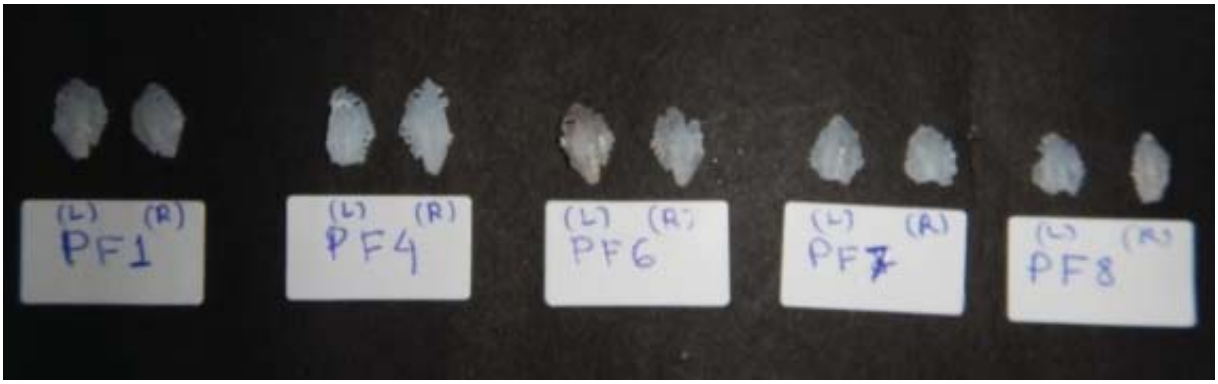


Plate 67: Otoliths of *P. filamenstosus*

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

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

PFZ advisories in Andaman are mainly affected during the monsoon or cloudy days as satellites were unable to sense the chlorophyll due to cloud cover. Altimter (Sea surface height) based fishing predictions/augmentation were studied as eddies (Anticylconic/cyclonic) are not influenced by cloud cover and persists for months. During the current year particular emphasis was given on mapping the traditional fishing grounds and subsequently validating the advisories. Altogether 117 PFZ advisories were received of which 23 advisories were validated from South, Middle and North Andaman. Though 44 Tuna forecasts were received, none of them were validated as the tuna advisories were distant from the shore (Fig. 18).

Traditional fishing ground database was generated by collecting data on fishing location, quantity and species caught from the local fishermen. Month wise, gear wise and major species wise fishing ground were plotted. It could be observed that gill net operations are limited to near shore areas and the maximum catch of about 500 kg/day is obtained from grounds like off Ross Island and in Ritchie's archipelago. Similarly for ring net it can be observed that comparatively ring net operations are few and limited to near shore area. The area with highest production is off Ross Island or in the vicinity of Port Blair. Long lines are operated all along the shore of ANI but maximum harvest is achieved only in the Nancowrie group of islands. Nancowrie group of Islands are known to harbour rich stocks of tuna and sharks which are harvested by the mechanized boats operating from Junglighat FLC Base. Trawl net operation is limited to few places like off Diglipur, off Port Blair, around Ritchies archipelago, North Sentinal Island and off Wandoor area. Maximum catch from trawl is caught from off Wandoor area.

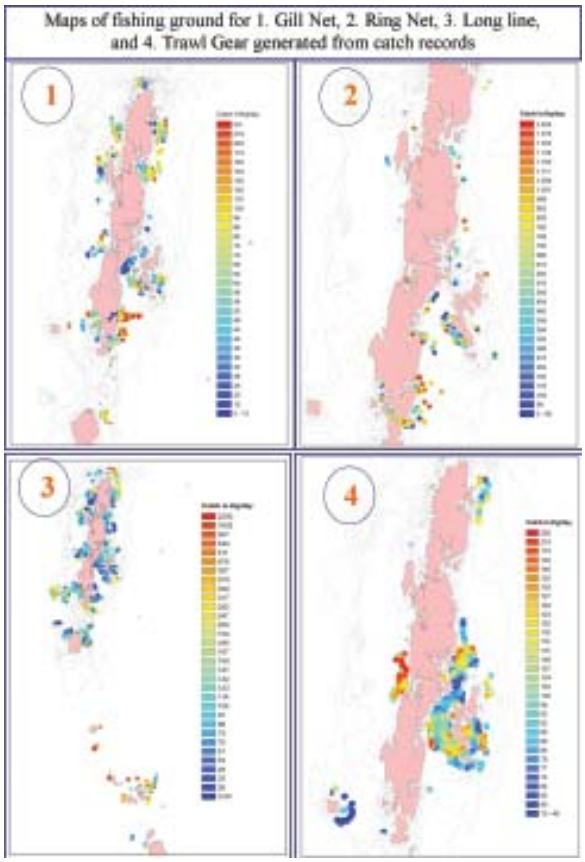


Fig. 18: Maps of fishing ground 1. Gill Net, 2. Ring Net, 3.Long line, and 4. Trawl Gear generated from catch records

During 2014-15, a total of 19 awareness campaigns and sensitization programmes were conducted at South (3), North (4), Middle (4) and Little Andaman (6) in Andaman Islands and Car Nicobar (1) and Campbell Bay (1) in Nicobar Islands. Altogether 519 fishermen were sensitized on PFZ technology. Also two fishermen from Junglighat were awarded as progressive fishermen who use PFZ advisories regularly. This has motivated their colleagues to use the PFZ advisors and use of modern technologies like GPS for locating fishing grounds and safe navigation.

Biophysical Characterization and Site Suitability Analysis of Indian Mangroves

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

Estimation of the biophysical properties of mangrove with remotely sensed data provides important inputs into models of global change and represents the scientific and methodological basis for regional scale forest assessment. Many studies have demonstrated the great potential for using imaging radar to estimate forest biophysical properties, but such studies involving Indian mangrove forest are yet to be assessed on broad spectrum. Considering these facts the present study proposes the use of both optical (LISS III & LISS IV) and SAR (Synthetic Aperture Radar) data with the following objectives (1) Characterization of mangrove ecosystems and modelling of biophysical parameters of mangroves (2) Estimation of gross primary productivity of Indian mangrove forests using remotely sensed data and *insitu* measurements. To assess the mangrove species diversity in Prolob Jig creek preliminary surveys were conducted at Yerrata creek and Shyamkund creek. A total of 25 mangrove species have been recorded. Among them *Rhizophora* hybrid was recorded for the first time in Prolob Jig area and two rare species i.e *Brownlowia tersa* and *Xylocarpus molluccensis* were also observed (Plate 68) . For collection of data, quadrat method will be adapted as shown in Plate 69.

Maximum 20 quadrats will be selected and within each quadrat, plants will be identified and tagged for estimation of parameters like species dominance, relative dominance, basal area, tree height, leaf area index and canopy closure to be calculated. Leaves, soil and water sample will be collected for chemical analysis.

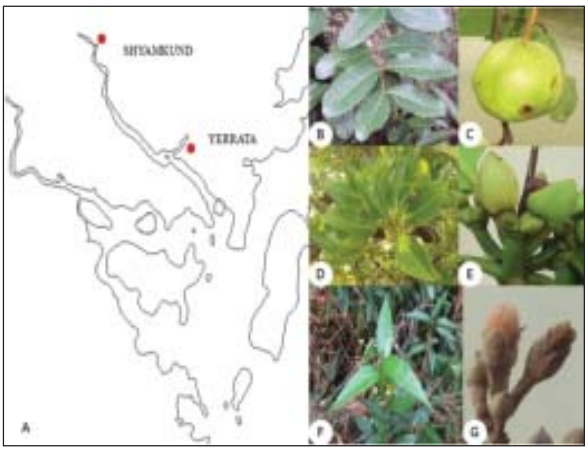


Plate 68: (A) Study area (B) leaves (C) Fruit of *Xylocarpus moluccensis* (D) Leaves (E) inflorescences of *Rhizophora hybrids* (F) Leaves (G) Flowers of *Brownlowia tersa.*

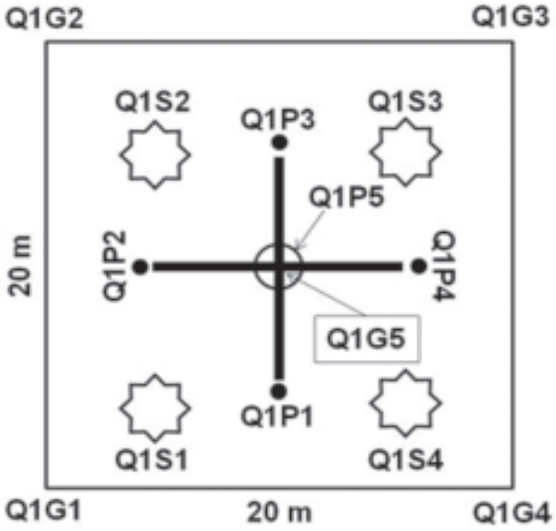


Plate 69: Note: Q: Quadrat, G: GPS reading, P: Plant, S: Soil sample

Determination of Conservation Value of Mangroves of Andaman Islands

Kiruba Sankar, R., K. Lohith Kumar, Raymond J. Angel, P. Krishnan and *S. Dam Roy*

Despite documentation of the mangroves all long the Andaman and Nicobar Islands, mangrove habitats with site specific species composition and their conservation status is not available. Assuming the vast importance of mangroves in Andaman, studying their conservation value is an important task in providing

recommendations/policy for their protection. Considering this fact the present study was undertaken with following objectives: Identification of contiguous patches and conservation value of mangroves along the coastal regions of Andaman and preparation of boundaries of all such mangrove patches which lie outside the marine protected area/tribal reserves with the collection of biological data with respect to identified mangrove patches. Totally 79 patches were identified, out of this 68 were used for assessment of diversity and vegetative structure. Total 192 quadrats were studied and 27 true mangrove species belonging to the 16 genera and 10 families have been identified (Fig. 19). *Rhizophora mucronata* is dominant species in Andaman Islands. *Sonneratia griffithii* one of the critically endangered species recorded in two sites i.e., Betapur and Panchwati. Density per hectare ranged between 22900/ha (Rutland, South Andaman) to 1000/ha (Lakshmanpur, Neil Island). Stand Basal area is highest in Mayabunder i.e., 52.97 m^2/ha and lowest in South Andaman (25.33 m^2/ha). The present study result would be the first comprehensive species specific information for mangroves of Andaman Islands. The detailed information on diversity, distribution and vegetative structure mangrove species of Andaman Islands provided here will eventually help in the long term monitoring of mangrove species and assess the conservation value of mangroves of Andaman Islands.

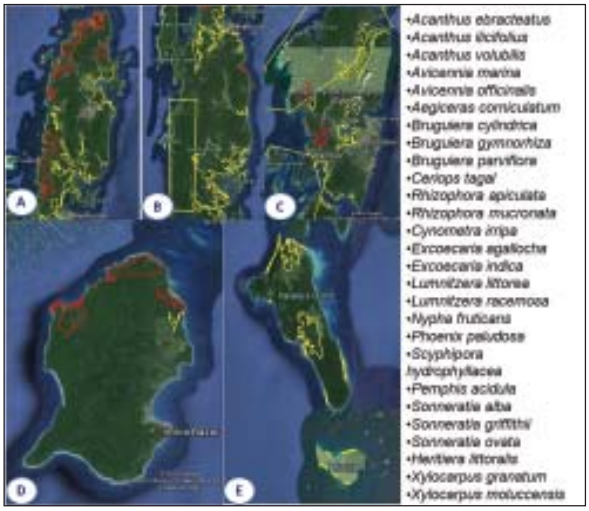


Fig.19: Identified patches in (A) North Andaman (B) Middle Andaman (C) South Andaman (D) Little Andaman (E) Havelock and Neil Island. Note: Yellow line indicates surveyed patches. Red line indicates sites nor surveyed. List of mangroves species recorded in this study is given in right side.

Integrated Coastal Zone Management

K. Lohith Kumar* and *Kiruba Sankar, R

Integrated Coastal Zone Management (ICZM) is the process of management of the coast using an integrated approach regarding all aspects of the coastal zone in an attempt to achieve sustainability. The major objective is to develop a GIS based model of integrated coastal zone management at a pilot scale along the selected parts of Indian coast. Other objectives are to assess coastal resources at cadastral level, to identify reason specific issues, to develop appropriate query modules for integrated coastal zone management and to suggest strategies and prepare plans for concern issues, while ensuring sustainability of resources & protection of environment. As a prerequisite, the baseline data of the beaches of Andamans were studied. Methodologies were developed for studying the beach indicies, granulometry and beach profiling. Preliminary beach profiling surveys were conducted by using "Emery Rod Method" at 16 sites along the Andaman coast *viz* Burmanallah, Carbyn Cove, Chidiyatapu, Collinpur, Wandoor, Beach No. 3 and Radhanagar, Neil Island, Long Island, Pearl park, Aamkunj, Avis Island, Karmatang, Smith Island, Ramnagar, Lamiya Bay and Kalipur. The beach types were noticed to range between intermediate to semi-reflective and the beach substratum varied from sandy to mixed type. Artificial structures were seen mostly along the beaches of South Andaman District.

Plate 70: Beach profiling

Identifying Critical Habitats of Dugong (*Dugong dugon*) using Satellite Data

Kiruba Sankar, R, Beena Kumari* and *Mini Raman

Dugong dugon Müller, 1776, also known as sea cow, are endangered marine mammal of the Order Sirenia, occurs in the Indo-West-Pacific region. In Andaman and Nicobar Islands, Dugongs were reported from Ritchie's Archipelago, North Reef, Little Andaman, Kamorta, Little Nicobar and Great Nicobar Islands. Habitat identification surveys were conducted in 27 sites under 8 locations *viz.,* North Bay, Snake Island, Burmanallah, Chidiyatapu, Jolly Buoy, Neil Island (South Andaman), Hut Bay (Little Andaman) and Kamorta (Nancowrie group of Islands). Radiometry surveys were conducted at Burmanallah, Chidiyatapu and Neil Island at different depth strata (0-30 m) in order to generate spectral signatures. A 20 × 20 cm^2 quadrat was used to determine the density of the seagrass. The physical (pH, temperature, salinity) and chemical parameters (dissolved oxygen, ammonia, nitrate, phosphorous, carbonate, bicarbonate and Chl-*a*) were also estimated.

A total of 9 seagrass species distributed among 2 families and 6 genera *viz., Cymodocea rotundata, Cymodocea serrulata, Halodule uninervis* and *Syringodium isoetifolium* (Cymodoceaceae) and *Enhalus acoroides, Halophila decipiens, Halophila minor, Halophila ovalis* and *Thalassia hemprichii* (Hydrocharitaceae) were recorded. It was found that *Halophila ovata* (reported previously) resembled *Halophila minor* which is present in A & N Island and not the *H. Ovate* (Table 19).

Seagrass survey: Density and percentage cover

Segrass survey showed that *T. hemprichii* was the most dominant species present in 6 (out of 8) surveyed locations from intertidal to 5 m depth, whereas, in shallow to upto 21 m depth, *H. ovalis* (Neil Is.) and *H. decipiens* (Snake Is.) were dominant. Chidiyatapu covered the highest density of seagrass i.e. 2869 followed by Hut Bay 2385, Neil Island 1046 and

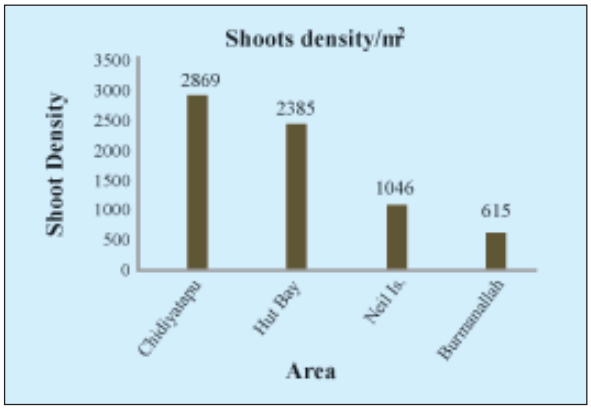


Fig. 20: Seagrass Density per area

Table 19: Distribution of Seagrass in A & N Islands

Seagrass species	Burmanallah	Chidiyatapu	North Bay	Snake Island	Jolly Buoy	Neil Island	Hut Bay	Nancowrie
Cymodocea rotundata	+	-	-	-	-	-	+	-
Cymodocea serrulata	-	-	-	-	-	-	+	-
Halodule uninervis	-	+	-	-	-	+	-	+
Syringodium isoetifolium	-	-	-	-	-	-	-	+
Enhalus acoroides	-	-	-	-	+	-	-	+
Halophila decipiens	-	-	-	+	-	+	-	+
Halophila minor	-	+	-	-	-	-	-	-
Halophila ovalis	-	+	-	-	+	+	-	+
Thalassia hemprichii	+	+	-	-	+	+	+	+

Burmanallah 615 shoots/m^2. *C. rotundata* was the most abundant seagrass in both Hut Bay and Burmanallah having density of 1310 and 420 shoots/m^2, respectively (Fig.20). *H. uninervis* was the most abundant species at Chidiyatapu with a density of 1401 shoots/m^2 and the second most abundant species at Neil Island with a density of 542 shoots/m^2. *H. ovalis* is the most abundant species at Neil Island with a density of 282 shoots/m^2. Further, highest abundance of seagrass species was recorded in Hut Bay 762, followed by Chidiyatapu 653, Neil Island 209 and Burmanallah with 123 shoots/m^2 (Fig.21).

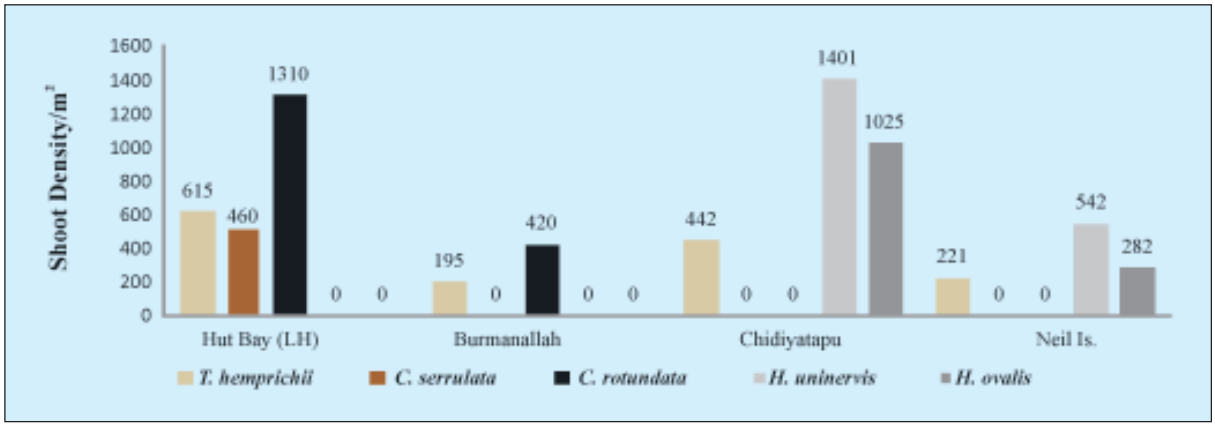


Fig. 21: Seagrass species density per meter

Water samples collected from 7 surveyed locations *viz.,* Carbyn's Cove, Burmanallah, Chidiyatapu, Jolly Buoy, North Bay, Neil Island and Hut Bay were estimated for physico-chemical parameters . It was noticed that phosphorous concentration was higher in Hut Bay (62.5 ± 6.5), ammonia and nitrate was higher in North Bay (11.9 ± 11.62 and 17.78 ± 15.82, respectively), carbonate and bicarbonate was high in Carbyn's Cove (2.89 and 3.53, respectively). The amount of chlorophyll-*a* recorded was high in Chidiyatapu i.e. 6.13 mgm^{-3}.

Marine Faunal Biodiversity of the Nicobar Group of Islands

Kiruba Sankar, R and *S. Dam Roy*

Marine faunal biodiversity surveys were carried out at Nicobar Group of Islands (Nancowrie group of Islands and Great Nicobar) through snorkelling in the sub-tidal and rocky shore exploration in the intertidal zones during low tides. Altogether, a total of 31 sites were covered under 10 locations for conducting faunistic surveys. The locations are mapped and the GPS coordinates of the survey sites are given in Table 20.

Table 20: Locations of all sites surveyed in each region

Region	Survey site	Latitude N	Longitude E
Great Nicobar (9)	Pigeon Is.	07°04.532'	93°54.308'
	Pigeon Is (North)	07°03.034'	93°55.261'
	B Quarry	07°00.625'	93°56.903'
	10 Km Light House	06°57.598'	93°56.817'
	22 Km Fish Point	06°54.247'	93°54.752'
	Gandhi Nagar Beach	06°50.709'	93°53.764'
	Joginder Nagar Beach	06°56.976'	93°55.581'
	18 Km	06°55.302'	93°55.020'
	Gandhi Nagar Reef	06°50.543'	93°54.056'
Nancowrie (22)	Western Entrance	07°59.722'	93°30.378'
	Saanu Village	08°02.017'	93°31.680'
	Tapong	07°59.963'	93°35.216'
	Ardahaya	08°00.956'	93°34.441'
	Hui Village	07°56.683'	93°33.226'
	Eastern Cliffs	07°58.191'	93°31.295'
	Tapaing	07°58.995'	93°30.439'
	Trinket 1	08°05.985'	93°33.625'
	Trinket 2	08°03.633'	93°34.175'
	Trinket 3	08°02.578'	93°34.862'
	Takai Ho	08°07.675'	93°27.487'
	Darring	08°06.004'	93°28.095'
	Kuitakaha	08°03.919'	93°28.845'
	Grasspad	08°03.982'	93°33.142'
	Heli	08°03.904'	93°33.170'
	Tapaing	07°56.253'	93°27.763'
	Katchal 1	07°56.810'	93°26.915'
	Katchal 2	07°59.007'	93°24.417'
	Katchal 3	07°55.178'	93°28.138'
	Katchal 4	07°56.096'	93°27.796'
	Changua	08°01.341'	93°29.058'
	Gate	07°59.861'	93°29.724'

Numbers in parentheses are numbers of survey sites in each region

A total of 262 species belonging to 6 phyla/groups *viz.*, Cnidaria (34), Porifera (49), Mollusca (9), Crustacea (6), Echinodermata (21), Fishes (143) were identified during the reporting period of which, 59% of the species were recorded from Nancowrie group of Islands and the selected photos are given in Plate 71.

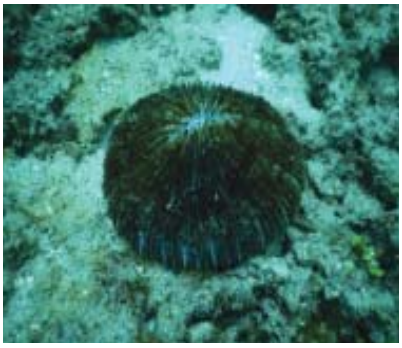
Cirrhitichthys falco

Diploprion bifasciatum

Diodon liturosus

Ctenactis crassa

Stylophora pistilata

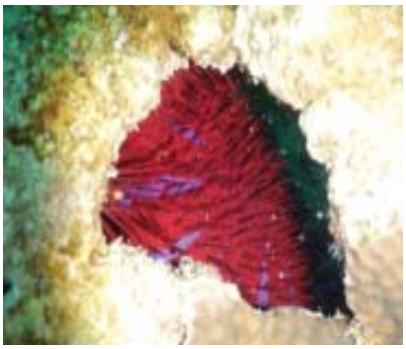


Fungia horrida

Ardeadoris egretta

Phyllidopsis phiphiensis

Glossodoris atromarginata



Acanthaster plancii

Oceanapia sagittaria

Xestospongia testudinadia

Plate 71: Marine faunal biodiversity of Nicobar group of Islands

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

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

Early detection of the disease and rapid response to the identified diseases are critical to the effective management of aquatic animal disease emergencies in the Island ecosystem. As there are few research reports on the incidence of diseases in the Islands, it is of utmost importance to conduct systematic investigation on present status of the finfish and shellfish diseases in the Islands to conserve the pristine biodiversity of Andaman and Nicobar Islands. With this background, the present project aims to explore the presence of aquatic animal diseases in Andaman and Nicobar Islands and also would be helpful to develop management strategies for the identified diseases. Baseline data for the State has been collected from the State Fisheries Department. A total of 10 freshwater fish farms were selected and baseline information was collected at Campbell Bay, Great Nicobar of Nicobar District (Plate 72). Water quality parameters for the selected fish farms were in the following ranges, temperature (°C): 28-29, pH: 5.5-10, dissolved oxygen (mg/l): 4-6.5, hardness (mg/l): 10-65, alkalinity (mg/l): 24-74, phosphate (mg/l): 0-1.35 and nitrate (mg/l): 0.28-3.36. Passive surveillance regarding the aquatic animal diseases of Andaman and Nicobar Islands has been initiated. Awareness programme was conducted at Campbell Bay in which, a total of 20 participants including fish farmers, fishermen and State Fisheries Department officials were sensitized regarding the importance of aquatic animal disease surveillance programme in Andaman and Nicobar Islands (Plate 73).

Plate 72: Selected freshwater fish farms at Campbell Bay

Plate 73: Awareness programme conducted at Campbell Bay

सामाजिक विज्ञान अनुभाग

Social Science Section

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

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

Need based technology intervention in the mode of training & technological application was carried by Out Reach Centre at Diglipur cluster of villages following group and participatory approach.

Training

Thirty five (35) trainings were conducted in agriculture and allied fields for the farmers, youths and other stakeholders with the Institutional support. A total of 770 men and 385 women totaling to 1155 got benefited. The percentage of participation was 67.00 men and 33.00 women. (Plate 74& 75).

Plate 74 & 75: Gram Pradhans interacts with the trainees & Experts during the training

Kharif technological application on high yielding varieties of rice

A total of 120 technological application through FLD of HYVs of rice was conducted in twenty(20) cluster of villages at Diglipur, North Andaman. The result revealed that CARI Dhan5, Gayatri & and CSR 36 gave an average yield of 4.0 t/ha. followed by CARI Dhan 4 (3.77 t/ha.) and CARI Dhan 3 (3.11 t/ha.) against the local check Jaya (2.57 t/ha.) respectively. The percentage increase in yield of CIARI rice varieties over the local check ranged from 38.59 to 63.26 % in farmers field. (Plate 76 & 77, Fig 22).

Plate 76 & 77: FLD on var. Gayatri & CARI Dhan 5

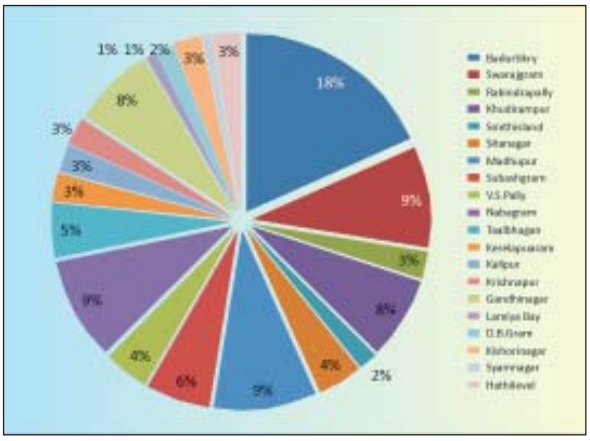


Fig 22: Percentage distribution of FLD in village

Rabi technological application of HYV of Pulses

Forty two demonstrations of pulses namely 20 in Green gram Var.Samrat (2.0 ha)and 22 nos. of black gram (Var.UIPU02-43), in 2.0 ha totalling to 4.0 ha in different cluster of villages namely *R.K.Gram, Subashgram, Sitanagar, Radhanagar, and Kerelapuram* was conducted. The crop immediately after sowing got flooded due to severe rain received (65%). However attempt has been made to collect the seed material from the crops, which has survived in the field. (Plate 78).

Plate 78 (a to c) : Incessant rain damages field of pulses (day one of sowing & after 15 days)

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

For the 4th successive year seed production of truthfully labelled seeds of paddy was taken in seed village concept mode with six farmers in 5 cluster of villages *viz Subashgram, Khudirampur, Kerelapuram, R.K.Gram & Madhupur*. A total of 4.6 Tonnes of seeds were produced under the technical guidance of Division of Field Crop Improvement and Protection of the Institute. Beside many other farmers have taken up production of TLS in their fields and earning through sale of seeds to the neighbouring farmers.

Facilitated Varieties Development in rice and vegetables

Through technological demonstration in agriculture and allied field jointly by the team of scientists of Division of Field Crop Improvement and Protection & Horticulture and Forestry at Diglipur under the aegis of ORC of the Institute supported by NABARD, facilitated development of ten varieties i.e. (4 in Rice, 1 in Poi (vegetable), 3 in Mung (pulses) & 2 in Amaranths (green and red leafy vegetables). These varieties were released by Institute Variety Release Committee for the benefit of farmers and other stakeholder's.

Impact of Technological Intervention at North Andaman

HYVs of Rice

During the PRA conducted in December, 2014, after introduction of seven(7) promising rice varieties in 2010, through front line demonstration in participatory mode to a total of 313 farmers covering70.18 ha till 2014(Five years), it was found that a total of 2620 farmers have adopted the HYV's varieties of Rice in the total area of 1219.64 ha spread over 32 cluster of villages at North Andaman. Rice variety Gayatri shared 713.53 ha of area followed by CARI 5 (146.17 ha), CSR 36(132.14 ha), CARI 4

(90.71 ha), CARI 3(60.63 ha) and Ranjit (20.68 ha) respectively. This indicates good horizontal spread of the varieties, which was only possible due to FLD, availability of improved varieties and quality seeds produced through seed village concept, which led to replacement of farmer varieties. There is good potential for increasing the production and the productivity by adopting CIARI rice varieties by the farmers in the coming years. (Fig. 23).

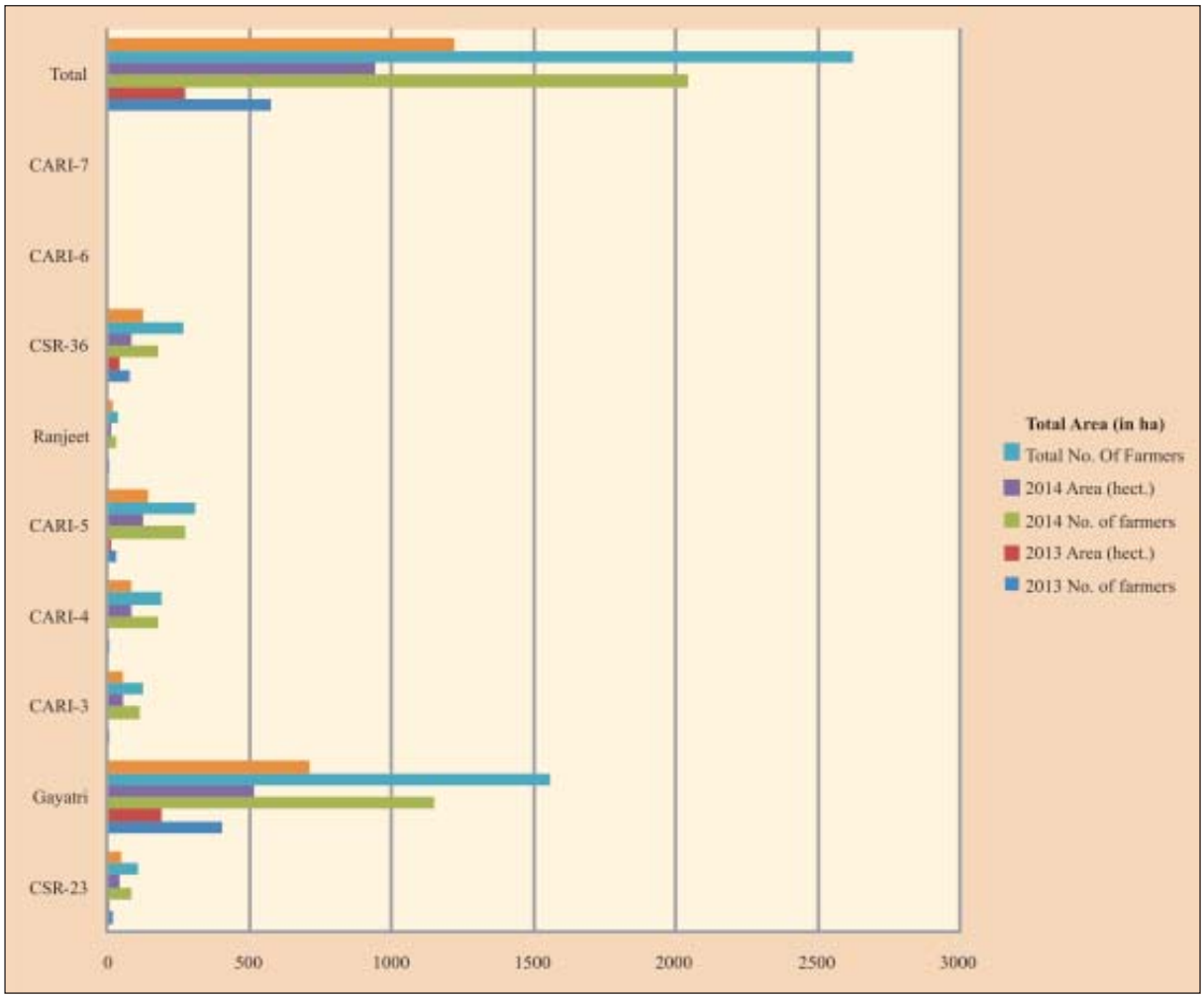


Fig 23: Horizontal Spread of HYV's of CIARI Rice varieties during 2013 &14

Pekin duck under Backyard

Pekin duck a demand driven technology for small farmers introduced in July 2010, could spread to 63 farmers with 3-5 ducklings in the backyard totalling to 388 numbers, spread over 15 villages by 2014 . The farmer could earn Rs16/- by selling eggs, Rs 400-450/- from adults and Rs 50-55/- for ducklings. when compared to desi duck for Rs 200/ , 10/-and 5 to 7/- respectively. The duck would grow to average weight of 2.637 Kg with low level of mortality, when compared to desi i.e. 1.975 kg of weight with high mortality rate. Pekin duck under backyard with a unit size of 03 birds could give a net return of Rs.4, 350 against the desi birds (Rs.1, 140/ -) thus giving an additional income of Rs. 3,210/-. A total of 881 eggs of pekin duck (2013 to 14) was spread to fifteen cluster of villages by a single farmer, and earn Rs13215/- as an additional income, which is a remarkable beginning of a credible technology given by Division of Animal Science of the Institute (Plate 79 to 81, Fig.24, Fig.25).

Plate 79: Pekin duck white

Plate 80:Shri. E.D.Menon the change agent

Plate 81:Pekin duck Coloured

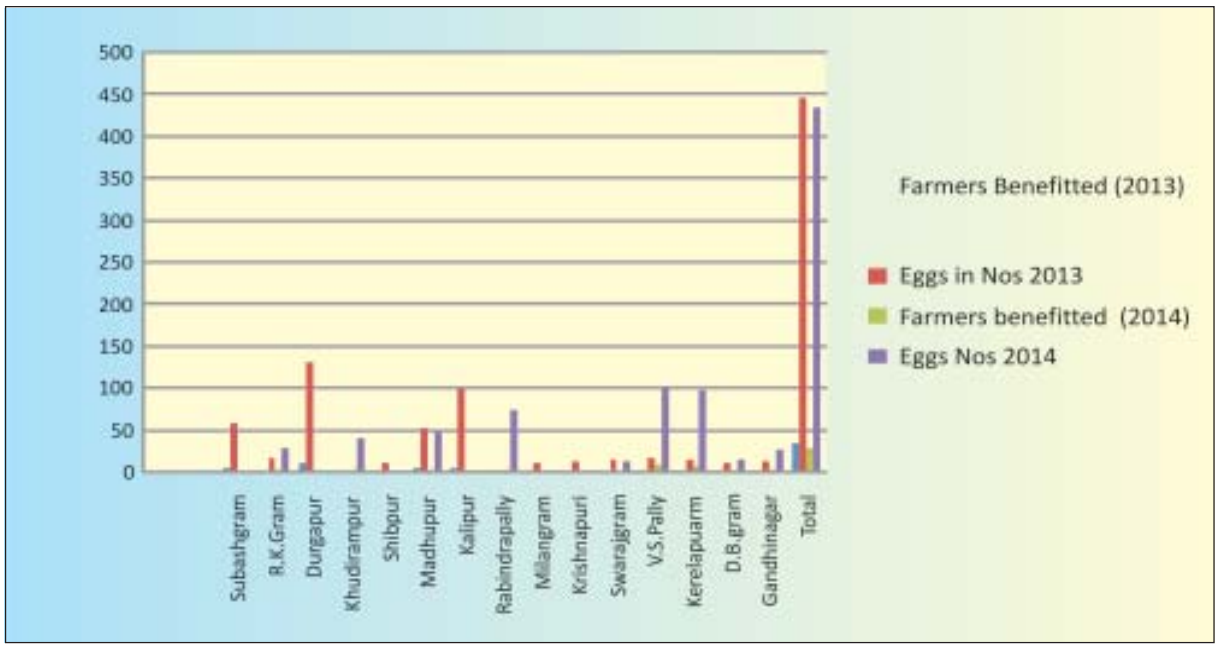


Fig.24: Pekin duck eggs spread by a single farmer Shri E. D. Menon during 2013 & 14

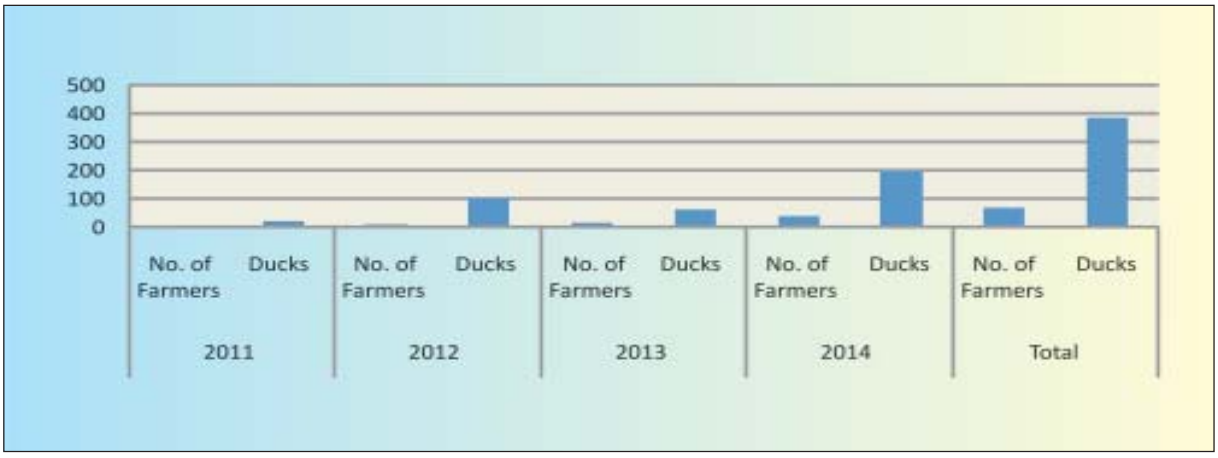


Fig.25: Horizontal spread of pekin duck through farmers to farmer's mode

Extension Activities

- 914 visits were made for selection of farmers, monitoring the crop, advisory & getting feed back. Beside, 320 target clientele visited Out Reach Centre (ORC) for discussion on crop, training and reading technical books for updating information.
- 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.
- Three Field days on Pond based Farming system, Intercropping system & varietal selection of Aath number Dhan were conducted, wherein a total of 57 beneficiaries participated and got benefitted.
- Twelve video shows on technological intervention in agriculture & allied fields & Farmers Right were screened, wherein 525 beneficiaries got benefitted.
- Thirty six 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.

Farmer's Club formed and sanctioned by NABARD for effective ToT and adoption

Two farmers clubs were formed during the period namely "Welfare farmers club" on 12/10/2014 with 15 members, at Badur Tikry and Nabajagaran Framers Club" with 12 members, at Kalipur. The accounts of both the clubs has been opened with the A & N Cooperative bank, Diglipur and Chief coordinator and Associate co-coordinator were appointed.

Economic Impact Studies on Crop Diversification and Technology Adoption in Horticulture (Network programme)

S.K. Zamir Ahmed and *Nagesh Ram*

Agricultural growth needs to be stepped up. The strategy should focus on low input-low volume high value agriculture. Food grain production should be at subsistence level; vegetables, oilseeds and perishables should be at semi-commercial level; and coconut, arecanut, should be at commercial level. In the context, the following measures need special attention i.e., high quality seeds, modern production techniques, irrigation, access to credit, transport and marketing facilities, integrated pest management, and farmers' training. There is a good scope for export of high value products like coconut, spices, fruits, flowers, medicinal and aromatic plants and processed products. Organic farming should be promoted and product certification system should be developed to help farmers fetch relatively higher prices for their products. Coconut and arecanut are important crops in ANI, however yield of these crops is low. Farmer's training in modern techniques of cultivating will improve the yield of these crops; and multi-tier cropping (with pepper, cloves and nutmeg) will increase the value of produce per unit area. Modern methods for processing of copra should be used. In order to exploit the export potential, commercialisation of identified products needs to be encouraged by investing in marketing and storage facilities, promoting/ developing linkages with food processing industries and creating efficient transport facilities. Over all agricultural extension services should be strengthened.

Over here an attempt has been made to collect the secondary data on area and production of major agricultural crops of ANI from for the period 2005 to 2014 and the productivity trends has been analyzed. The average productivity /ha in coconut was found to be 4470 nuts, in arecanut 1.38Mt, in paddy 2.82Mt, in pulses 0.55Mt, in oilseeds 0.60Mt, in vegetables 7.20Mt and in fruits it was 8.50Mt respectively. The productivity trend over the years has been found to be in increasing trends, but at marginal level (Table 21).

Table 21 : Productivity trend of major crops of ANI (2005-2014)

Particulars (yield/ ha)	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Average Productivity
	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	
Coconut (Nut)	3749	4153	3727	3776	3904	4364	4816	5713	6028	4470
Arecanut (MT)	1.36	1.44	1.4	1.38	1.25	1.39	1.41	1.42	1.39	1.38
Paddy (MT)	2.45	2.77	2.98	2.8	3.06	2.85	2.93	2.74	2.83	2.82
Pulses (MT)	0.65	0.55	0.65	0.54	0.59	0.44	0.52	0.49	0.49	0.55
Oilseeds (MT)	0.63	0.6	0.82	0.63	0.62	0.55	0.54	0.47	0.51	0.60
Vegetables (MT)	7.0	7.89	7.8	6.57	7.98	6.08	8.83	6.18	6.46	7.20
Fruits (MT)	6.67	7.63	7.6	8.3	8.58	9.11	8.84	11.74	8.04	8.50

Source: NHM, New Delhi (2014)

Thus, increasing productivity has long been recognised as the most important source of output growth and income improvement in the Islands of Agriculture sector. Agricultural productivity growth in Andaman & Nicobar also plays a particularly important role in increasing efficiency in production of the agriculture products and maintaining National competitiveness in the face of declining terms of trade, increasing climate variability and tightening constraints on natural resource use. In some industries, changing community attitudes and values are also emerging as important factors governing farm production systems.

KRISHI VIGYAN KENDRA

In Andaman and Nicobar Islands under the administrative control of ICAR - Central Island Agricultural Research Institute (CIARI), Port Blair three Krishi Vigyan Kendras(KVKs) were established in three Districts (South Andaman, North and Middle Andaman and Car Nicobar). The first Krishi Vigyan Kendra of A&N Group of Islands under Zone-II, Kolkata was established in 1993 at South Andaman. The second Krishi Vigyan Kendra was established on 20th May, 2010 at Car Nicobar. The third Krishi Vigyan Kendra of A&N Group of Islands was established on 7th February, 2012 at Nimbudera (Plate 82).

KVK is one of the innovative institutions with the mandate of imparting vocational training to the practicing farmers, farmwomen, rural youths 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.

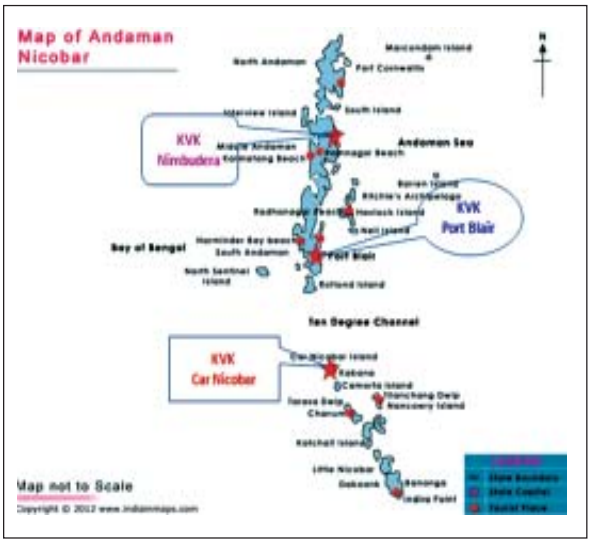


Plate 82: The locations of KVK in A&N Island

KVK-SOUTH ANDAMAN

Training Programme

The Krishi Vigyan Kendra, Port Blair has conducted 39 training programmes during the year 2014-15 covering South Andaman and Little Andaman for the benefit of practicing farmers/ farmwomen, rural youths and extension functionaries. The details of the training programmes are given in the table 22 and fig 26.

Table 22: Details of training programme

Discipline	No. of training	Male	Female	Total
Agronomy	7	88	87	175
Horticulture	7	49	86	135
Animal Science	8	117	122	239
Agriculture Engineering	6	57	38	95
Fisheries	6	111	42	153
Home Science	5	6	151	157
Total	39	428	526	954

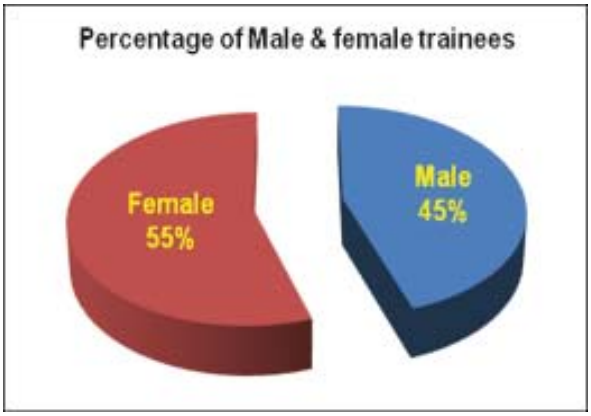


Fig.26: Distribution of male and female in training

Biopesticide preparation & its application

Table purpose groundnut

Annual & perennial intercropping system

Virgin coconut oil extraction

Power tiller repair and maintenance

Arecanut dehusker

Training on garment designing

Nutritious kitchen garden

Plate 83: Glimpses of vocational training under different areas

Front Line Demonstration [FLD]

Thirteen Front Line Demonstrations in agriculture and allied disciplines were conducted and the salient results are given below:

- **Salt tolerant paddy (CIARI Dhan 5)** recorded 29.0 % higher grain yield as compared to local check.
- **Black gram (VBN 6) r**ecorded an average yield of 6.74 q/ha was obtained as compared to the local check (5.4 q/ha).
- **Groundnut (ICGS-76) r**ecorded yield of 21.4 q/ha as compared to the local check (17.8 q/ha).
- **Indian spinach r**ecorded yield of 54 q/ha as compared to the local check (36 q/ha).
- **Spinach r**ecorded higher yield of 78 q/ha as compared to the yield of 39 q/ha of local variety.
- **Improved large White Yorkshire pigs** attained annual average body weight of 120 kg per animal over the local check (non descriptive) of 75 kg.
- **Duck farming with khaki Campbell duck** laid 210 eggs per annum compared to the local desi duck of 110 eggs per year.
- **Fodder cowpea (Co FC 8)** recorded an average yield of 280q/ha green matter as compared to the local check of 180q/ha.
- **Fodder Sorghum CoFS 29** recorded a yield of 170q/ha of green matter.
- **In gravity fed drip irrigation system for arecanut plantation,** 88% of water saving was recorded over the normal flooding method of irrigation
- **Oyster mushroom cultivation** recorded average yield of 600 gm per bundle (1kg.Paddy straw) with B: C of 1:2.25.
- **In promotion of floriculture at homestead level,** Marigold (Var. Pusa narangi) gave 4.6 ton/ha yield with good response in open field condition.
- **Development of IFS Model** with the component (Fish+ Duck+ Seasonal vegetables + Banana) was conducted at three farmer's field. Fish (Catla and Rohu) attained the average weight of 400gm and 250 gm in three months and ducks to 750gm (Av). Farmers received Rs. 2000/- to Rs. 2500/- from the sale of vegetables from an area of about 400 m^2.

FLD on Salt tolerant paddy (CIARI Dhan 5)

FLD on TPS Groundnut (Var. IGCS 76)

FLD on Blackgram (VBN 6)

FLD on Fodder Cowpea (Var. CO FC 8)

FLD on Duck farming

FLD on Oyster mushroom cultivation

FLD on Portable gravity fed drip irrigation system

FLD on Coconut Milk Extractor

Plate 84: Glimpses of FLDs

ON FARM TRIALS [OFT]

Ten On Farm Trials were conducted at farmer's field for assessment and refinement of the selected technology on agriculture and allied fields.

- Effect of LCC based nitrogen management in rice was conducted at farmers field. The results revealed that the number of panicles m^{-2} and number of grains per panicle over farmer practice increased significantly with application of N. Among treatments, LCC based N management resulted in significantly higher number of panicles m^{-2} and number of grains $panicle^{-1}$ in 20kg N/ha & 30 kg N/ha than other treatments. Production of number of panicles m^{-2} by the application of Leaf colour chart based nitrogen @ 20 kg/ha & 30 kg/ha (358 and 341 m^{-2} respectively) was on par with each other. The highest gross return and net return of Rs. 49200 and Rs. 25100 were recorded in LCC based N management @ 20 kg/ha with B C ratio of 2.04.
- Effect of maize based vegetable intercropping system was conducted and the results revealed that among the intercropping systems, maize + cowpea (1:2) recorded significantly higher than other systems. Maize + cowpea (1:1), maize + frenchbean (1:2) were on par with it. Maize + French bean intercropping system at 1:2 row proportion recorded significantly higher maize (8479 kg/ha) than other cropping systems. The next best system was maize with French bean intercropping in 1: 1 row proportion (6318 kg/ha). Maize with French bean in 1:2 row proportion recorded higher gross returns (Rs. 84793/ha) and net return (Rs. 60463/ha) than

Plate 85: Effect of LCC based nitrogen management in rice management in rice

Plate 86: Maize based vegetable intercropping system

other intercropping treatment combinations and sole crops. Sole maize crop recorded lower gross returns & net return of Rs. 31800/ ha and Rs. 11830 /ha respectively.

- Results on evaluation of bacterial wilt varieties of tomatoes revealed that the highest yield was recorded from Ayush (1.7 Kg/plant) followed by Arka Samrat (1.6 Kg/plant), Arka Vikas (1.4 Kg/plant) and the lowest yield were recorded from Farmers Variety (0.920 g/plant) with B C ratio of 4.0, 3.76, 3.29 and 1:11 respectively.

Plate 87: Evaluation of bacterial wilt varieties of tomatoes

- The results on evaluation of short duration and water stress tolerant varieties of sweet potato revealed that the highest yield was from CARI SP II (22 t/ha), CARI SP I (20.87 t/ha) followed by Gouri 85/16 (19.56 t/ha) with a duration of 125,120, 110 days and the lowest yield were recorded from Farmers Variety (7.5t/ha) with 140 days and B:C ratio of 6.11; 5.79; 5.43 and 2.30 respectively.

Plate 88: Evaluation of short duration and water stress tolerant varieties of sweet potato

- Performance evaluation of milk production through mineral supplementation and probiotics in crossbred cattle was conducted and results revealed that the average milk yield (lit.) was recorded highest in the group fed with normal feeding + probiotics + mineral supplementation in the tune of 5.70/ day /animal followed by group fed with normal feeding + mineral supplemenation (Calcium and Phosphoros @ 1650 and 850mg/100ml). The lowest milk yield was recorded in the group fed with normal feeding + probiotics. However, on average the milk yield characteristic was recorded to 4.05 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 essential in lactating cows during the peak lactation phase for improving the milk yield as per the genetic potential of crossbred dairy cattle.

- Performance of different soil erosion resisting crops on checking soil erosion on a 2-5% sloping terrain indicated that natural vegetation grown on land without any sort of tillage activities has the most ability to protect the top soil by reducing erosion and allowing only 577.5 g/m^2/min for a rainfall intensity of 3.85 cm/hr. Cowpea crop of one month duration has the high erosion resisting ability amongst the selected crops which is done by allowing sediment outflow rate of 1155 g/m^2/min. Hybrid napier and gunea grass were useful in developing the fodder bank as the crops are perennial in nature although the extent of resisting soil loss is less as compared to cowpea.

Plate 89: Hybrid napier

- Performance and evaluation of rainwater conservation measures on coconut cultivation was conducted. The results revealed that the conservation trench + coconut leaves/ husk mulching was found to be the best treatment followed by coconut leaves/husk mulch and conservation trench respectively. The water in the conservation trench was retained for an average 3 days during the monsoon season and the intermittent rain that makes the trench filled with excess runoff. The trenches are helpful in controlling the seepage in the sloping terrain and make the water available to the root zone of the crops on the slope. Since the cost of making of trenches and mulching added during the first year of initial investment, the BCR reduced in the treatments. During the year, rainfed crops exhibited the highest BCR of 5.00 followed by coconut leaves/husk mulching (4.40) and conservation trench only (3.78). Conservation trench + coconut leaves/ husk mulching recorded the lowest BCR of 3.63 due to the same reason.

Plate 90: Rainwater conservation

- Preparation of enriched vermicompost for home garden was conducted at farmers field. The results revealed that the quality of enriched vermi compost in technology option 2 (Cow dung+ farm waste + rock Phosphate @ 10 kg/t) is better compared to farmers practice and technology option 1 (cow dung + farm waste) as it has been enriched with rock phosphate. The net return was high (Rs. 1800/- unit) in technology option 2.

Plate 91: Vermicompost for home garden rainwater conservation

- The results on assessment and evaluation of vegetable cutter with hand glove for harvesting of Okra revealed that vegetable cutter was found suitable for harvesting of Okra. The work rate (kg/hour/labour) was increased 37.32 % by harvesting Okra using vegetable cutter with hand glove than manual harvesting. The farmers found it better to use vegetable cutter for harvesting Okra. Use of hand glove with vegetable cutter protects palm and finger from injury compared to manual harvesting. The net profit obtained from okra cultivation in one ha land was Rs. 2,79,600/- with BC ratio of 3.32.

Plate 92: Evaluation of vegetable cutter

- Evaluation of growth performance of stunted fingerlings of IMC were conducted in seven locations with three treatments. The technical option 2 (stunted fish seed + R.B. + GOC + Lime + RCD + pond management practices) gave better result. The cost of rearing was Rs. 11,500 and the increased yield was 7.0 q/ha over the farmers practices. The net return (Rs.3,26,000/ha) with BC ratio of 3.83 was obtained.

Plate 93: Evaluation of stunted fingerlings of IMC

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

a. 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.

b. To demonstrate site specific technology packages on farmer's fields for adapting to current climate risks.

c. To enhance the capacity of scientists and other stake holders 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.

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 by facing moisture stress (48.6% deficit rainfall) during early stage of crop growth. 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 with 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 with net return of Rs.4200 and B:C ratio was 1.20.

- **CIARI Poi selection for saline soil** 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. These fodders enhanced milk production of livestock by meeting its nutritional requirement. Fodder tree (Agathi) was 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.

- **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 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.

- **Awareness on status & 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.

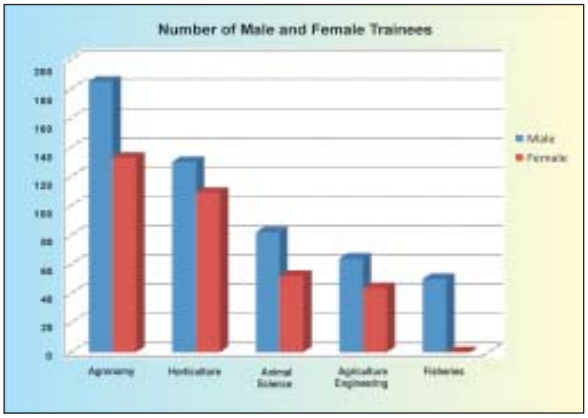
Krishi Vigyan Kendra - Nicobar, Car Nicobar

Trainings

During this year (2014-15) a total of 28 trainings were conducted in different disciplines of Agriculture *viz*. Agronomy, Animal Science, Horticulture, Agriculture Engineering, Fisheries. A total of 849 farmers including 338 female got benefited from the trainings. This involved 68 days and 1771 trainee days (Table 23).

Table 23: Discipline wise training conducted by KVK-Nicobar during 2014-15

Discipline	No. of training	Male	Female	Total
Agronomy	8	185	133	318
Horticulture	8	130	109	239
Animal Science	6	82	52	134
Agriculture Engineering	5	64	44	108
Fisheries	1	50	0	50
Total	28	511	338	849



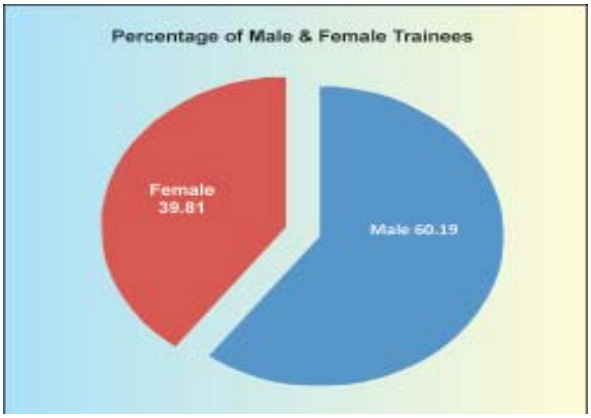


Fig.27: Participation of male and female in the training programme

On Farm Trials (OFTs)

i. Farmer participatory varietal evaluation of Sweet Potato cultivars under rainfed conditions: The highest yield was obtained from Local Cultivar 2 (198.1 q/ha) as compared to Local Cultivar 1 (179.1 q/ha), Local Cultivar 3 (148.8 q/ha), CARI SP 2 (147.6 q/ha), CARI SP 1 (147.6 q/ha).

Field view of OFT

Local Cultivar 2

Local Cultivar 1

Plate 94: Varietal evaluation of Sweet Potato cultivars

ii. Varietal evaluation of Brinjal cultivars under Island conditions

The brinjal cultivar was evaluated with the participation of tribal farmer. The result revealed that, the maximum fruit yield was recorded in CARI B 1 (437.7 q/ha) as compared to Arka Nidhi (284.0 q/ha), Pusa Anupama (256.5 q/ha) and Pusa Purple Cluster (173.9 q/ha). The farmers are fully satisfied with the performance of brinjal varieties. During the field experiment no bacterial wilt was observed. But shoot borer, mealy bug and aphid mildly affected the brinjal crop in the initial stage.

Director, ICAR-CIARI, visited OFT at Big Lapathy

CARI B 1

Pusa Purple Cluster

Plate 95: Varietal evaluation of Brinjal cultivars

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

The on farm trial (OFT) was conducted at farmer's field with 24 sqm area in each plot. The maximum average yield was recorded in portable rain shelter with IP net for the leafy vegetable of Spinach (6.2 Kg/plot), tomato (10.5 kg/ plot) and reddish (29.5 kg/ plot) as compared to traditional practice and portable rain shelter in production of all the leafy vegetable. The quality and appearance of produce was better than traditional and permanent rain shelter. For the conformity of the result OFT to be continue.

Plate 96: Evaluation of rain shelter for high value vegetable and leafy vegetable cultivation

iv. Evaluation of virgin coconut oil extraction technology:

The study was conducted in randomized block design with 3 treatments *viz*. T0: Natural fermentation method T1: Low pressure oil extraction method and T2: Modified kitchen method in 7 farmers field. The process was repeated three times at each replication. The result revealed that, the oil recovery from T0: 25.3 liter per 100 kg fresh grated coconut kernel, T1: 30.7 liter per 100 kg fresh grated coconut kernel and T2: 34.9 liter per 100 kg fresh grated coconut kernel. Hence, it can be concluded from the above study that, the modified kitchen method is suitable for home consumption, oil have transparent colour with low moisture content. Keeping in view the demand of virgin coconut oil, high pressure oil extraction machine is needed to be introduced in these Islands.

Plate 97: Virgin coconut oil extraction technology

V. Evaluation of different growth promoter in backyard poultry

The average weight at 20th week of age was higher in the group T4 (Farmers practice + probiotics + morinda fruit Juice) of 1236g followed by T3 (1066g) (Farmers practice + Probiotics), T2 (982g) (Farmers practice + morinda fruit Juice) and T1 (834g) (Farmers practice), whereas the mortality percentage at 20 weeks of age was higher in T1 (44%) followed by T3 (32%), T2 (28%) and T4 (20%). It was also found that

Plate 98: Evaluation of different growth promoter in backyard poultry

the B: C ratio was highest in T4 of 2.07 and lowest in T1 (1.19). The B: C ratios of T2 & T3 were relatively similar with the value of 1.51 and 1.52 respectively.

vi. Alternate feed supplement for pigs in Car Nicobar

During the study it was noticed that, in the backyard feeding condition for pigs, approximately 3:1 ratio is the maximum limit for including Azolla for feeding pigs in Nicobar. Increased ratio of Azolla, only leads to wastage of Azolla as leftover. Further it was found that replacing ¼ (3:1) of coconut with Azolla has aided in maintaining the weight gain in piglets (34.5kg) compared to the farmers practice (33.8kg) at six months. Economic feasibility study based on assumptions *viz*. Rs. 8/- per coconut and Azolla replacing half coconut per day per pig for 365 days will save an amount of Rs. 1460/- per pig. Azolla is now naturally available in the waterlogged areas of Car Nicobar and the pigs may feed on Azolla in the days to come.

Plate 99: Feeding Azolla to pigs

Front Line Demonstrations (FLD)

Title of the FLD	Results
Popularization of cowpea crop	Performance of cowpea cv. Arka Garima was good Yield: 13q/ha with B:C – 2.5
Promotion of tomato cultivation	Farmers were satisfied with the performance of tomato cv. Arka Samrat. Yield: 11q/ha, B:C – 2.2
Nutritious kitchen garden	Home consumption and surplus vegetable sold to villagers, Govt. servant, Anganwadi for mid-day meal. Earned Rs 22,657.00 during the period
Coconut solar tent dryer	Improvement in quality of copra. 70 percent colour of copra is white and edible.
Green fodder	• Reduction of drudgery to harvest fodder from wild trees and is encouraging to women for goat farming. Cowpea *var.* CO-1 gave yield of 110 q/ha. • Production of cuttings of H/Napier in progress for local availability.
Vermi-composting	Tribal farmers are very happy with the performance of vermicomposting technology. Yield: 800q/ha, B:C - 2.0

Plate 100: Glimpse of Front Line Demonstrations

Table 24: Extension Activities (including activities of FLD programmes)

Nature of Extension Activity	No. of activities	Farmers			Total		
		Male	Female	Total	Male	Female	Total
Field Day	11	125	84	209	125	84	209
Kisan Mela	1	216	134	350	216	134	350
Kisan Ghosthi	1	98	152	250	98	152	250
Method Demonstrations	6	68	54	122	68	54	122
Lectures delivered as resource persons	10	241	109	350	241	109	350
Scientific visit to farmers field	485	603	403	1006	603	403	1006
Diagnostic visits	102	69	33	102	69	33	102
Exposure visits	1	2	0	2	2	0	2
Carnic Festival	1	-	-	2000 aprox.	-	-	2000 aprox.
National Science Day-2015	1	-	-	200	-	-	200
Total	**620**	**1422**	**969**	**4591**	**1422**	**969**	**4591**

Organic Nutritious Kitchen Gardening at Car Nicobar - a Success Story

Background:

- An adult person should take at least 280 g vegetables a day.
- Per day consumption of vegetables in Car Nicobar is far short of the requirement and availability depends on other islands.
- The people of Car Nicobar purchase vegetables from shops, which grow in Andaman by using imbalance chemical fertilizers and heavy pesticides.
- During shipment vegetables losses nutritional quality and palatability due to and of refrigerated transportation facilities.
- Lack of scientific knowledge, skill of cultivation and non-availability of seeds of suitable cultivars of fruits & vegetables.

Intervention of KVK -CIARI:

- KVK-CIARI, Nicobar, since 2011, and has conducted 13 trainings in the field of scientific vegetables and fruits cultivation for establishment of organic nutritious kitchen gardens for nutritional food security. A total 325 farmers & rural youths including 224 male and 101 females got benefitted.
- In the year 2012, KVK, Nicobar adopted traditional farmer Shri. Petrik belongs of *Tur-hato Tuhet*, Tapoiming village, Car Nicobar to establish organic nutritious kitchen garden. The entire programme gave emphasis on practical skill and knowledge development to start scientific vegetable cultivation with full confidence.

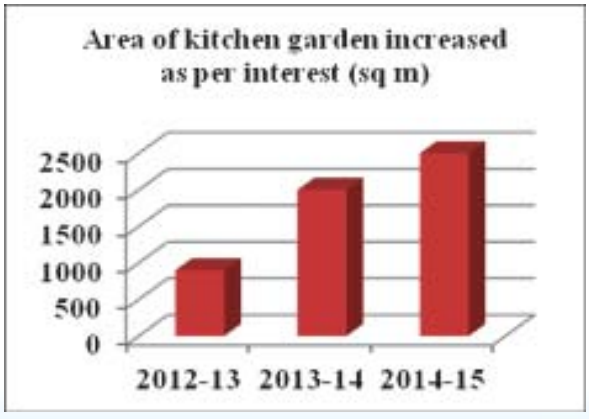


Plate 101: Harvesting of vegetables

Plate 102 before the caption

- The programme components included various techniques of landscaping, layout planning, growing vegetable nursery, sowing methods, application of organic manure (goat, poultry manure), composting, vermicomposting, plant protection measures *i.e.* neem oil, neem leaf extract, *Trichoderma*, kernel extract of *Barringtonia asiatica* and also seed production of vegetables.

Impact

- After technological interventions by the KVK in horticulture field, visible impact was seen in favourable adoption of technologies demonstrated, increase in income, providing livelihood, nutritional security, employment generation and improvement of socio-economic conditions of Shri Petrik and his *tuhet*.
- Through the intervention, he fulfilled his daily needs and surplus was sold to villagers, Govt. Servant, Anganwadi for mid-day meal and earned Rs. 18,421.00 and Rs 22,657.00 during 2013-14 & 2014-15, respectively. Now, he is a model farmer for the entire village.

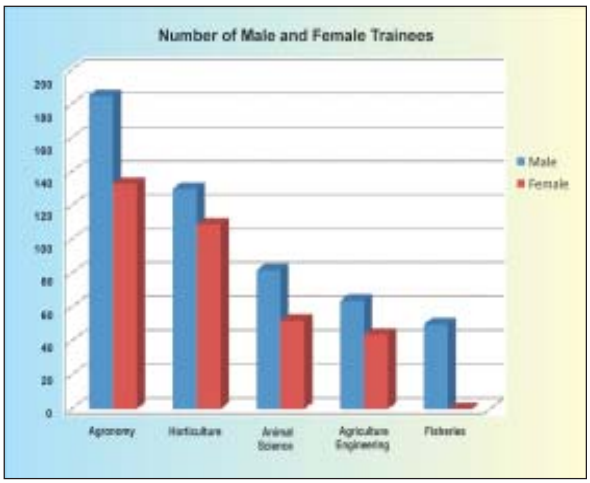
Krishi Vigyan Kendra - Nimbudera, North & Middle Andaman

Trainings

During this year (2014-15) a total of 16 trainings were conducted in different disciplines of Agriculture viz. Agronomy, Animal Science, Horticulture, Agriculture Engineering, Fisheries, Home science. A total of 418 farmers including 152 female got benefited from the trainings.

Table 25: Discipline wise detail of training done by KVK-Nimbudera during 2014-15.

Discipline	No. of training	Male	Female	Total
Agronomy	5	83	52	135
Horticulture	4	48	48	96
Animal Science	3	45	4	49
Agriculture Engineering	1	11	7	18
Fisheries	3	79	15	94
Home Science	1	0	26	26
Total	16	266	152	418



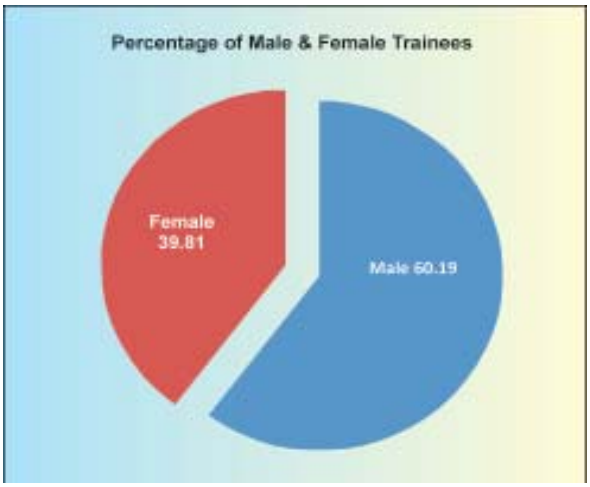


Fig.28: Distribution of participation of trainees

On plantation crops

On Maize production

Plate 103: Glimpses of vocational trainings

Tribal Sub-Plan

Since the initiation of Tribal Sub Plan Component by ICAR, the Institute has thrived hard to work under the frame to bring out significant economic and social changes among the tribal farmers of Andaman & Nicobar Islands. Since 95% of the total tribal population of ANI is composed of Nicobarese, the whole effort of TSP activities was concentrated in the Nicobar district (Car Nicobar, Nancowrie and Great Nicobar) and Harminder Bay in Little Andaman of South Andaman District. Empowerment of tribal's through training cum sensitization, creation of assets and carrying out improvements in the existing practices of agriculture and allied sectors, with a view to improve production, provide income generation and improve quality of life was taken up with the allocated budget.

The technological interventions in agriculture and allied fields was planned and executed through training, demonstration, community assets creations in participatory mode by Division of Horticulture & Forestry, Field Crop Improvement & Protection, Animal Science, Natural Resource Management, Fisheries Science, Social Science, Estate Section and KVK South Andaman & Nicobar. The Deputy Commissioner, Nicobar, Line departments, Tribal Council, Car Nicobar, Nancowrie, PRI members and others have played a pivotal role in reaching the unreached for sustainable development of the tribal farmers.

Technological intervention and activities undertaken

Based on the feedback, the problems identified were addressed by imparting awareness, knowledge and skill through capacity building programmes at Nicobar district and Little Andaman which is highlighted below:

- Knowledge and awareness on the occurrence of *Parthenium* in different places of little Andaman, its toxicity on human beings, cattles, buffaloes, goats, pigs, agricultural crops and its control measures were imparted. Methods of *Parthenium* weed management were discussed and the tribal farmers actively participated in the eradication of *Parthenium* weeds at residential areas of Harminder Bay.
- Importance of weed and nutrient management in vegetable and coconut plantations for increasing the farm income were informed. Lectures on management of weeds in home garden and coconut plantation, utilization of biomass/weeds for vermicompost preparation, intercropping of pulses and ground nut to enhance soil fertility, green manuring and mulching with coconut husk and integrated farming systems for coconut plantations were delivered. Vermicomposting was demonstrated and tribal farmers actively involved in learning the technique. Vegetable seeds like brinjal, bhendi, pumpkin, bitter gourd and bottle gourd and marsha were provided to farmers.

- The management of soil, water resources and plant produces with appropriate technology is the key for providing livelihood and sustaining the economic activity in an island condition with limited land area, inadequate fresh water storage, intricate production system and limited choice for crop combinations. Coconut and spices are better fit into these components for enhancing better income to the tribal's. Irrigation technology for higher water use efficiency, use of drip and sprinkler irrigation systems and use of

vermicompost for higher yield to the field crops were deliberated to the participants. To overcome the shortcoming of the traditional processing activity using machine dryer for copra production, the utility of solar dryer for quality copra production was discussed. Apart from this, vegetable seeds were provided as a mean for sustainable livelihood to the tribals.

- Management of natural resources and diversification of agricultural activities are vital for successful agricultural production particularly in island ecosystem. As coconut is the predominant crop in tribal areas of Hut Bay, agricultural diversification and efficient resource management would help them to improve their livelihood. Therefore, this was discussed with the tribal farmers and a programme for diversification of agriculture with various components were finalised after field visit. In addition, a training on enhancing the nutritional security through homestead IFS model was organized. During the training, organic waste recycling and water harvesting techniques were also demonstrated. Eight tribal farmers were identified for demonstration of these technologies under TSP. The land was surveyed and suitable locations were demarcated. Soil and water samples were collected and analyzed to assess its suitability. During the training programme, vegetable seeds, effective microorganisms and bio-fertilizers were distributed to the farmers for enhancing the farm production.

Training and distribution of vegetable seeds to tribals at Kamorta Island

- In tribal dominated region, the cultivation practices of pulses are minimal and depends on supply of dal from Port Blair for their daily diet. Tribals have shown keen interest for pulse cultivation in fallow lands as part of crop diversification. Areas have been demarcated for taking up cultivation of pulses.
- Importance of rain water harvesting and different methods of water harvesting, making of lined pond for water harvesting and its management were discussed. Further, effective utilization of harvested rain water through drip irrigation and vegetable cultivation during summer months were also discussed. The village was surveyed and ideal place for construction of lined pond was identified and measured. Tribal Council requested more number of water harvesting structures at Harminder Bay. Vegetable seeds and maize were distributed to farmers.
- Diversification of agriculture and efficient natural resource management is essential to meet the nutritional requirement of tribals of Car Nicobar. During the year, assessment and monitoring of Homestead based IFS model implemented at Car Nicobar was carried out. Farmers were trained on backyard poultry farming, composting, crop planning, ground nut cultivation, use of multipurpose tree species and bio-fencing with *Sesbania grandiflora* to protect their homestead

Training and input distribution to tribal farmers at Harminder Bay

Homestead based IFS model at Car Nicobar

from livestock and also to meet the fodder requirements.

- Fisheries Science Division (FSD) continued its activities in the tribal areas by providing fishing inputs and conducting, one three days training and one awareness programme. Beneficiaries for the distribution of fishing inputs were selected in consultation with the respective tribal councils. Due to the efforts of the FSD under TSP, it is seen that many youth are getting attracted towards fishing activity. Many beneficiaries of the OBM engines are building new hodi's (local fishing craft) which was witnessed by the Director, CIARI during his visit to Car Nicobar in March 2015. Now they are trying to use new technologies like GPS for both locating PFZ areas and to navigate safely. Deep freezers are used for storing the fish which are either sold or used during lean season. An appreciation letter lauding the efforts of CIARI in improving the

livelihood of Nicobar tribes was very well received and appreciated.

- Technological interventions for the tribal farmers was planned by Social Science Section under the project through training & demonstration in association with KVK's, both at Harminder Bay & Car Nicobar with an objective to transfer know how & do how to the tribal farmers. The concept of "Nutritious kitchen garden' for health ,happiness and wealth (HHW) was introduced ,wherein vegetable kits from IIHR, Bangalore containing eight different vegetables *viz.,* brinjal, onion, chilli, tomato, amaranthus, cowpea, french bean and okra, were made available for growing in backyard, to ensure nutritional security for six months for a family. Based on the feedback, it was found that 75 % of the tribal farmers adopted the technology and could harvest and consume the vegetables for providing nutritional security to their family members. Beside the tribal leaders after gaining the knowledge acted as a trainer during the training which led to effective transfer of know how and do how to their fellows. Two capacity building programmes was conducted at identified locations in collaboration with KVKs, Development Departments and Institute, wherein the PoP, planting techniques, conservation of moisture, mulching, harvesting technique, nutritious value of vegetables and its importance were imparted in participatory mode through group task and interaction. The vegetable kit was appreciated by tribal farmers and leaders of both the locale and have demanded for more number of kits for the next season.

  A total of 29 capacity building programme in agriculture and allied fields were conducted, wherein a total of 1353 got trained, of which 767 were men and 554 women. The details of the capacity building programme imparted for knowledge and skill development is given in the table 25.

Tribal Captain becomes trainer

Trainees with experts at Harminder Bay

SMS KVK Nicobar imparts training

Trainees with vegetable kit at Car Nicobar

Table 25 : Details of capacity building programme at Nicobar and South Andaman district

S. No	Name of the training	Date	No. of participants		
			Male	Female	Total
1.	Control of parthenium weeds at Harminder Bay	23rd May,2014	12	38	50
2.	Commercial cultivation of tuberose and jasmine as livelihood option for Nicobar farmers at Tapoiming	6th Aug., 2014	23	07	30
3.	Commercial cultivation of tuberose and jasmine as livelihood option for Nicobar farmers at Kinmai village	5th Aug., 2014	17	13	30
4.	Backyard poultry farming at Kinmai, Small Lapathy, Big Lapathy	28th Aug., to 1st Sept., 2014	13	13	26
5.	Scientific cultivation of tuberose, jasmine and banana at Kamorta	17th Sept., 2015	37	24	61
6.	Nutrient and weed management in vegetable and plantation crops at Harminder Bay	28th to 29th Oct., 2014	17	33	50
7.	Management of rice seed crop at Hut Bay, Little Andaman.	20th Nov., 2014	64	14	78
8.	Disease and pest management in brinjal crop at Harminder Bay, Little Andaman.	21st Nov., 2014	7	14	21
9.	Organic cultivation of tuber crops at Car Nicobar	16th to 17th Dec., 2014	13	17	30
10.	Nutritious kitchen garden at Harminder Bay, Little Andaman	14th to 15th January, 2015	26	25	51
11.	Production technology of tuber crops for livelihood options at Kamorta	18th to 20th Feb., 2015	30	20	50
12.	Improving the livelihood security of small holder farmers of tribal dominated areas of Andaman and Nicobar Islands through pulse and maize crops at Harmindar Bay, Hut Bay	27th Feb. to 1st March, 2015	30	25	55
13.	Scientific intervention for promotion of pulse crops and maize cultivation in tribal dominated areas of A & N Islands at Big Lapathy ,Car Nicobar	4th March, 2015	18	32	50
14.	Improving the livelihood security of small holder farmers of tribal dominated areas of Andaman and Nicobar Islands through pulse and maize crops at Small Lapathy , Car Nicobar	5th March, 2015	24	26	50
15.	Improving the livelihood security of small holder farmers of tribal dominated areas of Andaman and Nicobar Islands through pulse and maize crops at Tapoiming,Car Nicobar	7th March, 2015.	22	15	37

16.	Improving the livelihood security of small holder farmers of tribal dominated areas of Andaman and Nicobar Islands through pulse and maize crops at Mus ,Car Nicobar	8th March, 2015	57	7	64
17.	Improving the livelihood security of small holder farmers of tribal dominated areas of Andaman and Nicobar Islands through pulse and maize crops at Kinmai, Car Nicobar	9th March, 2015	29	20	49
18.	Farming systems and post harvest interventions for enhancing tribals farmer's income	10th to 12th March, 2015	42	18	60
19.	Potential fishing zone and geographical positioning System operation at Harminder bay, Hut Bay, Little Andaman	10th March, 2015	25	0	25
20.	Nutritious kitchen garden at Car Nicobar, Nicobar District	11th March, 2015	32	37	69
21.	Agricultural diversification for food security through efficient natural resource management at Harminder Bay, Little Andaman	12th to 14th March, 2015	14	15	29
22.	Improving the livelihood security of small holders farmers of tribal dominated areas of bay Islands through introduction of pulse/maize cultivation at Kamorta Islands	13th March, 2015	12	23	35
23.	Rain water harvesting through lined pond and efficient water management for sustainable agriculture at Harminder Bay	13th to 15th March, 2015	23	26	49
24.	Improving the livelihood security of small holder farmers of tribal dominated areas of Andaman and Nicobar Islands through pulse and maize crops at Kamorta , Nicobar	13th March, 2015	33	2	35
25.	Modern technologies in marine fisheries at Big Lapati Village, Car Nicobar	16th to18th March, 2015	50	0	50
26.	Operation and maintenance of Mini incubator at Car Nicobar	-	25	10	35
27.	Scientific rice cultivation in Nicobar Islands at Govind Nagar, Great Nicobar	17th March, 2015	21	24	45
28.	Scientific rice cultivation in Nicobar Islands at Gandhi Nagar, Great Nicobar	18th March, 2015	40	50	90
29.	Scientific intervention for promotion of pulse crops and maize cultivation in tribal dominated areas of A & N Islands at Rajeev Nagar, Campbell Bay	18th to 20th March, 2015	43	6	49
	Total		**767**	**554**	**1353**

Technological Demonstration

Under the TSP programme the tuber crop based farming system was demonstrated at Harminder Bay. The model comprises of 200 m^2 of fenced area in the vicinity of the tribal settlement and integrated with piggery unit. From the tuber crop based farming system the tribal farmers has generated an amount of Rs. 5500.00 to Rs. 9650.00 from crop component and from Pigs they generated approximately Rs. 20500.00 to Rs. 43000. The total income generated from the system ranged from Rs. 29000.00 to Rs. 52650.00 respectively.

Organic cultivation of elephant foot yam at Small Lapathy and Big Lapathy villages of Car Nicobar under community planting recorded the yield of 1350 to 1850 kg in 3750m^2 and 5000m^2. The income generated from the system ranged from Rs. 54,200.00 to Rs. 74,000.00 respectively.

Inputs distributed and community assets created is given in table 26 & 27.

Table 26: Details of inputs provided

Sl. No.	Inputs provided	No. / Unit
1.	Insect traps & lures	100 Units
2.	Vegetable seed kits	750 Kits
3.	Planting materials a) Elephant foot yam b) Ginger	2250 Kg 200 Kg
4.	Goats	50 Units)
5.	Poultry	(250 Units)
6.	Pigs	23 Units
7.	Poultry feeds	0.5 Ton
8.	Mineral mixtures	25 Units
9.	Farm implements	100 Units
10.	GPS	25 Units
11.	Life jackets	20 Units
12.	Paddy seed	15.0 Q.
13.	Weedicide	20 Kg.
14.	CARI Brinjal seeds	3 Kg.
15.	Pulses seeds a. Mung bean b. Urd bean c. Cow pea	2.04 Q. 1.0 Q. 30 Kg
16.	Bio control agents	100 Kg
17.	Planting materials a) jasmine b) tuberose c) banana	3000 Nos, 1000 Nos. 700 Nos.
18.	Black polythene mulching materials	90 Kgs.
19.	Groundnut seed	20 Kgs.

Table 27 : Details of committee assets created

Sl. No.	Community Asset created	No. / Unit
1.	Low cost goat sheds	10 Nos.
2.	Out board engines	20 Units of 4 hp
3.	Mini incubator	4 Nos.
4.	Solar dryer	2 Nos.
5.	Deep freezers	16 Units
6.	Home garden	04 Villages
7.	Low cost Rain shelter	10 Nos.
8.	Water harvesting (sintex)	10 Units

Transportation of piglets by ship

Model poultry shed

Release of Folders in Nicobari language

Operation of Mini incubator

WOMEN PARTICIPATION (SC/ST)

Institute has taken major thrust for empowering women specially the SC/ST by conducting various capacity building and technological demonstration in agriculture and allied fields under TSP programmes. The women participated for getting awareness, knowledge and skill in the field of organic farming, flower cultivation, backyard poultry, preparation of value added products from mango, pineapple and jamun, weed and nutrient management in vegetables & plantation crops, management of rice seed, pest and disease in brinjal, nutritious kitchen garden, pulse and maize crops, tuber, post harvest and value addition in fish , rainwater harvesting ,balanced diet , homestead farming , exposure visit etc . The participation of women were 892 in the category of ST comprising from Nicobar District and Little Andaman , beside 526 from South Andaman & 537 from North & Middle Andaman District belong to other than SC& ST category.

An overview of women participation

Model goat shed

TECHNOLOGIES TESTED, DEMONSTRATED & TRANSFERRED

- Pigeonpea varietal demonstration was conducted at Chukchuka tribal village.
- Mungbean, urdbean, cowpea demonstration trial at Kinmai, Tapoiming and Small Lapathy tribal village was conducted.
- Methods of application of Bio control agents were transferred to farmers of Hut Bay and Neil Islands.
- Evaluated and transferred ground nut production technology through demonstrations in South Andaman and Car Nicobar.
- Evaluated and demonstrated composting techniques for organic waste recycling.
- Evaluated and disseminated Phosphorus solubilizing microorganism and growth promoting bacteria (bio-consortia) for use in organic farming.
- Designed and tested prototype solar dryer for its drying characteristics in spices and coconuts.
- Demonstrated and transferred technology of pulse intercropping under Coconut plantation.
- Transferred methods of rain water harvesting through lined tank to the tribal's at Little Andaman and Car Nicobar.
- Pure nicobari fowls were popularized and transferred.
- Feed for rural poultry using locally available ingredients were demonstrated.
- Low cost poultry feeder and waterer were demonstrated.
- Artificial hatching using mini incubator were demonstrated and transferred.
- Pekin duck for small farmers under backyard at North Andaman was transferred.
- High Yielding Varieties of rice namely Gayatri, CARI Dhan 5, CSR 36, CARI Dhan 4, CARI Dhan 3 and Ranjit at North Andaman were demonstrated and transferred.
- Composite fish culture was popularized as a market led technology.
- Potential fishing zone advisory-based fishing for improving net income of fishers was popularized.

VARIETIES DEVELOPED FOR ISLAND CONDITION

A total of 12 varieties from the 4 crops *viz.* rice (2), mungbean (3), amaranthus (2) Poi (1) and Noni (4) have been released by Institute Variety Release Committee (IVRC) for the benefit of the farmers/ stakeholders of the Islands. The brief of the varieties is given as follows:

In Rice

CIARI Dhan 8 : This is a long duration (215 days) high yielding, tall (188 cm) variety with upright leaves. The grains are medium bold type and yellowish and shining with moderate number of tillers, long panicles with low spikelet sterility. It is suitable for low input management conditions and also gives good straw yield for fodder purpose.

This variety has been developed by the team comprising of R.K. Gautam, P. K. Singh, A.K. Singh, S.K. Zamir Ahmed, K. Sakthivel and S. Dam Roy.

CIARI Dhan 9 : This is a long duration (216 days) high yielding, tall (200 cm) variety with upright leaves. The grains are medium bold type and brown in color with moderate number of tillers, long panicles with low spikelet sterility. It is suitable for low input management conditions and also gives good straw yield for fodder purpose.

This variety has been developed by the team comprising of R.K. Gautam, P. K. Singh, A.K. Singh, S.K. Zamir Ahmed, K. Sakthivel and S. Dam Roy.

In Mung

CIARI Mung 1 : This is medium duration (66-70 Days) variety with synchronous maturity (at 75-80% physiological maturity), high yielding, bold seeded, brown and long pods with more number of seeds per pod, medium statured variety , profuse branches, test weight (>5.42g) and appreciable field resistance to charcoal rot, powdery mildew and MYMV.

This variety has been developed by the team comprising of A.K. Singh, Krishan Kritania, R.K.Gautam, Sanjeev Gupta, G.P. Dixit, Naresh Kumar, P. K. Singh, Krishna Kumar, S. K. Zamir Ahmed and S. Dam Roy.

CIARI Mung 2 : This is medium duration (66-70 days) variety with synchronous maturity (at 80% physiological maturity), high yielding, bold seeded, black and long pods with more number of seeds per pod, medium statured variety, profuse branches, test weight (>5.06g) and appreciable field resistance to charcoal rot, powdery mildew and MYMV.

This variety has been developed by the team comprising of A.K. Singh, R.K. Gautam , Khokan Mondal, Sanjeev Gupta, G.P. Dixit, Naresh Kumar, P. K. Singh, Krishna Kumar, S. K. Zamir Ahmed and S. Dam Roy.

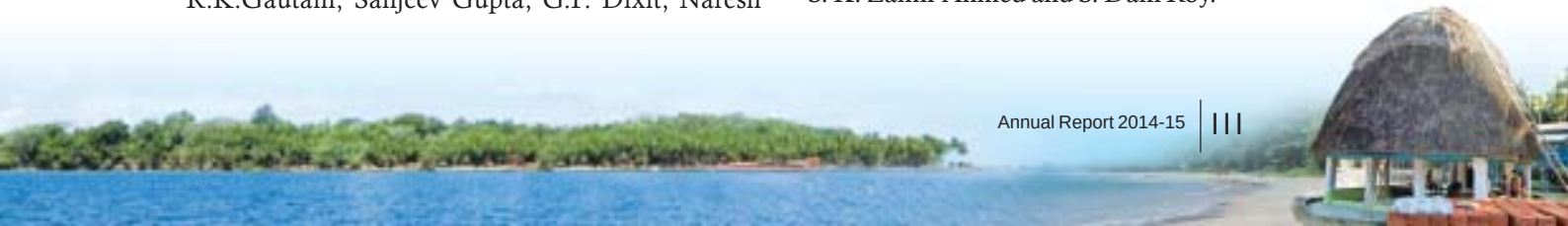
CIARI Mung 3 : This is medium duration (64-68 days) variety with synchronous maturity (at 80% physiological maturity), high yielding, medium seeded, black and long pods with more number of seeds per pod, medium statured variety, profuse branches , test weight (>4.9g) and appreciable field resistance to charcoal rot, powdery mildew, terminal drought and MYMV. This variety is suited for rice-fallow conditions.

This variety has been developed by the team comprising of A.K. Singh, R.K. Gautam, Prasanth Mondal, Sanjeev Gupta, G.P. Dixit, Naresh Kumar, P. K. Singh, Krishna Kumar, S. K. Zamir Ahmed and S. Dam Roy.

In Vegetables

CIARI Lal Marsha : It has the better growth, yield performance and consumer acceptance than the local materials. Average yield under normal condition is 14-16 t/ha.

This variety has been developed by the team comprising of Shrawan Singh, D.R.Singh, L.B.Singh, S. K. Zamir Ahmed and S. Dam Roy.



CIARI AMA Green : This is suitable for organic as well as commercial cultivation and crop diversification in existing farming system in open and inter-space conditions. It performs better with application of vermicompost at the rate of 3-5 t/ha.

This variety has been developed by the team comprising of Shrawan Singh, D.R.Singh, L.B.Singh, S.K. Zamir Ahmed and S. Dam Roy.

CIARI Poi Red (Shaan) : This is red stemmed type, medium duration variety (35-40 days) and found to be free from major pests. It is rich in anthocyanin and micronutrients and responds well to organic farming inputs and is thus promising for organic farming in islands.

This variety has been developed by the team comprising of Shrawan Singh, D.R.Singh, L.B.Singh and S. Dam Roy.

In Noni

CIARI Sampada : CIARI Sampada is a selection from local germplasm for medium and uniform size fruits with above bearing character. It has high recovery of fruit pulp and fruits are rich in phytochemical compounds. It is resistant to disease and pests. It also fit well in intercropping system**.** Fruit weight ranges from 160 to 200 g, fruit yield from 15.0 to 17.0 t/ha/ year. The fruit maturity takes place around 110 to 120 days after fruit bud formation. The tree is semi-vigorous tree.

CIARI Samridhi : The CIARI Samridhi is a dwarf statured selection having small fruits (63.1 g) and heavy and above bearing behaviour. The fruits maturity takes around 100-105 days from bud formation to fruit maturity. The juice recovery from ripe fruits of CIARI Samridhi is high and its fruits are rich in micronutrients and phyto-chemicals. The seeds contain high amount of fatty acids. Fruits and crude juice have better shelf life. It is resistance to disease and pests, suitable for intercropping in coconut and arecanut and for high density planting. The fruit yield ranges from 16.0 to 20.0 t/ha/year.

CIARI Sanjivini : Semi dwarf selection from local germplasm of *Morinda citrifolia*. It has medium small fruits (69.5g) with round the year above bearer capacity. Fruit maturity takes around 100-105 days after fruit bud formation and fruit yield ranges from 14 to 17 t/ ha/year. The variety is rich in phytochemicals, micronutrients and fatty acids. It is resistant to disease and pests. It is suitable for intercropping and open cultivation in tropical conditions**.**

CIARI Rakshak : It is selection from germplasm collected from sea-shore areas in Andaman and Nicobar Islands. CIARI Rakshak grows well in sea water affected lands in tropical region. It has dwarf stature (1.7-2.0 cm) and small size fruits (67.9 g). Fruits are relatively rich in phytochemicals and does not carry high content of sea salts. Though, the fruit is relatively low (7.0-9.0 t/ha) as compared to other varieties in normal soils but its adaptability in sea water challenged lands make it option for restoration of *Tsunami*/sea water affected lands.

All these four Noni varieties have been developed by the team comprising of D.R. Singh, Shrawan Singh, Krishna Kumar, and Ajanta Birah.

INFORMATION ON OTHER SECTION

Prioritization, Monitoring and Evaluation (PME) Cell

The Institute Research Council (IRC) Meeting was held from 19th to 20th June, 2014 at the Conference Hall of Library building under the Chairmanship of Dr. S. Dam Roy, Director, CIARI.

At the outset he expressed his happiness by stating that it is a historical day for conducting 1st IRC after the renaming of the Institute to Central Island Agricultural Research Institute (CIARI). He also informed that QRT and RAC have given direction / recommendations for giving future vision of the Institute based on its capability to meet climate change, meeting the disaster and dealing with the issues

related to small and big Island Nation. Agro Biodiversity platform has been included with a budget of 4.0 crores he added. He also appreciated the good work done in the field of conservation and characterization of germplasm, bio-prospecting, capture fisheries, animal science, providing livelihood opportunities, first line extension services by KVKs and ORC, TSP for tribals and NEH region alongwith challenge situation of Bali Island.

Dr. S. Ganeshan, Head, PGR, Bangalore, Dr. Swaraj Senani, Principal Scientist, NIAN&P, Bangalore and Dr. P. Mohan, Professor & Head, OS&MB, Pondicherry University, Port Blair participated as an expert in the field of Plant Genetic Resources, Animal Science and Fisherie, wherein the scientists could get benefit from the vast experience and fine tune their research programmes based on the valuable suggestions given during the deliberations. A total of forty six ongoing (both institute and external) and two new projects totalling to forty eight were presented, reviewed and approved by the house.

Sensitization on PME activities, RPP, Performance Indicator, HYPM, were given to the scientist and prioritization of the ongoing projects was done on four thematic areas. Important documents of the Institute *viz.*, Annual Report, News Letter, preparation of reports council like Cabinet, PMO, QPR, HPR and DARE, along with publishing of research articles, technical bulletins, folders, books, newsletter, 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 "Science for Nation Building" was conducted and document preparation for implementing ISO-9001-2008 was completed.

Library

CIARI library plays an important role and act as a centre for knowledge and information related to the Institute's mandate. 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 6922 books, 2520 miscellaneous publications in

addition to journals by subscription, gratis, on exchange basis and technical books. During the report year library has procured 83 books and a total of 61 Indian and six foreign journals were subscribed during the year. 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 also available for easy access to this information. Special collection of Island related books, Hindi books along with reprographic facility is also available. Besides, 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 students and progressive farmers visited the library for knowledge sharing and updation. The library is also having a well furnished conference room, wherein a total 22 meeting was conducted.

Official Language Cell

Steps were taken to popularize official language among the staff and to promote use of Hindi in the official work of the Institute. The activities conducted were:

- Hindi Fortnight from 16thSeptember to 28thSeptember, 2014, to inculcate maximum use of Hindi in official works. Various programmes like quiz, extempore, essay, letter writing, noting-drafting, vocabulary and speech competition for scientist/technical and administrative staff and farm ladies were organized to bring awareness about the importance of increasing use of Hindi.
- One day Rajbhasha Seminar on 17th September, 2015 was conducted , wherein Dr. Jaidev Singh, Principal, Tagore Govt. College, Port Blair attended as a main speaker.

- All India Radio, Doordarshan, Port Blair has broadcasted/telecasted agricultural article/ programme for the Island farmers in Hindi for the benefit of farmers and other stakeholders.
- Achieved targets of using Hindi in the field of transfer of technology.
- Scientific bulletins in Hindi, bilingual bulletins/ pamphlets for farmers were published and literature books in Hindi were added to the Library.
- Half yearly meetings of Town Official Language Implementation Committee, Port Blair was conducted on 25th July, 2014 and 30th January, 2015.

Achievement/Recognition

- Town Official Language Implementation Committee, Port Blair was awarded THIRD prize for the year 2012-2013 for best implementation of official language policy in Andaman and Nicobar Islands by Govt. of India, Ministry of Home Affairs, Dept. of Official Language. The award function was organized by Regional Implementation Office (Eastern Region), Kolkata at Bhubaneswar on 07th March, 2014.
- Town Official Language Implementation Committee, Port Blair has been awarded Second prize for the year 2013-2014 for best implementation of official language policy in Andaman and Nicobar Islands by Govt. of India, Ministry of Home Affairs, Dept. of Official Language. The award was given by Honourable Governor of West Bengal Shri Kesari Nath Tripathi to Dr. S. Dam Roy, Chairman, Town Official Language Implementation Committee, Port Blair and Director, ICAR-Central Island Agricultural Research Institute, Port Blair. A merit certificate for excellence in the work was also awarded to Smti Sulochana, Secretary, TOLIC, CIARI during the award function by Regional Implementation Office (Eastern Region) at Kolkata on 18.02.2015.

Smt. Poonam Juneja, Joint Secretary, Govt. of India, Ministry of Home Affairs, Deptt. of Official released,TOLIC annual magazine "DWEEP TARANG'' on the occasion.

- **Publication brought out:**

1. TOLIC Magazine Dweep Tarang
2. Annual Report 2012-13 (Hindi) of ICAR-CIARI

Glimpses of Hindi Fortnight Activities

Sub-Distributed Information Center (Sub-DIC)

Bioinformatics centre 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 scientists and students & also offers traineeships and studentship to deserving bioinformatics students. The database are developed using PHP, MySql and Xampp server which provides information on all bioresearches available in the Islands. It is user friendly and provides

information to the researchers, academician and development departments.

This centre has developed and released data base on corals, mangroves, horticultural biodiversity, 35 years of CARI research and animal biodiversity.

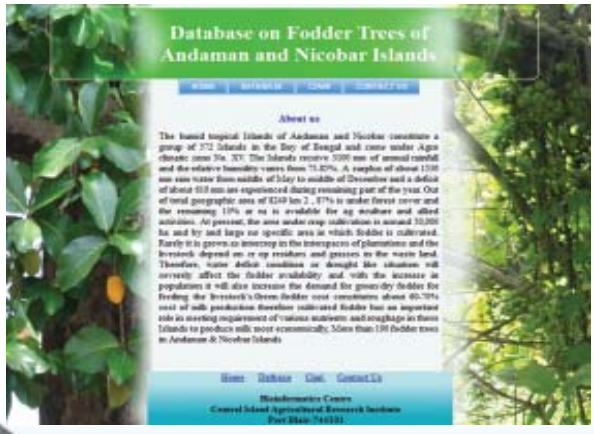
Ongoing Works:

Database on Island Biodiversity :

It consists of fauna and flora of Andaman and Nicobar Islands ,comprising of 215 species of butterflies classified into two super families and five families, 97 species of orchids, 6 species of spices, 18 species of underutilized fruits, 72 species of underutilized vegetables, 104 species of medicinal plants, 5 varieties of arecanut, 7 varieties of coconut, 21 species of mangroves and 51 species of sponges.

Database on Fodder Trees of Andaman and Nicobar Islands:

A total of 95 fodder trees are documented in the database and the work is in progress.



Institute Technology Management Unit (ITMU)

Technologies developed at CIARI were displayed in the 102nd Indian Science Congress during 3-7th January, 2015 at Mumbai and 12th Agricultural Science Congress during 3-6th February, 2014 at NDRI, Karnal, Haryana. Technology profiles of commercializable technologies were presented at Management development programme on technology management for researchers held during 19-23rd August, 2014, at NAARM, Hyderabad. Banners and display materials were displayed at Technology Display Centre, NIRJAFT Kolkata in the Zonal Committee meeting during 30-31st May, 2014. Material Transfer Agreement was made between CIARI and IIHR, Bangalore through NBPGR for transfer of CARI Brinjal 1. One application was filed under PPV&FRA for registration of Farmers variety Khoon phal (Andaman Grapes) . Information on "Streamlining management, use and commercialization of genetic/genomic resource" and "Active germplasm collections" of CIARI, Port Blair were submitted to Assistant Director General (IP & TM) , Secretary DARE & DG (ICAR) and National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi. A committee under the Chairmanship of Dr.G.S.Pandey, Director, Directorate of Agriculture, Andaman & Nicobar Administration ,visited Car Nicobar Islands during 4-6th August, 2014 along with I/c ITMU & Facilitator of Plant Genome Savior Community Award for Nicobari Tribes.

Post Graduate Cell

PG Cell 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 five students have registered for undertaking M.Sc dissertation and inplant training for research work ranged from one to four months, of which 2 students have registered for M.Sc (Biotechnology) and 3 students for B.Tech (Biotechnology) from different colleges of Tamil Nadu. The PG Cell also coordinated conducting of the Doctoral committee meeting of eight PhD students registered with PRIST University, Thanjavur. Examination of the Ph.D students of PRIST University was also conducted on 27th & 28th , March 2015.

Women Cell

Women Cell has been formed at ICAR-Central Island Agricultural Research Institute, Port Blair since 1998, to safe guard and promote well being of all women employees of the organization. It takes care of all complaints on sexual harassment of women at work place and action taken for redressal of complaint. It holds regular meetings even if there are no complaints and issues are resolved.

International Women's Day was organized by Women Cell, CIARI, Port Blair on 9th March, 2015. Smti Ranjita Dam Roy, Chairperson, Ladies Club, CIARI was the Chief Guest, while Dr. S. Dam Roy, Director, CIARI presided over the function. Dr. Manju Nair, Associate Professor, JNRM, Port Blair delivered lecture on the topic 'Empowering women, empowering Humanity" on the occasion. The HOD's of CIARI also spoke on the occasion As part of the programme, elocution competition was also arranged, wherein ladies employees of the institute participated. Prizes were distributed among the winners.

Games and Sports Activity

Annual sport meet of the Institute was held on 15th & 16th April, 2014 at Institute play ground. All the staff members of different houses *viz.* Shompen, Jarawa, Onge and Sentinalese participated in various track & field events in large numbers. The annual athletic meet was declared open by Director, ICAR-CIARI and oath was taken by the players. The indoor events such as badminton, table tennis, carrom, chess for men and women were conducted. The house championship was won by Jarawa House while Sentinalese, Onge and Shompen Houses stood 2nd 3rd and 4th respectively. Dr. Raymond Jani Angel of Jarawa House was declared as the best athlete for the year 2014-15. Institute team also participated in the Zonal Sports Meet of ICAR which was held in CIFRI, Barrackpore and won medals in Shot put (ladies), Javelin throw (Men), Chess (ladies) and High Jump (Men). Institute also represented in the Annual sports meet organised by the Central Government Employee Welfare

Coordination Committee (CGEWCC), wherein many prizes in the indoor, outdoor, and athletic events were won and stood runners in the cricket tournament amongst all the other Central Govt. Institution in the A & N Islands. The facilities for indoor sports like TT, multi gym have been developed for staff and family members. All the instruments are in working condition and a logbook has been maintained for its proper use.

Estate Section

The Estate section consists of Estate, workshop and instrumentation centre which takes up works related to infrastructure development of the Institute to support its research activities. It also takes up repairs and maintenance of residential and non-residential buildings of the Institute. The power supply plays an important role for laboratory research works for which a 320 KVA Generator Set is kept as stand by for restoration of power supply during power cuts and exigencies. It is further enhanced by adding two more D.G. Sets of 180 KVA & 250 KVA for Administrative building & Central Laboratory. The water supply system to residential & non-residential buildings is also operated by the section. The section also acts as the Nodal Agency for the works executed by CPWD, Port Blair, and Electricity Department of A&N Administration.

Infrastructure Development and Repair Works Undertaken:

Estimates have been prepared for about Rs.100 lakhs of which about 50 lakhs have been utilised for repair and maintenance of residential and non-residential buildings and development of new infrastructures based on availability of funds. Under the infrastructure development two poly houses covering an area of 300 sqm each was constructed for experimental purpose under LSRB-DRDO project near Type-I quarters at Garacharma Farm. Similarly a nursery and pot plant shed covering an area of about 90 sqm area has been constructed for raising nursery and other purposes for the Farm Section at Garacharma Farm. The RCC pillars with square tops were constructed for carrying out experiment on Dragon fruit for Horticulture Division at Garacharma Farm. A store room covering an area of about 15 sqm has been constructed for storing pig feed for NRM division at Garacharma Farm.

Contour surveying and mapping was done for an area of about 1 ha. at Garacharma Farm near Calicut gate for establishing Island Bio-Diversity park at Garacharma Farm. Cricket pitch of size:332 x62 has also been constructed in the Sports ground near Type-I quarter for regular sports activity. Under repair and maintenance carpentry repair works were carried out in residential buildings and non-residential buildings, whenever required including painting, plumbing, sanitary, roof leakage and maintenance work was also attended and done. Repair of pot holes of CIARI road was also taken up. Main gate and roads side walls surrounding the office building complex were painted for face-lifting of the Institute. Institute and buildings name boards were replaced with new name as per the direction received from ICAR Head Quarter.

Workshop

Regular school trips and management of vehicles during major events of the Institute were done. The repair works related to routine and major repairs of staff car, jeep and staff/school bus were also carried out in stipulated time to facilitate research activity of the Institute.

Instrumentation Cell

Repairs and maintenance of scientific equipments, refrigerators, air conditioner etc. installed in the Central Laboratory and other building were carried out to keep it in good condition. Un-interrupted power

supply was also provided through generators during important meetings and functions of the Institute.

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.

Other activities undertaken

- Providing internet connectivity to all Scientists, Officers of CIARI.
- Maintenance of VSAT of 2 Mbps for browsing and downloading information, networking, DAMA VSAT, all the computers and its accessories.
- 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 and statistical analysis for scientists.
- Providing visual aids for different programmes.
- PERMISNET - Personal Management Information System Network- updating of personal records of staff through online. PIMS project information updated.

Institute Website

- Institute bilingual website is updated regularly by publishing the latest Institute progress in terms of research, technologies developed, tender notifications, recruitment notifications and other information .The domain name of CIARI website has been changed from January 2015 to http://icar-ciari.res.in.

ARS-Net Online Examination Centre

ARS-NET Online Exam Centre is equipped with 2 servers, switches, router, modem, 20 desktop/ terminals and one UPS. The centre has conducted Assistant Direct Recruitment Preliminary Examination – 2014 on 5th January 2015, wherein 27 candidates appeared, ARS-2014 (Preliminary) and NET(2014) (II) examination on 22nd to 28th September, 2014 wherein 24 candidates appeared and the first NET 2014 online exam from 26th Marcy, 2014 to 4th April, 2014, wherein 15 candidates appeared for the exam from this Centre. Mock tests were conducted before each exam. Three numbers of CCTV cameras were installed in the exam centre for monitoring the candidates during the exams from the Server room.

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" was implemented in our in the month of December, 2014. Username and passwords were provided to the staff of the institute for submitting the official works through online for reducing the use of paper. There are five modules of MIS-FMS which are financial management (bill creation, payment etc. Users- DDO, 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). Training to Scientists, Technical and Administrative staff were given by M/s IBM personnel beside, one month onsite support was also provided from 10th December, 2014 to 9th January, 2015.

AWARD AND RECOGNITION

Scientist	Award/ recognition	Awarding agency/ organizing society
D.R. Singh	Chairman	HVADA , A & N Administration
	Member	Task force for finalizing of DUS test guidelines of *Morinda citrifolia* L
	Member	State Variety Release committee, A & N Administration
	Expert member	For evaluation of nominations for gold medal in floriculture and fellowship of HSI, New Delhi
	Fellow	NABS
	Prestigious Brandis Award	Indian Forester for Best Research paper on "Noni (*Morinda citrifolia* L.)"
M. Sankaran, P. Krishnan, S.K. Zamir Ahmed & T. Damodaran	Fakruddin Ali Ahmed Award	ICAR, New Delhi
V. Baskaran	Member	For establishment of model floriculture unit for orchids in Andaman Nicobar Islands
	As expert/ judge	Flower show during ITF 2015
	Chairman	Committee for selection of State Level Best Farmer Award for the year 2015
	Expert for landscape gardening plan and execution	• OTM/MD ACCN Complex at North & Middle Andaman, Diglipur. • Waves Restaurant, Carbyn's Cove, Dept. of Tourism, A & N Island
Shrawan Singh	Best Scientist Award	ICAR-CIARI, Port Blair
K. Abirami	As expert/ judge	For judging state level exhibits in Gyanodhya
Pooja Bohra	Peer reviewer	Journal of Food Science and Technology (Springer link Publishers) International Journal of Genetics and Molecular Biology Research (Academic Journals
Ajit Arun Waman	Peer reviewer	• International Journal of Pest Management (Taylor and Francis Publishers) • Journal of Microbiological Research and Reviews (Discourse Journals)
	Elected Executive Member (South Zone) for 2015-2018	Medicinal and Aromatic Plants Association of India (MAPAI), Anand, Gujarat
R.K. Gautam	Fellow	Indian Society of Genetics & Plant Breeding, IARI, New Delhi
	Best Institute Building Award	ICAR-CIARI, Port Blair
Awnindra K Singh	Fellow	Indian Society of Pulses Research and Development, IIPR, Kanpur
	Recognition for Research Paper	OMICS, LA, USA (2013-14 & 2014-15)
	Recognition for the oral Presentation	Research paper during 3rd International Conference on Agricultural & Horticultural Sciences, Hyderabad, 27th – 29th October, 2014
	Best Research Paper Award	AABS, Dharwad
B. Gangaiah	Fellow	Indian Society of Agronomy (ISA) Award for the year 2014

A. Velmurugan	Best Research Paper in Hindi language	In National Seminar on "Role of agricultural science and technology in food and nutritional security", held at IIHR, Bengaluru from 4th - 5th June 2014
	Best Scientist for publication in Hindi (official language) for 2013-14	Foundation Day held on 23rd June 2014, CIARI, Port Blair
S. Swain	Member of Technical Scrutiny Committee (TSC)	NMFP programme, Directorate of Industries, Port Blair
T.P. Swarnam & A. Velmurugan	Best Research Paper Award - 2013-14	CIARI, Port Blair
T.P. Swarnam, & A. Velmurugan	Judged as top ten papers by Biomed Lib LLC, Charlottesville, VA published during the year 2013.	Pesticide Residues in vegetable samples from the Andaman Islands, India. Environmental Monitoring and Assessment, 185: 6119-6127
V. Murugan, T.P. Swarnam & S. Gnanasambandan,		Status and effect of pesticide residues in soils under different land uses of Andaman Islands, India. Environmental Monitoring and Assessment, 185: 8135–8145)
Jai Sunder, J., T. Sujatha, A.Raja, A. Kundu & M.S. Kundu	Awarded Best Oral Presentation	XXVIII annual convention and International Conference on Challenges and Opportunities in Animal Health at the Face of Globalization and Climate Change held at DUVASU, Mathura from 30 October to 1 November 2014.
T. Sujatha, A Kundu, Jai Sunder & M.S. Kundu	Awarded Best Oral Presentation	National Conference on Native Chicken held at TANUVAS, Chennai on 4 -5 September 2014.
Jai Sunder, T. Sujatha, N.Pazhanivel, A. Kundu & M.S. Kundu,	Awarded Best Poster (First)	Technical session on Gut Ecology during the Global Animal Nutrition Conference, GLANCE 2014 on Climate Resilient Livestock Feeding System for Global Food Security held from 20-22 April 2014 at Bengaluru, India.
T.Sujatha	Best Extension Scientist Award	ICAR-CIARI, Port Blair
N.C.Choudhuri	Best Technical Staff Award	ICAR-CIARI, Port Blair
S.K. Zamir Ahmed	Best Extension Scientist Award	ICAR-CIARI, Port Blair
	2nd Position for preparation and presentation of RFD- 2014	NPC-India at Manali
	Member, Task Force	Task Force Committee on "Biotechnology based programme for SC/ST Population and Rural Development ", Govt. of India, Ministry of Science & Technology Dept. of Bio Technology, New Delhi
NRM Division ICAR-CIARI	First prize	Awarded Best stall for the theme presentation in Island Kisan Mela 2013-14, ICAR-CIARI, Port Blair
	Best Division Award (2013-14)	During foundation day on 23rd June, 2014, CIARI, Port Blair
KVK, Nicobar	2nd Prize	Best Stall in Carnic / Tribal Festival- 2015 from A&N Administration for displaying IFS and agricultural technologies relevant for Nicobar District
Facilitator, KVK, Nicobar	Farmer Innovation Award	Mr. A Nazir Hussain, Using Tuhet, Teetop, Car Nicobar in the year 2014 from Tamil Nadu Fisheries University, Nagapattinam alongwith a cash of Rs. 3000/- for his innovation in fabrication of fishing gear by locally available material
Facilitator, KVK, South Andaman	Jagjivan Ram Abhinav Kisan Puruskar, ICAR, New Delhi	Shri Laxman Das, Kalipur, Diglipur in the year 2014 from Indian Council of Agricultural Research, New Delhi along with a cash of Rs. 50000 and a citation for his innovation in domestication and extraction of honey from wild stingless bee.

ON GOING RESEARCH PROJECTS

External Funded

Title	Principal Investigator	Co-PI (s)	Budget (lakhs)	Year of Start	Year of Completion
PPVFRA					
Development and Standardization of DUS Characteristics Procedures for Noni (*Morinda citrifolia* L.)	D. R. Singh	Shrawan Singh	22.17	2013	2016
Collection, Characterization and Utilization of Farmers Variety, Landraces and Wild Relatives of Indigenous Pulses of Andaman and Nicobar Islands Agro-Ecosystem	A.K. Singh	S. Swain & R.K. Gautam	20.00	2014	2017
LSRB-DRDO					
Standardization of Technologies to Ensure Supply of High Value Vegetables to Defence Forces in Nicobar Islands	Shrawan Singh	D. R. Singh	55.45	2011	2014
DASD, Calicut					
CSS-National Horticulture Mission Scheme on Spices	K. Abirami	V. Damodaran	10.55	2012	2017
NABARD					
Establishment of Out Reach Centre for North & Middle Andaman	S.K. Zamir Ahmed	-	79.69	2009	2015
Floriculture Based Sustainable Livelihood Model for Tropical Island Condition	V. Baskaran	-	17.06	2015	2017
Sustainable Rural Livelihood for Rural women through Enhanced Rural Poultry Farming Techniques in Andaman Islands	T.Sujatha	A.Kundu, M.S.Kundu & N.C. Choudhuri	8.99	2013	2016
ICAR					
AICRP on Vegetable Crops	Shrawan Singh	V.B. Pandey & D.R. Singh	-	2005	Contd.
AICRP on Tuber Crops	V. Damodaran	-	16.25	2003	Contd.
AICRP on Palms	Ajit Arun Waman	-	34.30	2015	2017
AICRP on Fruits	K. Abirami	-	-	2015	Contd.
AICRP on Flowers	V. Baskaran	-	-	2015	Contd.
ICAR Seed Project: Seed Production In Agricultural Crops	P. K. Singh	A. K. Singh & R.K. Gautam	66.50	2006	2016
Consortium Research Platform on Borers	T. Bharathimeena	I. Jaisankar	25.00	2014	2017
Operational Research Programme on Management of Sucking Pests of Horticultural Crops	T. Bharathimeena	-	30.00	2014	2017
All India Network project on Vertebrate Pest Management	T. Bharathimeena	-	25.00	2009	2017

AICRP on Management of Salt Affected Soils and Use of Saline Water in Agriculture	A. Velmurugan	T.P. Swarnam & T. Subramani	12.5	2014	2017
All India Coordinated Research Project on Integrated Farming Systems	T.P.Swarnam	S. Dam Roy (N.O), A. Velmurugan, T. Subramani, S. Swain, M. Sankaran, Shrawan Singh, M.S. Kundu, R. Kiruba Sankar, B.K. Nanda & I. Jaisankar	85.0	2010	2017
Sero Surveillance and Monitoring of FMD in Andaman and Nicobar Islands	Jai Sunder	A.K. De	6.50	2014-15	Contd .
AICRP on FMD	Jai Sunder	-	4.30	2014-15	Contd.
AICRP on Goat Improvement	Jai Sunder	M.S.Kundu & A.Kundu	57.0	2014	Contd.
AICRP in Animal Disease Monitoring and Surveillance	Jai Sunder	T. Sujatha	-	2014	Contd.
Poultry Seed Project	A.Kundu	T. Sujatha	190.68	2014	Contd.
AICRP on Pig	M.S.Kundu	-	142.06	2015	Contd.
Economic Impact Studies on Crop Diversification and Technology Adoption in Horticulture	S. K. Zamir Ahmed	Nagesh Ram	21.70	2015	2017
National Initiative on Climate Resilient Agriculture (NICRA)	Nagesh Ram	L.B. Singh, A. K. Singh, B.K. Nanda, N. Bommayasamy & N.C. Choudhuri	30.35	2010	2015
DBT, Govt. of India					
Marker Assisted Introgression of Bacterial Blight Resistance in Popular Rice cultivars of Andaman and Nicobar Islands	R. K. Gau tam	P. K. Singh & K. Sakthivel	69.00	2013	2017
IRRI, Philippines					
IRRI-ICAR Project on Stress Tolerant Rice for Africa and South Asia (STRASA)	R. K. Gautam	P.K. Singh, A. K. Singh, S. K. Zamir Ahmed & A. Velumurugan	7.00	2011	2015
Ministry of Agriculture, Government of India					
Monitoring of Pesticides Residue Analysis at National Level	A. K. Singh	-	10.50	2011	2017
IMD (MoES)					
Integrated Agromet Advisory Services for A&N Islands	A.Velmurugan	T. Subramani, S. Dam Roy, T.P. Swarnam, P.K. Singh, Shrawan Singh, A. Kundu, R. Kiruba Sankar, Nagesh Ram & S.K. Zamir Ahmed	60.0	2008	2017

DAC (MoA)					
FASAL (Forecasting Agricultural Output Using Space, Agro-Meteorology and Land Based Observations)	A. Velmurugan	T. Subramani	17.0	2011	2016
RKVY, A&N Administration					
Base Line Survey to Ascertain the Present Status of Chemical Residues in Soil, Water and Agricultural Products and its Regular Monitoring	T.P. Swarnam	A. Velmurugan & S.K. Zamir Ahmed	26.0	2012	2015
MOFPI					
Food Processing Training Centre (FPTC)	S. Swain	-	20.0	2014	2023
INCOIS-Hyderabad					
Location Specific Augmentation of PFZ Advisories using Satellite Altimetry and Fishing Ground Database	S. Dam Roy	Kiruba Sankar, R, P. Krishnan, A. Anand & K. Lohith Kumar	75.00	2013	2017
SAC, Ahmedabad					
Identifying Critical Habitats of Sea Cow (*Dugong dugon*) using Satellite Data	Kiruba Sankar, R,	R, Beena Kumari & Mini Raman	11.00	2013	2015
Integrated Coastal Zone Management	K. Lohith Kumar	Kiruba Sankar, R	20.0	2013	2017
Biophysical Characterization and Site Suitability Analysis of Indian Mangroves	S. Dam Roy	K. Lohith Kumar, Raymond Jani Angel & Kiruba Sankar, R	16.08	2014	2017
CMLREn (MoES), Cochin					
Marine Faunal Biodiversity of the Nicobar Group of Islands	Kiruba Sankar, R,	S. Dam Roy	75.00	2013	2017
NCSCM, Chennai					
Determination of Conservation Values of Mangroves	Kiruba Sankar, R.	K. Lohith Kumar, Raymond J. Angel, P. Krishnan & S. Dam Roy	11.00	2014	2015
NFDB, Hyderabad					
National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) of Andaman and Nicobar Islands	K. Saravanan	A. Anuraj, Venkatesh R Thakur & J. Raymond Jani Angel	51.35	2015	2018

Institute Funded Research Project

Division / Section	Project Title	PI	CO-PIs
Natural Resource Management	Assessment and Utilization of Soil Biodiversity for Improving Soil Health under Tropical Island Condition	A.Velmurugan	T.P. Swarnam & K. Sakthivel
	Assessing the Status of Pesticide Residues in Sediments and Aquatic Biota in Neil Island	S. Dam Roy	T.P. Swarnam, A. Velmurugan & R. Kiruba Sankar
	Feasibility Evaluation of Pulses Cultivation and Resource Optimization under Coconut Plantation	T. Subramani	A. Velmurugan, A.K. Singh, V. Damodaran, B.K. Nanda & T. Bharathimeena
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 & S. Swain
	Genetic Improvement of Pulses Crops for Andaman & Nicobar Islands Conditions	A.K. Singh	P.K.Singh & R.K. Gautam
	Development of Biotic Stress Resistant Lines in Brinjal (*S. melongena* L.)	P. K. Singh	Shrawan Singh
	Induction of Systemic Resistance through application of Potential Antagonistic Microorganisms against *Ralstonia solanacearum* causing Bacterial Wilt in Solanaceous Crops	K. Sakthivel	-
	Insect Pests of Legumes in the Andaman and Nicobar Islands: Bio-Ecology and Management	T. Bharathimeena	A.K. Singh
Horticulture & Forestry	Development of Production Technology for Ornamental Crops in Bay Islands	V. Baskaran	D. R. Singh, A. Velmurugan & K. Abirami
	Collection and Evaluation of Medicinal Plants of Bay Islands	K. Abirami	K. Abirami, D. R. Singh, V. Baskaran & V.Damodaran
	Collection, Characterization and Agro-Technique Standardization of Fruit Crops in A&N Islands	K. Abirami	D. R. Singh, Shrawan Singh, M. Sankaran, V. Damodaran & V. Baskaran
	Development of Dwarf And High Yielding Varieties in Coconut for Andaman & Nicobar Islands	V. Damodaran	K. Abirami
Animal Science	Rejuvenation and Improvement of Endangered Nicobari Fowl through Collection, Propagation, Selection and Conservation	A. Kundu	T.Sujatha, Zachariah George & N.C.Choudhuri
	Dietary Supplementation of Micronutrient to Improve the Productivity of Livestock	M. S. Kundu	Jai Sunder & A. Kundu
	Development of Enriched Chicken Egg and Meat	T. Sujatha	M.S. Kundu & A. Kundu
Fisheries Science	Mariculture of Selected Marine Fin Fishes and Shell Fishes of Andaman Waters	Kiruba Sankar, R,	Benny Varghese, Nagesh Ram, S. Murugesan & Raymond Jani Angel
	Studies on Stock Assessment and Biology of *Pristipomoides filamentosus* (Valenciennes, 1830) from Andaman Water	S. Monalisha Devi	S. Dam Roy, K. Lohith Kumar & Kiruba Sankar, R.
Flagship Programme	Integrated Agriculture System for Eco regions	S.Dam Roy / A.Velmurugan	-

PUBLICATION

Research Article

Abirami, K., Baskaran, V., Singh, D. R., Gopinath, K., Sakthivel, K and Dam Roy, S. (2014). Phytochemical profile and antifungal activity of *Costus sp* of Bay Islands. *Journal of Andaman Science Association*, 19(1): 45-49.

Abirami, K., Baskaran, V., Singh, D. R., Sankaran, M and Dam Roy, S. (2014). Ethnomedicinal knowledge of the Nicobari tribes of Harminder Bay, Little Andaman, Andaman and Nicobar Islands. *Flora and Fauna*, 20(2): 225-232

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Bohra, Pooja., Waman Ajit, Arun., Sathyanarayana, B.N., Umesha K., Anu S.R., Swetha H.G and Gourish R.K (2014). Aseptic culture establishment using antibiotics with reference to their efficiency and phytotoxicity in difficult-to-establish native Ney Poovan banana (*Musa*, AB). *Proceedings of the National Academy of Science, India, Section B Biological Sciences,* 84(2): 257-263. DOI 10.1007/s40011-013-0220-8.

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Manual

Sujatha, T., Kundu, A., Jeyakumar, S., Sunder, J., Dam Roy, S., Sarma Kamal and George Zachariah (2014). Azolla as feed supplement for livestock, backyard poultry and fish under Island Ecosystem. CIARI, Port Blair .pp

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Dam Roy, S., Kiruba Sankar,R., Krishnan Pand Anand, A (2014). Annual progress Report (2014-15) of the project "Location – Specific augmentation of PFZ using satellite altimetry and fishing ground data base" Submitted to INCOIS, Hyderabad. pp 28.

In addition to above 72 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

Town Official Language Implementation Committee, Port Blair has been awarded Second prize for the year 2013-2014 for best implementation of official language policy in Andaman and Nicobar Islands by Govt. of India, Ministry of Home Affairs, Dept. of Official Language at Kolkata on 18.02.2015.

Honour's to the Institute for Research, Development & Extension

Fakhruddin Ali Ahmed Award, for outstanding research in tribal farming system (2013),was bagged by the team comprising of M.Sankaran, P. Krishnan, S.K. Zamir Ahmed, and T. Damodaran by ICAR-New Delhi.

Foreign Deputation

As a Indian delegate, attended 18th CORRA meeting and 4th International Rice Congress (IRC) at BITEC, Bangkok, Thailand from 27th Oct.,- 1st Nov., 2014

Special deliberations

- Sea surface height based Potential fishing zones predictions- preliminary observations from Andaman Islands during 2th -5th Dec 2014 at MECOS2, Kochi
- Gear wise major fish catch from various fish landing centres of Andaman Islands in the 10th Indian Fisheries Forum at Lucknow during 12th - 15th November 2014
- Biodiversity of Small Island States – a Case from Andaman & Nicobar Islands during 10th Indian Fisheries & Aquaculture Forum, Lucknow
- Characterization and Conservation of Agricultural Biodiversity of A&N Islands
- Status of fisheries in Andaman and Nicobar Islands - a review on 21st October 2014 at ICAR-CIFE, Mumbai

Peer recognition

- Member, UT Coordinator Committee, A&N Administration, 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 Board for Wild Life, A&N Islands, Port Blair
- Member, State Level Water Quality Review Committee, A&N Islands, Port Blair
- Member, Andaman & Nicobar Science and Technology Council, A&N Islands
- Member, State Level Sanction Committee for Rashtriya Krishi Vikas Yojana, A&N Islands
- Member, State Level Advisory Committee for Narrow Casting Project under the scheme Mass Media Support for Agril. Extension, A&N Islands.
- Member, State Seed Sub-Committee for Agricultural & Horticultural Crops, A&N Islands
- Member, Inter Departmental working Group to monitor and oversee the functioning of KISAN CALL CENTRE of A&N Islands
- 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 Islands
- Member, High Value Agriculture Development Agency for the UT of A&N Islands
- Member, Governing Council of Andaman & Nicobar Coconut Mission
- Member UT level Task Force Committee for A&N Islands
- Member, Agriculture Technology Management Agency Governing Body of A&N Islands
- 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 Islands
- Member, Inter departmental 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 Operationalisation of National Policy for Farmers, 2007

Participation in important meeting, symposium and workshop

Period	Details
5th to 11th April, 2014	Meeting with Director NRC, Orchid, Sikkim to discuss on the Networking programmes
28th April, 2014	Interactive meeting of Vice Chancellors of Agril. Universities and ICAR Directors.
26th May, 2014	4th Meeting of Scientific Panel of Fish & Fisheries Products held at FSSAI, New Delhi
27th May, .2014	Workshop on Priority Setting, Monitoring and Evaluation in National Agricultural Research System : Status, Experiences and & Way Forward at NASC Complex, New Delhi
30th May, 2014	Review meeting on Germplasm related issues at IIHR Bangalore
5th ,6th & 7th June 2014	• Directors Conference at New Delhi • Lecture delivered by Prof. CNR Rao on the Foundation Day of NAAS at New Delhi • Workshop on Capacity Building Programme under NAIP
27th & 28th June, 2014	ICAR Regional Committee Meeting Zone II held at CIFRI, Barrackpore
19th July, 2014	First meeting to prepare Inventory of Agricultural Technologies for West Bengal and Andaman & Nicobar Islands at ZPD, Zone II, Kolka ta
29th July, 2014	ICAR Foundation Day and ICAR Award Ceremony at ICAR, New Delhi
30th July, 2014	Vice Chancellors and Directors Conference at ICAR, New Delhi
5th Aug., 2014	Selection Committee Meeting held at ASRB, New Delhi for the Head of Division, Animal Science for CIARI, Port Blair
19th & 20th Aug., 2014	Krishi Vigyan Kendra Interface Workshop at NASC Complex, New Delhi
20th Aug., 2014	Selection Committee meeting held at ASRB, New Delhi for the Head of Division, Fisheries Science for CIARI, Port Blair

22nd Aug., 2014	Meeting on Fisheries Group for the preparation of Agricultural Technologies at ZPD, Kolkata
8th Sept., 2014	Special Convocation of the Post Graduate School at AP Shinde Symposium Hall on Conferment of the Degree of Doctor of Science to Dr. Jose Graziano da Silva, Director General, FAO at National Agriculture Science Centre
1st Oct., 2014	Selection Committee Meeting held at ASRB New Delhi for the Head of Division, Natural Resource Management for CIARI, Port Blair
20th Oct., 2014	Visited CPCRI, Kasaragod, and discussed issues related to taking over the CPCRI Centre at Minicoy Island
21st Oct., 2014	National Symposium in Fisheries Science at CIFE, Mumbai
27th Oct. to 1st Nov. 2014	International Rice Congress (IRC) and 18th CORRA meeting at Bangkok, Thailand
12th No., 2014	Career Advancement Scheme meeting for promotion from Sr. Scientist to Principal Scientist Grade held at ASRB, New Delhi
13th to 15th Nov., 2014	10th Indian Fisheries & Aquaculture Forum at NBPGR, Lucknow
17th Nov., 2014	Career Advancement Scheme meeting for promotion from Sr. Scientist to Principal Scientist Grade held at ASRB, New Delhi
26th Dec., 2014	Meeting on establishment of Bio-security and Quarantine facility at Port Blair with NDDB, Anand
12th - 16th Jan., 2015	Residential Training Programme on e-Governance & Knowledge Management to be held at Goa
3rd - 6th Feb., 2015	12th Agricultural Science Congress at NDRI, Karnal

Facilitated salient research, development & extension achievement

- Twelve varieties in crops *viz.,* two each in rice (CIARI Dhan 8 & 9) and amaranthus, (CIARI Lal Marsha & CIARI Shan) one poi (CIARI Poi Red), three mung (CIARI Mung 1,2 & 3) and four in noni (CIARI Sanjivini, CIARI Rakshak, CIARI Sampada and CIARI Samridhi) were developed and released by the Institute Variety Release Committee of the Institute for the benefit of the farmers.
- A total of fifty seven germplasm *viz.*, French marigold (2) , African marigold (7) *Jasminum sambac (1)* Tania (1), Sweet Potato (1) Alacasia (1) *Casuarina equisetifolia* seeds (11), *Calophyllum inophyllum* (1), *Calaphyllum soulattri* (1), *Aphanomixis polystachya* (1), papaya (04), banana (2), coconut (13), *Cinnamomum* (3), *Calophyllum inophyllum* (12) and one each of Korangi, Crossandra, *Casuarina equisetifolia*, *Bixa orellana*, *Sesbania grandiflora* and *Lecana leucocephala* were collected from different parts of Andaman & Nicobar Islands.
- In tomato , variety Ayush gave 18t/ha followed by Arka Vikash (12t/ha), Arka Rakskak (11t/ha) and Arka Samrat (10t/ha), in case of chilli variety 2011/CHIVAR-8 gave 8.1 t/ha followed by 2012/CHIVAR-5 (7.6 t/ha) and 2013/CHIVAR-4 (7.4 t/ha). In brinjal variety Arka Nidhi gave 19.2 t/ha followed by 2013/BRLVAR-5 (16.5t/ha) and 2013 BRLVAR-4 (15.0t/ha) and in case of Ridge gourd variety Arka Sujat gave 95.0q/ha and Rama (90.0 q/ha) and 2012/RGVAR-3 (85.4q/ha) respectively. All these varieties were found to be promising.
- FYM enriched Bio consortia for the management of bacterial wilt were tested in field conditions at both Garacharma and Bloomsdale farms with varieties CARI B1 and local. In both the locations, Bio-consortia has proven to have high efficacy in controlling bacterial wilt of brinjal.
- 17 active compounds were estimated in cinnamon oil and clove oil using GC/MS. Cinnamaldehyde was the major compound contributing about 40.41% followed by ß-linalool (5.85%) and ß-phellandrene (5.57%). Similarly,

clove oil contained eugenol (74.03%) followed by Acetyleugenol (11.33%) and traces of other seven bioactive compounds. The essential oil content in cinnamon and clove was found to be 1.6 % and 1.8 % at 5-6 % of moisture content (w.b). Further, Cinnamon oil and clove oil was reported for its antibacterial activity against four bacterial culture *viz.*, *Bacillus Thurigenesis, Bacillus Subtilis*, L. *Sphaericus* and *Bacillus cereus*. The combination of *Bacillus subtilis, Bacillus cereus* and *Pseudomonas simiae* was found to be the better combination to promote plant growth under island conditions.

- Among green gram varieties evaluated under coconut plantation, ANM-11-12 recorded higher no. of pods/plant (7.14 no's), seed (8.40 no's) and seed weight/plant (2.06 g) which lead to higher seed yield (650 kg/ha).
- Among the red gram varieties, Co-6 recorded higher number of pods per plant (89 nos), seed weight/plant (22.31 g/plant) and grain yield (544 kg/ha) which was at par with ANP-12-02. Among the spacing adopted, 75×45 cm recorded higher number of pods/ plant (71 nos), seed weight/ plant (18 g/plant) and grain yield (520 kg/ha).
- Sweet potato leaf beetle pest is being observed for the first time and the incidence and damage is very severe. Two species of Hadda beetles, were observed to be severely damaging cucurbits, brinjal. Chrysomelid pest of cole crops, *Phyllotreta* spp. was observed for the first time. One unidentified Cerambycid pest of fruit trees were also collected. Beside, one new species of rat, *Rattus norvegicus* was observed as a pest of paddy.
- Kalmegh supplementation in feed at the rate of 3 g per bird per day reduced the serum cholesterol by 15%.
- FYM enriched Bio consortia for the management of bacterial wilt were tested in field conditions at both Garacharma and Bloomsdale farms with varieties CARI B1 and local. In both the locations, Bio-consortia has proven to have high efficacy in controlling bacterial wilt of brinjal.
- Inter se mating and selfing work was completed in Coconut at WCGC, Sippighat farm and a total of 1811 female flowers were pollinated.
- Out of twenty vegetable samples analysed for the presence of pesticide residues, about 65 % samples indicated the presence of Dimethoate and â-endosulfan in the range of 0.06 - 0.306 ppm and 0.005-0.01 ppm, respectively. Imidachloprid was found in 35% of samples (0.002-0.127 ppm), where as Triazophos and acetaniprid was found in 10 % of samples of vegetables (in brinjal, bhendi, cowpea, green chilli and French bean) in South Andaman.
- Successful captive breeding of Sebae anemone fish, *Amphiprion sebae*, Skunk anemone fish, *Amphiprion akallopisos*, Red Saddle anemone fish, *Amphiprion ephippium* has been achieved for the first time in ANI.
- Altogether, 72 species of true mangroves and mangrove associates distributed among 37 families and 68 genera were reported from the identified contiguous patches.*Pemphis acidula* Forst. (Lythraceae) has been rediscovered after a lapse of 91 years from Andaman and Nicobar Islands. Further, *Rhizophora* (Rhizophoraceae) hybrids were reported for the first time from Hut Bay (Little Andaman).
- Surveys were conducted at Jolly Buoy for identifying seagrass patches through snorkelling, wherein a total of 3 species *viz., Enhalus acoroides, Halophila ovata* a*nd Thalassia hemprichii* were recorded.
- Nicobari pigs successfully reared and breed under intensive system. Six piglets successfully weaned after two months without any piglet mortality.
- Out of 574 cattle sera samples screened, 16 showed positive for Infectious Bovine Rhino trachitis, while none of the samples showed positive for Brucellosis. All the feacal samples (18) of goat showed positive for Amphistome and strongly ova. Beside, a total of 131 cattle post FMD vaccinated sera samples were screened

for antibody response by LPB ELISA, out of which 79%, 80% and 76% revealed protective titer against type O, A and Asia I respectively.

- 120 demonstrations of HYVs of rice was conducted and it has been reported that CARI Dhan 5, Gayatri & and CSR 36 gave an average yield of 4.0 t/ha. followed CARI Dhan 4 (3.77 t/ha.) and CARI Dhan 3 (3.11 t/ha.) against the local check Jaya (2.57 t/ha.) respectively. The percentage increase in yield ranged from 32 to 63%. During PRA conducted in 2014, horizontal spread of CARI rice varieties was reflected in 1219.64 ha spread over 32 cluster of villages in North Andaman with Var. Gayatri (713.53 ha.), CARI 5 (146.17 ha), CSR 36 (132.14 ha.), CARI 4 (90.71 ha.), CARI 3 (60.63) and Ranjeet (20.68 ha.) in 32 cluster of villages at North Andaman. Beside, two hundred eggs and 100 ducklings of pekin duck were found to spread horizontally from farmer to farmer in 15 cluster of villages to 35 famers of Diglipur,at North Andaman
- A total of 4.6 ton truthfully labelled of rice was produced under farmers participatory in seed village concept at North Andaman. Beside, one ton of Elephant foot yam variety Gajendra was harvested under organic cultivation in coconut garden from an area of 0.06 ha.
- A total of 118 training have been conducted in agriculture and allied fields for the farmers of Andaman and Nicobar Islands by three KVKs, Institute and Out Reach Centre (ORC) , wherein a total of 1975 male and 1401 female totalling to 3376 got benefited. Beside, under TSP 29 training were conducted for tribal farmers, wherein a total of 767 male and 554 females totalling to 1353 got benefited.
- Five awareness programmes were conducted on PFZ advisories involving 93 fishermen at V.K Pur (8), Hut Bay (14), R.K Pur (13), Harminder Bay (18) and Pani Ghat (40). In addition one hundred twelve weather based agro advisories have been issued for Andaman and Nicobar Island for crop management through Rural Knowledge Centre, ATIC, AIR and DD for the stakeholders.
- "KISAN portal" was activated on 24th June 2014 for Andaman and Nicobar Islands. The registered farmers (1200) received agro-advisories through 140 SMS both in Hindi and English.
- "AAP ke Sawal" a new initiative to interact with the target clientele was launched in coordination with the DDK, Port Blair, to provide a platform for direct interaction with the stakeholders of the Island on every Wednesday.
- A total of 40 research papers of which 32 with NAAS rating of > 6 and eight with global impact were published.

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. Attending most of the programmes conducted by the KVK's.
- Facilitated implementation of QRT recommendation, meeting of RAC, conduct of IRC, Biosecurity meet .
- Taken initiative for establishment of Biodiversity park, flora and fauna museum,maintenance of World Coconut germplasm, medicinal garden, collection of papaya and banana accession from Andaman and Nicobar Islands. Continuous effort was given for conducting exploration and collection of underutilized fruits and encouraging the custodian farmers through awareness campaign under the PPV& FRA. Apart from this germplasm particularly with respect to sponges, sea grasses, mangroves, mollusks etc., fishes were being identified and documented.

- Infrastructure like, construction of store room of size 5.0m x 3.0m x 2.50m,construction of RCC column for establishment of dragon fruit, nursery and pot plants shed, and two polyhouses were done to facilitate research work.
- Conducted quarterly meeting with the line department under the Chairmanship of Secretary Agriculture, Chief Secretary of Andaman and Nicobar Administration as per guidance of Hon'ble Lieutenant Governor of Andaman and Nicobar Administration.
- Attended Regional Committee meeting to address the requirement of Union Territory.
- Organized events like National Science Day, International Women's Day, Kisan Mela at three districts of A& N Islands. Training & capacity building of the farmers and stakeholders through three KVKs of CIARI, Port Blair situated at North and Middle Andaman, Car Nicobar and South Andaman as well as through Out Reach Center at Diglipur. Also organized Foundation Day, Sports & Cultural meet, officers club meeting, ladies club meeting in order to provide outlet to the staff and family members.
- A major initiative was taken for the recruitment of the staff of three KVKs of these Islands, altogether 15 posts were filled comprising of Subject Matter Specialists (SMS), Farm Manager, Programme Assistant, Stenographer, Tractor drivers and Vehicle drivers. Filling of the post of Librarian, Technical Assistant like draughtsmen, gardeners etc. for the Institute is in anvil.
- Recruitment of Head of Division of Animal Science and Natural Resource Management was done and around 12 Scientists were brought under the fold of the Institute

Resource generation

- From externally funded projects ,an amount of Rs. 288.11 lakhs were approved during the period from different funding agencies.
- Revenue of Rs. 33.61 lakhs was obtained from farm produce of Sippighat, Garacharma, Bloomsdale, Animal Science and Laboratory analysis , beside Rs. 5.14 lakhs was generated from guest houses.

Budget utilization

- Out of allotted Rs. 480.00 lakh of Plan budget, Rs. 479.23 lakh was utilized (99.84 %) and in Non-Planof Rs 1607.95 lakh, Rs. 1551.63 lakh was utilized (96.46%).

PARTICIPATION OF SCIENTIST IN CONFERENCE / SEMINAR / SYMPOSIUM / MEETINGS & TRAINING

Scientist	Program	Venue	Date / Duration
S.K. Zamir Ahmed	Meeting on Screening Committee for Broadcast by the Political Parties	Prasar Bharti, All India Radio & DDK, Port Blair	3rd April, 2014
R. K. Gautam, P. K. Singh & K. Sakthivel	49th Annual Rice Research Meeting	DDR, Hyderabad	5th - 8th April, 2014
M.S.Kundu , Jai Sunder & T.Sujatha	Global Animal Nutrition Conference 2014	Bangalore	20th - 22nd April, 2014
Pooja Bohra	Professional Attachment Training	ICAR- IIHR Bengaluru	12th May - 12th Aug., 2014
Ajit Arun	Professional Attachment Training	ICAR- DMAPR, Gujarat	12th May - 12th Aug., 2014
Awnindra K Singh	8th Annual Workshop of MPRNL Project	BCKV, Kalyani	22nd - 23rd May, 2014
V. Baskaran	National Seminar cum Workshop on Physiology of Flowering in Perennial Fruit Crops	CISH, Lucknow	24th -26th May, 2014
K. Sakthivel	National Symposium on Plant Pathology in Genomic era	IGKV, Raipur	26th -28th May, 2014
A.Velmurugan & T.P. Swarnam	National Seminar in Hindi on Role of Agricultural Science and Technology in Food and Nutritional Security	IIHR, Bangaluru	4th -5th June, 2014
M.S.Kundu	Current Concepts and Recent Developments in Animal Feed Resources and Fodder Seed Conservation Technology	Veterinary Collage and Research Institute Namakkal, Tamil Nadu	16th - 25th June 2014
T.Sujatha	Annual Review meet on ADMAS	Imphal, Manipur	25th - 29th June, 2014
Jai Sunder	Regional Committee Meeting	Kolkata	27th - 28th June, 2014
S.K. Zamir Ahmed	1st Meeting of the Task Force Committee on Biotechnology based programe for SC/ST Population and Rural Development	New Delhi	1st - 2nd July, 2014
T.P.Swarnam	Regional Workshop on Strengthening partnership and Refined Methodology for on Station Experiments of AICRP on IFS	ANGARU, Hyderabad	9th -11th July, 2014
D. R. Singh	National Conference on Pre and Post Harvest Losses and Value addition in Vegetables	IIVR, Varanasi	12th -13th July, 2014
V. Damodaran	23rd Annual Group meeting of AICRP on Palms	DOR, Hyderabad	25th - 28th July, 2014
Shrawan Singh	Seminar cum Workshop on Strategies for Improvement, Enhancing Productivity and Utilization of *Cucurbitsheld*	CHES, Bhubaneswar	8th - 10th Aug., 2014
T. Bharathimeena	Workshop and Launch Meeting of Consortium Research Platform on borers in Network Mode	ICAR-IIHR, Bangalore	18th -19th Aug., 2014
T.Sujatha	Annual Review meet on Poultry Seed Project	PDP, Hyderabad	21st - 23rd Aug., 2014

L.B. Singh	International Training on Pest Risk Analysis	NIPHM, Hyderabad	1st- 5th Sept., 2014
V. Damodaran	Celebration of World Coconut Day	Port Blair	2nd September, 2014
K. Lohith Kumar	Inception Meeting on Determination on Conservation Value of Mangroves	NCSCM, Chennai	3rd Sept., 2014
S.K. Zamir Ahmed	Joint Task Force Committee Meeting on Biotechnology Based Programme on rural SC/ST & women community	SKUAST, Jammu	4th - 5th Sept., 2014
A.Kundu & T.Sujatha	National Conference on Native Chicken	TANUVAS, Chennai	4th - 6th Sept., 2014
D. R. Singh	Task Force Meeting to finalize the DUS guidelines for *Morinda citrifolia* L.	WNRF, Chennai	8th - 9th Sept., 2014
P. K. Singh	IX Annual Review Meeting of ICAR Seed Project- Seed Production in Agricultural Crops	ANGRAU, Hyderabad	21st - 23rd Sept., 2014
V. Damodaran	Midterm Review meeting of AICRP on Tuber Crops	CTCRI, Bhubaneswar	24th Sept., 2014
Jai Sunder	Annual Review meet on AICRP on Goat Improvement	Navsari, Gujarat	28th - 29th Sept., 2014
Jai Sunder	Workshop of AICRP on FMD	College of Veterinary Science, Guwahati	10th - 11th Oct., 2014
Jai Sunder	Vision 2050 meeting	Krishi Bhavan, New Delhi	25th - 26th Oct., 2014
Awnindra K Singh	3rd International Conference on Agriculture & Horticulture	HICC, Hyderabad	27th -29th Oct., 2014
K. Saravanan & T.Sujatha	International Conference on Challenges and Opportunities in Animal Health at the phase of Globalization and Climate Change	DUVASU, Mathura, UP	30th Oct - 1st Nov., 2014
Zachariah George	Model Training Course Production, Processing and Certification of Quality Bovine Semen	ICAR-CIRC, Meerut, U.P.	18th - 25th Nov., 2014
L.B. Singh	Workshop on NICRA & NE-IPNI	ZPD, Zone II, Kolkata	21st - 22nd Nov., 2014
T. Bharathimeena	The Workshop and the XII plan meeting of Operational Research Programme on Management of Sucking Pests in Horticultural Crops	ICAR-IIHR, Bangalore	3rd Nov., 2014
D. R. Singh, K. Abirami, Ajit Arun & Pooja Bohra	6th Indian Horticulture Congress	CODISSIA Trade Fair Complex, Coimbatore, Tamil Nadu	6th - 9th Nov., 2014
J. Raymond Jani Angel, K. Lohith Kumar, K. Saravanan, A. Anuraj & Venkatesh R. Thakur	10th Indian Fisheries and Aquaculture Forum	NBFGR, Lucknow	12th -15th Nov., 2014
A.Kundu	Meeting on Fodder Development	IGFRI, Jhansi	17th Nov., 2014
B. Gangaiah & A.Velmurugan	National Symposium on Agricultural Diversification for Sustainable Livelihood and Environmental Security	PAU, Ludhiana	18th - 20th Nov., 2014

Harapriya Nayak	Training on Entrepreneurship Development in Agriculture and Allied Fields	ICAR- DRWIA, Bhubaneswar	27th Feb., - 28th May, 2014
Nagesh Ram, L.B.Singh, N.Bommayasamy, B K Nanda, Shailesh Kumar, Pooja Kapoor & Manoj kumar	Science Communication through Cultural Events	Swedishi Science Movement, Kerala & CIARI, Port Blair	16th - 20th March, 2015
T.Subramani, N.Bommayasamy & Dibakar Khan	Intensive Training Workshop on Innovative/Best Practices in NeGP-Agriculture & Allied Sectors being organized by of India	Port Blair	24th – 26th March, 2015
A.Velmurugan, Kiruba Sankar, R & T. Subramani	Training Workshop on Innovative / Best Practices in NeGP Agricultural and Allied Sectors	Port Blair	24th -26th March, 2015
Jai Sunder	Meeting on Avian Influenza, Control and Preparedness for the Veterinary Officers	Goalghar, DAHVS, Port Blair	28th March, 2015
V. Damodaran	Farmers Meet under CDB Scheme	Directorate of Agriculture, A & N Administration, Port Blair	31st March, 2015

Foreign Deputation

Scientist	Program	Venue	Date / Duration
S.K. Zamir Ahmed	4th International Rice Congress 2014	BITEC, Bangkok, Thailand	27th Oct.,- 1st Nov., 2014
A.Velmurugan	Land degradation management and carbon sequestration	Ohio State University, USA	12th -24th June, 2014

HUMAN RESOURCES DEVELOPMENT OF STAKEHOLDERS

Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
Training to stakeholders					
High yielding varieties of rice and nursery management	26th - 27th June, 2014	165	Farmers	North Andaman (4 villages)	FCI&P & ORC
Value addition in flower crops	22nd July, 2014	31	Farmers	R. K. Gram, Diglipur	H&F, ORC
Organic farming	24th July, 2014	30	Farmers	South Andaman	NRM
Backyard poultry farming	28th August - 1st Sept., 2014	26	Farmers	Car Nicobar	NRM
Development of value added products from mango, pine apple and jamun fruit	5th Sept., 2014	44	Farmers	ATIC, SSS	NRM
Scientific vegetable cultivation of vegetables and drumstick	30th Sept., 2014	25	Farmers	Neil Island	H&F
Weed and nutrient management in vegetable and plantation crops	29th - 31st Oct., 2014	50	Farmers	Harminder Bay	NRM
Safe use of insecticides in agriculture	2nd Nov., 2014	40	Farmers	ORC, Diglipur	FCI&P and ORC
Management of rice seed crop	20th Nov., 2014	78	Farmers	Hut Bay, Little Andaman	FCI&P
Women empowerment on rural poultry by enhanced rural poultry farming techniques	15th -17th Dec., 2014	30	Rural women	Neil Island	NABARD & CIARI
Cultivation of spices	26th - 27th Dec, 2014	60	Farmers	Kadamtala	H & F, KVK,
Flower and vegetable cultivation	30th Dec., 2014	31	Farmers	ORC	H&F
Role of quality seed in agriculture and their storage	12 Feb., 2015	45	Farmers	ORC	FCI&P & ORC
Floral bouquet making as livelihood option for women	18th Feb., 2015	31	Women Farmers	ORC	H&F, ORC
Value addition of flower crops	17th, 2015 March	23	Students	JNRM College	H&F
Cultivation of spices as livelihood option for Island farmers	19th - 21st March, 2015	25	Farmers	ATIC, SSS	H & F, SSS & ACANI

Extension Activities

Title	Period	Participants (Nos.)	Type of participants	Venue	Conducted by
Awareness on scientific goat farming	24th Sept.,2014	30	Livestock Farmers	CIARI	ICAR-CIARI
	3rd Feb.,2015	33		Ranchi Basti village	DAH & VS, A & N Admn.
	5th Feb., 2015	64		Sippighat village	KVK, Sippighat DAH & VS, A & N Admn.
	11th Feb., 2015	41		Calicut village	DAH & VS, A & N Admn.
Sensitization programme on control of FMD	22nd August, 2014	32	Paravet staffs, DAHVS, A&N Admn	Goalghar, DAH&VS	DAHVS, A&N Admn.
Awareness on status and control of FMD in cattle	3rd March, 2015	42	Livestock farmers	Rangachang, S. Andaman	DAH & VS, A & N Admn.
	9th March,2015	30	Livestock farmers	Kamaraj Nagar, S.Andaman	DAH & VS, A & N Admn.
Animal health camp	26th March, 2015	156	Livestock	Sippighat	KVK, Sippighat, DAH & VS, A & N Admn.

Radio Talks

Title	Date of broadcast	Expert
Monsoon se pehle pahsun me ahtiyat	9th April, 2014	Jai Sunder
Suitable rice varieties for Islands	11th April, 2014	R. K. Gautam
Monsoon se pehle pahsuvon me ahtiyat	17th April, 2014	Jai Sunder
Sorghum cultivation for fodder in Island	1st May, 2014	S.Dam Roy
Rainshelter technology for vegetable cultivation	19th May, 2014	Shrawan Singh
Murgipalan se arthik sammridhi	19th May, 2014	N.C.Choudhuri
Dhan ki kheti main brown manuring	04th June, 2014	N. Bomayasamy
Dweepon me bater palan	12th May, 2014	A.Kundu
Canopy management on fruits crops	16th May, 2014	L. B. Singh
Biodiversity & Agriculture	22nd May, 2014	S.Dam Roy
Cultivation of fodder for livestock in the Islands	17th June, 2014	M.S.Kundu
Weather based farming	Weekly program (June 2014 to March 15)	A.Velmurugan
Technologies for vegetable production in Andaman and Nicobar Islands	30th July, 2014	Shrawan Singh
Rice production technologies under low land conditions	31st July, 2014	A.Velmurugan
Minor fruits	18th Aug., 2014	D.R.Singh
FMD in livestock	18th & 21st Aug., 2014	Jai Sunder
Discussion with Award winning Scientist	18th Aug.,2014	S.Dam Roy
Dwipon me tamatar ki kheti	24th Aug., 2014	Shrawan Singh
Dweepon main Moogfali ka kheti	27th Aug., 2014	N. Bommayasamy
Polythene mulching in flower crops	4th Sept., 2014	V. Baskaran
Safe vegetable production and consumption	18th Sept.,,2014	T.P.Swarnam
Parthenium weed management	25th Sept., 2014	T. Subramani
Jeevanu murjhan pratirodhi kism kairee baigan 1	14th Oct., 2014	P. K. Singh
Rodent management in paddy crop	14th Oct., 2014	R. K. Gautam
Ande ba mans utpadon ka mulya sambardhan	18th Oct., 2014	N.C.Choudhuri

Murgi palan mein bisankraman aur swachhata	31st Oct., 2014	A.Kundu
Gobhi vargiya sabjiyon mein narsury prabandhan	4th Nov., 2014	A.K.Tripathi
Murgi palan mein bisankraman aur swachhata	6th Nov., 2014	A.Kundu
Dwipon me mirchi ki kheti	10th Nov., 2014	Shrawan Singh
Integrated nutrient management in plantation crops	13th Nov., 2014	L. B. Singh
Rabi crops ke liye KVK Ki Taiyariyan	14th Nov., 2014	Nagesh Ram
Prospects of floriculture in A& N Islands	17th Nov., 2014	D.R.Singh
Azolla cultivation under IFS field	8th & 22nd Jan., 2015	I. Jaisankar
Maintenance of power tiller	28th Nov., 2014	B.K.Nanda
Poshak grah vatika kyun aur kaise	19th Jan., 2015	Amit Srivastava
Fodder production under silvipasture system for Andaman and Nicobar Islands	29th Jan., 2015	I.Jaisankar
Quail farming	21st Jan., 2015	A.Kundu
Pulse intercropping under coconut plantation	4th Feb., 2015	T. Subramani
Cultivation of multipurpose trees under Integrated Farming System	27th Feb., 2015	I. Jaisankar
Care of ponds during summer months	27th Feb., 2015	S.Dam Roy
Dwipon me phoolgobhi ki kheti	28th Feb., 2015	Shrawan Singh
Integrated Disease management in organic farming	Feb., 2015	K. Sakthivel and A. Velmurugan
Mushroom cultivation in organic farming	March, 2015	K. Sakthivel and A. Velumurugan

Farm School (in Tamil)

Title	Date of broadcast	Expert
Farm School: Enhancing food production and organic farming in the coastal areas	10 weeks (Sept. 14 to Nov 14)	A.Velmurugan, T.P.Swarnam, T.Subramani, I. Jaisankar & K.Sakthivel
IFS for prosperity and stability	10 weeks (Feb – April 15)	A.Velmurugan, T.P.Swarnam, K.Sakthivel, I.Jaisankar, T.Subramani & K.Saravanan

Doordarshan Interview

Title	Date of broadcast	Expert
Management of degraded land: technological options for A&N Islands	10th April, 2014	A.Velmurugan, T.P.Swarnam, & T.K. Biswas
Sorghum and CARI Brinjal 1 varieties	22nd April, 2014	R. K. Gautam & P.K. Singh
Sorghum cultivation production for fodder in Island	1st May, 2014	S.K. Zamir Ahmed & P.K. Singh
Land shaping methods for degraded coastal areas	8th May, 2014	A.Velmurugan
Role of KVK in promotion of agriculture and allied sector in A & N Islands	10th May, 2014	Nagesh Ram
Agriculture as livelihood option	25th June, 2014	S.K. Zamir Ahmed
Quail farming in A&N Islands	26th Jan., 2015	A.Kundu

Quail farming in A&N Islands	26th Jan., 2015	A.Kundu
Livelihood options in agriculture and allied for the farmers and youth	28th Jan., 2015	S.K. Zamir Ahmed
Potential underutilized fruits of A&N Islands	30th June, 2014	D.R.Singh
Potential leafy vegetables in Island	30th June, 2014	D.R.Singh
Fresh water fish seed production	June,2015	Nagesh Ram
Brown manuring in paddy	June,2015	N.Bommayasamy
Balance diet for women	June,2015	Harapriya Nayak
FMD in livestock	30th July, 2014	Jai Sunder
Plant propagation technique on fruit crops in Andaman and Nicobar Islands	July,2015	L B. Singh
Nutritional Anaemia	July, 2015	Harapriya Nayak
Use of drudgery reducing small farm implements	July, 2015	B. K. Nanda
Broiler farming practices	Aug., 2015	N.C.Choudhuri
Grafting techniques on tree spices	Aug., 2015	L B. Singh
Crab fattening technique	Aug., 2015	Nagesh Ram
Prospects of culture of Catfish (Singhi& Magur) in Andaman	3rd Aug., 2014	Nagesh Ram
Narrow casting programme on goat feeding practice	5th Aug., 2014	M.S.Kundu
How to increase rice productivity through improved varieties	13th Aug., 2015	R. K. Gautam
Multi storied cropping system in plantation crops	14th Aug., 2014	M. Sankaran & V. Damodaran
Indigenous germpolasm of A&N Islands with special reference to Nicobari Fowl	21st Aug., 2015	A.Kundu
Weather based farming practices	21st Aug., 2014	A.Velmurugan
Bio – pesticides preparation and its application	25th Aug., 2014	N.Bomayasamy
Cultivation of tuberose	1st Sept., 2014	V. Baskaran
Paddy cultivation in Islands	3rd Sept., 2014	P. K. Singh
Dweepon mein mung ki unaat kheti	8th Sept., 2014	Awnindra K Singh
Fodder resources and their cultivation practices for better livestock production	8th Sept., 2014	M.S.Kundu
Sanitation and hygiene in poultry farm	9th Sept.,2014	A.Kundu
Value of medicinal plants	10th Sept., 2014	K.Abirami
Diseases on goats	10th Sept., 2014	Jai Sunder
Sanitation and hygiene in poultry farm	11th Sept., 2014	A.Kundu
Organic farming is the need of the hour	17th Sept., 2014	A.Velmurugan
Integrated farming system for hilly areas of the Island	Sept., 2014	T.P.Swarnam
Use of biopesticide in pest & disease management	Sept., 2015	N.Bommayasamy
Scientific pig farming	Sept., 2015	N.C. Choudhuri
Value addition in flowers	2nd Oct., 2014	V. Baskaran
जीवाण मुर्झान प्रतिरोधी किस्म कैरी बैंगन 1	14th Oct., 2014	P. K. Singh
Growing medicinal plants in kitchen garden for primary health care	16th Oct., 2014	K. Abirami
Organic cultivation of elephant foot yam under coconut plantation	27th Oct., 2014	V. Damodaran
Intercropping of ginger in coconut	30th Oct., 2014	V. Damodaran

Pond based farming system	Oct., 2015	Nagesh Ram
Scientific papaya production in Andaman	Oct., 2015	L. B. Singh
Vegetable production in Andaman and Nicobar Islands	20th Nov., 2014	Shrawan Singh
Increasing rice productivity in A&N Islands through purification of local varieties	26th Nov., 2014	R. K. Gautam
Growing specialty flowers in Islands	27th Nov., 2014	V. Baskaran
द्वीपों में उरद कि खेती	27th Nov., 2014	Awnindra K Singh
Scope of speciality maize production	Nov., 2015	N.Bommayasamy
Backyard poultry farming	Nov., 2015	N.C. Choudhuri
Alternate poultry scope and importance in the Islands	11th Dec., 2014	A.Kundu
Kitchen garden for food & nutritional security	Dec., 2015	Harapriya Nayak
Round the year pineapple cultivation techniques	Dec., 2015.	L. B. Singh
Nutritious kitchen garden	19th Jan., 2015	Shrawan Singh
Quail farming in A&N Islands	20th Jan., .2015	A.Kundu
Kisanoe evam Yuva ke Swarojgaar ke liye CIARI ke aham Bhumika	20th Jan., 2015	S.Dam Roy
Backyard poultry farming	21st Jan. 2015	A.Kundu
Plant propagation technique on fruits crops	21st June, 2014	L.B.Singh
Scientific cultivation of gladiolus	22nd Jan., 2015	V. Baskaran
Diseases of cattle and its control measures	3rd Feb., 2015	Jai Sunder
Career prospects of the students of agriculture and allied fields in coming decades	4th Feb., 2015	S.K. Zamir Ahmed, Jai Sunder &Shrawan Singh
High yielding rice varieties for A & N Islands	4th Feb., 2015	R. K. Gautam
Dweepon mein arhar ke kasht ki sambhavnayein	9th Feb., 2014	Awnindra K Singh
FMD in cattle & livestock	18th Feb., 2015	Jai Sunder
Out Reach Centre (ORC) ki krishi prasar gatividhiya	25th Feb., 2015	S.K. Zamir Ahmed
Andaman evam nicobaar dweep samuh mein dalhani faslon ki kheti	26th Feb., 2015	Awnindra K Singh
Ghar ke peeche sabjiyon ki kheti	4th March, 2015	S.Dam Roy
Marigold cultivation	09th March, 2015	V. Baskaran
High yielding rice varieties	11th March, 2015	R. K. Gautam
Noni for livelihood and health security	14th March, 2015	Shrawan Singh
Sapota production technology in a Andaman	16th March, 2015	L.B.Singh
Livelihood opportunity in agriculture and allied fields	17th March, 2015	Jai Sunder
Spices utilization in Andaman and Nicobar Islands	25th March, 2015	L.B.Singh
Dweepon main machlipalan ki sambhavanayen	22nd Oct., 2014	Nagesh Ram
Horticultural crops	24th Dec., 2014	L.B.Singh
Scientific banana production in A& N Islands	23rd Feb., 2015	L.B.Singh
Integrated fish farming system	26th Feb., 2015	Nagesh Ram
Oyster mushroom cultivation	3rd March, 2015	Harapriya Nayak

TRAINING AND CAPACITY BUILDING

Scientist	Program	Venue	Date / Duration
R.K.Gautam, S.K. Zamir Ahmed & Jai Sunder	MDP Workshop on PME of Agricultural Research Project	NAARM, Hyderabad	4th - 8th Aug., 2014
T. Subramani	Model Training Course on Technology Management	NAARM, Hyderabad	18th -23rd Aug., 2014
S.K. Zamir Ahmed	Result Framework Document (RFD) and Balance Scorecard for Performance Measurement	Manali, HP	22nd - 26th Sept., 2014
A.Velmurugan	Training on Data analysis and SAS	NAARM, Hyderabad	10th - 15th Nov., 2014
I. Jaisankar	Short Training Course on Ecosystem Services on Agroforestry Systems	ICRISAT, Hyderabad	16th - 21st Nov., 2014
S.Dam Roy	Residential Training Programme on e-Governance & Knowledge Management	Goa	12th - 16th Jan., 2015

ROUND UP OF INSTITUTE ACTIVITIES

Celebration of Independence Day and Republic day

Independence Day and Republic Day were celebrated in the institute with gaiety and fervour. Dr. S. Dam Roy, Director CIARI hoisted the National flag. Highlighting the achievements of the Institute during the he applauded the staff members for their commendable contribution for accomplishing new heights in the research, development and extension activities. After the flag hoisting ceremony, various events like quiz, drawing competition for children's and fun games for ladies were arranged in the forenoon.

During the Republic day celebration Director CIARI, unfurled the National flag. In his address he appreciated the staff members for their valuable contribution towards the research and development of the institute in the last one year. On this occasion Director gave away the commendation certificates and reward money to the best employee among the Technical, Administrative, Supporting and TSM staff. Variety programmes for the staff and children's were also held on the occassion.

Republic Day Celebration at KVK-Nicobar

The 66th Republic Day was celebrated at KVK-Nicobar on 26th January, 2015 in a befitting manner with tribal farmers.

Republic Day Celebration at KVK, Nimbudera

The 66th Republic Day was celebrated at KVK-Nimbudera on 26th January, 2015 in a befitting manner with farmers and Pradhan of Basantipur.

Swachh Bharat Abhiyan

Launching of Swachh Bharat Abhiyan at ICAR-CIARI on 2nd October 2014

Along with whole country, the Swachh Bharat Abhiyan was launched at ICAR- Central Island Agricultural Research Institute, Port Blair by the Director on 2nd October 2014, the birth anniversary of Shri. Mahatma Gandhi and Shri. Lal Bahadur Shastri. On this auspicious day, Director paid homage to these two great sons of Mother India.

The Swachh Bharat Abhiyan at the Institute started with the Swachhata Shapath by all the staff members at Conference hall. Later, cleaning of CIARI campus premises was done by the staff members (including project staff) which covered the areas from entry gate to the residential campus. Swachhta Abhiyan was also launched in the other campuses of CIARI *viz*. Marine hill, Sippighat farm, Bloomsdale farm, KVK, Sippighat, Nimbudera and Nicobar.

Oath taking & Cleaning of premises on 2nd October 2014

Various activities were initiated by the institute to continue the Swachh Bharat Anbhiyan ,which were reviewed and monitored routinely. Many important points were suggested during the meeting to make the campus clean and green. Along with the cleaning of the premises, it was suggested to all HoDs/I/c section to create awareness among the staff members to maintain their division/lab/farm premises neat and clean. Some of the important activities which have been taken are:

- Weeding of the old newspapers/files stacked in the library for many years.
- Weeding and cleaning of old records/documents etc from the division and office.
- Cleaning of the back side of the laboratory.
- Replacing the broken/hanging/non-working electrical bulbs/tube lights switches in the office buildings.
- Displaying of wall mounted photographs of Nobel laureates and great Scientists for the aesthetic look of the corridor of the Central lab and the library.
- All the equipments/almirahs/refrigerators etc kept the corridor were kept in proper places.
- Regular cleaning of the office building, library, and laboratory are being carried out.
- Every Saturday of the month (except 2nd Saturday) has been declared as Shram Dan Day. On this day all the staff members of the Institute participate voluntarily for cleaning of the premises.

Shram dan on 3rd March 2015

All the staff members of the institute participated in the Shram Dan activity declared as a part of the Swachh Bharat Abhiyan which were launched by Dr S. Dam Roy, Director, CIARI. Staff members took active participation in the cleanness drive at library, office building, residential complex and campus premises.

Swachh Bharat Programme at KVK-Nicobar

Organized an awareness programme on Sanitation and Hygiene for the tribal people of Sawai Village, Car Nicobar .The KVK-Nicobar staff observed Swacha Bharat programme for making the KVK premises clean on every saturday.

Awareness on Sanitation & Hygiene

Central Island Agricultural Research Institute Employees Welfare Association (CIARIEWA)

CIARIEWA, the welfare arm of the Institute is engaged in organizing welfare activities for the employees, during the year.

- Awarded scholarship to the wards of the CIARIEWA members, who excelled in the higher secondary (10+2) board examination (Miss P. Jyothi Priya D/O Mr. P Simhachalam and Miss Soni Salomi Baraik D/O Mr Sanichar Baraik were awarded the scholarship on 15th August 2014).
- Selected the best workers of the Institute for the year 2014. (Mr. Theophil Gidth from Animal Science Division under technical category; Shri Nehru Ram, under Administrative category , Shri P. Malaikanu of G/Farm and Shri Tulsi Das of NRM Division under Skill Supporting Staff category and Smt S. Pancha of NRM Division under T.S.M category received best worker award on 26th January, 2015).
- Coordinated meeting of the Central Government Employee Welfare Association in which all the heads of the Central Government Offices at Port Blair were present and discussed on the welfare issues of the employees.
- Facilitated to organize the cultural programme by the wards of CIARIEWA members on the eve of annual day of Central Government Employees' Welfare Associations at ALHW campus and also during the Central Island Kisan Mela 2015 held at CIARI. Beside, drawing and painting competition were organized among the wards of the staff on the eve of Independence Day and Republic day.
- Organized farewell function in honour of the members during their transfers (5), superannuation (9) and welcomed the new members joining CIARI and KVK.
- CIARIEWA bids farewell to Shri B. Dhanaraju
- Facilitated collection of fund for flood victims of the Kashmir in response to the request of the Vice Chancellor of Sher-e-Kashmir University of Agriculture and Technology of Kashmir. The association also extended help for treatment of one of the ward of staff at Mainland hospital.
- The association also placed the charter of demand for consideration to the Chairman of 7th CPC on 5th February, 2015.

CIARIEWA bids farewell to Shri B. Dhanaraju

National Science Day (NSD) at Institute

National Science Day-2015 under the theme "Science for Nation Building" in honour of Nobel laureate and great Indian Physicist Sir C.V.Raman for his discovery of Raman Effect was conducted from 23rd to 28th February, 2015. Open day, farmers right sponsored by PPV & FRA, poster display, mini science quiz, , innovative programme for farm women, home makers and ladies staff of the Institute, Ek mulakat vaigyanik ke Sath and elocution competition were the programmes conducted during the NSD – 2015 .

Dr. S. Dam Roy, Director, ICAR-CIARI, impressed upon the participants on the Nobel work of Sir C.V. Raman, known as Raman Effect which was discovered on 28th February and is being celebrated as National Science Day every year by our Nation. He appreciated the talent of the students of rural areas who participated during the poster presentation, mini science quiz, Ek mulakat vaigyanik ke saath and elocution competition. He also appreciated the conduct of National Science Day from 23rd onwards in befitting manner which also had the attraction of Open day, farmers right and innovative programme for the women. Further he also shared his thought on the topic "Beti Bacho aur Beti padhao" The winners



of the poster making, mini science quiz, extempore (women) and elocution competition for students and staff were suitably awarded. A total of 427 participants attended the week long programme.

Auto Seed Planter introduced during NSD 2015

As a part of the National Science Day (NSD) 2015 , on 25th February, 2015 an **Auto Seed Planter** which is used for precision farming and zero tillage was introduced and dedicated to the Island farmers by Dr. S.Dam Roy, Director, ICAR-CIARI in presence of Dr. R.K. Gautam, HoD, Field Crops, Dr. A.K. Singh, Senior Scientist, Dr. Nagesh Ram, PC, KVK and Dr. S.K. Zamir Ahmed, Incharge Social Science.

While lauding the effort of Dr. A.K. Singh, Senior Scientist the Director advised the farmers to use the machine which will be kept in the premises of the KVK, South Andaman for sowing the crops like mung, urad, arhar, maize, okra etc. in the residual moisture after the harvest of the rice crops. He further informed that the machine enables the farmer to maintain spacing and save both seed and labour to the tune of 32 to 46%.

Later, the farmers from South and Middle Andaman were shown both in house and field demonstration of the Auto Seed Planter. A total of 61 farmers of which 34 women and 27 men participated. The NSD-2015 was coordinated by Dr. S. K. Zamir Ahmed alongwith Mr. Amit Srivastava and Mrs. Rina Saha.

National Science Day at KVK, Car Nicobar

Painting / drawing competition for students of GSSS Lapathy with the theme of Science for Nation Building was organized on 27th February, 2015 at GSSS Lapathy, alongwith popular lecture on science and video film show on activities of KVK, wherein 50 students participated. Exhibition on "Agricultural


Technologies for Nicobar" was also organized at Community Hall, Big Lapathy for students, teachers and general public on 28th February, 2015 as a part of National Science Day – 2015 celebration. A total of 200 individuals witnessed the exhibition.

National Science Day at KVK, Nimbudera, North & Middle Andaman

National Science Day was observed by KVK, Nimbudera by organizing painting / drawing and quiz competition for students of GSSS Govindpur and also lecture and various competition for farmers and farm women at Vegetable market, Nimbudera with the theme of Science for Nation Building on 27th& 28thFebruary, 2015. About 200 students and 100 farmers and farm women participated.



Observation of National Science Day - 2015 at Nimbudera

Carnic/Tribal Festival-2015

KVK, Car Nicobar participated in Carnic/Tribal Festival – 2015 at BJR Stadium, Tamaloo, Car Nicobar, by putting up a stall under the theme "Integrated Farming System" from 7th – 10th January, 2015 for the benefit of the tribals. The stall was adjudged with second prize.



Carnic/Tribal Festival - 2015 at BJR Stadium, Tamaloo, Car Nicobar

Kisan Mela at Car Nicobar

The ICAR-Krishi Vigyan Kendra-Nicobar, Car Nicobar, ICAR-Central Island Research Institute, Port Blair organized one day KISAN MELA-2015 with the theme "One Drop More Crops" at Priyadarshini Auditorium, BJR Stadium, Tamaloo, Car Nicobar on 25th March, 2015 for the farming community, students and interested persons of Car Nicobar. During the Kisan Mela, activities of different development department of Car Nicobar *viz.* Department of Agriculture, Department of Animal Husbandry & Veterinary Services, Department of Fisheries, Department of Industries and KVK-Nicobar were displayed for highlighting agricultural technologies for general awareness. Dr. S. Dam Roy, Director, ICAR-CIARI, Port Blair, inaugurated the event in the presence of Guest of Honour Shri. Akhil Kumar, Assistant Commissioner, Car Nicobar and officers of the Line departments and members of Tribal Council, Car Nicobar. The event was graced by Dr. Dulal Biswas, SVO, Dept. of AH&VS, Shri. Abdul Salam,

Assistant Director, Dept. of Fisheries, Shri. M. Hassan, DPD, ATMA, Car Nicobar, Shri. T. Aboobaker, Incharge, Dept. of Industries, Shri. Nagrajan, AO, Dept. Agricuture, Car Nicobar, Shri. Paul Benjamin, 1st Headman, Tamaloo, Shri. Kindness Israel, 1st Headman, Kinmai, Shri. Lawrence Mathew, 1st Headman, Tapoiming, Shri. Regional Watchful, 1st Headman, Kimios, Shri. Othniel Timothy, 1st Headman, Kinyuka, Shri. K. Marcus, 2nd Headman, Small Lapathy, Shri. George Samuel, 2nd Headman, Kakana along with other dignitaries. A total of 65 school students from Govt. Middle School, Tamaloo, Car Nicobar marched to the event and witnessed the exhibition at Kisan Mela. Altogether 250 farmers representing 15 villages of Car Nicobar and 45 officials and staff of Government departments participated in the Kisan Mela 2015.



Kisan Mela at Nimbudera, North & Middle Andaman

The ICAR-KrishiVigyan Kendra, Nimbudera, organized one day KISAN MELA-2015 with the theme "One Drop More Crops" in the premises of KVK on 30th March, 2015 for the farming community, students and interested persons/ public of N&M Andaman. During the Kisan Mela, activities of different development department of N&M Andaman *viz.* Department of Agriculture, Department of Animal Husbandry & Veterinary Services, Department of Fisheries, Medical Department and KVK was displayed for highlighting agricultural technologies for general awareness. Innovative farmers and Self help groups also came forward to display their farming practices and products. Shri. K. Shirnivasan, Adhyaksh, Zilla Parishad inaugurated in the presence of Guest of Honour Shri A.K. Trivedi, Assistant Commissioner (HQ), Mayabunder and officers of the Line departments and PRI's members of N&M Andaman. A total of 25 school students from Govt. Secondary School performed cultural events highlighting importance of organic farming and evils of alcoholism. Altogether 350 farmers from all the 03Tehsil *viz* Diglipur, Mayabunder and Rangat and 35 officials and staff of Government departments participated in the Kisan Mela - 2015.



KISAN MELA-2015 with the theme "One Drop More Crops"

Major Events Conducted (April 2014 to March 2015)

Sl. No.	Events	Date
1.	Online HYPM and RFD 2014-2015 of the Institute	April, 2014
2.	International Day for Biological Diversity on the theme Islands Biodiversity	21st to 22nd May, 2014
3.	Post harvest and product development for Nicobari fishers in collaboration with CIFT, Cochin and State Fisheries Andaman and Nicobar Administration under Tribal Sub Plan (TSP)	26th to 27th May, 2014
4.	IRC Meeting -2014	19th to 20th June, 2014.
5.	36th Foundation day of the Institute was celebrated, wherein Prof. K. V. Devaraj, Former Vice -chancellor, U.A.S, Bengaluru, delivered the foundation day lecture on the topic "Island agriculture and agro - biodiversity"	23rd June, 2014.
6.	Interfacing Innovation and IPR for Diffusion of Technology at Port Blair	9th July, 2014
7.	86th ICAR Foundation day Celebration at Institute	16th July, 2014
8.	Half yearly meeting of Town Official Language Implementation Committee, Port Blair	25th July, 2014
9.	Group Discussion to explore the possibilities of fodder production in Islands	21st Aug., 2014
10.	Hindi fortnight	16th to 30th Sept., 2014
11.	ARS (Prelims 2014) & NET-2014	23rd to 28th Sept., 2014
12.	Swachh Bharat Mission was organized through a detailed action plan and launching of the various cleanliness activities at its premises	25th Sept., to 2nd Oct., 2014
13.	Swachh Bharat Mission Launched	2nd Oct., 2014
14.	Visit of DDG (HS) to conduct first meeting of Bio-security at CIARI, Port Blair	7th to 11th Nov., 2014
15.	Vigilance Awareness Week	27th Oct. -1st Nov., 2014
16.	Institute participated by putting up stall to showcase R & D activities in 10th Indian Fisheries and Aquaculture Forum at NBFGR, Lucknow	12th to 15th Nov., 2014
17.	Financial Management System (FIMS) & Management Information System (MIS)	24th Nov., 2014 to 10th Jan., 2015
18.	Scientist interaction with NABARD	5th Dec., 2014
19.	Training on "ISO Certification 9001:2008" conducted by National Productivity Council Regional Directorate, Kolkata.	9th to 19th Dec., 2014
20.	Recruitment of KVK staff for KVK, Nimbudera and Nicobar (First phase)	13th to 17th Oct., 2014
21.	Recruitment of KVK staff for KVK, Nimbudera and Nicobar (Second phase)	1st to 5th Dec., 2014
22.	Institute Variety Release Committee meeting	16th Dec., 2014.

22.	Institute Variety Release Committee meeting	16th Dec., 2014.
23.	Institute participated by putting up stall to showcase R & D activities in 102nd Indian Science Congress at Mumbai	3rd -7th Jan 2015
24.	Assistant (Direct Recruitment) (Prelims) Examination in online mode conducted by ASRB, New Delhi	5th Jan., 2015
25.	Institute participated in the 12th Agricultural Science Congress on theme: Sustainable Livelihood Security for Small Holder Farmers at NDRI, Karnal by putting up a stall to showcase the research and development activities	3rd to 6th Feb., 2015
26.	National Science Day under theme "Science for Nation Building"	23rd to 28th Feb., 2015
27.	UT level Coordination Committee Meeting with A & N Administration	7th March, 2015
28.	International Women Day	9th March, 2015
29.	ISO9001:2008 sensitization on documentation of quality & procedure manual with training on Internal auditing	10th to 23rd March 2015
30.	Kisan Mela at KVK, Nicobar district	25th March ,2015
31.	Kisan Mela at KVK, Nimbudera, North & Middle Andaman district	28th March ,2015
32.	Kisan Mela at KVK, South Andaman district	30th March ,2015

IMPRESSION OF DELEGATES

"The Institute covers a variety of research activities in agriculture, animal husbandry and fisheries, specific to Andaman. Research work done is of International standard as evidenced by the publications and outcomes. I wish the Institute all success and complement the Director for motivating young researchers. "

M.A. Atmanand,
Director, NIOT, Chennai on 2nd January, 2015

Delegates	Impression
Cdr Rakhi Ram, Indian Navy	A great display of the laudable work being undertaken for the Islanders. God bless you succeed in your entire endeavour.
B. Santhosh, Principal Scientist, VRC of CMFRI, Thiruanantapuram	Good display of CIARI activities. The posters are self explanatory. Congratulation.
V. Anbarason, Commandant Chief (Staff Officer Cooperation, Coast Guard, HQ A & N Islands	An excellent opportunity for me to understand a different world of learned people and domain of A & N Islands. Very many thanks.
H. Moosa & Manohara, CPCRI, Karasgod	Nice display of the commendable work going.
A.K. Sethi, P.S. CRRI, Cuttack	CIARI is beautiful Institute and the staff of CIARI is very helpful.
K.V. Devaraj, Former Vice -Chancellor, University of Agricultural Sciences, Bangalore	Very nicely and systematically arranged display in the Museum. Highly informative and well arranged supported with excellent photographs. Dr. Dam Roy & Dr. S.K. Zamir explained all the activities and achievements of the Institute. Wishing the best.
Sanjay Kaig, DBT, New Delhi	Andaman are worthwhile to visit. CIARI as an Institution has helped in making economics of people self relevant a sustainable. Institution with its entire staff deserves accolade and appreciation for warmth and spirit of cooperation.
G.N. Sinha, IFS, PCCF (WL), ANI	An excellent. Institution with high level of research output and it has well kept museums, library and labs etc. It was my privilege to be here on the occasion of vigilance week valedictory 2014.
C.S. Dubey, Ret. Oil Seed Scientist, MPAU, Rajanthan	Your museum has added a lot to know. Thanks.
Sawabh Agarwal, Vice Chairman & Prof. of Finance, 45A, KP –III, Greater Noida, UP	Excellent attempt. Interactive aids are required to make it techno savvy .
Pradip Chakraborty, Director, National Productivity Council, Kolkata	Highly informative. The developments and growth in various fields is highly commendable.
B.C. Mal, IIT, Kharagpur	I briefly learnt about the achievement of CIARI.

S.K. Dutta, DDG(CS), ICAR, New Delhi	Excellent coverage of Life forms – plants, animals and other living organisms kept in the museum. This is a unique island where ICAR institute is working with local ecosystem and inspiring the 'forms' and helping the local people. Wish all the best for the Institute and staff working here.
Ratan Tiwari, Principal Scientist, IIWBR, Karnal	Makes feel proud of ICAR set up and also the rich diversity of Andamans. Museum is quite impressive and well kept.
Ashok Kumar, Principal Scientist, CIRG, Mathura	Excellent depiction of contribution. Research activities in the museum are very informative to visitors. I personally gained knowledge about farming system in A & N Islands.
Hiranmoy Dutta, Assam	Excellent show of multidisciplinary activities under taken by CIARI. This is also going a long way in generating sustainable livelihood for the residents of the region.
Deep Krishna, CTO, SOVTECH	Museum is just excellent, with lots of information. The research work should be shared more to general public.
N.B. Singh, Director, Extension Education, Solan, HP	Very interesting and valuable information available and the same time nicely presented. This institute is having 03 KVKs and much emphasis is given on Transfer of Technology.
Wieser Norbert, Australia	Congratulation, what a place – showing a better future.
Gaya Prasad, ADG (AH), ICAR, New Delhi	Going around the exhibits gives the feeling of very rich biodiversity prevalent in the Island. The research and development interventions made by CIARI have made substantive positive change in the life of the people of Andaman and Nicobar Islands. Working in difficult condition is a challenge. Keeping this in view the scientists and other staff deserve huge commendations.

LINKAGE AND COLLABORATION WITH OTHER DEPARTMENTS

- International Rice Research Institute, Manila, Philippines
- Directorate of Rice Research, Hyderabad
- Bioversity International, New Delhi
- Department of Biotechnology (DBT), New Delhi
- Directorate of Seed Research, Mau, UP
- Department of Nuclear Agriculture, BARC, Trombay, Mumbai
- Indian Institute of Pulses Research, Kanpur
- Banaras Hindu University, Varanasi
- ANGRAU (RARS, Lam Centre), Hyderabad (AP)
- TNAU (NPRC, Vamban), Coimbatore
- Directorate of Maize Research, New Delhi
- National Seed Corporation
- ICAR Research Complex for NEH, Barapani, Meghalaya
- AICRIP on Rodent Control, CAZRI, Jodhpur.
- NBAIM, Mau, U.P.
- PPV&FRA, New Delhi
- Space Applications Centre, Ahmedabad
- Indian National Centre for Ocean Information Services, Hyderabad
- Regional Remote Sensing Centre (ISRO), Nagpur
- CMLRE, Ministry of Earth Science, Cochin
- RMRC, ICMR, Port Blair
- ICAR Institutes; IVRI, PD_ADMAS, PD-FMD,CIRG, PDP.
- DAHVS, A&N Administration.
- TANUVAS, Tamil Nadu
- NABARD, Port Blair
- ZSI, BSI, ASI, FSI, Port Blair
- India Meteorological Department, Pune
- SRRA, Centre for Wind Energy Technology, MoNRE
- P-P Partnership
- RKVY
- ICAR-IIFSR, Modipuram
- ICAR-CSSRI, Karnal
- ICAR- CRIDA, Hyderabad
- ICAR - DWR, Jabalpur
- MoFPI, New Delhi
- Dept.,of Industries (DOI), A & N Administration
- Dept. of Agriculture, A&N Administration
- Dept. of Animal Husbandry & Veterinary Services, A & N Administration
- Dept. of Fisheries, A & N Administration
- Tribal Council, Car Nicobar and Nancowry
- Andaman Chamber of Commerce
- Zilla Parishad, South & North Andaman
- Shri Hari Fabricators, Industrial Estate, Port Blair
- ACANI, NGO, Port Blair'
- CPTL, NGO, Port Blair
- Akashvaani, Port Blair
- Door Darshan Kendra, Port Blair
- Surabhi, Don Bosco, Lal Pahar, South Andaman

PERSONNEL

Director	**Dr. S.Dam Roy**
Head / Incharge Divisions / Section / KVK	
Head I/c, Division of Horticulture & Forestry	Dr. R.K. Gautam (w.e.f. 5th Dec.,2014) Dr. D.R. Singh (upto 4th Dec., 2014)
Head, Division of Field Crop Improvement & Protection	Dr. R.K. Gautam
Head, Division of Animal Science	Dr. A. Kundu
Head, Division of Natural Resource Management	Dr. B. Gangaiah (w.e.f. 1st Dec,.2014) Dr. A.Velmurugan (upto 30th Nov., 2014)
Head i/c, Division of Fisheries	Dr. Kiruba Sankar R.
Incharge, Social Science Section	Dr. S.K. Zamir Ahmed
Programme Coordinator, KVKs (South, N & M Andaman & Nicobar)	Dr. Nagesh Ram
Chief Administrative Officer	Mr. Debasis Moitra
Finance & Accounts Officer	Mr. Gauranga Ghosh
Incharge, Prioritization, Monitoring & Evaluation Cell	Dr. S.K. Zamir Ahmed
Incharge, Computer Cell	Dr. T. Subramani (w.e.f.20th Aug. 2014) Dr. M. Sankaran (upto 19th Aug., 2014)
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
Overall Incharge, Security & Sanitation	Er. S.L. Paik
Incharge, Guest House	Dr. V.B. Pandey
Security Officer	Dr. S. Murugesan
Incharge, Sippigaht Farm	Dr. V. Bhaskaran (w.e.f. 20th Aug., 2014 Dr. M. Sankaran (upto 19th Aug., 2014)
Incharge, Bloomsdale Farm	Dr. P.K. Singh
Coordinator, Bio-Informatics Centre	Dr. T. Subramani (w.e.f .20th Aug. 2014) Dr. M. Sankaran (upto 19th Aug., 2014)
Incharge, ITMU	Dr. T. Subramani (w.e.f. 20th Aug. 2014) Dr. M. Sankaran (upto 19th Aug., 2014)
Coordinator, Out Reach Centre	Dr. S.K. Zamir Ahmed
Incharge PG Cell	Dr. Jai Sunder
Coordinator TSP	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. Shrawan Singh
Nodal Officer online HYPM & RFD	Dr.S.K.Zamir Ahmed
Nodal Officer, PIMS, PERMISnet & ASRB Online	Dr. T. Subramani (w.e.f. 20th Aug. 2014) Dr. M. Sankaran (upto 19th Aug., 2014)
Nodal Officer, Biometric Attendance System	Mr. R.N.Mazumdar
Nodal Officer, FMS/MTS (ERP)	Mr.Debasis Moitra
Nodal Officer, Court Case Monitoring System	Mr. Amit Srivastava
Nodal Officer, Swachh Bharat Abhiyan	Dr. Jai Sunder
Nodal Officer, GKMS	Dr. A. Velmurugan
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, Principal Scientist & Head (w.e.f. 01st Dec,.2014)
Dr. A. Velmurugan, Senior Scientist (Soil Science: CF & M) & Head I/c, (upto 30th Nov., 2014)
Dr. T.P. Swarnam, Senior Scientist (Agronomy)
Dr. T. Subramani, Scientist (Agronomy)
Dr. Sachchidanand Swain, Scientist (ASPE)

Division of Field Crops Improvement & Protection

Dr. R.K. Gautam, Principal Scientist & Head
Dr. Pankaj Kumar Singh, Senior Scientist (Plant Breeding)
Dr. Awnindra Kumar Singh, Senior Scientist (Plant Breeding)
Dr. Israr Ahmed, Scientist (Agri. Biotechnology) (upto 12th June, 2014)
Dr. Naresh Kumar, Scientist (Plant Breeding) (upto 3rd May, 2014)
Mr. K. Sakthivel, Scientist (Plant Pathology)
Miss. T. Bharathimeena, Scientist (Entomology)

Division of Horticulture & Forestry

Dr. R.K. Gautam, Principal Scientist & Head I/c (w.e.f. 5th December, 2014)
Dr. D.R. Singh, Pr. Scientist & Head I/c (upto 4th December, 2014)
Dr. M. Sankaran, Senior Scientist (Horticulture) (upto 19th August, 2014)
Dr. V. Bhaskaran, Senior Scientist (Horticulture)
Dr. Shrawan Singh, Scientist (Vegetables)
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)

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Dr. A. Kundu, Principal Scientist (LP&M) & Head
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Dr. Madhu Sudan Kundu, Principal Scientist (Animal Nutrition)
Dr. T. Sujatha, Scientist (Poultry Science)
Dr. Arun Kumar De, Scientist (Animal Biotechnology) on study leave

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)

Social Science Section
Dr. S.K. Zamir Ahmed, Principal Scientist, (Agriculture Extension) & Section I/c

Krishi Vigyan Kendra, Port Blair
Dr. Nagesh Ram, Programme Coordinator
Mr. L.B. Singh, Subject Matter Specialist (Horticulture)
Dr. Abhay Kumar Singh, Subject Matter Specialist (Animal Science)
Er. Bijaya Kumar Nanda, Subject Matter Specialist (Agri. Engineering)
Mrs. Haripriya Nayak, Subject Matter Specialist (Home Science)
Mr. N. Bommayswamy, Subject Matter Specialist (Horticulture)
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, Programme Coordinator I/c
Mr. Sanjay Kumar Pandey, Subject Matter Specialist (Agronomy) on study leave
Dr. Zachariah George, Subject Matter Specialist (Animal Science)
Dr. Viveka Nand Singh, Subject Matter Specialist (Horticulture)
Er. Chandrika Ram, Subject Matter Specialist (Agri. Engineering)

Krishi Vigyan Kendra, North & Middle Andaman
Dr. Nagesh Ram, Programme Coordinator I/c
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)

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Dr.(Mrs.) T. Sujatha	:	Member
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Mrs.S. Monalisa Devi	:	Member
Mrs. Pandiamma	:	Member
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Mr. Shyam Sunder Rao : Member
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Mr. Amit Srivastava : Member
Dr. Venkatesh Ramrao Thakur : Member
Mr. Shyam Sunder Rao : Member
Mrs. Sulochana : Member Secretary

Institute Joint Staff Council Committee

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Mr.Dibakar Khan, Sr. Technical Assistant : Member

Administrative

Mr. M.S.R.C. Murthy, Jr. Clerk : Member
Mr. P. Karapaya, Assistant : Member

Supporting

Shri K. Ali, S.S.S. : Secretary (IJSC)
Shri K. Ramachandran, S.S.S. : Member

Official Side (Nominated by the Director)

Chief Administrative Officer : Member Secretary
Finance & Accounts Officer : Member
Estate Officer : Member
Dr. Pankaj Kumar Singh, Sr. Scientist : Member
Dr. A. Kundu, Pr. Scientist : Member
Dr. (Mrs.) K. Abirami, Scientist : Member

NEW ENTRANTS/ TRANSFER/ PROMOTION/ RETIREMENT/LEFT FOR HEAVENLY ABODE

New Entrants

- Dr. K. Saravanan, Scientist (Fish Health) on 9th April, 2014
- Dr. Venkatesh Ramrao Thakur, Scientist (Aquaculture) on 09th April, 2014
- Dr.(Miss) Pooja Bohra , Scientist (Fruit Science) on 09th April, 2014
- Dr. Anuraj . A, Scientist (Aquaculture) on 9th April, 2014
- Dr. Waman Ajit Arun, Scientist (Spice Plantation) on 09th April, 2014
- Dr. J. Raymond Jani Angel, Scientist (Aquaculture) on 09th April, 2014
- Mr. K. Lohit Kumar, (Fisheries Resource management) on 09th April, 2014
- Mr. Anup Indwar, Joined the post of SSS on 17th June, 2014
- Smti D. Thangam Joined the post of SSS on 17th June, 2014
- Mr. Narasimmlu TSM Joined the post of SSS on 12th September, 2014
- Mr. B. Tulsi Rao, TSM Joined the post of SSS on 22nd December, .2014
- Mr. T. Chakrapani, TSM joined the post of SSS on 22nd December, 2014

Selection as Head

- Dr. B. Gangaiah joined as HoD (NRM) at ICARI-CIARI from DRR, Hyderabad on 1st December, 2014

Transferred from CIARI

- Dr. Naresh Kumar, Scientist, CIARI to IARI, New Delhi on 3rd May, 2014.
- Dr. Israr Ahmed, Scientist, CIARI to CISH, Lucknow on 12th June, 2014
- Dr. M. Sankaran, Sr. Scientist, CIARI to IIHR Bangalore on 18th August, 2014
- Mr. Bipul Chandra Roy, Technical Officer, CIARI to Guwahati Centre of CIFRI on 17th December, 2014

Selection as Director

- Dr. D. R. Singh, Pr. Scientist , on selection as Director of ICAR-NRC Orchid, Sikkim got relieved on 29th January, 2015 from CIARI.

Retired

- Mr.D.K.Saha, Asst. on 30th April, .2014
- Mr. T. Kurma Rao, SSS on 31st May, 2014
- Mr.B. Dhanaraju, Asst. on 30th June, 2014
- Mr.K. Ramchandar, T-3 (Driver) on 30th June, 2014
- Mr. P. Ramu, SSS on 31st July, 2014

- Mr. K. Narayan, T-3 (Driver) on 31st August, 2014
- Mrs. P. Janaki, AAO, on 31st October, 2014
- Mr. Norman David, Technical Officer on 28th February, 2015
- Mr. E. Tata Rao, SSS on 28th February, 2015

Promotion

- Mr. K.M. Singh, SSS to Technician on 17th December, 2014
- Mr. Nehru Ram, Jr. Clerk to Sr. Clerk on 23rd March, 2015

Left for heavenly abode

- Mr. Abdul Majeed, T-4 (Driver) on 18th April, 2014
- Mr. Shukru Kullu, SSS on 29th April, 2014

CIARI in News

CLIMATE AND CLIMATIC PARAMETERS OF ANDAMAN AND NICOBAR ISLANDS AN OVERVIEW

Andaman & Nicobar Islands (ANI) has a normal rainfall of 3180 mm received during May - December months both from South - West and North - East monsoons. The analysis of 68 years (1947-2014) of rainfall data of ANI (Fig. 29) has revealed that the average rain fall as 2907.4 mm and is received in 151.6 days (1961-2014). During these 68 years period, rainfall was the highest (4362 mm) in 1961 and was the least (1950.3 mm) during 1979. The South-West Monsoon (May- October) that starts around 15-20th of May and prior to that during April, summer showers are received. Most part of the year (May-December) remains wet during which the precipitation (rainfall) exceeds the evaporation and the rest of the year remains dry (rainfall < evaporation). ANI has a mean maximum and minimum temperature of 30.16 and 23.34^{0}C (1949-2014). The increasing mean maximum (Fig . 30) and minimum (Fig. 31) earth temperatures (by about 1.5 ^{0}C) over the past 170 years is a point of great concern not only to farming but also to the general population of Islands. The mean (1966-2014) relative humidity (%) of ANI varied from 77.43 (8.30 hours) to 80.51 (17.50 hours). A mean (1975-2014) wind speed of 9.058 km/hour was recorded in ANI.

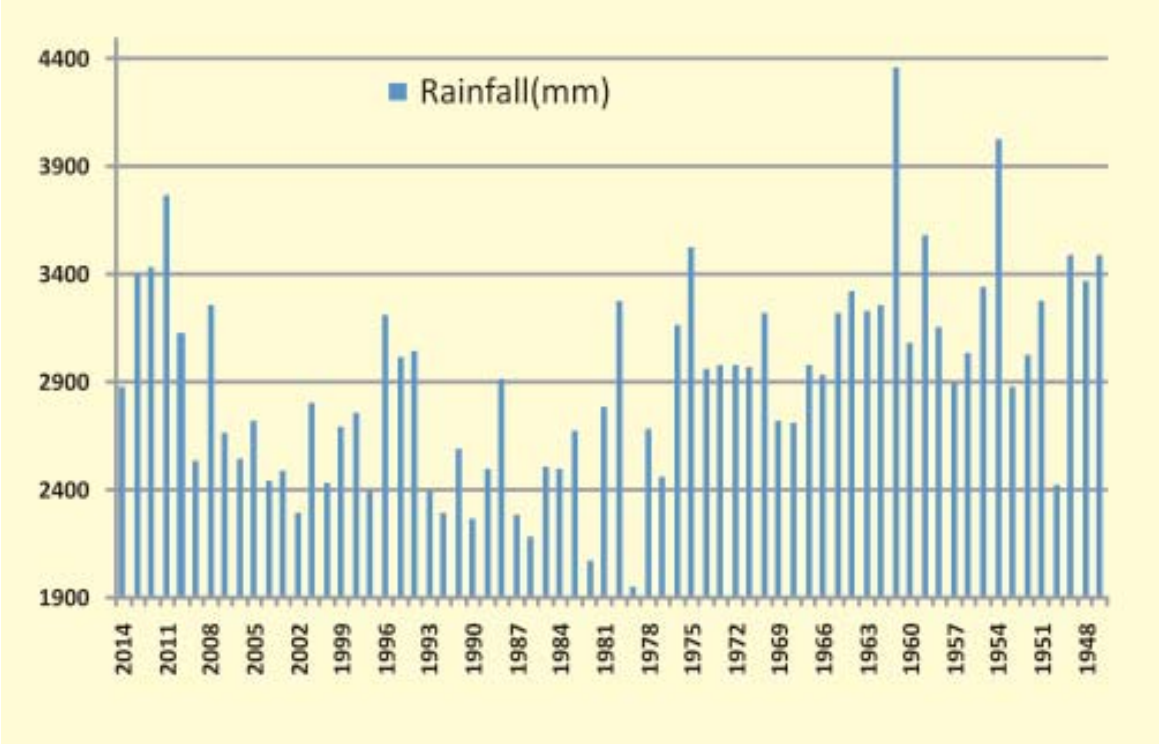

Fig 29. Mean annual rainfall of ANI in the past 66 years.

Source: Directorate of Economics and Statistics, A & N Administration, Port Blair

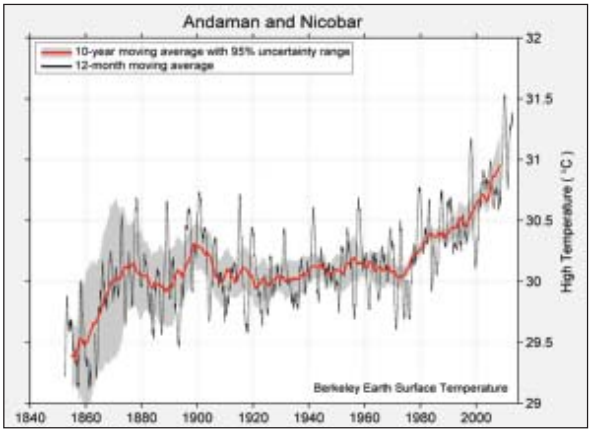

Fig 30. Mean maximum surface temeperature of ANI in the past 170 years.

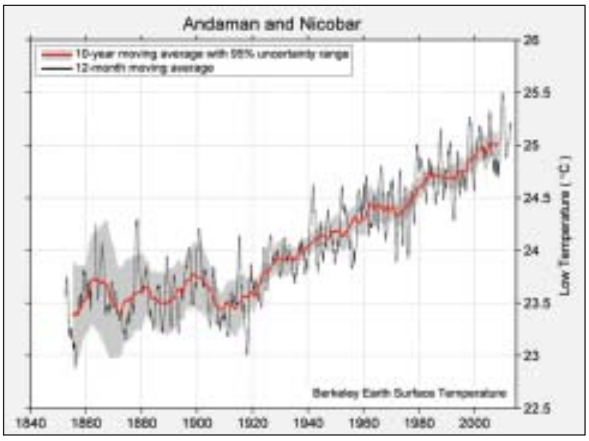

Fig 31. Mean minimum surface temeperature of ANI in the past 170 years.

During the current financial year (April 2014 to March 2015), ANI has received a total rainfall of 3075 mm of which 2600 and 203 mm was received during monsoon and post monsoon periods (Fig 4). Rainfall received was highest during the month of July and two months (April-14 and February-15) did not register any rainfall. The overall performance of the monsoon was rated as normal during the year and is higher than the 68 years mean rain fall of 2907.4 mm. The year recorded a mean annual temperature of 27.9°C with a mean maximum and minimum temperatures of 31 and 24.8 °C. Mean monthly temperatures were highest during April-14 (34.0 °C) and lowest during January-15 (24.8 °C). The climatic parameters are depicted in the following figure.

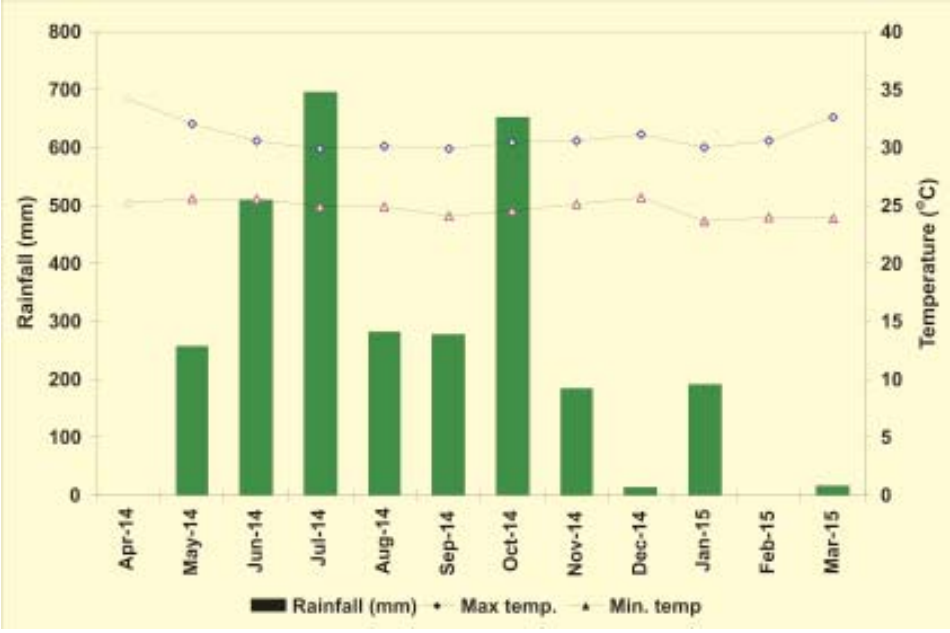

Fig 32. Climatic parameters of Andaman and Nicobar Islands (2014-15)

Results-Framework Document (RFD)

for

Central Agricultural Research Institute

(2013-2014)

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 1 :
Vision, Mission, Objectives and Functions

Sl. 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.	25	130	120	110	100	90
			Evolving high yielding lines of agri, horticulture and allied crop	Development of improved varieties for higher yields and other traits	No.	20	07	06	05	04	03
2.	Natural resource management for island ecosystem and transfer of technology for dissemination and adoption.	44	Development of production/ management technology	Development of technology for increasing production	No.	8	07	06	05	04	03
			Production of seeds, planting materials and value added products	Production of quality planting materials of spices	No.	2	9000	8000	7000	6000	5000
				Production of quality planting materials of coconut	No.	2	1100	1000	900	800	700
				Production of quality planting materials of elephant foot yam	Kg.	2	600	500	400	300	200
				Production of quality planting materials of ginger	Kg.	2	400	300	200	100	50
				Production of TLS of rice	Tons	2	5	4	3	2	1
				Production of quality fresh water fish fry	No.	3	28000	25000	22000	19000	16000
			Development of technologies for natural resource management	Number of technologies developed/ tested/ validated	No.	06	02	01	--	--	--
			Animal health management	Disease surveillance surveys and health management practices	No.	03	10	09	08	07	06

			Dissemination of Potential Fishing Zone (PFZ) advisories for enhancing marine fish catch	Number of awareness campaign	No.	02	06	05	04	03	02
			Dissemination of Agro advisory for minimizing production losses	Number of Agro advisories	No.	02	85	80	70	60	50
			Organizing training and demonstration	Number of trainings	No.	05	100	90	80	70	60
				Number of demonstrations	No.	05	55	50	45	40	35
	Efficient functioning of the RFD system	3	Timely submission of Draft RFD (2013-14) for approval	On-time submission	Date	02	15/05/2013	16/05/2013	17/05/2013	20/05/2013	21/05/2013
			Timely submission of Results for RFD (2012-13)	On-time submission	Date	01	01/05/2013	02/05/2013	05/05/2013	06/05/2013	07/05/2013
	Administrative reforms	4	Implement ISO 9001 as per the approved action plan	% of implementation	%	02	100	95	90	85	80
			Prepare an action plan for Innovation	On-time submission	Date	02	30/07/2013	10/08/2013	20/08/2013	30/08/2013	10/09/2013
	Improving internal efficiency / responsiveness / service delivery of Ministry / Department	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	02	100	95	90	85	80
				Independent Audit of implementation of public grievance redressal system	%	02	100	95	90	85	80

* Mandatory Objectives (s)

SECTION 3 :
Trend Values of the Success Indicators

SI.No.	Objectives	Actions	Success indicators	Unit	Actual values	Actual Values	Target value	Projected values	Projected Values
					2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
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.	30	110	120	125	130
		Evolving high yielding lines of agri, horticulture and allied crops	Development of improved varieties for higher yields and other traits	No.	07	04	06	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.	02	05	06	07	08
		Production of seeds, planting materials and value added products	Production of quality planting materials of spices	No.	14500	5000	8000	8500	9500
			Production of quality planting materials of coconut	No.	1800	1100	1000	1100	1200
			Production of quality planting materials of elephant foot yam	Kg.	-	-	500	600	700
			Production of quality planting materials of ginger	Kg.	-	-	300	400	500
			Production of TLS of rice	Tons	-	04	4.0	4.5	5.0
			Production of quality fresh water fish fry	No.	14450	19500	25000	26000	27000

		Development of technologies for natural resource management	Number of Technologies developed/tested/ validated	No.	08	02	01	02	03
		Animal health management	Disease surveillance surveys and health management practices	No.	01	06	09	10	12
		Organizing training and demonstration	Number of training	No.	38	62	90	92	95
			Number of demonstration	No.	17	55	50	55	60
	Efficient functioning of the RFD system	Timely submission of Draft RFD (2013-14) for approval	On-time submission	Date	-	-	16/05/2013		
		Timely submission of Results for RFD (2012-13)	On-time submission	Date	-	-	02/05/2013		
	Administrative reforms	Implement ISO 9001 as per the approved action plan	% of implementation	%			95		
		Prepare an action plan for Innovation	On time submission	Date			10/08/2013		
	Improving internal efficiency / responsiveness / service delivery of Ministry / Department	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%			95		
			Independent Audit of implementation of public grievance redressal system	%			95		

SECTION 4 : 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 : Description and Definition of Success Indicators and Proposed Measurement Methodology

Sl. 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 Crop, Medicinal, Ornamental crops, Microbes, Livestock,Nicobari fowl, Nicobari pig, Marine fin & shell fishesis 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.
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	Production of quality planting materials for distribution to development agencies/ farmers and other stakeholders	Production of planting material in the form of coconut	Number of planting material produced	Planting material includes seedlings of coconut
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 ofelephant 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
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
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

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

Sl. No.	Outcome / Impact of Department / Ministry	Jointly responsible for influencing this outcome/ impact with the following Department(S)/ Ministry(ies)	Success Indicator	Unit	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
1.	Increase in productivity of coconut	Ministry of Agriculture , A & N Administration, NGOs, Private partners/planters, CDB, NABARD and Lead bank	Increase in area	%	1.5	2.0	3.0	3.2	3.6
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	%	5.0	10.0	15.0	17.0	20.0
			Increase in productivity of fresh water fish	%	10.0	15.0	20.0	25.0	30.0

Annual (April, 2013 to March 31, 2014) Performance Evaluation Report in respect of RFD 2013-2014 of RSCs i.e. Institutes
Name of the Division : Horticulture

Name of the Institution : Central Agricultural Research Institute, Port Blair
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.	25	130	120	110	100	90	132	100	25	110	
			Evolving high yielding lines of agri, horticulture and allied crop	Development of improved varieties for higher yields and other traits	No.	20	07	06	05	04	03	07	100	20	116.66	
2.	Natural resource management for island ecosystem and transfer of technology for dissemination and adoption.	44	Development of production/ management technology Production of seeds, planting materials and value added products Development of technologies for natural resource management	Development of technology for increasing production	No.	08	07	06	05	04	03	06	90	7.2	100	
				Production of quality planting materials of spices	No.	02	9000	8000	7000	6000	5000	9000	100	2.0	112.50	
				Production of quality planting materials of coconut	No.	02	1100	1000	900	800	700	1000	90	1.8	100	
				Production of quality planting materials of elephant foot yam	Kg.	02	600	500	400	300	200	680	100	2.0	136	
				Production of quality planting materials of ginger	Kg.	02	400	300	200	100	50	475	100	2.0	158.33	
				Production of TLS of rice	Tons	02	05	04	03	02	01	04	90	1.8	100	
				Production of quality fresh water fish fry	No.	03	28000	25000	22000	19000	16000	25621	92.07	2.8	102.48	
				Number of technologies developed/ tested/ validated	No.	06	02	01	--	--	--	01	90	5.4	100	

			Animal health management Dissemination of Potential Fishing Zone (PFZ) advisories for enhancing marine fish catch	Disease surveillance surveys and health management practices	No.	03	10	09	08	07	06	10	100	3.0	111.11	
				Number of awareness campaign	No.	02	06	05	04	03	02	06	100	2.0	120	
			Dissemination of Agro advisory for minimizing production losses	Number of Agro advisories	No.	02	85	80	70	60	50	85	100	2.0	106.25	
			Organizing training and demonstration	Number of trainings	No.	05	100	90	80	70	60	104	100	5.0	115.56	
				Number of demonstrations	No.	05	55	50	45	40	35	58	100	5.0	116	
3.	Efficient functioning of the RFD system	3	Timely submission of Draft RFD (2013-14) for approval	On-time submission	Date	02	15/05/2013	16/05/2013	17/05/2013	20/05/2013	21/05/2013	10/05/2013	100	2.0	-	
			Timely submission of Results for RFD (2012-13)	On-time submission	Date	01	01/05/2013	02/05/2013	05/05/2013	06/05/2013	07/05/2013	30/04/2013	100	1.0	-	
4.	Administrative reforms	4	Implement ISO 9001 as per the approved action plan	% of implementation	%	02	100	95	90	85	80	0	0	0	-	
			Prepare an action plan for Innovation	On-time submission	Date	02	30/07/2013	10/08/2013	20/08/2013	30/08/2013	10/09/2013	30/07/2013	100	2.0	-	
5.	Improving internal efficiency / responsiveness / service delivery of Ministry / Department	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	02	100	95	90	85	80	0	0	0	-	
				Independent Audit of implementation of public grievance redressal system	%	02	100	95	90	85	80	0	0	0	-	
	Composite Score Rating													92 Very Good		

NOTE