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



ANNUAL REPORT 2019



ICAR-Central Island Agricultural Research Institute
(Indian Council of Agricultural Research)

Port Blair – 744 105

Andaman & Nicobar Islands, India

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Director, ICAR-CIARI, Port Blair

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PREFACE



ICAR-Central Island Agricultural Research Institute, Port Blair is a unique organization under Indian Council of Agricultural Research mandated with addressing the researchable issues pertaining to Island ecosystems of the country, presently cater to the needs of Andaman & Nicobar Islands in Bay of Bengal and Lakshadweep in Arabian Sea. The Institute, established during 1978 has been instrumental in developing various technologies in agriculture and allied sectors with its strong scientific group and dissemination to the stakeholders. It is my privilege to present the annual report 2019 (April to December 2019) of the Institute comprises research achievements, technology dissemination and development activities at the Institute.

The period under this report was eventful with various awards bagged by the scientists including ICAR-Fakruddin Ali Ahmed Award for the best services rendered to the tribal communities, various awards of excellence for best publications, extension work etc.

The Institute under the Horticulture and Forestry has made significant progress during the period. Two coconut accessions viz., Andaman Green Dwarf and Andaman Yellow Dwarf were identified as better performing dwarf varieties. The guava variety Arka Kiran was observed to be early bearing after third year of planting. Micropropagation protocol developed for mass multiplication of *Musa indandamanensis*, an endemic and threatened crop wild relative. Higher fruit yield in noni trees planted at a spacing of 4m x 4m (8.25 kg/plant/quarter) was found. Blood fruit was identified as potential crop for backyard cultivation in the islands and demonstrated in 21 home gardens. Technology for preparation of dehydrated mango ginger shreds and osmotically dehydrated product from rind of *Garcinia kydia* was developed.

Bhendi variety Arka Nikita was found to perform better for yield and free from Yellow Vein Mosaic incidence. Successful implementation of tuber crops based farming systems in tribal *Tuhet* areas (0.2 ha) showed increase of net income and employment generation to the tune of about two times. Botanical identity of woody pepper was confirmed as *Piper pendulispicum*. Gerbera variety Arka Ashwa was found to be better for higher flower production. China Aster variety Arka Archana performed better for desirable traits. Morphology of growth, flowering and seed set were documented in endemic orchid collections. The Institute has obtained IC numbers for 172 germplasm accessions of different horticultural crops/ wild relatives collected from Andaman and Nicobar islands under joint explorations with ICAR-NBPGR.

Under the field Crops Improvement, two elite lines of Black Burma and Khusbbuyya (BB13-1 and KU13-65) were identified for further exploitation. Nutritional profiling of CIARI and Karen rice varieties revealed dual richness of zinc (>20 ppm) and iron (>10 ppm) as compared to national checks Swarna and IR64. A new elite rice line ANR 40 was identified with high yielding, long duration, photosensitive and short grain. Three potential *Rhizobium* isolates were identified on basis of nitrogen fixation and other nutrient mobilization studies.

IFS model showed increase in farm production from 2.8 MT to 20.2 MT during 2011 - 2019 in terms of rice equivalent yield providing ₹.2,15,000 net return due to diversification and intensification through raised beds, rainwater harvesting and inclusion of dairy component. Study of soilless culture showed that coco peat + saw dust (1:1 v/v) recorded higher yield of tomato with 100% required nutrient solution. Monitoring of pesticide residues in vegetables revealed the presence of pesticide residues of various compounds in around 25% of samples but, only 3% of the samples had the residues above Maximum Residue Level. The forecast by the Institute under agromet advisories recorded 75% and 60% matching cases for Andaman and Nicobar, respectively.

Under the Animal Sciences, the establishment of mini incubator for conservation of poultry and duckling resources in North and Middle Andaman (N& M Andaman) has improved the hatchability. Presence of five haplogroups of chickens (A, B, E1, E2, E3, F & I) has been observed in Nicobari fowl opening a new vista for selecting populations for conservation and breeding. Molecular characterization of *Rhipicephalus microplus* complex has been done through mitogenome analysis exploiting supergene approach. The tick, *R. microplus* belonged to clade A which is not reported from mainland of India and



is the first report from Island South East Asia (ISEA). Haematological profile was correlated with multiple birth frequency in Andaman local goats. A significantly higher leucocyte percentage ($p < 0.05$) was observed in does with multiple births kidding compared to does which never gave multiple births. In the Andaman local goat, high genetic and phenotypic correlations were found between six and nine month body weight indicating the suitability of selection based on six month body weight.

Assessment of mineral status in soil, fodder and serum samples indicated that mineral deficiency (Cu and Zn) and imbalance of Ca:P ratio is one of the reasons for the reproductive problems of the bovine population of these Islands. A successful attempt on oestrus synchronization and fixed time artificial insemination (AI) was made under semi intensive rearing system.

A new species of unpatterned moray eel was described and named as *Gymnothorax andamanensis* (common name: Andaman brown moray) being a significant discovery to marine faunal diversity. Twelve species of caridean shrimps were identified based on the morphometric characters and generated barcode for one species. Twenty eight elasmobranch species belonging to 22 genera, under ten families and five orders have been recorded from three different gear types (Long line, Gill net and Trawl net) from different landing centres. Thirty-four species of major perches (groupers, snappers and emperors), belonging to three families were also identified. Wild marine shrimp samples namely, *Penaeus monodon*, *P. indicus*, *P. merguensis* and *Fenneropenaeus penicillatus* collected from various landing centres of North and Middle Andaman and South Andaman Districts gave positive results for White Spot Syndrome Virus (WSSV) and Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV).

Climate change studies among 50 farmers of North & Middle Andaman revealed that 68% farmers have experienced decrease in the quantity of monsoon rainfall, increase in summer temperature, increase in chillness and duration of winter, decrease in the duration of monsoon with increase in the occurrence of cyclones, delayed onset and early withdrawal of monsoon. Studies on the problems and prospects of vegetable value chain in Diglipur market area revealed that 78% of farmers dispose their produce at wholesaler, while 14% supply to retailer and 8% sell directly at Diglipur farmers' market. The major constraints in the input market and output market were identified. Success of BBFS in problem soil was documented at different localities with increased productivity and profitability of crops and pisciculture.

The Institute scientists have taken up number of demonstrations, training programmes, interactive meetings and mass media popularization of technologies. Besides, the three KVKs under the Institute at Port Blair, Nimbudera and Car Nicobar have immensely contributed in dissemination of technologies and served the Island farming community exceedingly well.

I take this opportunity to express gratitude to Dr. T. Mohapatra, Director General and Dr. A.K. Singh, Deputy Director General (Horticultural Science), ICAR, New Delhi for the guidance and support. The continued support by Dr. W.S. Dhillon, ADG (Hort), Dr. T. Janakiram, ADG (Hort) and officials from SMD, ICAR, New Delhi is acknowledged. I profusely thank the collaborating ICAR Institutes, SAUs, Secretaries and Directors of line departments of Andaman and Nicobar administration, officials of NABARD and other stakeholders for their kind cooperation and support to the Institute during the period through them the Institute could reach the island farming community in an effective way.

I express sincere thanks to Dr. A Kundu and Dr. B. Gangaiah who were Acting Directors of the Institute during the period for their guidance and support. I congratulate all the members of the editorial team for bringing out this report in a comprehensive manner. I would like to place my gratitude and congratulations to all my colleagues and staff for their immense contribution to the farming community while addressing the research needs of Island agricultural systems. I am sure the Institute would become a centre of excellence in Island Agriculture in the coming years.

Date : 12-06-2020


(Dr. B. Augustine Jerard)
Director

EXECUTIVE SUMMARY

Horticulture & Forestry

- Two coconut accessions *viz.*, Andaman Green Dwarf and Andaman Yellow Dwarf were identified as better performing dwarf varieties in terms of earliness, dwarfness, tender nut yield and quality of tender coconut water. Coconut accessions *viz.*, Rennel Tall, Katchal Tall, Auck Chung tall, Tahiti Tall, Tamaloo Tall and Pao Pao Tall were identified for further exploitation for varietal development. A unique Niu Leka palm with orange coloured fruits was marked for developing as unique genetic stock.
- Among the guava varieties evaluated, early fruiting was observed in the variety Arka Kiran in third year after planting. Micropropagation protocol for mass multiplication of *Musa indandamanensis*, an endemic and threatened crop wild relative, was developed. Observations from spacing trial revealed higher fruit yield in noni trees planted at a spacing of 4m x 4m (8.25 kg/plant/quarter) followed by 3m x 3m spacing. Blood fruit was identified as potential crop for backyard cultivation in the islands and its cultivation was demonstrated in 21 home gardens in South, North and Middle Andaman.
- Better performance of Bhendi variety Arka Nikita over Arka Anamica and local varieties for yield and free from Yellow Vein Mosaic incidence was documented.
- Successful implementation of tuber crops based farming systems in tribal *Tuhet* areas (0.2 ha) showed increase of net income from Rs 28,900 (B: C ratio of 1.26) to Rs 1, 30,855 (B: C ratio of 2.21). The employment generation increased to 495 man days/ha as compared to 280 man days/ha in their traditional system.
- Botanical identity of woody pepper was confirmed as *Piper pendulispicum* and to conserve the species, 200 plants were produced and about 100 are established at the Institute.
- Technology for preparation of dehydrated mango ginger shreds was developed. Use of two bud inoculum was identified as appropriate size for obtaining micropropagated plants. Technology for preparation of osmotically dehydrated product from rind of *Garcinia kydia* was developed. Cinnamon variety Konkan tej was identified as a suitable variety for commercial cultivation under open condition in Andaman Islands and mother block was established at KVK, South Andaman.
- *Calathia* sp. was identified as a potential cut flower for the Islands considering its traits such as flowering throughout the year and long shelf life. Among the Gerbera varieties evaluated, *Arka ashwa* was found to be promising with higher flower production. Among the China Aster varieties, *Arka archana* performed better for number of flowers per plant and prolonged flowering duration. Seasonal variation in flowering under differential shade conditions was documented in *Alpinia* flower production. Morphology of growth, flowering and seed set were documented in endemic orchid collections of *Cymbidium*, *Eulophia*, *Eria*, *dendrobium* and *Arachnis*. *Vanilla andamanica* and *V. nicobarica* were collected for conservation.
- A total of 15906 units of elite planting material of fruits, plantation crops, trees and 1525 kg of seed tubers/ rhizomes of elephant foot yam, ginger and turmeric were produced and supplied to the farmers. 1820 planting materials of different spices, besides 1200 kg of turmeric and 1500kg of ginger seed rhizomes were produced.

- Regional volume table was estimated in padauk (*Pterocarpus dalbergioides*) which will be useful in assessing productivity estimation by non-destructive method. The mean carbon stock of the pure casuarina stand was observed as higher (5.07 kg carbon/tree) when compared to the intercropped casuarina wherein it was 2.41 kg.
- IC numbers received for 172 germplasm accessions of different horticultural crop/wild relatives from Andaman and Nicobar Islands collected through explorations undertaken by Institute as well as joint explorations with ICAR-NBPGR.

Field Crops Improvement & Protection

- Two elite lines of Black Burma and Khushbuyya rice such as BB13-1 (3.11 t/ha) and KU13-65 (4.06 t/ha) were identified based upon their grain yield performance over the year and locations. Nutritional profiling of CIARI and Karen rice varieties study revealed dual richness of zinc (>20 ppm) and iron (>10 ppm) as compared to national checks Swarna and IR64.
- ANR 40: a new elite rice line identified with high yielding (5.5 to 6.0 t/ha), long duration (155 days), photosensitive and short grain.
- Three potential *Rhizobium* isolates were identified on the basis of nitrogen fixation and other nutrient mobilization studies.
- A total of 17 q TFL seeds of rice were distributed among the farmers through Seed day for FLDs, whereas in pulses 356 kg of TFL seed of pulses were supplied to KVK, Nimbudera.
- Three multi-potential bacillus isolates were selected on the basis of *in-vitro* PGP and nutrient mobilization tests from seaweeds.

Natural Resource Management

- Study of IFS model showed increase in farm production from 2.8 MT to 20.2 MT during 2011 - 2019 in terms of rice equivalent yield providing ₹ 2,15,000 net return due to diversification and intensification through raised beds, rainwater harvesting and inclusion of dairy component.
- Among different organic treatments, application of panchagavya at 15 days interval to okra increased the growth, yield and phytochemical activities over untreated plants. Biogel + panchagavya was found to be superior which increased okra fruit yield by 31% than control. Significant increase in proline concentration with saline tolerant PGPR treatment was observed in brinjal and tomato than control. Vacuum drying of organically grown clove had higher eugenol and other antioxidants.
- Studies showed that addition of FYM to coconut increased soil organic carbon and residence time of labile organic fraction.
- Study of soilless culture showed that coco peat + saw dust (1:1 v/v) recorded higher yield of tomato with 100% required nutrient solution. From a vertical farming prototype with a spatial coverage of 10 m², 5.1 kg of spinach and 4.8 kg of coriander were harvested in 3 months rotation.
- Monitoring of pesticide residues in vegetables revealed that 25% of samples were positive to various compounds. However, only 3% of the samples had pesticides residues above maximum residue level (MRL).

- Verification of forecast in agromet advisories revealed 75% and 60% matching cases for Andaman and Nicobar, respectively. The frequency distribution of rainfall showed increase in rainless days and very heavy rainfall category while moderate rainfall has decreased.

Animal Science

- Establishment of mini incubator for conservation of poultry and duckling resources in North and Middle Andaman improved the hatchability by 17.53% compared to previous year. There was more than two fold increase of poultry farms and 2.82 fold increase in availability of chicks after the intervention. This novel effort addressed implementation of conservation strategy, economic upliftment of the farmers and a breakthrough in sustainable poultry rearing system within house back up with mini incubator.
- Genetic diversity (Hd) has been observed in Nicobari fowl with the presence of five haplogroups of chickens (A, B, E1, E2, E3, F & I). This approach has opened a new vista for selecting populations for conservation specifically for breeding to develop lines for disease resistance under impending climate change scenario.
- Molecular characterization of *Rhipicephalus microplus* complex has been done through mitogenome analysis exploiting supergene approach. The tick, *R. microplus* belonged to clade A which is not reported from mainland of India. Existence of clade A in this insular part of India may be due to cattle trade or presence of founding population in this island. The report on clade A is the first report from Island South East Asia (ISEA).
- Haematological profile was correlated with multiple birth frequency in Andaman local goats. A significantly higher leucocyte percentage ($p < 0.05$) was observed in does with multiple kidding compared to does which never gave multiple births. Further, this was noticed that, zinc concentration in does was more without any history of multiple birth compared to does with multiple births kidding.
- In the Andaman local goat, high genetic (0.778 ± 0.14) and phenotypic (0.64 ± 0.05) correlations were found between 6 month body weight and 9 month body weight indicating the suitability of selection based on 6 month body weight.
- Reproductive stages and endocrinological profile were assessed in crossbred cows of A& N islands to improve reproductive disorders. This was found that, FSH, LH, estradiol and cortisol were significantly higher in oestrus stage and significantly lowest in anoestrus stage. Progesterone concentration was significantly higher in pregnancy followed by anoestrus and di-estrus stages.
- The trend of the DIVA-ELISA test indicated that there is sharp decline in the number of samples showing positive to DIVA test which indicated that there is less chance of circulation of Foot and Mouth Disease virus in the population.
- Assessment of mineral status in soil, fodder and serum samples indicated that mineral deficiency (Cu and Zn) and imbalance of Ca:P ratio is one of the reasons for the reproductive problems of the bovine population of these Islands. It is concluded that the inadequate supplementation of minerals are to some extent responsible for reproductive problem in dairy animal.

- A successful attempt on oestrus synchronization and fixed time artificial insemination (AI) was made under semi intensive rearing system. Present study indicated that, all the animals responded to oestrus synchronization treatment and conception rate was 62.5%.

Fisheries Science

- A new species of unpatterned moray eel was described and named as *Gymnothorax andamanensis* (common name: Andaman brown moray) being a significant discovery to marine faunal diversity.
- *Coi* gene of an undescribed Andaman rice fish (*Oryza sp.*) was characterized and barcode has been generated along with osteological studies. About 12 species of caridean shrimps were identified based on the morphometric characters and generated barcode for one species
- Twenty eight elasmobranch species belonging to 22 genera, under ten families and five orders have been recorded from three different gear types (Long line, Gill net and Trawl net) from landing centres of Juglighat, Wandoor, Guptapara, Burmanallah and Dignabad. Thirty-four species of major perches (groupers, snappers and emperors), belonging to three families were identified during the period.
- Wild marine shrimp samples namely, *Penaeus monodon*, *P. indicus*, *P. merguensis* and *Fenneropenaeus penicillatus* collected from various landing centres of North and Middle Andaman and South Andaman Districts gave positive results for White Spot Syndrome Virus (WSSV) and Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV). Besides, two parasitic disease due to *Argulus sp.* and *Ichthyophthirius sp.* were reported from freshwater fishes. Occurrence of marine and freshwater fish parasites such as *Cymothoa frontalis*, *Lernaenicus sp.*, *Philometra sp.* and *Camallanus sp.* were also recorded.

Social Science

- Climate change study conducted during *rabi* 2019-20 among 50 farmers across 18 villages of Diglipur tehsil, North & Middle Andaman revealed that 68% farmers have experienced decrease in the quantity of monsoon rainfall, increase in summer temperature, increase in chillness and duration of winter, decrease in the duration of monsoon with increase in the occurrence of cyclones, delayed onset and early withdrawal of monsoon.
- Studies on the problems and prospects of vegetable value chain in Diglipur market area revealed that 78% of farmers dispose their produce at wholesaler while 14% supply to retailer and 8% sell directly at Diglipur farmers' market. With regard to input market, seeds, organic fertilizers and pesticides are purchased from the private dealers at Diglipur. The major constraints in the input market and output market were identified. The findings of the survey were validated through Focus Group Discussion.
- Success of BBFS in problem soil was documented at different localities with increased productivity and profitability of array of crops and pisciculture.
- Few modules of an innovative fish catch mobile app was developed to systematically record real time marine fish catch data from 51 landing centers across three districts of Andaman and Nicobar Islands. The *app* integrated with web server and MySql data base server to store and retrieve data on real time *have the ability to collect species-wise total* catch landed at landing centre, vessel information, fisherman details, fishing effort and gear details. This will facilitate to bring all scattered catch data under one roof so that researchers and planners can use this real time data for policy decision.

- The varietal demonstration conducted with ICAR-IARI varieties under National Extension Programme revealed that farmers are willing to adopt Moong var. Pusa Vishal owing to synchronized maturity and yellow mosaic virus resistance, cauliflower var. Pusa Meghna has good performance, tight curd formation than the local check White Veina, brinjal var. Pusa Uttam has less number of fruiting than CIARI Brinjal 1, but enjoys more market preference. It is susceptible to Fruit and Shoot borer than CIARI Brinjal-1, but ideal for round the year cultivation.
- During the reporting period, 596 school students, 110 professionals and 16 dignitaries visited the Institute to get sensitized on the R & D activities and building of scientific temperament among young generation.
- The Government of India's flagship programme "Mera Gaon Mera Gaurav" is being implemented by the Institute since 2015-16 to promote direct interface between Scientists and farmers. For the year 2019-20, 9 teams comprising 44 Scientists and Technical Officers have been formed to cover 37 villages across South Andaman district. The multi-disciplinary teams periodically visit their respective adopted villages and conduct meetings/*Goshthies*, trainings and demonstrations; provide mobile based agro advisories, distribute planting materials and critical inputs to address the field-level problems in agriculture and allied sectors.

Krishi Vigyan Kendra, South Andaman

- A total of 37 training programmes (Vocational and in-service) were conducted of which 12 were "ON" and 20 "OFF" Campus. The target groups trained were practicing farmers (345), Rural Youth/ Farm women (248), SHGs (259) and the Extension functionaries (75), which total to (927) in numbers.
- Two 30 days Skill Development Training under Rashtriya Krishi Vikas Yojana (RKVY) through Agriculture Skill Council of India(ASCI) for the job role "Organic Grower" (200hrs) and "Small Poultry Farmer" (240 hrs) was held at the ASCI affiliated training Centre ICAR-KVK, Sippighat, South Andaman from 25th February to 25th March,2020.
- For assessment and refinement of technologies relevant to South Andaman agro - climatic zone, a total of 14 on farm trials (OFTs) were successfully undertaken with the participation of 54 Farmers and 15 numbers of front line demonstration (FLDs) in agriculture and allied activities *viz.* Salt tolerant rice, Okra, CIARI-mushroom -1, ginger (Jorhat), dietary fibre enriched fish cutlet from marine fish mrigal (*Lutjanus spp.*) , poultry farming (Vanraja bird), duck farming (Chara chambelli), ICAR-CIAE developed Naveen sickle, manual arecanut nut plucker and manual coconut tree climber were conducted during the period.
- One hundred numbers of Jal Shakthi Abhiyan Melas were performed in association with Department of Agriculture, Rural development Department, PBMC and Environment and Forest Department in thirty one Gram Panchayats including one tribal council (Harminder Bay) under three blocks (Ferrargunj, Portharpur and Little Andaman) of South Andaman district wherein 1740 farmers including senior officials from different line departments of Andaman and Nicobar administration were participated. Besides, more than seventy five numbers of Swachhta pakwada and Swachhata - Hi sewa programmes were conducted in nine gram panchayats, high school and senior secondary schools of south Andaman district.
- Eleven numbers of important events of National and International live and web telecast programme were performed in 'On' and 'Off' campus, wherein 1890 farmers, rural youth, farm women and extension personals from line departments (Agriculture, AH&VS, Fisheries, Industries, ATMA,



UTAMA, NCUI, Environment and education) of south Andaman district participated, Fifteen Radio talks (KVK experts and Farmers) and eight DDK programmes were delivered.

- Ninety eight diagnostic field visits were made in different areas of South Andaman and Identified major problems like Papaya mealy bug, Papaya root rot, Banana bunchy top, Damping off and Bacterial wilt (tomato, brinjal, chilli), Downey mildew in cucurbits, Hump shore disease on cattle in South Andaman district were identified and control measures were taken up.
- Two farmers' honoured by the ICAR, New Delhi and Coconut Development Board, Cochi for their respective works on "Empowering Youth for Technology Led Farming" and "Best Coconut Farmer" (National level).

Krishi Vigyan Kendra, Car Nicobar

- Eight trainings were conducted in the disciplines of Agronomy, Horticulture, Fisheries and Animal Science, wherein a total of 426 farmers including 156 (36.62%) females got benefited.
- For assessment and refinement of technology relevant to Nicobar, a total of three On Farm Trial (OFT) viz. Effect of decomposers on soil properties and yield of coconut, Effect of waste decomposer on growth and yield of CARI Brinjal-1, Evaluation of efficacy of Herbal Eye Drop in treating conjunctivitis in poultry were conducted.
- 4 Nos. of Front-Line Demonstrations (FLDs) were also undertaken with the participation of four tribal farmers on Nutritional Kitchen Garden, Okra (Arka Anamika), Incubator and Hatchery, and Popularization of Dairy Products.
- A total of 138 extension activities were carried-out benefiting more than 1446 tribal farmers, students and general public for agricultural development in Nicobar district.

Krishi Vigyan Kendra, North and Middle Andaman

- A total of 17 training programmes were conducted in Agronomy, Horticulture, Animal Science, Fisheries, Agriculture Engineering and Home Science. A total of 671 farmers including 296 female got benefited from the trainings.
- Eight On Farm Trials (OFT) were conducted which are need based to address local problems of farmers.
- A total of nine Front Line demonstrations (FLD) were conducted in agriculture and allied aspects for the dissemination of latest technology and skills to the farmers. Seven field days were organized on successful demonstration of technologies in farmer's fields.
- A total of 4543 farmers were benefited from the different extension activities of KVK like Kisan Ghosthi, Film Shows, Method Demonstrations, Group Meetings, SHGs meeting and Swachh Bharat Abhiyan.
- In order to overcome the farmers problems in plant protection, soil health, fish and animal diseases, 338 scientific/diagnostic visit to farmers fields during the year were undertaken and recommended suitable remedies.
- A total quantity of 2000 Kg of Paddy (CIARI varieties) Truthful seeds were produced and supplied to farming community. In addition to this, vegetable, paddy seeds, fish seeds, nursery plants and chicks were supplied to farmers.

INTRODUCTION

ICAR -Central Island Agricultural Research Institute (CIARI)

Andaman and Nicobar (A&N) Islands are a group of 572 Islands situated in Bay of Bengal between 92°12' E and 93°57' E longitude and 6°45'N and 13° 41'N latitude on 8249 km² area 10°N channel separating the Andaman group of Islands and Nicobar group of islands. Of 572 islands, 36 are inhabited by 3,80,000 people as per 2011 census having an annual tourist foot fall of 400018 Nos as of 2016 as the Islands is a customary tourism destination in the country. It is administered as a Union territory of India with its capital at Port Blair blessed with one of the unique and diversified ecosystems of the world. Its physical isolation from mainland by 1200 km of oceanic waters provides not only pollution free environment but also rich endemic germplasm resources. In the Islands North, Middle and South Andaman are within the Andaman group and Great Nicobar in the southern group of islands have an area of about 1,000 km². The Little Andaman with an area of 731 km² is the next largest Island. Amongst the rest, 32 islands exceed 10 km² area each, while 96 are less than 1 km² in area individually. Of the inhabited islands, 12 have population exceeding 1,000 persons per island. The average annual rainfall is 3,070 mm spanning over May to December. The period between January and April is the driest when the number of rainy days in each month hardly exceeds three. During the dry period agricultural crops often suffer severely. The mean temperature (24.3°-30.5°C), relative humidity (82.5%) and wind speed (5.8 km/h) remain almost the same throughout the year.

The Union Territory of Lakshadweep (Capital: Kavaratti) comprises of 36 islands having an area of 32 km², out of which only ten islands *viz.*, Androth, Amini, Agatti, Bitra, Chetlak, Kadmat, Kalpeni, Kavaratti, Kiltan and Minicoy are inhabited by 64000 people. Agriculture sector mainly relies on the coconut and oceanic fishery mainly tunas.. Being flat low lying Islands they are highly vulnerable to climate change impacts and extreme events.

Mission

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

Vision

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

Mandate

- To provide a research base to improve the productivity of agri-horticulture, livestock and fisheries of Andaman & Nicobar and Lakshadweep group of Islands through basic, applied and adaptive research
- Conservation, characterization and sustainable utilization of natural resources and harnessing through post-harvest and value addition
- To standardize technologies for health coverage and bio security of plant, animal and fishery resources
- To standardize techniques for capture and culture fisheries including coastal aquaculture

- Vulnerability studies of Island ecosystem and adaptive strategies to develop climate resilient agriculture
- Transfer of technology, capacity building, policy support and market intelligence to stake holders

Thrust Areas

Broad research programmes are as under

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

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.

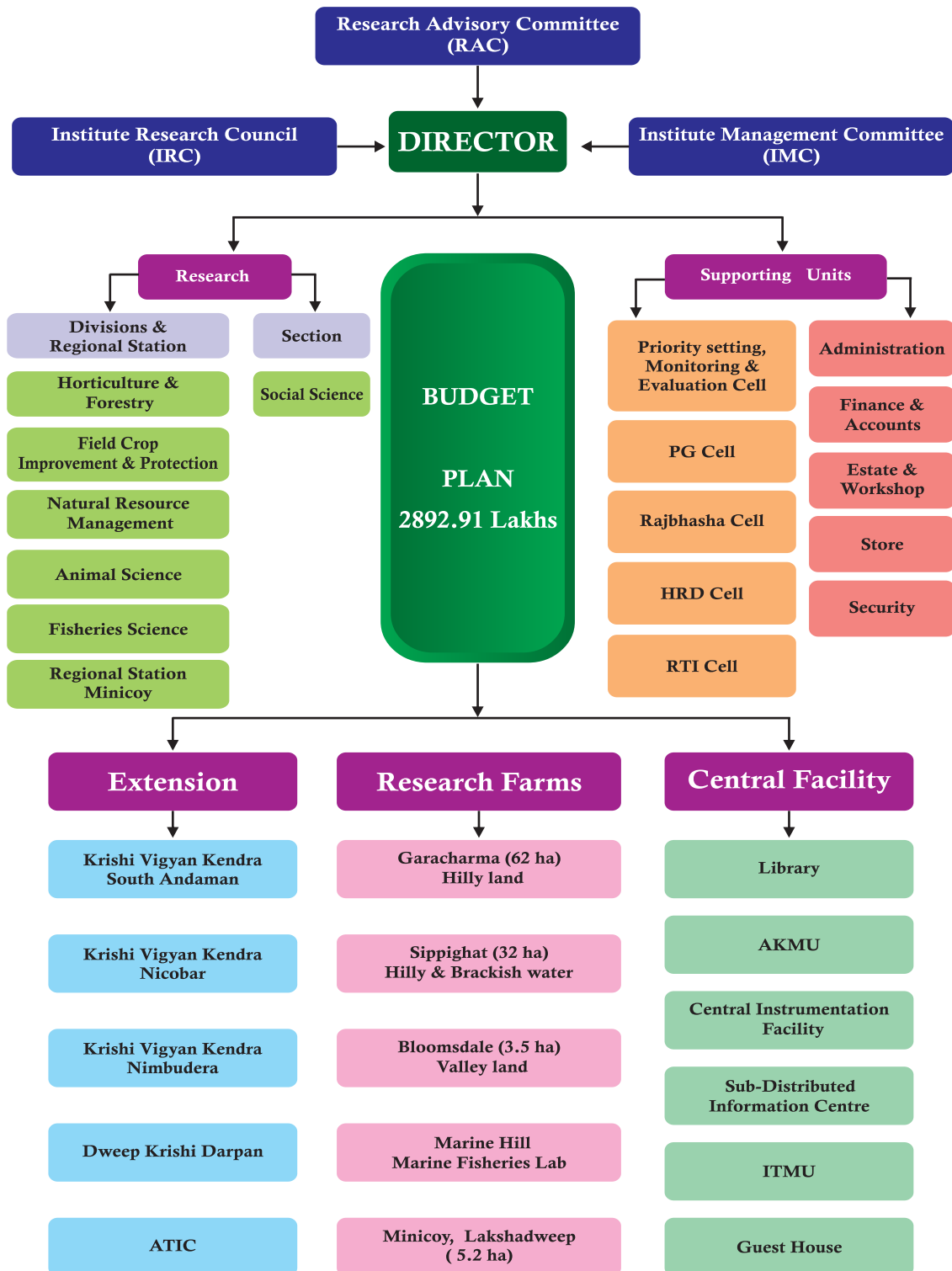
Staff Position

Sl. No.	Category	Sanctioned	Filled	Vacant
1	Scientist	44+1	34	10+1
2	Technical	43	26	17
3	Administrative	25	21	04
4	Supporting	66	65	01
Total		178+1	146	33

Budget Utilization during 2019 (April 2019 to December, 2019)

Head of Account Particulars	Annual Plan (in Lakhs)	
	Sanction	Expenditure
Establishment Charges	1950.00	1948.51
Equipment, Furniture, IT, Livestock & Library	30.00	29.90
TSP	37.50	37.41
SCSP (Gen)	10.00	10.00
SCSP (Capital)	7.50	7.28
Pension	214.95	214.95
TA	29.29	29.29
HRD	5.67	5.67
RC	448.00	448.00
Works	160.00	160.00
Total	2892.91	2891.01
P. Loans & Advances	-	2.0

ORGANOGRAM







RESEARCH ACHIEVEMENTS





DIVISION OF
HORTICULTURE & FORESTRY

4.1 DIVISION OF HORTICULTURE & FORESTRY

Plantation, Spices and Aromatic Crops

Conservation and utilization of coconut and arecanut genetic resources

Two dwarf accessions viz., Andaman Green Dwarf and Andaman Yellow Dwarf (Plate 1 & 2) have been identified as potential high yielders suitable for tender coconut purpose under Island conditions and they are proposed for release and commercial exploitation. The palm morphological traits, fruit component traits, tender nut quality were assessed and documented.

The Andaman Green Dwarf palms are medium statured with slender stem without bole, produces dark green leaves, petiole, rachis and fruits. The bunches are huge, fruits are round, medium sized; dehusked fruits are round with average weight of 370g. The palms are regular bearers, shorter drooping leaves, not having very strong attachment of leaves with the stem when compared to yellow and orange dwarfs. The nuts are early germinating. Self-pollinating with intra and inter-spadix overlapping of male and female phases was observed. Owing to the good tender nut water quantity (over 350ml), nut yield (over 150 fruits per palm per year), dwarfness and regular production of bunches, it could be a preferred variety to be grown under home gardens.



Plate 1: Andaman Green Dwarf



Plate 2: Andaman Yellow dwarf

The palms of Andaman Yellow Dwarf have yellow coloured petiole, rachis and fruits. The fruits are round to oblong, bright attractive yellow coloured, bunches are huge, leaf tip is drooping. It is preferred cultivar for home gardens for tender coconut purpose. The palms are robust, medium sized stem, no bole at the base, tender fruits weigh over 2kg, tender nut water is sweet, quantity ranges from 300 to 400 ml per nut. The seedlings are early splitting, vigorous, the palms are early flowering (about 30 months after planting) with regular bunch production. Owing to the attractive colour of fruits and graceful appearance of palms with drooping canopy, it could be used for avenue planting in landscapes besides home gardens for tender coconut purpose.

Among the WCGC coconut accessions, Rennel Tall, Katchal Tall, Auck Chung Tall, Tahiti Tall, Tamaloo Tall and Pao Pao Tall were identified for further exploitation for varietal development. The individual typical palms of these accessions were identified for further observations and seed production. The observations on identified Niu Leka Dwarf palms (Plate 3) were continued for fruit production. A single Niu Leka palm with orange coloured fruits was marked for developing as a unique genetic stock. The analysis on fatty acid profile of 35 coconut accessions are in progress for which the oil samples were sent to ICAR-IIHR, Bengaluru.

Forty-five F_1 seedlings have been transplanted and maintained in the field for further evaluation of growth and yield parameters. Observation on nine hybrid combinations revealed that, AOD x Annapurna recorded maximum girth of stem (151 cm), longest leaf (409 cm) and more number of leaflets on one side (114) followed by AGD x AYD.

The morphological characterization was continued in the Andaman Local and Andaman Dwarf arecanut accessions. High variability was observed among the Local population for fruit characters. The dwarf palms generally exhibited low fruit set and high variability for leaf production, leaf length and inter nodal length among the seedlings. The collar girth was higher in dwarf than the tall cultivars. The seedlings of hybrid combinations of Andaman Aracanut Dwarf made with Samridhi and Andaman Local are ready for field planting. The palms at established block of Andaman Aracanut Dwarf are under vegetative growth stage.

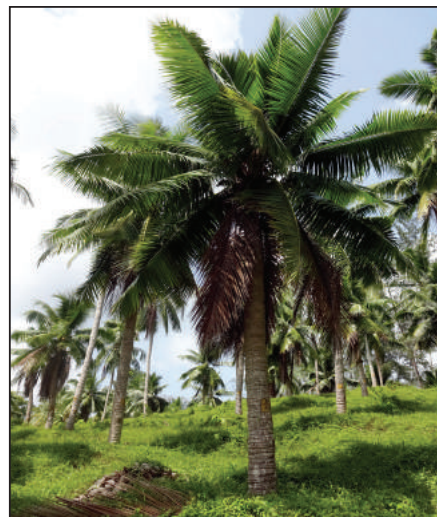


Plate 3: Niu Leka palm with orange coloured fruits

Arecanut based cropping system models

Arecanut monocropping (T_1) was compared with intercrop combinations such as arecanut + Burmese coriander ‘CIARI Broad Dhaniya 1’ (T_2), arecanut + coriander ‘Arka Isha’ (T_3) and arecanut + mint (T_4). During the study period, intercrops were established in the field and the evaluation continued. Arecanut palms were harvested twice which recorded chili yield of 4.23 t/ha (T_1), 3.50 t/ha (T_2), 2.99 t/ha (T_3) and 2.83 t/ha (T_4) (Plate 4).



Plate 4: Arecanut based cropping system models

Coriander and mint intercrops in arecanut plantation

Evaluation of improved varieties of cinnamon

Essential oil content of different island cinnamon collections ranged from 0.125% (Little Andaman) to 0.79% (Middle Andaman) with mean oil content of 0.432%. Among the five improved varieties evaluated under open condition, the bark oil content was higher (0.8 to 2.0%) than in local collections (0.4%). Wide variability was recorded for leaf morphological traits, bark yield and oleoresin content. Variety Konkan Tej with high yield (220 g/plant) and quality parameters is identified as better for open cultivation in the islands. A trial has been initiated to test the performance of these varieties as intercrop in arecanut plantations.

Evaluation of improved varieties of black pepper

Improved varieties of black pepper were evaluated on glyricidia standard under open condition. Of the varieties studied, eight varieties came to flowering during the year. Spike length varied between 8.6 to 16.7 cm; while berry setting percentage ranged from 46.3 to 71.8 %. Boldest berries were noticed in IISR-Thevam (15.0 g/100 berries), while berries were smallest in Panchami. Green yield was found to be the highest (2612.5 g/ plant) in IISR-Malabar Excel, followed by IISR- Girimunda (1432.9 g/plant).

Collection, conservation and evaluation of woody pepper

Botanical identity of woody pepper was confirmed as *Piper pendulispicum* with input from international expert (Prof. A. Chaveerach, Khon Kaen University, Thailand) and conserved for further evaluation using arecanut standard. Serpentine method of propagation was successfully employed for multiplication of woody pepper (Plate 5). Planting material (200 nos.) was produced for further research and distribution to stakeholders. To promote conservation and cultivation of this unique spice, planting material was distributed to three farmers in South Andaman and Forest Training Institute, Wimberligunj.



Plate 5: Conservation in arecanut standards

Evaluation of wild nutmeg species

Recovery of extract was found to be higher when methanol was used as solvent than acetone in *Myristica fragrans*, *Knema andamanica* and *Horsfieldia glabra*, while extract yield remained unaffected in case of *Myristica andamanica*. Highest extract yields were obtained in *Horsfieldia glabra* (25.08% and 23.83%), while those were lowest (8.06% and 12.02%) in cultivated nutmeg. Total phenolic content varied with species and solvent with more recovery in methanolic extracts. Methanolic extract of *M. andamanica* had the highest total phenolic content, much higher than the cultivated nutmeg.

Evaluation of ginger and turmeric genotypes

Fourteen genotypes of ginger were collected conserved and evaluated. The dry recovery through sun drying ranged from 16.15% (AG-11) to 22.32% (AG-5). Rhizome rot PDI was observed to be high in AG-8 (67.70%) while it was lowest in the AG-12 (11.30%) followed by AG- 7 (13.0%). The highest essential oil (10.4 mg/g) was recorded in AG-7. The fresh rhizome yield estimate was significantly high in AG-12 (22.65 t ha⁻¹), while lowest yield of yield was estimated in AG-10 (9.54 t ha⁻¹). Twenty-five genotypes of turmeric collected from Andaman Island were characterized and evaluated for growth and yield performance. The highest estimated yield was observed in AT-17 (22.70 t/ha) whereas AT-22 recorded lowest (10.45 t/ha). Highest rhizome rot PDI was observed in AT-22 (21.10%) while it was lowest in AT-18 (3.23%)

Micropropagation studies in mango ginger

In order to optimize the culture density during subculture for obtaining superior multiplication, an experiment was conducted with single (1B), double (2B) and triple (3B) bud inoculum. The results revealed that culture multiplication increased from 7.1 shoots/ inoculum in single bud explant to 12.9 shoots/ inoculum in double bud explant. Further increase in inoculum size did not improve the culture multiplication as 12.8 shoots/ inoculum were obtained from three bud explant. Considering this, use of two bud inoculum could be recommended as appropriate size for obtaining micropropagated plants without compromising with the multiplication ratio.

Effect of biocontrol treatment on turmeric

The mother rhizomes of turmeric variety Co-2 were treated with *Trichoderma* formulation both as rhizome dipping and rhizome dipping combined with spray in seven different treatment combinations. The treatment

T 7 (Rhizome dipping 18 hours combined with spraying two months after planting) showed maximum yield (964.3 g per plant) compared with control treatment (489.5 g per plant) (Plate 6). Generally there were no disease symptoms in treated plots.



Plate 6: Treatment T 7- maximum growth and yield in turmeric

Evaluation of Lemongrass and Ocimum

Eight genotypes of lemon grass were collected, conserved and characterized. The accessions, AL-1 and AL-6 gave higher herbage yield. Higher essential oil was recorded in AL-2 (2.45 %), followed by AL-1- (2.12%), it was lowest in AL 5-(1.37%). Light red leaf sheath colours were observed in AL-1, AL-4 and AL-5 JL-1 while AL-2, JL-2 and AL-6 showed red and dark red. Highest plant height (166.64 cm), leaf length (103.57 cm) and number of tiller (26.33) were observed in AL-6. However, lowest plant height (84.6 cm) and leaf length (58.33) were observed in AL-3.

Twenty accessions of *Ocimum* spp. were collected from south and little Andaman areas and characterized using DUS traits. Higher essential oil was observed in AO-11 (0.254 %) followed by AO-15 (0.215%), while it was lowest in AO-2 (0.074%). Among the twenty genotypes, AO-7, AO-11 and AO-20 performed better with respect to different quantitative and qualitative traits (Plate 7).



Plate 7: Best performing *Ocimum* genotypes AO 11 and AO 20

Fruit Crops

Collection and conservation of germplasm

Two mango varieties *viz.*, Arka Suprabhath and Arka Udhaya released from ICAR-IIHR, Bengaluru were added to the germplasm conservation block at the institute. Suckers of four banana varieties *viz.*, Saba, Namwakom, Bengirer and Udhayam collected from ICAR-NRCB were conserved for further evaluation. 14 new germplasm accessions of eight different *Garcinia* species were collected and conserved for further evaluation, *viz.*, *Garcinia mangostana* (2), *G. cowa* (3), *G. kydia* (2), *G. xanthochymus* (01), *G. celebica* (01), *G. dhanikhariensis* (03), *G. dulcis* (01) and *G. andamanica* (01). The plants are at various stages of growth and development at field gene bank.

Molecular characterization of dragon fruit

Inter Simple sequence repeat (ISSR) analysis was used to study the genetic diversity among four dragon fruit accessions DGF 1, DGF 2, DGF 3 and DGF 4 (Plate 8). Among 15 ISSR primers screened, 14 primers produced amplification and produced a total of 178 reproducible amplified bands. The number of amplified bands varied from 5 in UBC 887 to 19 in UBC 811 with an average of 12.7 bands. The range of polymorphic bands and % polymorphism observed were 1 to 13 and 20.0 to 92.8 respectively. The polymorphic information content value of ISSR marker ranged from 0.42 (UBC 895) to 0.91 (UBC 856). Dendrogram generated by using UPGMA method of cluster analysis on basis of Jaccard's similarity coefficient differentiated all four dragon fruit accessions at 50% similarity.

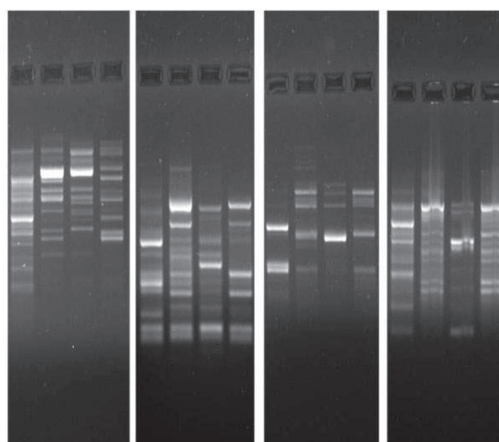


Plate 8: ISSR profile of dragon fruit accessions using primers UBC900, UBC811, UBC 824, UBC834

Effect of nursery media on growth and development of dragon fruit cuttings

Stem cuttings of 10 cm length of four dragon fruit accessions were evaluated for growth and development under eleven different treatment combinations of nursery media comprising vermicompost, FYM, cocopeat, sand and perlite as pot culture experiment. The observations recorded six months after planting showed significant variations in growth and development. In the accessions DGF 1, DGF 2 and DGF 4, the treatment combination of sand: vermicompost: cocopeat and FYM in ratio of 2:1:1:1 showed maximum root growth and shoot growth. This treatment combination showed maximum root length (46.7 cm), shoot length (29.2 cm), three secondary shoots, root weight (13.62 g) and shoot weight (180 g) in DGF 1. Maximum root length (38.2 cm), shoot length (31.2 cm), four secondary shoots, root weight (10.8 g) and shoot weight (240 g) were observed in DGF 2. In DGF 4, the same treatment combination recorded maximum values for root length

(37.1 cm), shoot length (32.2 cm), 03 secondary shoots, root weight (9.3 g) and shoot weight (500 g). In the accession DGF 3, the treatment with sand and cocopeat in ratio of 2: 1 has showed maximum root length (20.3 cm), shoot length (32.1 cm), 03 secondary shoots, root weight (8.1 g) and shoot weight (432.7 g).

Seed germination in *Garcinia dhanikhariensis*

In *Garcinia dhanikhariensis*, pre-treatments with KNO_3 (0.1%) and GA_3 (500 mg/L) showed 87 and 86% germination respectively after four months of sowing. The collections GDH/DK and GDH/LP exhibited superior germination (96% and 87%) and seedling vigour index (1777.0 and 1412.9) (Table 1).

Table 1: Seed germination parameters of *Garcinia dhanikhariensis* collections (128 days after sowing)

Seed source	Germination (%)	Seedling length (cm)	No. of leaves	No. of roots	Seedling Vigour Index
GDH/DK	96.0	18.5 ± 0.53	7.6 ± 0.34	9.0 ± 1.07	1777.0 ± 51.21
GDH/KT	54.1	13.1 ± 0.41	4.9 ± 0.31	2.6 ± 0.50	708.7 ± 22.23
GDH/LP	87.0	16.2 ± 0.52	7.8 ± 0.47	11.9 ± 0.89	1412.9 ± 45.19

Seed germination and seedling growth in *Haematocarpus validus*

Among the different media, vermicompost promoted early germination as 69.5% seeds germinated within 89 days of sowing as against 21.0% (sand) and 24.3% (soil: vermicompost). However, with the passage of time, germination percentage improved drastically in sand and soil: vermicompost substrates. After 144 days of sowing, germination percentage reached to 85.2% (soil: vermicompost), 85.7% (sand) and 90.0% (vermicompost). Germinated seedlings were transplanted in polybags and are being maintained in the nursery.

Micro-propagation in banana cultivars

Cheena Kela: Studies pertaining to optimization of kind and concentration of cytokinins for *in vitro* multiplication were conducted in banana cultivar *Cheena Kela*. Five growth regulator supplements along with fixed dose of naphthalene acetic acid (0.2 mg/L) and adenine sulphate (70 mg/L) were compared with MS basal medium as control. Cultures inoculated onto MS basal medium had lowest multiplication of 1.9 shoots/ inoculum and use of cytokinins suitably favoured culture multiplication. Incorporation of BAP (3 mg/L), *meta*-topolin (2 mg/L) or thidiazuron (1.0 mg/L) could induce superior multiplication of 3.6 shoots/ inoculum.

Korangi: Cytokinin optimization studies were undertaken in standardization of micropropagation protocol of banana cultivar *Korangi*. Thidiazuron was the most efficient cytokinin in inducing *in vitro* multiplication in this variety, while *meta*-topolin and 6- Benzyl aminopurine did not support multiplication. Thidiazuron at lower concentration (0.5 mg/L) was found to be optimum cytokinin as a total of 7.3 shoots per inoculum were recorded in this treatment as against 2.0 shoots per inoculum in growth regulator free control.

Micro-propagation in *Musa indandamanensis*

A total of 1,014 microshoots of *M. indandamanensis* have been regenerated through *in vitro* means for further studies.

In vitro rooting: Standardization of *in vitro* rooting in *M. indandamanensis* revealed significant influence of indole 3 butyric acid on rhizogenesis (Plate 9). Mean number of roots per microshoot were 9.4 in case of auxin free medium, which increased significantly to 13.2 in IBA (2 mg/L) treatments (Plate 10). Length of

longest root showed decreasing trend with increase in auxin concentration; however the differences remained non-significant.

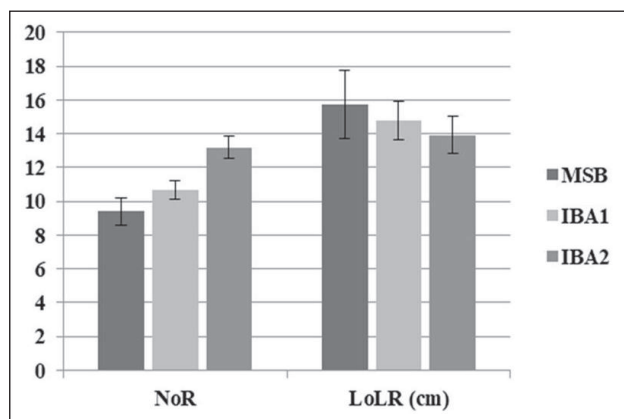


Plate 9: Response of *M. indandamanensis* microshoots to auxin supplementation during *in vitro* rooting



Plate 10: *In vitro* rooting response in *M. indandamanensis* (left to right : MS basal, IBA 1 mg/L and IBA 2 mg/L)

Acclimatization: *In vitro* rooted microshoots of *M. indandamanensis* were transferred to primary hardening medium consisting of sterilized soil: perlite: vermicompost (1:1:1). Survival of microshoots during hardening improved with increase in IBA concentration used during rooting from 80% (MS basal) to 100% (IBA 2mg/L). Further, use of IBA also improved number of roots per shoot (NoR), number of leaves (NoL), shoot length (SL) and root length (RL) over control.

Comparative evaluation of micropropagated and sucker derived banana plants

Performance of tissue culture and sucker derived plantlets of banana cultivar *Korangi* was evaluated under rainfed condition. Bunch weight from tissue culture (TC) group was higher (5.51 kg) than sucker (SK) derived one (4.00 kg). Though bunches from both groups had six hands each, number of fruits per hand, number of fruits per bunch and fruit weight were distinctly higher in TC. In case of Grande Naine, bunches are in developmental stage in both sucker and tissue culture plants (Plate 11).



Plate 11 : Fruits from TC plants and from Suckers

Varietal evaluation of banana

Five commercial banana varieties and cultivars namely Grand Naine, Poovan, Ney Poovan, Red Banana and Monthan were planted in three different planting seasons March, 2018, July 2018 and May, 2019. The growth and yield observations were recorded for all the five varieties planted during March, 2018. Pseudostem height (2.15 m) and girth (30.5 cm) was higher in the cultivar Ney Poovan. Early shooting was observed in Ney Poovan (309 days) with minimum number of days from shooting to harvest (114.5 days). The hands per bunch was maximum in Poovan (8.3) with maximum number of fingers per bunch in Grand Naine (101.3). Maximum finger weight (128.2 g), pulp weight (79.8 g), finger length (18.9 cm) and finger diameter (13.8 cm) were maximum in the variety Monthan. Maximum TSS was observed in Ney Poovan (22.6° B) and maximum acidity were recorded in Monthan and Grand Naine (0.5%).

Evaluation of mango and guava germplasm

The mango germplasm block consisting 12 varieties are at vegetative stage. Evaluation of varieties revealed early fruiting in Arka Kiran at third year after planting (Plate 12). The average individual fruit weight was 160.9 g with TSS of 10.5°B. Average fruit yield per tree during the first year of bearing was 28.6 fruits per tree. The average yield was 1.31 Kg/tree.



Plate 12: Early fruiting in the variety “ Arka Kiran”

Evaluation of *Garcinia species*

Two accessions of *Garcinia andamanica* collected from Little Andaman (GA/LA/NN) and Middle Andaman (GA/MA/PT) were evaluated for their fruit and seed characteristics. Fruits of GA/MA/PT were longer, narrower and lighter than the fruits of collection GA/LA/NN. Interestingly, peel content did not vary between the two accessions. Fruits of GA/MA/PT were rich sources of carotenoids (9.47 ± 0.045 mg/100 g), while fruits of GA/LA/NN had mere 0.52 ± 0.022 mg/100 g carotenoids content (Table 2).

Table 2: Characteristics of *Garcinia andamanica* accessions

Parameters	<i>Garcinia andamanica</i> accessions	
	GA/LA/NN	GA/MA/PT
Fruit length (cm)	5.2 ± 0.10	6.1 ± 0.08
Fruit width (cm)	6.6 ± 0.09	6.1 ± 0.07
Fruit weight (g)	116.1 ± 5.14	95.0 ± 3.28
Peel thickness (mm)	5.7 ± 0.17	6.7 ± 0.36

Peel content (%)	62.2 ± 1.17	61.2 ± 0.97
Pulp content (%)	16.9 ± 1.33	25.7 ± 0.57
TSS (°B)	7.8 ± 0.25	9.0 ± 0.00
pH	2.61 ± 0.010	2.44 ± 0.005
Total carotenoid content (mg/100g)	0.52 ± 0.022	9.47 ± 0.045
DPPH scavenging activity (%)	92.95 ± 1.084	91.33 ± 1.084
Number of seeds/ fruit	4.6 ± 0.48	3.8 ± 0.26
Seed length (cm)	3.1 ± 0.04	2.6 ± 0.05
Seed width (cm)	1.9 ± 0.04	1.7 ± 0.03
Seed thickness (cm)	1.6 ± 0.02	1.3 ± 0.03
Seed weight (g)	5.4 ± 0.22	3.6 ± 0.19

Varietal evaluation of banana

Five commercial banana varieties and cultivars namely Grand Naine, Poovan, Ney Poovan, Red Banana and Monthan were planted in three different planting seasons March, 2018, July 2018 and May, 2019. The growth and yield observations were recorded for all the five varieties planted during March, 2018. Pseudostem height (2.15 m) and girth (30.5 cm) was higher in the cultivar Ney Poovan. Early shooting was observed in Ney Poovan (309 days) with minimum number of days from shooting to harvest (114.5 days). The hands per bunch was maximum in Poovan (8.3) with maximum number of fingers per bunch in Grand Naine (101.3). Maximum finger weight (128.2 g), pulp weight (79.8 g), finger length (18.9 cm) and finger diameter (13.8 cm) were maximum in the variety Monthan. Maximum TSS was observed in Ney Poovan (22.6 °B) and maximum acidity were recorded in Monthan and Grand Naine (0.5%) (Plate 13).



Red Banana

Poovan

Monthan

Plate 13: Varietal evaluation of Banana

Evaluation of noni varieties

Among the noni varieties, highest DBH was recorded in CIARI Sampada (4.66 m and 8.22 cm respectively) and lower height of 3.76 m and DBH of 5.48 cm was recorded in CIARI Rakshak. The maximum number of branches (31.2) and fruit yield per tree (38.16 kg) recorded in CIARI-Samridhi variety followed by CIARI Saampada. The number of leaves per twig, length and width of the leaves was maximum in CIARI Samridhi (Table. 3). In spacing trial, noni trees planted at spacing of 4m x 4m showed maximum yield (8.25 kg/plant/quarter). Four new accessions of noni were collected and conserved.

Table 3: Growth and yield performance of *Morinda citrifolia* reference varieties

Name of the Variety	Height of the Tree (m)	DBH (cm)	No. of branches/tree	No. of fruits/tree	Fruit yield kg/tree/year	No. of leaves/twig	Length of Leaf(cm)	Width of leaf (cm)
CIARI Sampada	4.66	8.22	26.2	57.2	35.16	9.6	28.2	14.6
CIARI Samridhi	3.8	7.6	31.2	58.8	38.16	10.6	29.2	15.2
CIARI Sanjivini	5.6	6.74	27.6	56.8	35.04	9.6	28	14.2
CIARI Rakshak	3.76	5.48	30	56	26.88	8.6	27.6	14.8
SE(m)	0.438	0.443	2.675	2.684	1.833	1.017	1.526	0.855
C.V	21.97	14.12	20.80	10.49	12.12	23.68	12.08	13.01

Vegetable and Tuber crops

Germplasm collection, conservation and evaluation

Edible fern species: Two edible fern species collected from Great Nicobar were also multiplied for further conservation and evaluation. IC numbers were also received for these new accessions. Nine accessions of the edible fern *Drynaria quercifolia* were collected from South Andaman and characterized morphologically and phytochemically (Plate 14). The result revealed that the weight of the rhizomes ranged between 251 g to 2580 g and the coconut host plant accessions observed to be a healthy with higher weight of rhizome. The phytochemical analysis revealed that tannin standard ranged from 0.119-0.815 and the rhizome samples ranged from 0.502 – 0.937 at 755nm and the phenols standard ranged from 0.187-0.941 and the rhizome samples ranged from 0.179-0.330 at 765nm.

Amaranthus: Thirty amaranthus accessions received from ICAR-NBPGR, Thrissur are under performance evaluation. Three better performing lines are identified in terms of early growth and yield attributing characters. The lines are grown for seed production for further evaluation.



Plate 14: *Drynaria* on palm trunk

Brinjal: Sixteen lines of brinjal comprising indigenous and exotic origin received from NBPGR and 30 local accessions are planted in pots for seed production.

Chilli: Seed production was undertaken in 70 diverse accessions of Chilli germplasm collected from Andaman and Nicobar Islands. Three new chilli genotypes collected from Nicobar Islands are conserved for further evaluation. Two unique chilli genotypes identified are characterized for further evaluation (Plate 15).



Plate 15: Unique chilli genotypes collected

Bhendi: Field evaluation trial of bhendi varieties viz., Arka Anamika, Arka Nikita and Local collection revealed the maximum fruit yield of 1139 g /plant in Arka Nikita followed by Arka Anamika (656 g /plant) and the least fruit yield of 223 g/plant was recorded in the local collection. Based on the growth, yield performance and lesser mosaic disease incidence, Arka Nikita was identified to be better for Island conditions (Plate 16). Evaluation was taken up at three locations in South Andaman and Car Nicobar.



Plate 16: Arka Nikita – best performing bhendi variety

Leafy vegetables: One high anthocyanin rich *Hibiscus subdariffa* local accession was identified, conserved and multiplied for further improvement. High herbage yielding local accession of *Cardiospermum halicabum* (balloon vine) collected and seeds produced for further evaluation as leafy vegetable.

Cowpea and bottle gourd: A high yielding, variegated, unique vegetable cow pea collected from Little Nicobar was multiplied and the seeds are stored for further evaluation. A bottle gourd line collected from eastern Uttar Pradesh was evaluated and found to be high yielding and produced 150 cm long fruits. The accession was multiplied for further evaluation.

Varietal evaluation of vegetables: Under AICRP-VC trials, 58 lines of tomato, 84 lines of brinjal and 37 lines of garden pea were received. Seedlings of the lines were transplanted in the field for evaluation. The trials included, Brinjal (Long) - AVT-I, Brinjal (Long) - AVT-II, Brinjal (Round) - AVT-II, Brinjal Hybrid Long - AVT-I, Brinjal Hybrid Round – AVT-I, Brinjal Small Round AVT-II, Brinjal Long – IET, Brinjal (Round) - AVT-II, Brinjal (Round) - IET, Brinjal Hybrid Long IET, Brinjal Hybrid Round IET, Garden Pea (Early) – IET, Garden Pea (Mid) – IET, Garden Pea (Early) – AVT II, Garden Pea (Mid) – AVT- II, Garden Pea (Mid) Powdery Mildew IET, Tomato Determinate AVT-I, Tomato Determinate AVT-II, Tomato Indeterminate AVT-I, Tomato hybrid Determinate- AVT-II, Tomato Determinate IET, Tomato ToCLV Hybrid IET, Tomato hybrid Determinate- IET, and Cherry Tomato – AVT-I (Plate 17) . The trials are at various stages of growth and development.



Plate 17: Local cowpea and bottle gourd accessions

Tuber crops: Two accessions of tuber crops viz., one each in *Amorphophallus* sp and colocasia were collected and conserved. A total of 136 accessions are being maintained in the filed gene bank. The biofortified sweet potato varieties Bhu sona and Bhu Krishna were collected and conserved for further evaluation. The tuber accessions of sweet potato, greater yam, *Dioscorea piscatorum*, *Dioscora glabra*, *Colocasia esculenta*, *Tacca* and *Xanthosoma* collected from Nicobar Islands during 2019 were planted in the main field for further multiplication, conservation and evaluation. Thirteen entries of colocasia germplasm collected from A& N Islands were evaluated along with two released varieties for growth and yield. Among the entries, Diglipur

B-1 recorded highest cormel yield/plant (382.7 g) followed by RKP-C1 and HB-C1. Whereas the entry CARI- Nic-C1 recorded the highest yield of 22.4 t/ha followed by HB-2, RKP-C1, Diglipur B-1 and HB-C1 respectively

Floriculture

Collection, conservation characterization and evaluation

Orchids: Three orchid species viz., *Phalanopsis tetrapsis*, *Dendrobium anceps* and *Dendrobium farmosum* were collected from Campbell Bay and conserved in the orchidarium. Crossing attempted unsuccessfully between *Arachnis floesaeris* and *Eulophia andamanensis*. Seed germination attempt with various treatment was also unsuccessful from pods of *Arachnis floesaeris*. Flowering season, duration, morphology of growth, flowering and seed set were documented in endemic collections of *Cymbidium*, *Eulophia*, *Eria*, *Dendrobium* and *Arachnis*. *Vanilla andamanica* and *V. nicobarica* were collected for conservation. Flowering observed in *Vanilla planifolia* (Plate 18). A variant of *Eulophia andamanica* having fascinated flowers was collected from Little Andaman and conserved. The physiological observations on leaf morphology and drought tolerance traits are under progress in the conserved orchid species.



Plate 18 : Flowering in conserved endemic orchid species

Calathea sp.: Rattlesnake (*Calathea sp.*) is an attractive speciality cut flower with green spikes which makes it a good choice for floral arrangements (Plate 19). The rhizomes initiated flowering in six months after planting. One year after planting, the plant height recorded was as 3.0 m with plant spread of 141.7 cm, number of leaves (62.3/plant), number of flowers (75.7/plant) and spike length was 43.7 cm. The duration of flowering is 201.3 days indicating almost round the year flower production. The average shelf life of the flowers in the plant was observed as 21.3 days.

Torch ginger: Three conserved torch ginger (*Etilingera sp*) accessions Acc 1 (Red), Acc 2 (Pink with Red tinge) and Acc 3 (Baby Pink) were evaluated for their growth



Plate 19: *Calathea sp* (Rattlesnake) in full bloom

and field performance under tyre system (Plate 20). Observations showed maximum plant height (4.4 m) and number of flowers per plant (14.3) and early flowering (09 months after planting) in Acc 1.



Plate 20: Conserved torch ginger accessions 1, 2 and 3

Gerbera: Released varieties of ICAR-IIHR viz., Arka Ashwa and Arka Nesara were evaluated for their growth and yield performance under low cost polyhouse (Plate 21). Arka Ashwa showed maximum growth and yield with more number of flowers per plant (34/ plant), whereas it was only 21 per plant in Arka Nesara. The stalk length (61.3 cm) and flower size (11.7 cm) were maximum when compared with Arka Nesara (Stalk length 47.5 cm and flower size 9.4 cm).



Plate 21: Field performance of Arka Ashwa

Alpinia purpurata: An experiment conducted to study the growth and flowering of *Alpinia* in different shade levels revealed that the growth and flowering varied over seasons. During rainy season, *Alpinia* grown under open condition gave higher number of flowers with good flower quality. During non rainy season, *Alpinia* grown under partial shade gave higher number of flowers with good quality of flowers when compared to other treatments (Plate 22). When the shade level increased more than 80%, the flower yield and quality was observed to be low.



Plate 22 : *Alpinia* under partial shade (Lux : 13900 – 15700)

China aster: Five new entries of china aster namely Arka Kamini, Arka Archana, Arka Aadhya, Local Pink and Local White were evaluated for their growth and yield performance for three consecutive years. The analysis of pooled data showed that the variety Arka Archana performed better under Island condition with higher number of flowers per plant (47), plant spread (40.9 cm) and prolonged flowering duration (34 days).

Star jasmine: One year after planting, star jasmine (*Jasminum nitidum*) recorded plant height of 174.6 cm with plant spread of 174.8 cm and 39.6 branches per plant. Number of flowers per plant ranged from 215 to 240. Round the year flowering was observed in this species under Island conditions.

Pinching treatment on yield of marigold

In marigold, flower yield is mainly dependent on number of flower bearing branches. Pinching in marigold influences the quality and quantity of flower production. Earlier experiments proved that double pinching gave higher yield in marigold. An attempt was made to study the influence of repeated pinching (four times) in flower yield. Among the treatments imposed, T₁ (control-no pinching), T₂ (single pinching) and T₃ (repeated pinching (four times)). The results showed that r T₃ recorded the highest number of flowers per plant (382.0), flower yield per plant (1.37 kg) and increased flower duration (52.0 days) which resulted in highest yield of flowers per unit area (Plate 23).

Vivipary in marigold

Vivipary in flowering plants is defined as the precocious and continuous growth of the offspring when attached to the maternal plant. Though, vivipary is reported in many horticulture crops, it was first time observed in a particular local marigold accession (Plate 24). This could be due to imbibition, reserve mobilization and resumption of metabolism in response to environmental signals. Further studies are in progress among the progenies.



Plate 23: Flower yield by repeated pinching

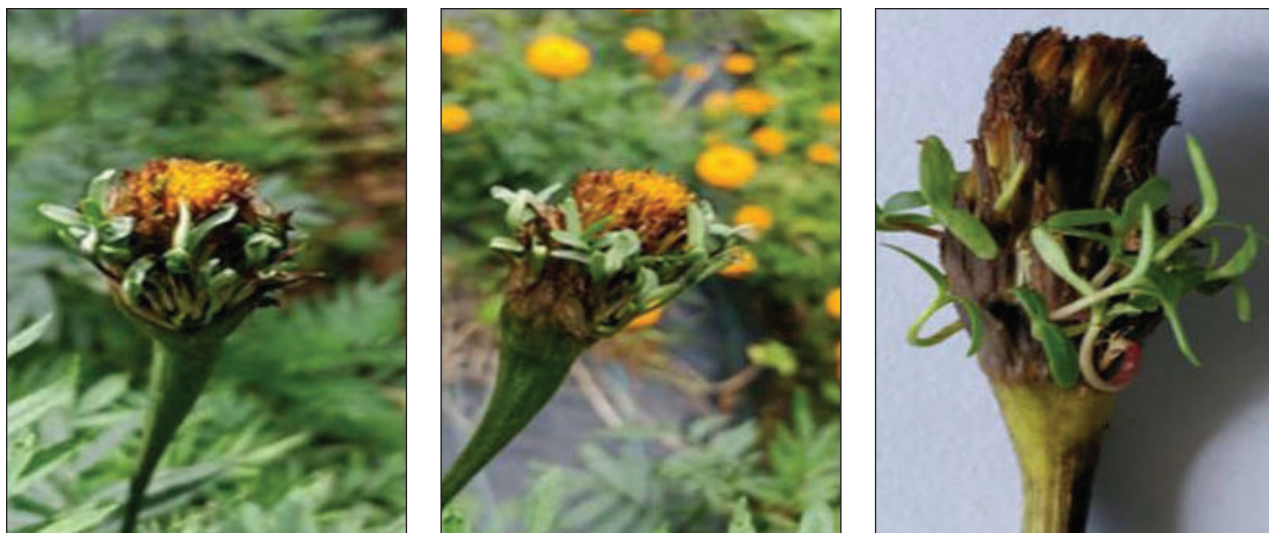


Plate 24: Viviparous germination in local marigold accessions

Agroforestry

Mangrove community zonation and biophysical characterization of Island coast

Field survey conducted in South Andaman, Hut Bay Island and parts of the North & Middle Andaman in mangrove patches with sampling plot (Standard plots size of 0.1 ha (31.6 m x 31.6 m) laid in mangrove area (Plate 25).

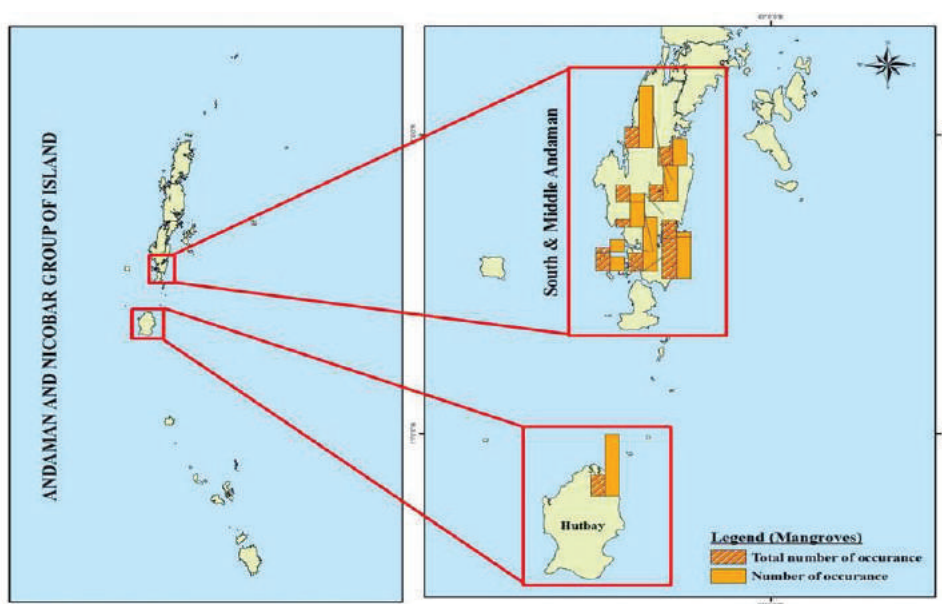


Plate 25 : Field survey in South Andaman

Based on the observations from various sample plots, the total number of occurrence and number of occurrence were plotted in the available GIS map. The results revealed that the total number of occurrence were high (319) in Shoal Bay mangrove patches followed by Hut Bay (282). The number of occurrence

were high in Hut Bay (28 species) followed by Manjery (19 species) mangrove patches. Fruit bunches were collected from exclusive *Nypa fruticans* patches at Sipighat and Dhanikhari area of South Andaman. The fruit morphological characters were recorded as per the standard procedure and the results revealed that the total weight of the fruit bunch of 5.77 kg (No. of fruits filled 76 and ill filled 31) and 17.5 kg (No. of filled 50 and ill filled 43). The fruit collected from Dhanikhari, each fruit length was ± 12 cm, breath was ± 10 cm and in Shippighat each fruit length was ± 14 cm, breath was ± 10.5 cm respectively.

Exploration and characterization of Andaman padauk (Pterocarpus dalbergioides)

An exploratory survey was carried out to identify the plus trees (phenotypically desirable traits such as plant height, GBH (Girth at Breast Height Level) and knots free trunk) from different parts of Island. 49 plus trees were identified from Diglipur, Mayabunder, Rangat, Long Island, Prolob Island, Baratang, Hut Bay, Nicobar (Katchal) and South Andaman forest Divisions in collaboration with Department of Environment and Forests, Andaman and Nicobar Islands.

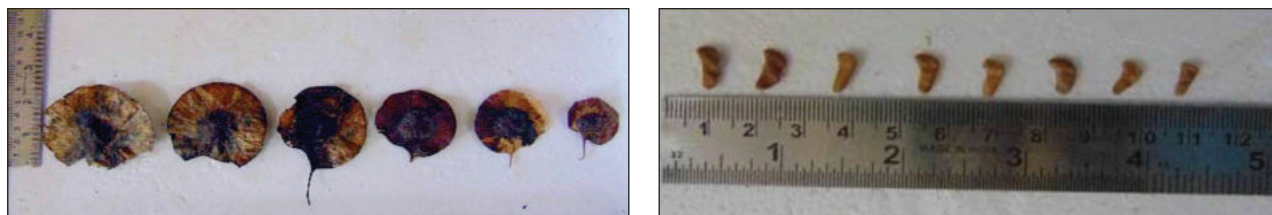


Plate 26: Variation in samara and seed

The height of the selected plus trees ranged from 20 m to 34 m and the GBH ranged from 135 cm to 515 cm. The length of the samara (winged seed) ranges from 4.5 cm to 7.6 cm and width ranges from 4.8 cm to 7.7 cm (Plate 26). The average 100 samara weight was 74.11 gm, average 100 seed weight was 5.47 gm and the proportion of seed to hard stone and wings was 17 %. A new padauk block comprising of 60 padauk seedlings was developed at Institute farm at a spacing of 3m x 3m for its long term evaluation and use in collection of explants for tissue culture experiments.

The accession, Kalpong recorded highest germination percentage of 41.50 followed by Jirkatang (40.50 %) and the least germination percentage was recorded in Katchal and Danapur (26.50 %) accessions.

Regional volume table in padauk

Five different models viz., straight line, polynomial, logarithmic, power and exponential were tried using dbh, height and d^2h as independent variables (x). Among different growth parameters used for establishing prediction models, dbh and d^2h proved to be more reliable independent variables for predicting the dry weight of all the biomass components. Among the different equations tried, the power equation proved superior to other equations as evident from its greater values of co-efficient of determination ($R^2 = 0.827$) as well as from lesser values of standard error (SE = 0.138) and FI value (FI = 0.043) for stem wood of *Pterocarpus dalbergioides*. Prediction equation $y = 1.225x^{0.789}$ was used to calculate the stem wood volume of *Pterocarpus dalbergioides*. The stem wood volume ranged from 3.582 m³ to 29.358 m³ per tree when diameter ranges from 60-95 cm and height ranges from 7-37 m. The identified best-fit regression models for predicting stem wood volume of *Pterocarpus dalbergioides* will be useful to researchers and plantation managers in assessing productivity estimation by non-destructive method.

Anatomy of padauk seed

The seed sample was viewed under a Scanning Electron Microscope (FEI SEM, Quanta 250) using an LFD detector. EDX analysis was performed in the true seed. The FT-IR (Fourier Transformation- Infrared Analysis) was performed using Jasco FT/IR 6800 model to analyze the chemical composition in the true seed.

SEM images of the seed exomorphic features revealed interesting details related to the *Fabaceae* origin. The true seed coat tissue components depicted in plate 27. it showed the presence of a well differentiated hilum, a micropylar region and continuous cuticle layer, depicting the common characteristics of fabaceae family seed coat structures. The magnified cuticular layer has cracks and pits with waxy depositions.

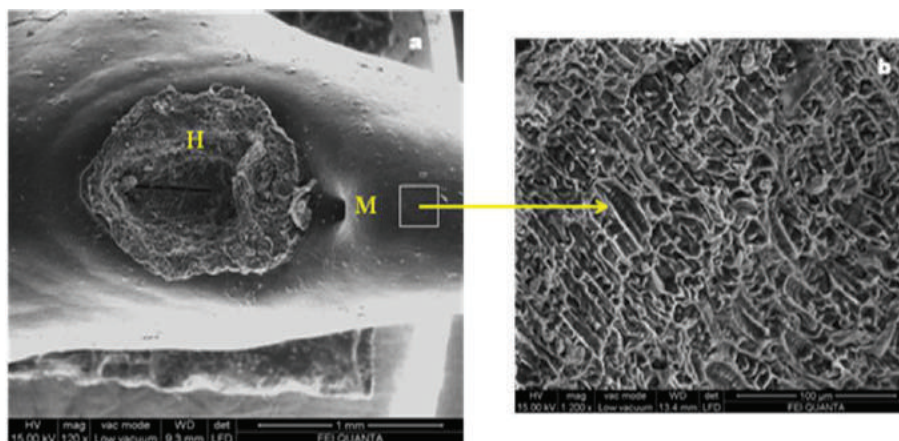


Plate 27: True seed depicting (a) hilum (H) and micropyle region (M) and (b) magnified surface structure

Fully matured dry seeds were taken for the examination, cut transversely. The plate 28 shows a thin, delicate undulated epidermal cell layer (EL). The EL forms a single layer above the sclereid layers. The radially elongated and tightly packed cells are referred to as Macrosclereids (MS) or palisade cells.

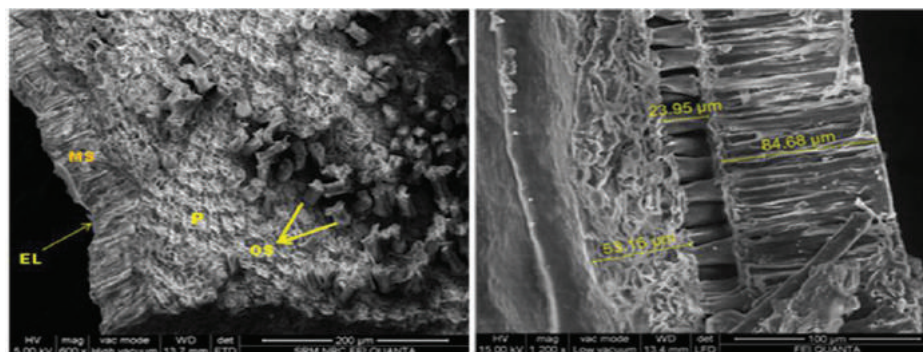


Plate 28: SEM images of a matured dry padauk seed depicting (a) outer testa (b) magnified cross sectional view of seed

The thickness of the parenchyma layer is around 53.16 μm, while that of the OS and MS layer is 23.95 and 84.68 μm. The size of OS cells has a length of 25.81-34.56 μm; diameter 12.14-16.5 μm and width 7.97-12.60 μ. These parenchyma cells consist of vascular systems that provide nutrition to the growing embryo. The image under SEM shows starch granules (SG) with intercellular spaces that act as store reserves for further metabolic inter-conversion. The interlocular spaces observed could be due to the shrinkage of SG in the fully matured and dry seed. The endosperm cell layer has a wavy or fold appearance owing to the sickle shaped cells of the Andaman Padauk seed.

FTIR spectra of padauk seed was studied to find the probable chromophoric groups that are likely to be present in the seed. Various functional groups such as N-H, O-H, C-H, C=O, C-O have been identified in the seeds indicating the presence of carbohydrates, amino acids, amides, esters, ethers, phenols, proteins and fats in the padauk fruits.

Evaluation of multi-purpose trees in coconut plantations

The growth observations recorded on the multipurpose trees planted in coconut garden showed more height (4.15 m) in *Sesbania grandiflora* and lower height (0.72 m) in *Sterculia villosa* while the highest basal diameter (5.2 cm) was recorded in *Callophyllum inophyllum* (Plate 29).

Higher biomass production was recorded in casuarina trees in terms of green (23.39 kg/tree) and dry biomass (14.26 kg/tree). However, lower mean green (16.19 kg/tree) and dry (9.32 kg/tree) biomass was recorded in coconut intercropped trees.. The mean carbon stock of the pure casuarina stand was 5.07 kg carbon/tree and the intercropped casuarina carbon stock was 2.41 kg carbon/tree.

The pH of the soil of the intercropped field ranged from 4.3 to 5.1. Electrical Conductivity ranged from 0.04 μ s to 0.10 μ s and organic carbon ranged from 0.62 % to 1.68 %. In the rhizosphere soil enzyme analysis, acidic phosphatase (6.5 pH) ranged between 4.97 μ g p-nitrophenol/hour/g soil to 65.01 μ g p-nitrophenol/hour/g soil, the alkaline phosphatase (11pH) ranged between 2.40 μ g p-nitrophenol/hour/g soil to 61.95 μ g p-nitrophenol/hour/g soil. However, the dehydrogenase (mgTPF/hour/g soil) ranged between 1.44 to 10.70 and urease (mg urea/hour/g soil) ranged between 2.98 to 4.77. besides the pH of the intercropped field was ranged from 4.3 to 5.1, Electrical Conductivity ranged from 0.04 μ s to 0.10 μ s and organic carbon ranged from 0.62 % to 1.68 %.



Plate 29: Evaluation of multi-purpose trees in coconut plantations

Germplasm collection and augmentation from Andaman and Nicobar Islands - Joint exploratory survey with teams from ICAR- NBPGR and ICAR-IISR

Out of 213 important wild/cultivated horticulturally important plant species comprising several accessions of fruits vegetable medicinal plants trees etc. collected from Nicobar Islands through joint exploratory survey conducted by ICAR- CIARI and ICAR- NBPGR, (RS) Thrissur, a total of 81 accessions were successfully conserved at Sipighat Research farm and the remaining are under various stages of growth and establishment.

New distribution of economically important plant species such as *Cucumis melo* L. subsp. *agrestis* (Naudin) Pangalo, *Ipomoea littoralis* (L.) Blume, *Solanum insanum* L. *Tragia involucre* L. and

Vigna stipulacea Kuntze were documented and herbarium was submitted to NBPGR, New Delhi. From the survey gregarious flowering of climbing bamboo (*Dinochloa nicobariana*) was documented in Nicobar group of Islands. IC numbers have been received for 172 germplasm accessions which have been collected and conserved/deposited at ICAR- CIARI, Port Blair and NBPGR, New Delhi and (RS) Thrissur.

Planting material production in horticultural crops

The mother blocks of coconut, arecanut, guava, sapota, dragon fruit, *Garcinia* species, carambola, different multipurpose tree species, ornamental plants, spices and medicinal plant conservatory were maintained for producing planting materials. During the reporting period, about 15906 units of elite planting material of horticulturally important crop/tree as listed of above and about 1525 kg of seed tubers of Elephant Foot yam, black pepper (10000), clove (2000), cinnamon (4000), nutmeg (1200), ginger (1200 Kg), turmeric (1500 Kg) and betelvine (1000) were produced. 3000 rooted cuttings of black pepper distributed to a farmer in New Bimblitan for field demonstration. Over 9000 planting materials of coconut, arecanut, noni, minor fruits, economic important trees and spices are in the nursery at various stages and being maintained for distribution in the coming season (Plate 30).

Propagation techniques were standardized in prioritized underutilized species for production of their planting material for further promotion. Planting material of more than 20 selected underutilized species are produced and provided to various stakeholders including farmers, entrepreneurs, parks, schools, UT Departments of Agriculture and Forestry. Important underutilized species that are multiplied at the Institute nursery include Andaman *kau phal* (*Garcinia andamanica*), Andaman kokum (*G. dhanikhariensis*), Nicobari mangosteen (*G. celebica*), orange *kau phal* (*G. kydia*), *mundu* (*G. dulcis*), *kau phal* (*G. cowa*), Mysore gamboge (*G. xanthochymus*), blood fruit (*Haematocarpus validus*), *mariam khatta phal* (*Grewia calophylla*), hog plum (*Spondias dulcis*), bael (*Aegle marmelos*), *khatta phal* (*Baccaurea ramiflora*), woody pepper (*Piper pendulispicum*), long pepper (*Piper longum*), mango ginger (*Curcuma mangga*) etc. Further, other commercial crops such as mangosteen (*G. mangostana*), Malabar tamarind (*G. gummi-gutta*), West Indian cherry (*Malpighia glabra*), black pepper (*Piper nigrum*), cinnamon (*Cinnamomum verum*) and tejpata (*C. tamala*) are also being multiplied. So far, 4,000 plants of these species have been produced for sale and distribution since July 2019.



Plate 30: Planting material production of coconut and arecanut



DIVISION OF **FIELD CROP IMPROVEMENT AND PROTECTION**



4.2 Division of Field Crops Improvement & Protection

Rice

ANR 40: A new elite rice line ANR 40, a long duration (155 days), photosensitive, short grain, high yielding (5.5 to 6.0 t/ha) suitable for rainfed low land conditions of Andaman and Nicobar Islands (Plate 31) was developed. It is short statured (95-100 cm), lodging tolerance and bears 7-8 effective tillers (panicle bearing) with long panicle 30-31cm.



Plate 31: A new elite rice line, ANR 40 a) Panicle b) Paddy c) Milled rice and d) Polished rice

Pureline selection from karen rice landraces

The pure lines selected and advanced from popular Karen rice landraces Black Burma and Khushbuyya were evaluated. Based upon the six years performance evaluation across locations for grain yield (t/ha), it was found that the selection BB13-1 (3.11) performed best followed by BB13-40 (2.98) and BB13-6 (2.95). Similarly, in Khushbuyya, KU13-65 (4.06) ranked first followed by KU13-51 (3.75). The nutritional profiling of Andaman rice varieties facilitated by ICAR-IIRR, Hyderabad indicated that CARI Dhan 1, 2, 3, 4, 8, 9, Khushbuyya, Mushley and Red Burma possess dual richness of zinc (>20 ppm) and iron (>10 ppm) as compared to the national checks Swarna and IR64. The phenol test in the rice grains revealed that among all local rice varieties, CARI Dhan 8 and 9 are *japonica* types whereas the remaining turned out to be *indica* types.

Marker assisted transfer of BB resistant genes in CIARI rice varieties

The evaluation of bacterial blight (BB) resistant introgressed lines (BC_3F_2 stage) derived from back cross of CARI Dhan 8 x IRBB60 revealed that among four lines viz. 125-1, 125-2, 125-4 and 125-5 having 4 genes

(*Xa4*, *xa5*, *xa13* and *Xa21*), 7 plant to row families showed morphological similarity with recurrent parent CARI Dhan 8. Similarly, the pyramided lines (BC_3F_3) derived from salt tolerant variety CARI Dhan 5 x IRBB60 back cross revealed 25 plant to row families exhibiting morphological similarity with recurrent parent CARI Dhan 5. These resistant lines are being further evaluated.

Multi-parental crosses of rice developed

Total of 424 individual F_3 plant progenies of four way crosses were obtained from GSR33/Gayatri/Khusbuyya/IRLON 50 and CSR 36/SPS26/IRBB60/IRLON 25 evaluated in field with wider spacing. Considerable phenotypic variability for plant height, days to flowering, tiller/plant, and panicle length were observed. The range of plant height (cm), panicle bearing tillers/plant and panicle length (cm) was observed as 67 to 194, 9 to 17 and 23 to 31, respectively. Thirty one lines were observed as absolute resistant against BLB out of 424 lines screened. Likewise 168 individual F_2 plant progenies of eight way crossing of parents (GSR33/Gayatri/Khusbuyya/IRLON 50 (Female) x CSR 36/SPS26/IRBB60/IRLON 25 (Male) were also evaluated and mentioned for further selection.

Evaluation of elite rice lines under rainfed lowland conditions

Yield evaluation rice trials consisting of 4 elite rice lines with 2 checks (Jaya and CARI Dhan 7) were conducted at three locations *viz.*, Bloomsdale Research Farm at South Andaman, Farmers Field at Nimbutala, and KVK at Nimbudera, North and Middle Andaman during *Kharif* under rainfed lowland conditions. The results revealed that all rice lines under study are medium duration and medium-statured. The panicle length was recorded as 22 to 25 cm with average tillers/plant of 6.53. The highest grain yield (t/ha) was recorded for ANR 58 (5.10) followed by ANR 51(4.17) and ANR 47 (4.11) compare to best check CARI Dhan 7 (4.46). However, 22.66 % higher grain yield over the check variety was recorded for ANR 58. All artificial inoculated lines were showed moderate resistances for BLB except ANR 51 (Table 4).

Table 4: The Performance of elite rice lines under rainfed lowland conditions (kharif 2018)

Lines	PH	DF	T/P	PL	Grain yield (t/ha)			AY (t/ha)	YA (%)	BLB (Score)
					BF	FF	KVK			
ANR 44	97	85	7	24	2.90	3.68	3.68	3.42	-16.39	3
ANR 47	95	82	7	24	3.48	4.42	4.42	4.11	0.46	3
ANR 51	100	85	6	24	2.98	4.76	4.76	4.17	0.30	7
ANR 58	102	83	6	24	3.65	5.82	5.82	5.10	22.66	3
Jaya	96	84	7	25	3.11	3.73	3.73	3.53	-13.36	3
CARI Dhan 7	102	84	7	24	3.23	4.46	4.68	4.12	0.00	1
Mean	98.5	83.7	6.5	24.3	3.2	4.5	4.5	4.1	-1.1	

PH=Plant height (cm), **DF**=Days to flowering (50%), **T/P**=Tillers/plant, **PL**= Panicle length (cm), **BF**= Bloomsdale farm, **FF**= Farmers filed, **KVK**=KVK, Nimbudera, **BLB**=Bacterial Leaf Blight, **AY**=Average yield, **YA**=Yield advantage over check (%).

Evaluation of global rice array lines

A total of 58 lines were evaluated in RBD with two replications (Plate 32). Each entry was planted as 12 hills per row in 10 rows, spaced 20 cm between rows and hills. Among these, *Oryzicasabana* 10 produced highest grain yield of 2.13 t/ha followed by TEQING (2.1 t/ha) and IR 69726-116-1-1 (2.0 t/ha), whereas NSIC Rc240 genotype performed poorest (1.0 t/ha). Among the 58 lines, 32 lines showed resistance against

the bacterial blight pathogen. Following phenol test, 9 lines showed *japonica* and 49 genotypes showed *indica* rice status.



Plate 32: Field view of 58 genotypes under GRA Rice trial 2019-20

Pulses

Evaluation of mungbean and urdbean lines

Totally, 47 pulses lines (27 Mungbean and 20 Urdbean) including checks and CIARI varieties were evaluated during *Rabi*. The lines with higher seed yield per plant in mungbean were ANM-14-02 (5.6 g), ANM-11-15 (4.9 g), ANM-14-09 and ANM-14-01 (4.8 g) against best check CIARI Mung 3 (4.4 g) and in urdbean were ANU-12-02 (4.6 g), ANU-11-09 (3.7 g) and ANU-10-11 (3.6 g) against best check LBG 752 (3.0 g).

Mushroom

AICRP trial on oyster mushroom

Oyster mushroom production trial was conducted on paddy straw, where the complete mycelial colonization observed within 15 days. Primordium initiation and fruiting body formation were recorded within 20 & 24 days, respectively on them. Paddy straw substrate gave significantly higher mushroom yield (715 g kg⁻¹ wet substrate) compare to local check substrate of banana leaves (500 g kg⁻¹ wet substrate). Subsequently, 172 spawns of CIARI Mushroom 1 (90 nos.), CIARI Mushroom 2 (49 nos.), CIARI Mushroom 3 (23 nos.) have been distributed to Island farmers and Department of Agriculture.

Genetic Resources

Characterization of mungbean and urdbean genotypes

Fifty genotypes each of Mungbean and Urdbean along with four checks were evaluated during *Rabi* in augmented design using spacing of 30 x 10 cm. Range of variation on important characters of these accessions was presented in Table 5. The genotypes with higher seed yield per plant in greengram were IC398988 (7.3 g), IC343868 (7.2 g) and IC436515 (6.9 g) against best check CIARI Mung 3 (4.6 g), whereas in blackgram were IC436638 (10.8 g), IC281995 (6.9 g) and IC343939 (6.9 g) against best check VBN 7 (6.2 g).

Table 5: Range of variation on important characters of Mungbean and Urdbean accessions evaluated (Rabi season 2018-19)

Parameters	Clusters/ plant		Pods/plant		Pod length (cm)		Seeds/pod		Seed yield/ plant (g)	
	Mung	Urd	Mung	Urd	Mung	Urd	Mung	Urd	Mung	Urd
Min	2.2	2.0	3.6	3.0	6.0	3.7	8.0	4.6	2.5	2.9
Max	5.0	5.8	17.2	13.8	9.7	10.8	14.6	14.0	7.3	10.8
Mean	3.2	3.4	8.9	7.1	7.3	4.4	10.6	6.2	5.3	4.6
SE	0.1	0.2	0.4	0.5	0.1	0.2	0.2	0.2	0.1	0.2
Vari.	0.5	1.1	7.3	10.2	0.6	1.2	1.5	2.0	0.8	2.2
Std. Dev.	0.7	1.1	2.7	3.2	0.8	1.1	1.2	1.4	0.9	1.5
CV	21.4	31.3	30.1	44.7	10.8	24.5	11.4	22.7	16.9	32.1

Seed production

Quality seeds of rice and pulses (greengram and blackgram) were produced (Table 6 and Plate 33). Truthfully labelled (TFL) seeds were produced under farmers participatory at farmers' fields and KVK, Nimbudera farm, while nucleus and breeder seeds produced at CIARI research farm. The details are as follows:

Table 6: Seed production (2019-20)

Crops	Nucleus seed (kg)	Breeder seed (kg)	TFL seed (kg)
Rice	17.6	90.0	4579.0
Green gram	5.0	10.0	390.0
Black gram	2.0	5.0	200.0
Total	24.6	105.0	5169.0



Plate 33: Seed production of rice a) Field view of breeder seed production, b) Farmers participatory seed production and c) Field inspection during post-flowering/ milking stage

Plant protection

Characterization and utilization of endophytic bacteria isolates of Seaweed

A total of 63 bacterial endophytes were isolated from 10 different seaweeds collected from five different locations of South Andaman Islands and tested for in vitro PGP and nutrient mobilization tests like IAA, siderophore, N, P, K, Zn mobilization tests and broad spectrum antagonistic ability against bacterial plant pathogens (*Ralstonia solanacearum* and *Xanthomonas oryzae*). Out of them, 15 multi-potential isolates were subjected to 16s rRNA characterization and three multi-potential *Bacillus* isolates were selected for further studies.

Characterization of Rhizobium isolates in pulses

Twenty six endophytes isolated from root nodules of Black gram, Green gram, Cowpea, Red gram and *Vigna marina* were subjected to molecular confirmation of 16sr DNA for *Rhizobia*. Out of them, three potential *Rhizobium* isolates were identified on basis of nitrogen fixation and other nutrient mobilization studies.





DIVISION OF
**NATURAL RESOURCE
MANAGEMENT**



4.3 Division of Natural Resource Management

Integrated Farming System for Doubling Farmers Income

Studies on the potential of Integrated farming systems (IFS) models for doubling farmers income revealed that crop + dairy based system has increased total farm production from 2.8 MT in 2011 to 20.2 MT (rice equivalent yield) in an area of 0.75 ha. This was mainly due to diversification and intensification of cropping system through raised beds, rainwater harvesting and inclusion of dairy component. The net return from the IFS model has increased to Rs 2,15, 000 which is 3 times the net return realized by farmers (Rs.60, 000) in the surrounding areas (Fig. 1). Thus the adoption of this model provides great opportunity for the farmers to increase farm production per unit area and doubling their income.

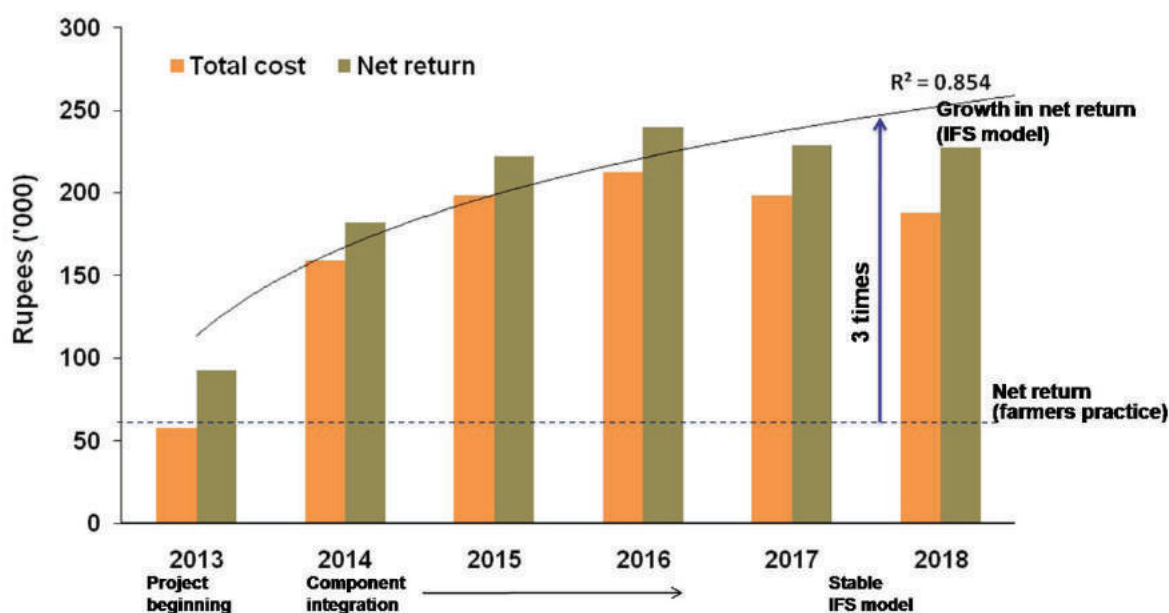


Fig.1 Performance of IFS model for lowland areas

Effect of Organics on Yield and Quality

Use of Panchagavya

The application of panchagavya (3% solution) at 15 days interval upto 75 days of sowing to okra increased the number of fruits (20 no's) and fruit yield (360 ± 9.0 g) per plant compared to untreated plants. Phytochemical analysis showed that panchagavya significantly increased phenols and flavonoids content (Table 7). The analysis of antioxidant activity or radical scavenging activity using the ABTS method showed increased antioxidant activity (2.5%) over untreated plants. The same trend was observed for free radical scavenging capacity as measured by DPPH activity. However, there was no significant difference in metal chelating ability.

Table 7: Effect of Panchagavya on antioxidant properties of okra

Parameter	Treated	Control	% increase or decrease
Phenols (mg GAE/g FW)	9.77	8.37	16.7
Flavonoids (mg Quercetin /g)	94.7	87.1	8.7
ABTS (μ mole trolox/g)	32.6	31.8	2.5
FRAP (mg BHT /g)	26.68	19.18	39.1
Fe chelating activity (mg EDTA/g)	0.07	0.12	- 41.6

Quality of clove

A study was undertaken to determine the effect of drying (oven, solar and vacuum drying) process and solvent (methanol and ethanol) on phyto-constituents of organically grown clove in IFS model (hilly terrain). The results showed significant ($P < 0.05$) difference in phytochemical content between drying process and solvent except β -carotene bleaching assay. Methanol extract of vacuum dried clove had highest phenolics (9.14 mg GAE/g), flavonoids (167.4 mg QE/g), tannin (91.1 mg tannin acid/g) and antioxidant activity (except MCA and NO) followed by solar and oven dried clove. Thus vacuum drying of organically grown clove has greater potential for enhancing health promoting effects due to higher eugenol and other antioxidants.

Production Technologies

Soilless culture

The study on soilless culture to standardise the growth media, nutrient concentration and irrigation frequency for high value vegetables showed that among the growth media (Plate 34), cocopeat + saw dust (1:1 v/v) recorded higher yield (821 g/plant) of tomato which was at par with cocopeat + vermiculite + saw dust (1:1:2 v/v). Evaluation of different nutrient concentrations (Cooper's nutrient solution at 100%, 75%, 50%, and 25%) and irrigation frequencies (daily and alternate days) showed that in cucumber, application of 100 % nutrient concentration recorded higher number of fruits per plant (5.6), fruit weight (243 g) and total fruit yield (1343 g/plant) than other treatments ($p < 0.05$). Similarly in tomato, application of 100 % concentration solution recorded higher number of fruits per plant (16) and fruit weight (53 g) and total fruit yield (866 g/plant) ($p < 0.05$). Irrigation frequencies did not have significant influence on the yield of cucumber and tomato.



Plate 34 : Soilless culture (a) Cucumber (b) Tomato

Vertical farming

A vertical farming prototype for growing leafy vegetables in kitchen/terrace garden was developed with a spatial coverage of 10 m² besides two trays of 4 m² in between the vertical frames (Plate 35). The pots were connected with drip system to supply required concentration of Hoagland's nutrient solution and the drained out nutrient solution was recycled into the systems. The results showed that light intensity (lux) under the structure ranged from 8680 (3 pm) to 35,600 (11 am) and the harvested rainwater supplemented the water requirements. From this system 5.1 kg of spinach and 4.8 kg of coriander was harvested in 3 months rotation.



Plate 35: Prototype vertical farming system

Use of PGPRS

The results of the experiment conducted to assess the effect of saline tolerant PGPR prepared as Biogel (bioconsortia + seaweed extract) and other organics on okra in a raised bed system during monsoon season (July – October) showed that organic treatments significantly increased the fruit number, fruit weight and per plant fruit yield ($p > 0.05$) (Table 8). Biogel + panchagavya was found to be superior over all other organic treatments which increased fruit yield by 31% than control. Although biogel formulation, bioconsortia and panchagavya were at par for all other yield parameters, saline tolerant PGPR in biogel formulation significantly increased fruit weight by 27% and fruit yield by 18.7% over control. The results demonstrated the potential of saline tolerant PGPR in biogel formulation either alone or in combination with panchagavya for improving crop performance under island condition.

Table 8: Effect of organic treatments on yield parameters of Okra grown on raised bed

Treatments	Fruit weight (g)	Fruit Number	Fruit yield / plant (g)	Fruit yield/ha (ton)
Control	9.0 ^a	10.2 ^a	106.6 ^a	5.93 ^a
Biogel (Bioconsortia + Seaweed extract)	11.5 ^c	11.4 ^b	126.5 ^b	6.96 ^{bc}
Biogel+ Panchagavya	12.9 ^d	11.8 ^b	140.0 ^c	7.70 ^c
Panchagavya	11.7 ^c	11.6 ^b	125.5 ^b	6.90 ^{bc}
Bioconsortia	10.6 ^b	12.0 ^b	121.6 ^b	6.75 ^b
CD (0.05)	0.945	1.051	15.024	0.823

Use of Bioconsortia

Pot culture experiment was conducted to study the effect of saline tolerant bioconsortia on brinjal and tomato under varying salinity level (2, 4, 6 dSm⁻¹) indicated that bioconsortia treatment significantly increased plant height and biomass at all levels of salinity however, the effect was more pronounced in brinjal (Plate 36). The study also showed significant increase in proline concentration with the increase in soil salinity level both in brinjal (0.9, 1.1 and 1.3 mM/g fresh wt) and in tomato (0.8, 1.0 and 1.1 mM/g fresh wt). The results demonstrated the potential of bioconsortia as organic input to enhance the performance of brinjal and tomato under moderate saline condition.



Plate 36: Growbag with brinjal and tomato plants

Organic coconut production

The experiment on standardization of organic production package for coconut based multitier cropping system didn't show significant improvement in nut yield. The results showed increased organic carbon content from 0.44±0.03 % to 0.48±0.02 % due to the addition of organic manure at the rate of 50 kg FYM palm⁻¹ year⁻¹. Further, from an incubation study, the mean residence time of labile organic fraction was found 17.9 and 12.7 weeks at 27 and 37°C, respectively.

Waste utilization

At Neil Island, the potential of organic waste recycling through improved method of composting and other organic inputs were demonstrated to ten responsive farmers (Plate 37). The farmers were given necessary inputs and training for preparing enriched compost, pest repellent, biocontrol and growth promoters. The

results showed that the quality of vermicompost was of desired level and the parameters were well correlated. Farmers could prepare 1.5 ton of enriched compost per cycle which was used in vegetable production.



Plate 37: Compost preparation at farmers field with monitoring team

Weed management

Under AICRP- Weed Management, aluminium sheet was used(1 mm thickness) to cover the arecanut tree around the pole. This resulted in exclusion of weeds from the covered area but water penetration to the pole region was normal.

Silicon content

Silicon content of two varieties of paddy harvested for fodder as a measure of climate change adaptation at booting stage (November, 2019) ranged from 5.2 - 5.5% in CARI Dhan 8 and CARI Dhan 9.

Environmental Monitoring

Studies on pesticide residues

Presence of pesticide residues in food commodities affects human health. During the reporting period, a total of 316 samples comprising 290 vegetables, 06 pulses, 12 fruits and 08 water samples were periodically collected and analysed for the presence of pesticide residues (Plate 38). The results indicated that around 25% of samples shown the presence of pesticide residues of various compounds in which 15% samples recorded the presence of non approved pesticides for the specific crop.



Plate 38: Vegetable samples collection at farmer's field

However, only 3% of the samples had pesticides residues above Maximum Residue Level (MRL). No pesticide residues were found in pulses and fruit samples, while majority of rice samples showed the presence of pesticide residues but below MRL. Further, over the years the numbers of positive farm gate samples and samples above MRL have come down due to restriction on sale of pesticides in the islands.

Integrated Agromet Advisory Services

During the period a total of 77 agromet bulletins were issued covering all aspects of agriculture production based on the weather forecast received from IMD, Pune with the help of multidisciplinary advisory team. It was aimed at minimizing the production losses, aid in timely decision making in farm operations and support marketing of farm produces. Using mKISAN portal, agromet advisories were sent to 11,000 registered farmers. At present AMFU, Port Blair stands second in the country after Delhi in terms of percentage of responsive farmers covered out of total farm household. Further, the services of All India Radio (AIR), Doordarshan, print media, KVK, VRC, social media and other means are effectively utilized to reach out to the farmers even in remote islands.

Verification of forecasted and observed values of rainfall (skill score) revealed that forecasted and observed values of rainfall for pre-monsoon, monsoon and post-monsoon were matching to the tune of 78%, 75% and 71%, respectively for Andaman Islands and 54%, 53% and 65% respectively for Nicobar Islands. Analysis of frequency distribution of rainfall showed increase in rainless days and decrease in moderate rainfall category over ANI while the incidence of very heavy rainfall has increased over Andaman Island (Fig. 2). Further, 5% decrease in total number of rainy days was recorded in 2019. This necessitates rainwater harvesting, water conservation and proper planning for efficient use of available water.

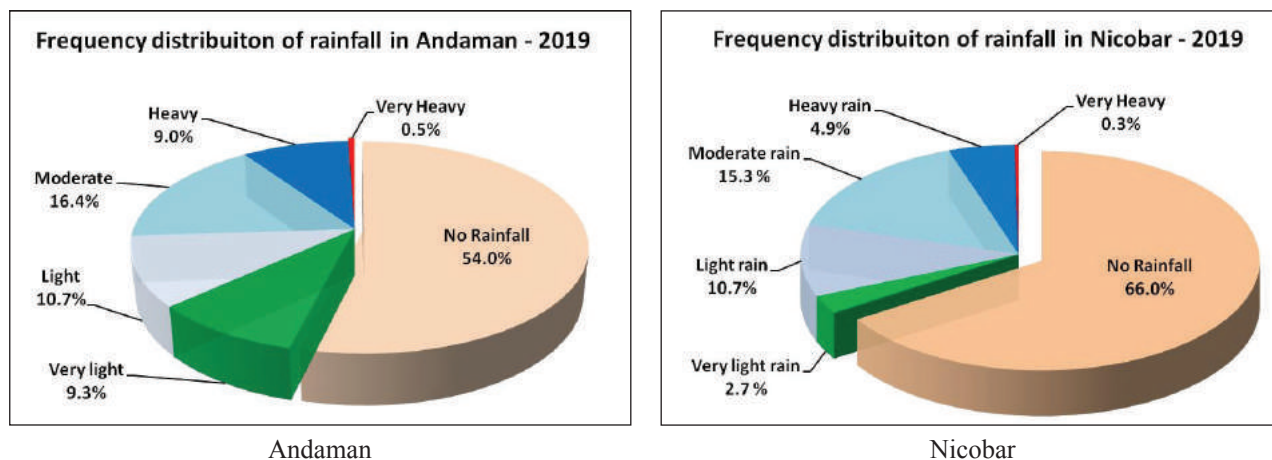


Fig.2: Frequency distribution of rainfall in 2019



gene pattern

P-2

P-3

P-4



DIVISION OF
ANIMAL SCIENCE



4.4 Division of Animal Science

Germplasm Conservation and Characterization

Breeding performance of Vanaraja breeders

To assess the breeding performance of *Vanaraja* breeders under Poultry Seed Project, 398 female and 40 male *Vanaraja* breeders were reared under intensive poultry rearing system. A total of 16395 numbers of hatchable eggs were produced between 27 to 64 weeks of age. The age at sexual maturity (ASM) was 190 days with average egg weight of 37.36 ± 8.9 g. The age at 5% egg production was 220 days. During breeding period, average feed allowance was 145 g per bird per day. The body weight during the period of 27 to 45 weeks of age ranged from 3.55 ± 0.55 kg to 4.30 ± 0.6 kg males and 2.75 ± 0.3 to 3.45 ± 0.8 kg for females.

Growing performance of Vanaraja parents (sixth batch) and Srinidi

A total of 1162 *Vanaraja* and *Srinidi* parent stock were received from Project Directorate on Poultry, Hyderabad during the period. The mean body weight (g) of *Srinidi* of male and female at 4th week were 765.25 ± 0.06 and 205.65 ± 0.02 and at 16th week, 2351.6 ± 0.05 and 2166.85 ± 0.04 respectively. The mean body weight (g) of *Vanaraja* fifth batch of male and female birds at 4th week was 876.6 ± 0.02 and 260.1 ± 0.01 respectively.

Propagation of germplasm

During the period of April to December 2019, in a span of 9 months, a total of 16709 germplasm of hatchable poultry eggs including *Vanaraja* and *Grampriya* were supplied.

Establishment of duckling resource unit

To conserve the precious local germplasm, mini incubator was established in North and Middle Andaman and a total of eight batches were hatched out during the period. The mini incubator was used by farmers for hatching of 587 eggs and has produced 345 chicks. The mean hatchability percent was 58.43% based on total eggs set. The handling skill of farmers on mini incubator has improved which is justified by improvement in hatchability per cent of 17.53 as compared to last year. Since the establishment of duckling resource unit, a total of 22 batches of hatching have been completed with setting 1711 eggs and 827 chicks have been hatched out with overall mean hatchability per cent of 49.66. The establishment of this mini incubator unit has significantly improved the unit size of poultry farm from 420 nos to 1186, farmers have their own source for the chicks and own sale of chicks to other farmers and resulted in 2.82 fold increase in the availability of chicks in N&M Andaman.

Conservation of indigenous germplasm of pig of Island ecosystem

During period under report, phenotypic characterization and production performance of Andaman Local pig, an indigenous pig germplasm of Andaman and Nicobar Islands were recorded (Table 9). Reproductive parameters such as litter size at birth, total and individual litter weight at birth, litter size at weaning, total and individual litter weight at weaning and pre and post-weaning mortality were recorded. The results revealed that significantly ($p < 0.05$) higher body weights were observed from month 1 to 9 under intensive system in male compared to female pigs. Similarly, significant differences were observed in the reproductive parameters between pigs of male and female and significantly higher values were observed in male than in female pigs. It is baseline information for further process for conservation and propagation of Andaman local pig.

Table 9: Productive and reproductive performance of Andaman Local Pig

Sl. No	Traits/ Characters	Mean ± SE		
		Male	Female	Total
1	Litter size at birth (no.)	3.867±0.1642 ^a	3.167±0.1183 ^b	7.033±0.1887
2	Avg. Individual weight at birth (Kg)	1.660±0.01264 ^a	1.417±0.0161 ^b	1.660±0.01264
3	Litter Weight At birth (Kg)	6.412±0.2720 ^a	4.483±0.1656 ^b	10.89±0.3045
4	Litter size at weaning (no.)	3.325±0.1320	3.108±0.1123	6.433±0.1966
5	Avg. Individual weight at weaning(Kg)	10.55±0.09306 ^a	9.512±0.0640 ^b	-
6	Litter weight at weaning (kg)	35.08±0.3094 ^a	29.56±0.1990 ^v	64.64±0.3488
7	No. of days for weaning (d)	42	42	
	Body weight at different ages (Kg)			
	1 Month	6.67 ± 0.15 ^a	5.96 ± 0.2 ^b	
	2 Month	14.51±0.1768 ^a	13.08±0.1855 ^b	
	3 Month	19.79±0.2154 ^a	18.05±0.1952 ^b	
	4 Month	28.36±0.2411 ^a	26.13±0.2913 ^b	
	5 Month	45.13±0.1750 ^a	40.77±0.2673 ^b	
	6 Month	59.13±0.3036 ^a	56.96±0.2741 ^b	
	7Month	75.96±0.2894 ^a	69.53±0.3882 ^b	
	8 Month	80.45±0.1449 ^a	75.47±0.2160 ^b	
	9 Month	85.67±0.2336 ^a	78.00±0.3677 ^b	

Molecular Characterization of Immune System Genes of Nicobari Fowl

The project has both characterization of Mitochondrial DNA (MtDNA) and immune genes (Toll-like receptors) of Nicobari fowl. MtDNA is widely used in phylogenetic studies because of its variability, lack of recombination and maternal inheritance. This maternal marker (MtDNA) is used for identifying wild ancestors and localizing domestication centers. Currently, MtDNA control region was targeted for population genetics analysis and to identify haplogroups of Nicobari chicken native to Andaman & Nicobar Islands. The complete control region DNA sequences of 45 Nicobari chickens including brown, black and white were submitted to NCBI Gene bank and got accession number MK847522 to MK847566. In addition, blood samples of Nicobari chicken from Car Nicobar were collected and DNA was isolated from whole blood using DNeasy Blood & Tissue Kit (Qiagen). The complete control region (D-Loop) was PCR amplified to get specific product of 1325 bp. The PCR product was sequenced and edited to generate 38 complete control region DNA sequences in this study.

The control region DNA sequence (1232 bp) is used to calculate haplotype diversity (Hd), nucleotide diversity (π) and number of segregation (or) polymorphic sites (S) for different populations of Nicobari chicken using DnaSP software. The nucleotide diversity range from 0.00476 - 0.00633 in different populations of Nicobari chicken, the least value of nucleotide diversity is seen in ICAR-CIARI Farm and highest is seen in Nicobar village population (Table 10). The haplogroups A, B, E1, E2, E3, F & I were seen in different populations of Nicobari chickens. The haplogroups A and B is widely distributed but not found in Africa. The haplogroup E1 is most widely distributed in most geographical region across the globe, but the haplogroups E2

and E3 occur mainly in domestic chickens and red jungle fowls of South Asia. The haplogroup I is very rare being found only indomestic chickens of South Asia.

Table 10: mtDNA diversity indices of Nicobari chickens

Different populations	Number of sequences (N)	Nucleotide diversity (π)	Number of haplotypes (Nh)	Haplotype diversity (Hd)	Number of segregation/polymorphic sites (S)
Nicobar Villages	23	0.00633	8	0.719 \pm 0.094	34
Nicobar Farm	15	0.00548	7	0.781 \pm 0.102	22
CIARI Farm	45	0.00476	7	0.774 \pm 0.038	18

Molecular signature of eco-sustainability of indigenous livestock breeds

Trinket cattle, highly endangered feral cattle of Trinket Island, are linked with the colonial history of Andaman and Nicobar Islands. Danish people during their colonial time introduced these cattle in Trinket Island. Great Sumatra earthquake and Indian Ocean Tsunami in 2004 has forced these cattle to become feral in nature. Due to negligence, the cattle are at the brink of extinction and only around 150 of descendants of the cattle are reported. The haematology, serum biochemistry and mineral profiles of Trinket cattle were evaluated. All the haematological parameters were within the normal physiological range of cattle as depicted in Merck's Veterinary Manual. Total serum protein concentration was 7.490 \pm 0.1442 g/dl (7.21 g/dl -7.69 g/dl). Concentration of serum albumin and globulin was 3.48 \pm 0.13 g/dl and 4.23 \pm 0.07 g/dl respectively. Serum concentration of glucose, urea, SGOT, SGPT and ALP was 63.59 \pm 2.58 mg/dl, 31.75 \pm 1.43 mg/dl, 88.85 \pm 2.22 IU/l, 28.70 \pm 1.11 IU/l and 101.60 \pm 2.25 IU/l respectively.

Whole mitochondrial genome (Mitogenome) analysis of indigenous livestock species

Whole mitochondrial sequencing of Nicobari pig, Andaman Desi pig, Teresa goat, Andaman Local goat, Trinket cattle and Andaman Buffalo has been done by NGS based methodology and the sequences have been deposited in GenBank with following accession numbers (Table 11) .

Table 11: Details of sequences deposited in GenBank

Nicobari Pig	Andaman Desi Pig	Teresa Goat
		
MK248681	MK248682	MK234705



Evaluation of Nicobari fowl using molecular marker

For selection of Nicobari fowl a total of 30 day old Nicobari chicks were selected for the study, all the birds were individually tagged and body weight of individual birds were recorded from day old stage up to 4 month. The average body weights (Mean±SD) of Brown, White and Black Nicobari at day old stage were 30±0.83 g, 29.44±0.55 g and 29±0.66 g respectively. At the end of 4th month, the average body weights (Mean±SD) of Brown, White and Black Nicobari were 1.61±0.11 kg, 1.59±0.07 kg and 1.705±0.11 kg respectively. Further, two genetic markers namely signal transducer and activator of transcription b5 (STATb5) and Cathepsin D (CTSD) were selected for evaluation of productive potential of the birds. The PCR amplification conditions of the markers have been standardized.

Molecular characterization of Rhipicephalus microplus complex

A comprehensive profile of mitogenome analysis of *Rhipicephalus microplus*, isolated and identified from Andaman and Nicobar Islands, a part of Maritime South East Asia has been worked out in details. Complete mitogenome of Indian isolate of *R. microplus* (MK234703) was 14903 bp. Mitochondrial (mt.) genome had 13 protein coding genes (PCGs), 22 tRNAs, two ribosomal subunits and two control regions. All PCGs were located on the H-strand except nad1, nad5, nad4 and nad4L. All start codons were ATN codon and abbreviated stop codons were seen in cox-2-3, nad-5 and cytb. A purine rich tick-box motif has been identified. A tandem repeat unit (TTTATT), described as a region alike to nad1 was identified in 130 bp insertion in between nad1 and tRNA-Glu and in nad1 sequence. Presence of two control regions (CRs) proved that, two CRs have evolved in concert rather than independently. Strong biasness towards A and T in Indian isolate of *R. microplus* is a typical feature for most of the arthropods. Subtracted values of dn and ds suggested that, there was least effect of mt. sequence of cox1 gene when Indian isolate was compared with other isolates of *Rhipicephalus*. On the basis of phylogenetic analysis, species of the genus *Rhipicephalus* could be clustered in three groups; ticks of the genera belonging to sub-family Rhipicephalinae could be grouped in a single cluster. Finally, cox1 sequence of MK234703 indicated that the isolate belonged to clade Asensu Burger *et al.*, 2014 which has not been reported earlier from India (Fig.3).

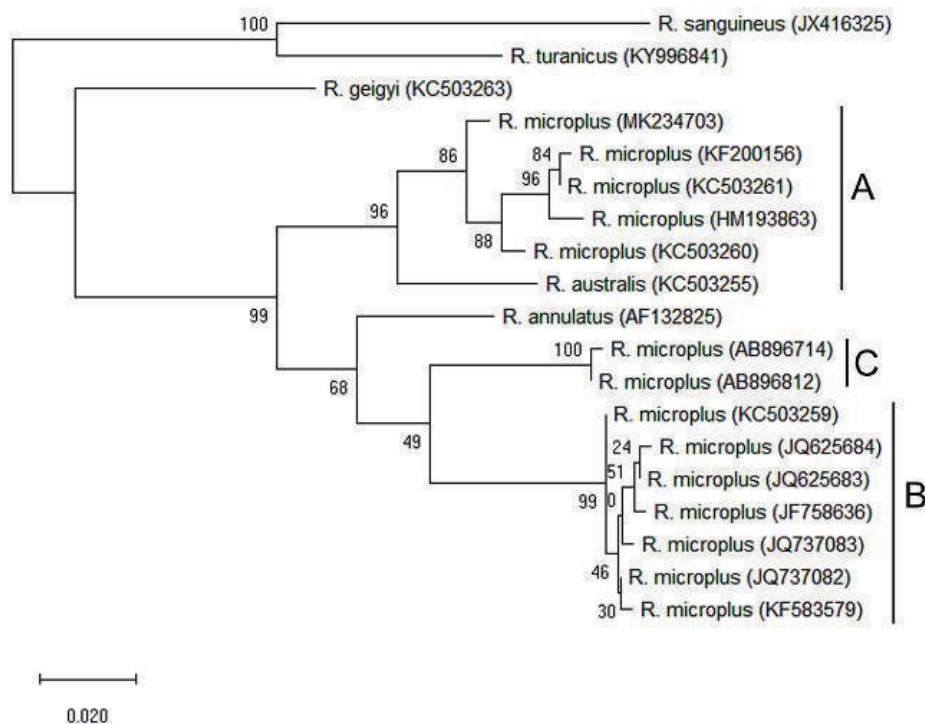


Fig.3: Molecular Phylogenetic analysis of *Rhipicephalus* spp. by Maximum Likelihood method based on partial sequence of coxI. (A= *R. microplus* clade A sensu Burger *et al.*, 2014, B= *R. microplus* clade B sensu Burger *et al.*, 2014 and C= *R. microplus* clade C Low *et al.*, 2015)

Improvement of Andaman local goat

AICRP- Goat Improvement project on Andaman Local goat has created considerable improvement in productivity enhancement and economic status of the goat farmers and till date, three clusters were established at south Andaman, Middle and North Andaman. A total of 324 farmers have been registered in 36 villages comprising of 3766 goats. The overall least square means of body weights (kg) at birth, 3, 6, 9 and 12 months of age are 1.33 ± 0.02 , 5.23 ± 0.14 , 9.03 ± 0.17 , 11.98 ± 0.12 , 15.49 ± 0.11 . Age at first mating, weight at first mating, age at first kidding, weight at first kidding, kidding interval, service period and gestation period was 194.69 ± 4.97 days, 11.44 ± 0.23 kg, 405.26 ± 4.88 days, 16.46 ± 0.08 kg, 230.07 ± 4.58 days, 86.69 ± 4.75 days and 145.5 ± 0.13 days respectively. High genetic (0.778 ± 0.14) and phenotypic (0.64 ± 0.05) correlations were found between 6 month body weight and 9 month body weight indicating the suitability of selection based on 6 month bodyweight. Forty two male kids were selected, on the basis of 6 month body weight and 60 days milk yield for future breeding purpose. The selection differential of 0.42 kg body weight and 119.76 ml milk yield of dam for 60 days over population mean was recorded. The kidding percentage of 77.27 on the basis of tupped does and the kidding rate of 1.47 were recorded in the present stock. The percentage of singles, twins, triplets were 51.5, 43.1 and 8.0 respectively. A total of 2838 goats were given the mineral mixture, 2231 were treated for different illness and 2523 goats were given deworming. The overall mortality during the period was only 3.83 %. A total of 165 farmers have been trained under the project for scientific goat rearing (Plate 39). The overall economic growth of the farmers is 52% after the intervention of the project and the net income from per doe productivity has been enhanced to 14.17 %.



Plate 39a: Training and distribution of mineral mixtures



Plate 39b: Distribution of superior bucks at Nimbudera cluster

Cryobiology

Genetic and Management Interventions to identify the key role players in bull semen freezability and to reduce the cryo-injury on bull spermatozoa

To undertake the study, animals with good and poor cryo-preserved semen producers were grouped based on more than 30 observations per bull and were categorized into poor and good (Fig.4). Their semen was processed for the antioxidant assays and oxidation stress status was assessed. Comparison of RNA extraction with respect to Cell type, Concentration and protocols showed that sperm RNA is degraded can't be detected in MOPS gel. The RIN value obtained i.e. 2-2.5 is low compared to expected 8 and above (Fig.5). A larger number of sperm populations i.e. in the range of 50 were needed for RNA extraction and best results was obtained in combinational approach of RNA extraction. The present study investigated protein profiles of RNAlater preserved and fresh PBMCs using three extraction buffers viz. Triton X-100, RIPA and SDS. Proteins were separated in discontinuous gel electrophoresis and quantified using densitometry.

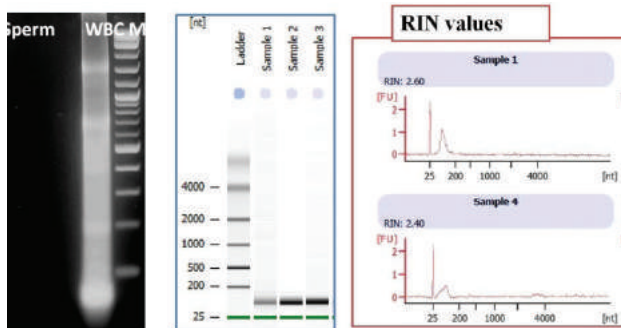


Fig.4: Denaturing Gel electrophoresis of Sperm and WBC (A), Agilent bio analyzer (B) and RIN values (C) of sperm RNA

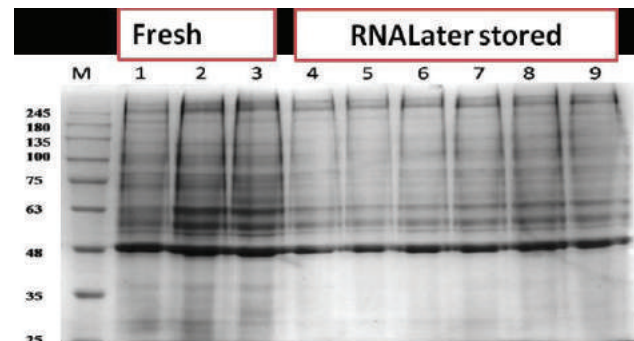


Fig.5: Protein profiles of Fresh and RNAlater stored cells using Triton X-100 (Lane 1, 4-5), RIPA (Lane 2, 6-7) and SDS (Lane 3, 8-9) buffers

On average 19.3 bands from fresh and 15.6 bands from RNAlater storage cells were obtained with a molecular weight ranging from 25 to > 250 kDa. RNAlater storage generated a fewer number and lesser quantity of low molecular weight proteins while yielded a similar or high quantity of high molecular weight protein fractions. The principal component analysis showed that TritonX-100 was inferior as compared to

SDS and RIPA with respect to their protein bands and quantity yielded. While RNA later was effective in preserving PBMC for proteome analysis, our findings warrant caution in its use in proteomics experiments especially if the target was low molecular weight proteins.

Reproductive management

Identification of Genome-wide molecular signatures in Andaman Local goats

Association of hematological profiles with multiple birth frequency in Andaman Local goats were assessed. A significantly higher WBC percentage ($p < 0.05$) was observed in does with multiple births kidding compared to does which never gave multiple births. Further, evaluation of the association of Zn and Fe on Multiple births using AAS showed association of multiple birth frequency with Zn concentration. A high concentration of Zn was noticed in does with no history of non-multiple birth while Fe showed no association (Fig.6). PCR-SSCP pattern for BMP15 and Kiss peptin genes were generated using PAGE (Fig.7). While four patterns and two patterns were detected in Kisspeptin and BMP15 genes respectively, No significant association with multiple birth frequency could be found.

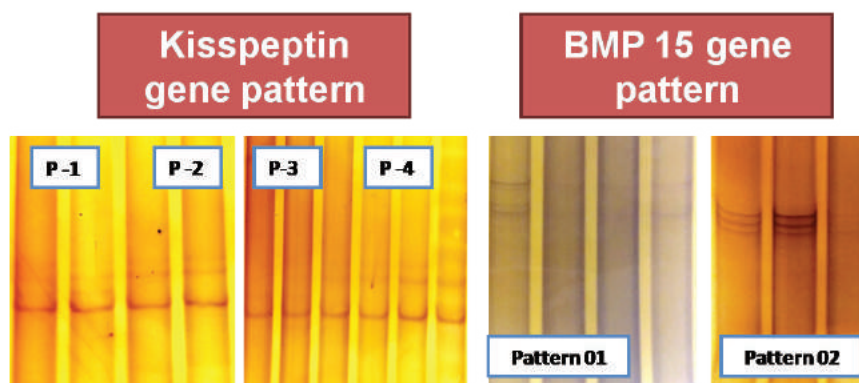


Fig.6&7: PCR-SSCP patterns of kisspeptin and BMP15 genes in Poly acrylamide gel

Endocrinological and Biochemical Profiles of Bovine Species for Enhancing Fertility in Bay Islands

Effect of different stage of reproduction on hormonal variations in crossbred cows of Andaman and Nicobar Islands: Hormonal variation on different reproductive stages such as heifer, pregnant, non-pregnant, oestrus and anoestrus in crossbred cows of Andaman and Nicobar Islands was studied. Endocrinological profiles such as follicle stimulating hormone (FSH), luteinizing hormone (LH), progesterone, estrogen, thyroxine and cortisol were estimated. Result revealed that FSH, LH, estradiol and cortisol were significantly higher in oestrus stage and significantly lowest in anoestrus stage. Progesterone concentration was significantly higher in pregnancy followed by di-estrus stage and lowest was observed in oestrus stage. Thyroxine concentration was significantly higher in pregnant and lowest was in anoestrus and di-estrus stage. It concludes that significant variation on endocrinological profiles was observed between reproductive stages in crossbred cows of Andaman and Nicobar Islands.

Effect of different pathological disorders on hormonal variations in crossbred cows of Andaman and Nicobar Islands: Hormonal variation on different pathological disorders such as post-partum anoestrus, repeat breeding syndrome, post pubertal anoestrus, underdeveloped genitalia, cystic ovarian degeneration, retention of foetal membrane, post-partum metritis and endometritis in crossbred cows of Andaman and Nicobar Islands

was studied. Endocrinological profiles such as follicle stimulating hormone (FSH), luteinizing hormone (LH), progesterone, estrogen, thyroxine and cortisol were estimated. Data analysis revealed that hormone profiles were significantly deviated from the normal unaffected animals. It concludes that affected animals were deficient or misbalance/imbalance for different endocrinological profiles.

Birth rate and birth weight of crossbred calves in Andaman and Nicobar Islands: Month, season (wet and dry) and year variation on calving pattern and birth weight was studied in crossbred dairy cows. The datas were analysed from 207 calves born during 1999 to 2018 at ICAR-CIARI, Port Blair. Relative female ratio (RFR) and secondary sex ratio (SSR) were also calculated. Result revealed highest birth rate at April, August and May, intermediate at January, February, and October to December and lowest at March, June, July and September. Birth-rate in year-wise showed a non-cyclical fluctuation. Birth weight was non-significant between sexes, seasons, months and years. Non-significantly higher birth weight was observed in male than female, wet than dry season. Maximum calving was during wet and minimum was during dry season. It concluded sex ratio and birth weight not differed between months or seasons or years. However, wet season/months were found to be most conducive for breeding of cattle under semi-intensive system in A & N Islands, India.

Walking and dry season stresses on crossbred cows of Andaman and Nicobar Islands: Effect of walking stress during dry season on physiological, biochemical and hematological profiles in crossbred cows of Andaman and Nicobar Islands was studied. Two experimental groups, Gr I: control (n=6; not exposed to walking stress) and Gr II: treatment (n=6; exposed to walking stress). Cows in stress group walked 10 km to and fro from during dry season. Physiological parameters, blood profiles, antioxidant profiles and lipid peroxide profile were measured. Data analysis revealed that physiological, hematological profiles and also oxidative profile concentration were increased significantly ($p < 0.05$) and concentration of antioxidants were decreased significantly ($p < 0.05$) in the treatment crossbred cows than in control animal group. The study concludes that walking stress during dry season has significantly ($p < 0.05$) influenced the performance of crossbred cows of Andaman and Nicobar Islands.

Augmentation of breeding efficiency through controlled breeding programme in infertile cattle: Controlled internal drug release (CIDR) based oestrus synchronization was conducted in 8 numbers of cattle. All the cattle were responded to the oestrus synchronization and expressed heat. Artificial insemination was done. Five animals were confirmed as pregnant (62.5%).

Biochemical and molecular mining of hormonal profile of buck under abiotic stressors and managerial intervention for its mitigation

Effect of season on endocrinological, biochemical and scrotal & testicular profiles of caprine species (buck) of Bay Islands: Effect of seasonal variation on scrotal circumference & testicular biometrics, endocrinological, oxidative and antioxidant profiles in Teressa and Andaman local goat was measured. Statistical results revealed that the SC & testicular biometrics, biochemical profiles and endocrinological profiles differed significantly ($p < 0.05$) between seasons. Significantly ($p < 0.05$) greater SC and testicular volume & weight were observed in monsoon than in dry season. Endocrinological profiles such as FSH, LH/ICSH, testosterone & thyroxine were significantly ($p < 0.05$) greater and cortisol were significantly ($p < 0.05$) lower in monsoon than in dry season. Antioxidant profiles were higher and malondialdehyde levels were significantly higher in monsoon than in dry season. It was concluded that the monsoon season has significantly greater beneficial effects than dry season on reproduction and artificial breeding programme in semi-intensive management of goat in the Andaman and Nicobar Islands.

Walking and summer stress on physiological, hematological and antioxidant profiles in Andaman local goat under Island tropical ecosystem: Effect of walking stress on physiological, hematological and antioxidant profiles in Andaman local goat. The animals were divided into two groups, viz. group-I (n=6): control (not exposure to walking stress) and group-II (n=6): treatment (exposure to walking stress). The treatment group was allowed to walk 8 km to and fro from the farm without allowing grazing. Immediately after stress, physiological parameters were measured and hematological profiles and antioxidant profiles were assessed. Result revealed physiological, hematological profiles and malondialdehyde were significantly higher and antioxidant profiles were significantly lowered in stressed animals than in unstressed animal group. It concludes that walking stress during dry season has significantly affected the performance of Andaman local goat (Fig. 8).

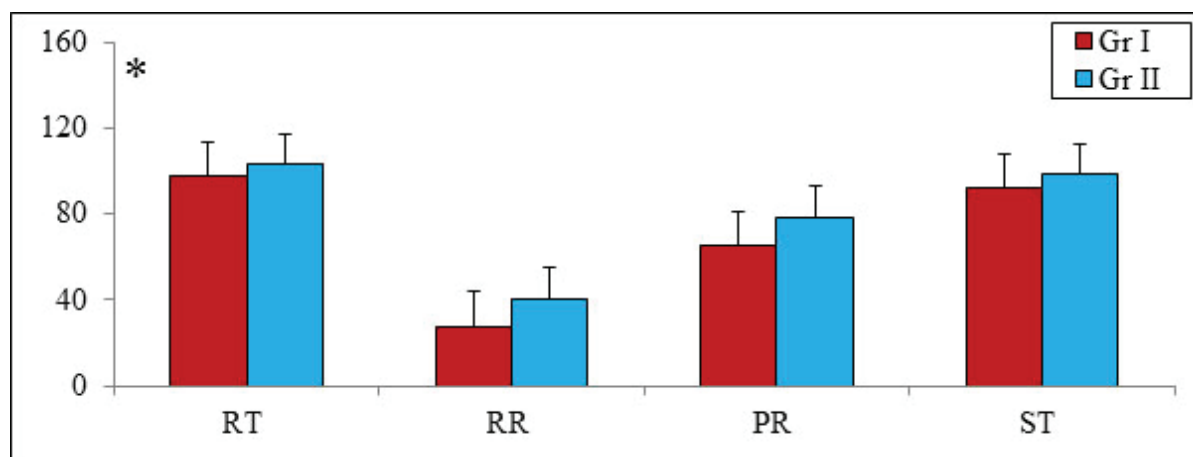


Fig. 8: Effect of walking and dry season stress on physiological profiles in Andaman Local goat; RT: Rectal Temperature (°F), RR: Respiration Rate (beats per minute), PR: Pulse Rate (beats per minute) and ST: Skin Temperature (°F). GI: Unstressed animal group, GII: Stressed animal group. * indicates $p < 0.05$ between treatment and control groups.

Physical, biochemical and molecular characterization of semen in pigs of bay islands Vis-a-Vis study on feasibility of artificial insemination

The responses of the local boar to oestrus female while semen collections using gloved hand technique were recorded. The libido exhibited by boars ranked high to medium with libido index of 1.37. The average time spent to prepare for collecting semen over oestrus sow was 3.38 ± 0.63 minute. Duration of ejaculation was 4.63 ± 0.55 minute with an ejaculation rate of 23.75 ± 2.39 ml per minute. Sexual behaviour characters like grunts, chomps, salivation, rhythmic micturation, nudging, nosing of perineum, licking, striking out the forelimb, mount, intromission, pelvic thrusts and ejaculation were exhibited. Length and width of right testis in local pig of 6^{1/2} month age was measured 13.63 ± 0.60 and 7.93 ± 0.51 cm whereas length and width of left testis was measured 14.27 ± 0.52 and 8.883 ± 0.51 , respectively. Height and thickness of right testis was measured 7.93 ± 0.31 and 2.86 ± 0.16 cm whereas height and thickness of left testis was 8.27 ± 0.24 and 3.20 ± 0.17 cm, respectively. In Nicobari pigs at 6^{1/2} month of age, the length and width of right testis was measured 14.13 ± 0.79 and 8.13 ± 0.67 whereas length and width of left testis was measured 15.10 ± 0.66 and 8.67 ± 0.54 , respectively. The height and thickness of right testis was measured 8.70 ± 0.53 and 2.59 ± 0.14 , respectively whereas left testis it was 9.13 ± 0.39 and 2.93 ± 0.22 cm, respectively. Partial scrotal circumference of local and Nicobari pigs at 6^{1/2} month of age was measured 15.46 ± 0.61 and 14.27 ± 0.35 , respectively. The comparisons of mean values of scrotal and testicular measurements between right and left testes within local or Nicobari pig as well as between the local and Nicobari pigs was found non-significant ($p \leq 0.05$). The mean values of

seminal attributes like total ejaculate volume, gel free semen, pH, sperm concentration; total and progressive sperm motility was 210 ± 10.03 ml, 182.5 ± 7.52 ml, 7.6 ± 0.10 , 197 ± 13.04 million per ml, $87.5 \pm 7.52\%$ and $82.5 \pm 7.52\%$, respectively in local boars. Artificial insemination was performed in one sow in field at farmer's door and three sows at farm with semen diluted in ready to use extender. Sperm head length, sperm head width, and sperm tail length and total sperm length in local pigs were measured 9.42 ± 0.04 , 5.24 ± 0.28 , and 43.93 ± 4.22 and 52.37 ± 2.11 μm , respectively. Microbial investigation of extended semen samples revealed microbial count of 77.4×10^6 CFU per mL which is within normal range. Gel electrophoresis of sperm cells revealed on an average 15 bands in the range of 35kDA to more than 250 kDA. However, number of protein bands observed in gel portion was less than 15 and a distinct band observed only in gel.

Oestrus synchronization and fixed time artificial insemination in crossbred anoestrus cows under semi intensive rearing in tropical island ecosystem

A study was conducted in cross bred cattle at institutional farm to record the success of oestrus synchronization treatment and conception in anoestrus cows. The cattle at the farm were maintained under semi intensive rearing which is also prevalent practice of rearing cattle in these Islands. A total of eight cows were selected based on history of anoestrus and after thorough reproductive examination including pregnancy status. The non pregnant cows with normal genitalia and reproductive organs were selected for experimentation. All the experimental anoestrus cows were treated with combination of Ovsynch and CIDR. Fixed time artificial insemination with frozen semen was performed twice at 12 hr interval. Pregnancy diagnosis was performed by per rectal examination and with ultrasound by 60 days post insemination. Present study has shown that all the animals (100%) responded to oestrus synchronization treatment. Five out of eight cows were diagnosed pregnant (62.5%) using oestrus synchronization treatment and fixed time insemination. It was concluded that CIDR with Ovsynch protocol is effective to induce oestrus in anoestrus cows and fixed time insemination after oestrus synchronization can be implemented successfully to improve fertility in anoestrus cows.

Livestock Health

Prevalence and economic impact of gastro-intestinal parasites of livestock in Andaman and Nicobar Island

Prevalence of coccidiosis in Andaman local goat, a native goat breed of Andaman and Nicobar Islands has been worked out. The study was undertaken for one year. The maximum oocyst output was seen in kids of <6 months of age in the month of March followed by in the month of November, July, August, October, September, December, May and April. More oocyst count in kids of < 6 months of age compared to those of older goats may be attributed towards lower immunity towards this infection. Increase of oocyst output from the month of July was due to increase in relative humidity due to high rainfall. Onset of clinical cases of caprine coccidiosis with high oocyst count was due to fodder crisis in the month of March due to less rainfall for consecutive two months. Four species of *Eimeria* was detected and the most prevalent species in pooled sample was *E. arloingi* (48%), followed by *E. faurei* (20%), and *E. pallida* and *E. parva* (16% each) and among them *E. arloingi* has been seen to be associated with clinical coccidiosis of goats. Amprolium, a potent thiamine antagonist, was used to treat the infected animals with high oocyst count and the compound was found effective @ 50 mg/kg body weight which was evaluated on the basis of oocyst count, improved body weight and clinical recovery. The report is the seminal information on prevalence of coccidiosis, species richness, metaphylaxis and its effect in Andaman local goat from Andaman and Nicobar Islands, an isolated insular region of India.

Effects of Salmonella typhimurium Lipopolysaccharide on natural immunity of native Nicobari fowl

It is being the practical and field experience that native Nicobari fowl of A&N Islands is having higher immunity towards Ranikhet Disease, Marek's disease, IBD, *Salmonella*, *E.coli* and coccidiosis. Generally, vaccination against poultry disease is not provided to the birds under farm and field condition to indigenous fowl of A&N Islands. Modern immunology, however, has revealed that a group of genes, called the major histocompatibility complex (MHC) genes, interleukins and interferon gamma seem to be intimately associated with both disease resistance and immune responsiveness. Nevertheless, there is a scarcity of information on the effects of *Salmonella typhimurium Lipopolysaccharide* on natural immunity of native Nicobari fowl of A&N Islands. Hence, the current study was undertaken to investigate the effects of LPS on these cytokines. LPS dissolved in saline at an approximate dose of 5.0 mg/kg BW. The Nicobari fowls of both parents and their progeny were divided into four groups viz., T1 parents with LPS T2: injected intravenously with 0.2 mL sterile saline (control) T3: progeny with LPS; T4: progeny with saline. The cloacal temperature was recorded. Serum concentration of MHCs, IL-6 and Interferon gamma (IFG) were quantified using ELISA method at 2, 4, 12 and 24 hours intervals. The cloacal temperature of LPS-treated birds was elevated at 2 h post treatment in both the parents and progeny. However, it was not significantly different from saline groups. The mean values of serum levels of cytokines for the respective groups were of MHCs (ng/L); 1280.75, 1276.60, 1274.67, 1279.82, IL_6 (pg/ml): 400.80, 399.26, 399.76, 41; IFG (pg/ml): 2.40, 2.40, 2.40, and 2.407. All the groups were not significantly different in sero-concentration of cytokines. It is inferred that this information validates that native Nicobari fowl has natural immunity as they have higher pyrogenic tolerance, innate immune homeostasis (MHCs), resistance to invading pathogens (IL-6) and improved immune function (IFG).

Sero-surveillance and monitoring of important diseases of livestock

During the period no major outbreak of livestock and poultry diseases were reported from the Islands. Passive surveillance reported the occurrence of 14322 parasitic cases across the A & N Islands. The main parasitic infestation reported were fascioliasis (34.52%), amphistomiasis (30.63%) and ascariasis (25.63%). Percent prevalence was found to be more in cattle (46.9%), followed by goat (44 %) and buffalo (9.1%) respectively. Spatial distribution shows that percent prevalence in relation to total diseases was more in South Andaman (65%), followed by North & Middle Andaman (25.63%) and low in Nicobar (9.25%) district. According to livestock population size of cattle, buffalo and goat, total parasitic cases were high (200 nos. per 1000 animals) in South Andaman and low in N&M Andaman (59 nos.). The temporal distribution analysis showed that the overall percent prevalence was found to be high (14%) in the months of August and November and low (7-8%) during April to June. As per total livestock population, parasitic cases increase from 10 nos. to 20 nos. per 1000 animals during rainy seasons. A total of 105 goat sera samples were screened to detect specific antibody against *Peste des petits ruminants virus* (PPRV) by competitive ELISA and bluetongue by blocking ELISA. Results showed that almost 90% of the samples were found positive to PPRV and 86 % to bluetongue. Screening of cattle sera samples (394) for foot and mouth disease virus antibodies by DIVA (differentiating vaccinated from infected animals) ELISA test was done. The result indicated that none of the samples were positive. The trend of the DIVA test indicated that there is sharp decline in the number of samples showing positive to DIVA test which means that there is less chance of circulation of FMD virus in the population (Fig.9). The herd immunity during the year was found to be 55.2 % (Type O), 46.9% (Type A) and 61.7% (Type Asia-1).

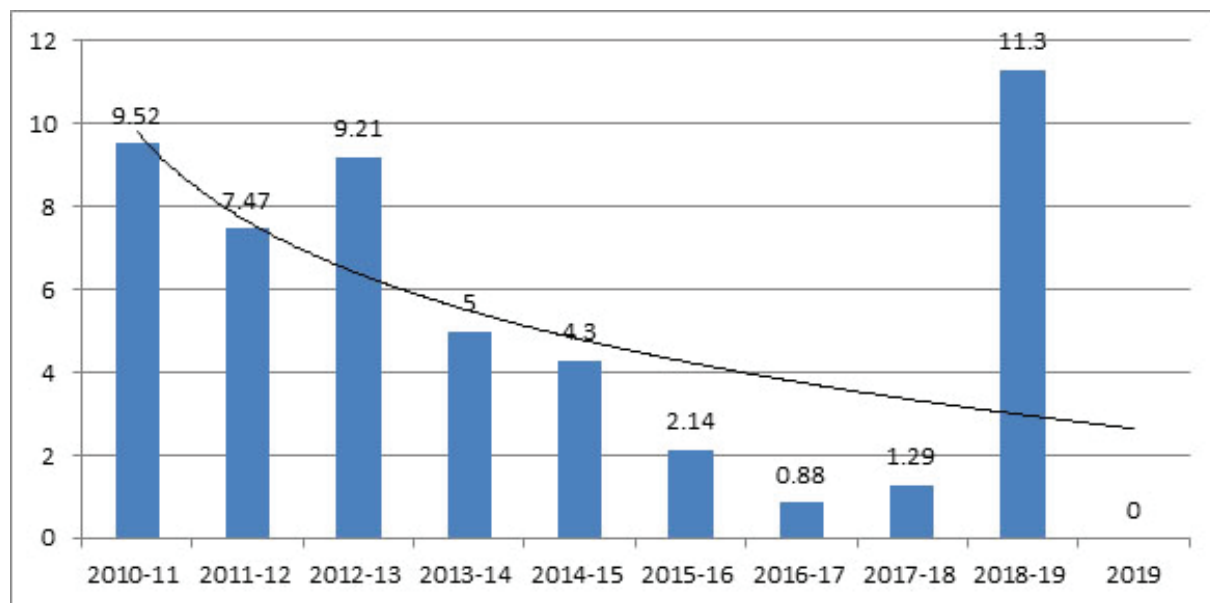


Fig.9: Trend in of DIVA sero positivity in cattle

Status of mineral profile in soil, fodder and its relation with productivity

During the period three micro minerals such as copper (Cu), zinc (Zn) and iron (Fe) and macro minerals viz. calcium (Ca) and phosphorus (P) were analysed in the fodder, soil and cattle sera of South, N&M and Car Nicobar. Average soil moisture was maximum in wet season (28%) and then was low in the dry season (19%). Average pH ranges from 4.9 to 6.8. Soil in this range is considered to be healthy soil for most food plants. The Zn content in both soil (<1.5 ppm) and fodder (<20 ppm), Cu in soil (< 1 ppm) and fodder (<5 ppm), Mn (< 20ppm) was found to be below the critical level across wet and dry season. This study indicated that cattle are deficient in Cu (<0.57 µg/ml) and Zn (< 0.6 µg/ml) during all production stages of growing, pregnancy and lactating. Moreover, this deficiency might be one of contributing factors for infertility. Serum analysis revealed that the concentration of Fe and Mn was within the normal range but was deficient in Cu and Zn. The level of Ca and P was also out of range and the required calcium phosphorus ratio was not maintained across all stages of production. Based on the preliminary study fertile and infertile zone was selected and serum samples were analyzed for Ca: P ratio which might have adverse effect on production performance. Ca: P ratio close to 2:1 is required for good production. Thus the result revealed that deficiency of minerals may be the reason for infertility. The present study revealed significant wide variations and deficiency in the levels of macro and micro elements in soils, fodder and serum of animals. Assessment of mineral status in soil, fodder and serum samples indicated that mineral deficiency is one of the reasons for the reproductive problems of the bovine population of these Islands. It is concluded that the inadequate supplementation of mineral are to some extent responsible for reproductive problem in dairy animal.

Drug Read Out System

Botanical identification of ethno veterinary medicinal plants of tribal farming community

A total of 20 medicinal plants were documented from tribal farming community of Car Nicobar and Hutbay meant for eye and gastrointestinal problems in animals. Their botanical name was identified viz., 1. Meuitameuyo – *Sida acuta*; 2. TANFĀTö, TUMLö - *Sida cordifolia*; 3. TökURòTòNG - *Tabernamontana crispera*; 4. PANRĀPö- *Carcharusaestuans/ Jasminum syringifolia*; 5. Amra – *Spondiaspinnata*; 6. ÔLKA- *Annona reticulate*; 7. TACHUHÛRÒi - *Alstonia macrophylla*; 8. Töngäv-el Kúi - *Lepidopetalum jackianum*; 9. Marvalu – *Abutilon indicum*; 10. KUYAVö – *Psidium gujava*; 11. HiNYôYö – *Glochidion calocarpum*; 12. HANöHMISöKKö – *Premnacorymbosa*; 13. Hötliök – *Vernoniapatula*; 14. Hakonpookore- *Ageratum conyzoides*; 15. Pööcho – *Ehretialaevis*; 16. Mufut - *Paederia foetida*; 17. Raneül – *Crotalaria alata*; 18. Hingot – *Flueggavirosa*; 19. Chamrevo – *Lepisanthes rubiginosa*; 20. Tokiteuny- *Leea indica*

Preliminary in vitro evaluation of medicinal plants of Nicobari tribes for further processing as feed and water additives in poultry

Preliminary in vitro screening was done to study the efficacy of medicinal plants against poultry gut microbes. A total of 25 cloacal swabs were collected from vanaraja birds that were under intensive system of management. The swabs were inoculated in nutrient broth and incubated at 37°C overnight. The cultures were then streaked on EMB and Mackonkey agar plates. Out of which, a total of 20 *E. coli* (80%) and 19 *Salmonella* (76%) isolates were identified based on colonial morphology and further biochemical tests. The isolates will be submitted to National *Salmonella* and *Escherichia* Centre, Kasauli, Himachal Pradesh for serotyping. Methanolic extracts of medicinal plants were prepared and diluted with DMSO (@ 50 µg per µl). Medicinal plant extracts in different concentration were used for antibacterial activity against *E. coli* isolates (10⁷cfu per ml) by using conventional disc diffusion method and zone of inhibition (mm) were recorded. The present findings showed that all the methanolic extracts have moderate antibacterial activity (Table 12) against *E. coli* isolates of cloacal swab. Comparatively better antibacterial activity was recorded with *Spondias pinnata*, *Ageratum conyzoides*, *Flueggea virosa*, *Psidium gujava*, *Morinda citrifolia*, *Ehretia laevis*, *Leea indica*, *Taberna montana crispera* and *Abutilon indicum*.

Table 12: Antibacterial activity of extracts of medicinal plants of Nicobari tribal farming community against *E. coli* isolates

Sl.No	Common name (Nicobari language)	Plant name	Zone of Inhibition (mm)	Minimum Inhibitory concentration (µg per µl DMSO)
1	Amra	<i>Spondias pinnata</i>	15.0	80
2	Chamrevo	<i>Lepisanthes rubiginosa</i>	14	285
3	HANöHMISöKKö	<i>Premna corymbosa</i>	13.0	60
4	Hakonpookore	<i>Ageratum conyzoides</i>	14.0	160
5	Hingot	<i>Flueggea virosa</i>	14.0	210
6	HiNYôYö	<i>Glochidion calocarpum</i>	12.0	410

Sl.No	Common name (Nicobari language)	Plant name	Zone of Inhibition (mm)	Minimum Inhibitory concentration (μg per μl DMSO)
7	Hötliök	<i>Vernonia patula</i>	11	310
8	KUYAVö	<i>Psidium gujava</i>	16	165
9	Lurong	<i>Morinda citrifolia</i>	17	270
10	Meuitameuyo	<i>Sida acuta</i>	14	100
11	Mufut	<i>Paederia foetida</i>	12.0	160
12	ÔLKA	<i>Annona reticulate</i>	13.0	90
13	PANRÃPö	<i>Corchorus aestuans/ Jasminum syringifolia</i>	12.0	120
14	Pööcho	<i>Ehretia laevis</i>	14.0	160
15	Raneúl	<i>Crotolaria alata</i>	14.0	510
16	TACHUHÚRÒi	<i>Alstonia macrophylla</i>	12.0	190
17	TANFÃTö	<i>Sida cordifolia</i>	12.0	310
18	Tokiteuny	<i>Leea indica</i>	15	770
19	TökURòTòNG	<i>Tabernaemontana crista</i>	16	475
20	Marvalu	<i>Abutilon indicum</i>	15	170
21	Gentamicin (10 μg) (Positive control)	Under identification process	25	-
22	DMSO (Negative control)	Under identification process	Nil	-



DIVISION OF
FISHERIES SCIENCE



4.5 Division of Fisheries Science

Marine capture fisheries

Biology and Population dynamics of major perch fishes of Andaman Islands: The larger perciformes fishes belonging to families Serranidae (groupers), Lutjanidae (Snappers) and Lethrinidae (Emperors) are termed as ‘major perches’. Thirty-four species of major perches, belonging to three families were identified during the period. Among these species *Lutjanus malabaricus*, *L. rivulatus* and *L. argentimaculatus* of family Lutjanidae; *Plectropomus maculatus*, *P. pessuliferus*, *Epinephelus bleekeri*, *E. malabaricus*, *Aethaloperca roga* of family Serranidae; *Lethrinus lentjan*, *L. nebulosus*, *L. conchyliatus* were frequently landed in the commercial longline fishery of Junglighat, Guptapara and Wandoor with some catches landed through trawlers from Juglighat. Small perches such as *Cephalopholis sonnerati*, *C. miniata*, *Epinephelus fasciatus*, *E. tauvina*, *Variola louti* (family Serranidae) *Aprion virescens*, *Lutjanus bohar*, *L. decussates*, *L. fulvus*, *L. kasmira*, *L. gibbus*, *L. lunulatus* (Family Lutjanidae) and *Lethrinus ornatus*, *L. mahsena* and *L. harak* (family Lethrinidae) are landed and transported to local markets. Monthly biological analysis (feeding and reproductive) of *Lutjanus decussates* were done from September 2019 to December 2019. From the feeding behaviour it was observed that the fish is a carnivore (crustacean feeder) during the post-monsoon season and the stomachs are dominated by coral crabs, followed by Alpheid shrimps, Palaemonid prawns and hermit crabs. In some cases *Apogon* sp., *Ambasis* sp., fish scales and digestive matter of fishes are observed in the stomachs of examined samples. From gonad it is observed stage VII and stage III of gonad and indicates that the species is a monsoon breeder and the gonad gets regenerating during the post-monsoon season.

Elasmobranch fisheries of Andaman Islands

Twenty-eight elasmobranch species belonging to 22 genera, under ten families and five orders have been recorded from three different gear types (Long line, Gill net and Trawl net) from landing centres of Juglighat, Wandoor, Guptapara, Burmanallah and Dignabad. Among all elasmobranchs, sting rays constituted 57% (16 species) followed by sharks 39% (11 species) and showel nose rays 4% (1 species). Among sharks *Loxodon macrorhinus* (74-106 cm TL), *Carcharhinus amblyrhynchos* (99-130 cm TL) and *sphyrna lewini* (55-226 cm TL) were frequently found in the landings. Among sting rays, *Himantura leoparda* (40-180 cm DW), *H. uarnak* (60-130 cm DW), *H. undulata* (95-150 cm DW) and *Neotrygon indica* (40 to 60 cm DW) were observed frequently among sting rays and *Glaucostegus cf granulatus* (120-180 cm TL) among showel nose rays. The majority of the catches from Islands are targeted by the skilled Thoothoor fishers of Tamil Nadu, as they employ large mesh sized bottom drift gill nets and low numbered hooks (1 to 4) for elasmobranch fishing. The remaining catches were mostly bycatches of hooks/long lines and trawl fishers. Around 98% of elasmobranch landings are exported to Kochi (99% & large varieties) and Kolkata (1% & smaller varieties) ports. Only 2% (small sharks and rays) consumed as fresh and dried salted forms in the domestic markets.

Aquaculture

Mariculture: The creeks of Sippighat, Chidiyatappu, Wandoor, Manjeri, Shoal bay, Collinpur, Marine hill, Kurumadra and Badabalu were surveyed to assess the availability of candidate marine finfish and shell fish seeds suitable for mariculture. During the surveys mullet seeds (*Chelon parsia*) were found available through the season in survey sites and is found to be a candidate species for brackish water culture in tsunami inundated areas. The milk fish (*Chanos chanos*) locally known as ‘ruyimachi’ seeds were found abundant particularly during monsoon season in the creeks of Collinpur and Kurumadera which is another candidate species for aquaculture. Fewer numbers of *Lutjanus argentimaculatus* seeds were also collected from Chidiyatapu and Port Mout creeks. The seed availability at survey sites in different seasons are given in Table 13. Sites suitable for cage culture were surveyed in Bamboo flat, Sippighat, off Ross Island region, Marine Hill area, Port Mout, Minne Bay, off Carbyn and North Bay. Location, depth, transparency, salinity and temperature of the surveyed region were recorded. The bays of North Bay and Port Mout were identified as suitable sites for open sea cage culture. During the wild seed surveys a new species of Moray eel was discovered and named as *Gymnothorax andamanensis* with proposed common name as Andaman brown moray being a significant discovery to marine eels of Andaman and Nicobar Islands.

Table 13: Commercially important wild fish seed resources in South Andaman

Species	Pre- Monsoon				Monsoon				Post- Monsoon													
	Sippihat	Chidiyatapup	Port Mout	Wandoor	Manjeri	Shoal Bay	Collinpur	Marine Hill	Bada Balu	Kurumadera	Sippihat	Chidiyatapup	Port Mout	Wandoor	Manjeri	Shoal Bay	Collinpur	Marine Hill	Bada Balu	Kurumadera		
Fin fish species																						
<i>Chanos chanos</i>									✓												✓	
<i>Chelon parsia</i>	✓		✓		✓										✓							✓
<i>Lutjanus argentimaculatus</i>																						
<i>Lutjanus johnii</i>			✓																			
<i>Ellochelton vaigiensis</i>		✓				✓									✓							
<i>Epinephelus orngus</i>							✓															✓
<i>Sillago sihama</i>			✓											✓								
<i>Psettodes erumei</i>													✓									
Crustaceans																						
<i>Panulirus ornatus</i>								✓														
<i>Penaeus monodon</i>			✓																			✓
<i>Fenneropenaeus indicus</i>			✓													✓						
<i>Fenneropenaeus mergutensis</i>																						
<i>Fenneropenaeus penicillatus</i>			✓																			
Molluscans																						
<i>Perna viridis</i>								✓														
<i>Tegillarca granosa</i>																						
<i>Pinctada margaritifera</i>																					✓	✓
<i>Crassostrea rivularis</i>																						
<i>Septoteuthis lessoniana</i>																						

Aquaponics system incorporating fisheries and agri-components

One freshwater flood and drain aquaponic unit was set up in Garacharma farm of ICAR-CIARI with four hydroponic units integrated with one FRP fish tank of 500L capacity. After completing 15 days of dry cycling i.e. running the system without fish and plant components, puntius fish (*Barbonymus gonionotus*) was stocked in the fish tank @ 100 nos m⁻³. The unit was run for another 30 days with fish and without plants to establish the bacterial colonies in the hydroponic bed. After 45 days cycling process, saplings of tomato, ladies finger, capsicum and coriander seeds were planted in the hydroponic beds. No water exchange was done during the trial but water level was maintained by adding freshwater to compensate the evaporation, transpiration and handling losses. Periodical samplings were carried out to assess the water quality, plant growth and fish growth. During the experimental trial, water quality parameters were observed in the optimum range for fish culture. Poor growth performance in terms of stunted growth in capsicum and poor germination and survival in the case of coriander were observed and the same were replaced with Amaranthus and Malabar spinach saplings. The average plant and fish growth observed during the trial is shown in the Figure 10. Plants such as ladies finger and tomato showed good growth and fruit production during the trial. Feed conversion ratio and protein efficiency ratio were 1.8 and 2.2 respectively. Outdoor experimental trials to optimize the culture conditions in freshwater and marine aquaponics systems are planned for the next year.

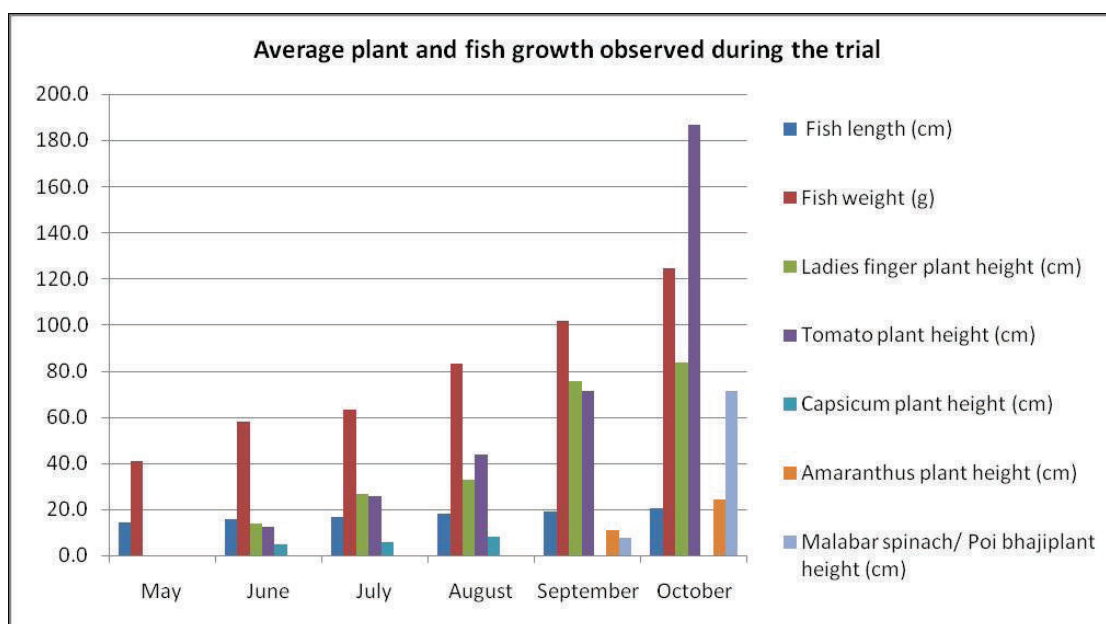


Fig 10: Average plant and fish growth observed during the trial

Fish diseases and health management

Surveillance for aquatic animal diseases (NSPAAD)

Under the passive surveillance, an outbreak of *Argulus* sp. was observed in catla, rohu and mrigal in a fish pond of South Andaman. Mass mortality of *Barbonymus gonionotus* due to *Ichthyophthirius* sp. was recorded from a freshwater aquarium at South Andaman. In order to promote better management practices in freshwater aquaculture, baseline data has been collected from 247 freshwater fish farms located at North and Middle Andaman and South Andaman Districts and necessary advices were provided to improve the farming practices (Plate 40).



Plate 40 : Collection of baseline data, fish and shellfish samples

As a part of active surveillance, marine and freshwater fish and shellfish samples were collected from North and Middle Andaman and South Andaman districts for screening against the target pathogens by following the standard protocol. A total of 136 freshwater carps, 193 wild marine shrimps, 170 marine groupers and 6 seabass samples were collected (Plate 41). Wild marine shrimp samples namely, *Penaeus monodon*, *P. indicus*, *P. merguensis* and *Fenneropenaeus penicillatus* collected from Junglighat, Lohabarrack, Kalighat, Betapur and Durgapur landing centres gave positive result for White Spot Syndrome Virus (WSSV) and Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV) by PCR method. Under the capacity building activity, a total of 4 numbers of awareness programmes (Table 14) were conducted on fish health management measures in which a total of 77 farmers have participated (Plate 43).

Table 14: Awareness programmes conducted under NSPAAD project

SI. No.	Date	Venue	Number of Participants
1	01-06-2019	Badmaspahad, South Andaman	16
2	01-08-2019	Chouldari, South Andaman	21
3	27-09-2019	Guptapara, South Andaman	14
4	21-12-2019	Mithakhari, South Andaman	26



Plate 41: Awareness programmes conducted at Chouldari and Mithakhari

Parasites infesting commercial marine and freshwater fishes

Surveys were conducted in fish landing centres, fish markets, freshwater farms and natural water bodies of South Andaman to study the incidences of fish parasites in commercial fishes of Andaman Islands. Altogether 50 fish samples comprising of marine (mainly Groupers, Nemipterus, Mackerels and Carangids) and freshwater fishes (Killi fishes, Snakehead murels and Barbs) were collected and examined for the presence of

parasites. The presence of Pleistophora cysts and *Camallanus* sp. were identified and confirmed in the viscera of Groupers and gut of *Rastrelliger kanagurta*, respectively. A case of mass infestation of *Caligus* sp. was also recorded in *Esomus danrica*. Marine fish parasites such as *Lernaenicus* sp. was reported from *Stolephorus* sp. and *Cymothoa frontalis* was recorded from *Paraexocoetus mento*. Besides, gonad infesting *Philometra* sp. was found in *Nemipterus randalii* and *Camallanus* sp. was recorded from the intestine of *Channa striata*. Further surveys and examination could provide comprehensive insights on the list of parasites that infests the commercial marine and freshwater fishes and the loss of fishery caused due to parasitic infestations.

Post harvest and value addition

Post harvest utilization trends and market potential for value added products

Market surveys were conducted to identify the consumer preferences and scope for marketing of value added fishery products in the Islands. Parameters such as fish price, frequency of purchase, freshness, and quality criteria were taken in to account in the surveys. Major fish landings centres in Junglighat and fish markets of Bathubasthi, Mohanpura and Junglighat were surveyed for data collection from stakeholders. The major constrains reported by the consumers includes wider fluctuations in market price and poor quality of fishes in certain instances. Most of the respondents had idea on value added fish products and are certainly receptive of such produces in local markets if prepared and marketed hygienically. Further market surveys and data collection could provide detailed insights on the consumer preference and market potential for value added products in the Islands.

Seafood quality and safety assessment studies

The study aimed to understand the existing quality and safety management protocols in the major commercial fish landings of the Andaman Island. Reconnaissance surveys were conducted in fish markets and landing centres to gather adequate information on the general hygiene and existing handling practices of fish. A questionnaire was prepared by considering all the aspects of hygiene and quality of fish to collect the data from stakeholders. Markets and landing centres at Junglighat, Mohanpura, Bhathubasthi, Guptapara, and Wandoor were visited for data collection. Lesser sardines, anchovies, carangids, perches, elasmobranchs, seer fishes, barracudas etc. are the common fish landings identified in the surveys. Unhygienic handling practices of fish and insufficient use of ice were the major issues observed in the markets. Depending on the quality, price of the fishes gets fluctuated and the same fish are sold at different price on the same day. Based on the inputs collected from the stakeholders a popular article was prepared on sanitation and quality of fish products for the welfare of stakeholders. The hygienic status of the fish markets, microbial quality of seafood including all the contact surfaces of fish and the prevalence of microorganisms of public health significance will be further studied to assess the quality as well as safety aspects of seafood.





SOCIAL SCIENCE SECTION



4.6 Social Science Section

Adaptive strategies to develop climate resilient agriculture

A survey was undertaken to study the perception of tribal *vis-a-vis* non-tribal farmers about climate change, and to document their indigenous adaptation strategies to mitigate climate change effects on agriculture, among the farmers of Diglipur tehsil, North & Middle Andaman. Fifty farmers across 18 revenue villages of 12 gram panchayats were interviewed through multi-stage random sampling technique.

Farmers' perception about climate change

Out of 50 farmers, 68% have perceived various changes in the climatic pattern over the years. While 91% of farmers who perceived a change in the climate felt a decrease in the quantity of monsoon rainfall, 3% have asserted an increase in the same (Figure 11).

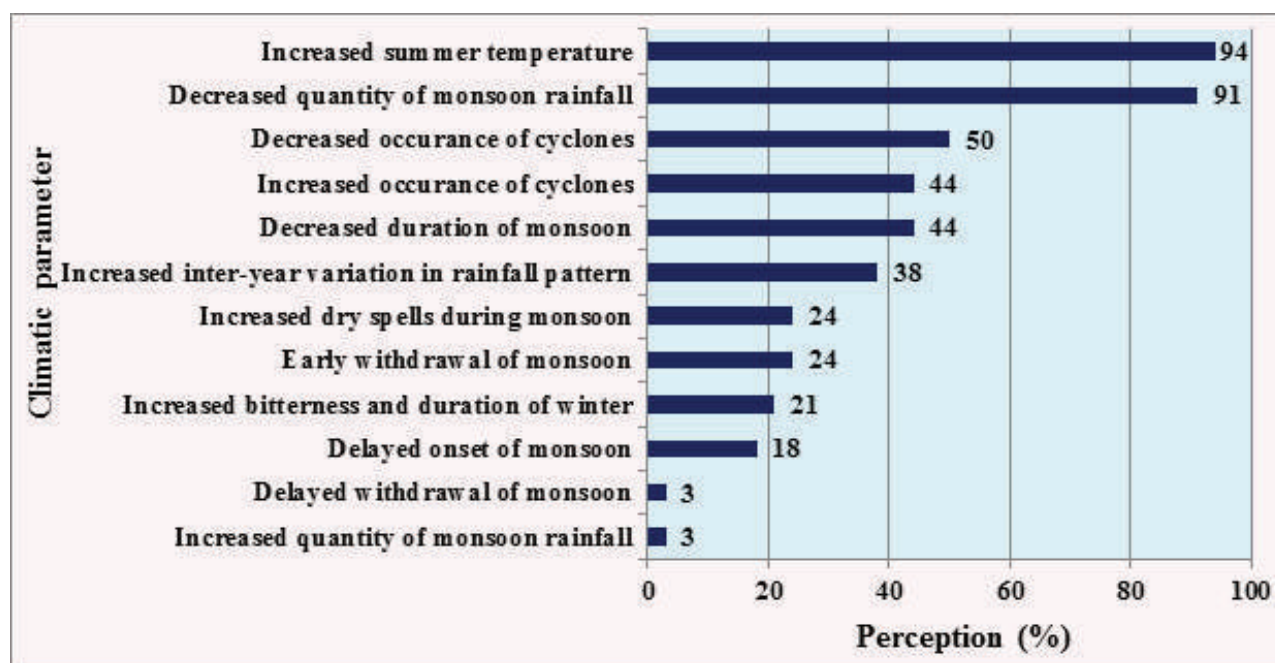


Figure 11: Perception of Diglipur farmers about climate change

Though 94% of farmers have felt an increase in summer temperature, 21% opined that the chillness and the duration of winter have increased in the recent years. Even as 44% of farmers felt that the duration of monsoon has decreased with increase in the occurrence of cyclones, 50% of farmers felt that the number of cyclones has decreased of late. Whereas 18% of farmers experienced a delay in the onset of monsoon, 24% have experienced an early withdrawal of monsoon. Incidentally, 3% of farmers have felt withdrawal of monsoon is getting delayed over the years. According to 38% of farmers, the inter-year variation in the rainfall pattern has increased even as 24% of farmers felt that the dry spells during the monsoon have increased alarmingly.

Perceived impacts of climate change on agriculture

Farmers who have perceived a change in the climatic parameters are convinced that it is adversely impacting their farming in one way or other. While most of the farmers perceive a decreasing yield in paddy and vegetables over the years, many have complained of increased pest, disease and physiological disorder

occurrence in vegetables *viz.* leaf curl in chilli, cercospora leaf spot and fusarium wilt in brinjal, collar rot in tomato, leaf miner in cucumber and blossom end rot in watermelon.

While the untimely rainfall during end of south-west monsoon damages the matured paddy crop ready for harvest and denies taking up rice fallow pulse leaving excess moisture in the soil, farmers are left high and dry to cut short their commercial rabi cropping season due to depletion of water storage structures *viz.* pond, river, canal and borewell as north-east monsoon withdraws early. A few farmers reported increased disease and mortality in livestock especially poultry.

Indigenous adaptation strategies

Incidentally, farmers in the study area are pursuing a diversified cropping system to tide over the production risk emanating from climate change and marketing risk emanating from price volatility. While paddy is predominantly the sole crop during kharif season from June to September, variety of vegetables *viz.* brinjal, bhendi, cauliflower, cabbage, chilli, khol khol, vegetable cowpea, beans, lablab bean, radish, tomato, leafy vegetables, bitter gourd, pumpkin, cucumber, bottle gourd, snake gourd and ridge gourd are being cultivated during rabi season from October to March in small pockets ascertaining the irrigation potential and market demand. While they ensure their food security by conserving the harvested paddy for home consumption, the income security is ensured by the commercial vegetables. Besides, the arecanut plantation on hilly settlement lands offers a sustained income to the farmers. Livestock components *viz.* cattle, goat, poultry and duck are a part of the integrated farms.

The commonly adopted indigenous adaptation strategies against climate change include mulching of arecanut plantation with paddy straw during summer season, farm pond, intercropping (eg. Cabbage in chilli, chilli/tomato in young arecanut), border cropping (eg. Maize in chilli) relay cropping of vegetables during rabi season, crop diversification (with vegetables, pulses, plantation, fruits etc), farm diversification with livestock, reduction in cultivable area during rabi season for want of irrigation and cultivation of long duration, lodging resistant rice varieties such as Gayatri.

Constraints in adaptation of indigenous strategies

Though farmers are inherently adaptable to climate variability, the impending climate change has left them startled due to lack of sufficient irrigation capacity, lack of drought tolerant, pest and disease resistant high yielding vegetable varieties, lack of timely availability of inputs *viz.* seeds, fertilizer; labour shortage and volatile market.

Institutional adaptation strategy

With climate issues high on the global agenda, the potential role of crop insurance in development, disaster risk reduction and climate change adaptation is attracting widespread attention among governments and donor agencies as it increases the resilience of the insured, allow households to improve their decision-making process, provides them cash at opportune times to make capital investments and encourage adoption of new technologies. To this effect, Government of India has implemented Pradhan Mantri Fasal Bima Yojana (PMFBY) on 18th February 2016. Of the sampled 50 farmers, 42 were aware of the scheme and its functionalities. In that, 43% of farmers got the first information about the scheme through Agriculture Department, 29% through Television, 14% through neighbors, 12% through Primary Agricultural Cooperative Society and 2% through Gram Sabha.

Constraints in adoption of crop insurance

Ironically, only 52% of the 42 farmers who were aware of the scheme have insured their crops viz. paddy during kharif; and pulses and vegetables during rabi. Tenancy and undivided ancestral land are the major bottlenecks in purchasing insurance.

Policy support research for agriculture development

Problems and prospects of vegetable value chain in Diglipur Market Area

Endowed with a dedicated farming community, conducive physiography and predominant ruralness, North & Middle Andaman district tops the vegetable cultivation with an acreage of 3,230 ha under varied vegetables viz. brinjal, bhendi, cauliflower, cabbage, chilli, knolkhol, vegetable cowpea, beans, lablab bean, radish, tomato, leafy vegetables, bitter gourd, pumpkin, cucumber, bottle gourd, snake gourd and ridge gourd. Diglipur, the second urban centre after Port Blair is the major vegetable market area wherein vegetables cultivated across 34 revenue villages of 15 Gram Panchayats reach Diglipur market for local sale and transportation to Port Blair.

A study has been undertaken during *Rabi* season 2019-20 on the problems and prospects of vegetable value chain in Diglipur market area. Through multi-stage random sampling technique, fifty farmers were interviewed across 18 revenue villages of 12 gram panchayats to know about the existing vegetable value chain, source of various inputs and constraints in their accessibility; and various channels of marketing, problems and prospects thereupon (Plate 42).



Plate 42: Interaction with vegetable farmers at shyam nagar

Existing vegetable value chain

With a sparse population of 43,183 spread across 884 sq.km, the demand for vegetables in Diglipur tehsil is not sufficient to absorb the humongous supply. Hence the variety of vegetables produced across Diglipur tehsil are aimed to cater the burgeoning urban market of Port Blair located 300 km down south (Figure 12).

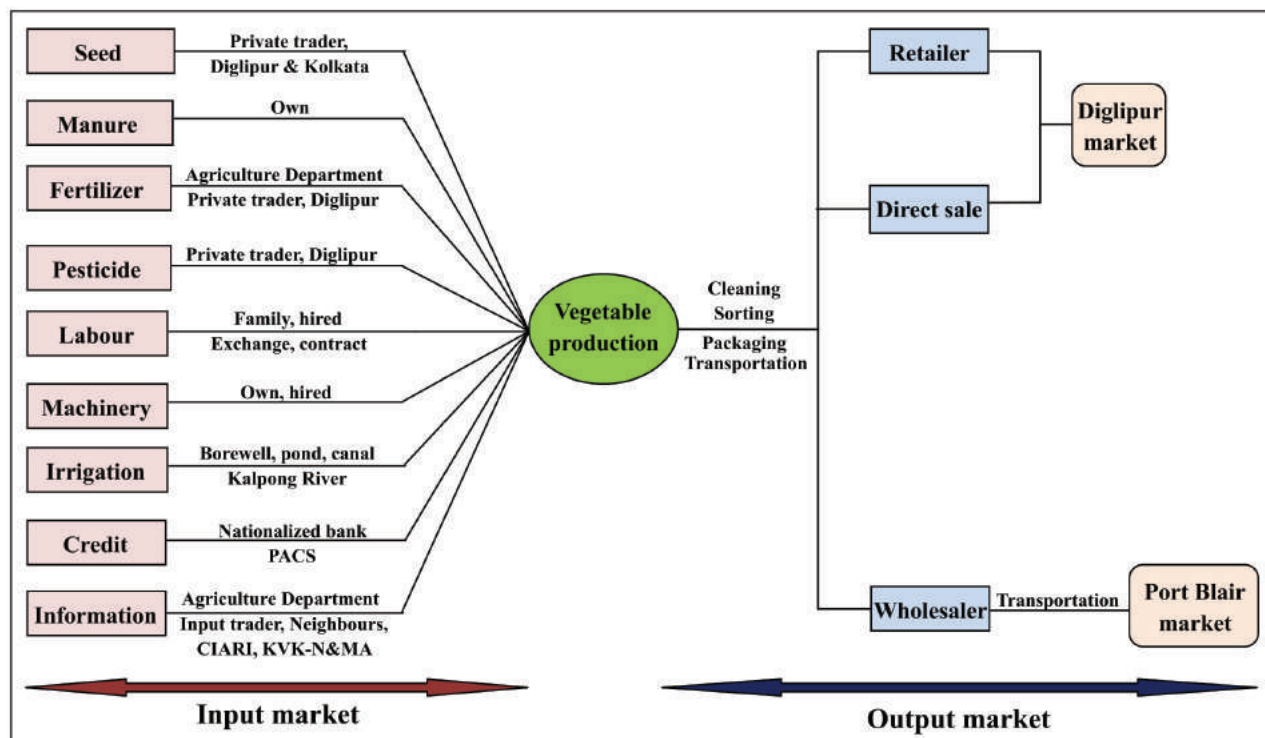


Fig.12: Existing vegetable value chain in Diglipur market area

Input market and constraints

Every season, Agriculture Department supplies vegetable seeds to farmers but has stopped supplying inorganic fertilizers as a policy decision to convert the Island agriculture to organic. Though some progressive farmer's source out vegetable seeds from Kolkata through personal contacts and produce vermicompost, generally seeds, organic fertilizers and pesticides are purchased from a few input dealers at Diglipur. Farmers produce their own farm yard manure from few farm cattle. Almost all the family members share the farm operations from sowing to harvesting, thereby saving a huge expenditure on labour. The labour needed over and above the family labour is met out through relatives, hired labour in the village and contractual labour from Kolkata in few cases. Power tiller is the predominantly used machinery for land preparation. Kalpong, the only river of the Islands is the life line of vegetable cultivation in Diglipur tehsil during rabi season. This apart, ponds are the integral part of any farm in the region. A few farmers have borewells too. While the farmers have access to institutional credit for agriculture, they get agro-advisories from Agriculture Department, input dealer, neighbours, CIARI and KVK-Nimbudera.

The major constraints in the input market are erratic seed supply, seed quality, higher price of seeds, non-availability of organic manures/fertilizers in required quantity, quality of available manures, lesser adaptation of vermicomposting methods, lower production of manures due to lesser number of farm cattle, exorbitant price of pesticide, their quality, lesser access to timely advisories, lesser/non availability of bio control agents, seasonal water shortage due to erosion, saline ground water and insufficient pond water for irrigation purpose.

Output market and constraints

Farmers either sell their produce on their own in the farmers' market at Diglipur or supply to retailers thereby saving their time for farm operations. Farmers harvesting larger produce will clean, sort and package their produce; and supply to wholesalers who in turn transport the same to Port Blair. Among the sampled farmers, 78% dispose their produce at wholesaler while 14% supply to retailer and 8% sell directly at Diglipur farmers' market (Plate 43). Cauliflower, cabbage, vegetable cowpea, brinjal, bhendi, chilli, khol khol and beans are the major vegetables sent to Port Blair.



Plate 43: Farmers' Market at Diglipur

Though farmers are endowed with assured market for their high value produce, they face certain constraints such as fluctuating prices and low bargaining power due to perishability of vegetables.

Focus Group Discussion

The findings of the survey were validated through Focus Group Discussion with 60 vegetable farmers of Madhupur and surrounding villages (Plate 44).



Plate 44: Focus Group Discussion at Madhupur village

While the participants acknowledged the survey findings, few suggestions have emerged for the betterment of vegetable production and marketing in the region which includes resumption of ICAR-CIARI Out Reach Centre, assured supply of quality seeds from Institutes such as ICAR-IIHR, Bangalore, promotion / strengthening of Farmer Producer Organization to favour marketing and providing dedicated space for Diglipur produce at Junglighat market in Port Blair. The participants also desired more vegetable trials in Diglipur and regular rabi campaigns for agro-advisories to farmers throughout the vegetable production season by KVK, Nimbudera.

Two-tier Broad Bed & Furrow System of cultivation in challenged area through Scientist-Farmer-Market Approach

Locale: Chouldari, South Andaman

During second year, Shri Sudhir Dutta, a farmer in Creekabad village with a modified Broad Bed Furrow System of 1,188 sq.m. comprising 2 beds and a furrow in-between, had harvested 1.8 t of bottle gourd var. Pusa Santushti from 656 m² bed area and earned a net income of Rs.39,000/-. Fingerlings of Rohu (500 Nos.) were introduced in the furrow to enhance the profitability.

Locale: Dasrathpur, Middle Andaman

A Broad Bed Furrow System of 2,000 sq.m was made at Dasrathpur, Middle Andaman during May 2019 in the field of Shri Rabindranath Chandra Das. The following interventions were made viz. banana var. Raja (250 Nos.), banana var. Local (200 Nos.) and Arecanut var. Mangla (750 Nos.) under fruit component; local selections of brinjal, cowpea, pumpkin, snake gourd, bottle gourd and ridge gourd under vegetable component were grown in 1500m² of beds. Besides, fingerlings of rohu, catla and potti (200 Nos. each) were also introduced in the furrow.

Under the scientific management, the introduced vegetables could yield as follows: brinjal (800 kg), cowpea (500 kg), bitter gourd (200 kg), pumpkin (200 kg), ridge gourd (120 kg), snake gourd (180 kg) and bottle gourd (150 kg) from an area of 1500 m² of beds. Net return with gate price of sale ranging from Rs.30 to 80 was Rs.1,50,000/- in four to five months period with cost of cultivation of Rs.50,000/- only.



Plate 45: Technological intervention in BBFS at Middle Andaman

Locale: Kausalaya Nagar, Middle Andaman

Another Broad Bed Furrow System of 2,000 sq.m. was made at Kausalaya Nagar, Middle Andaman during May 2019 in the field of Smti. Gurudasi Paik. Banana var. Raja (1,000 Nos.), coconut (100 Nos.), arecanut var. Mangala (250 Nos.), mango (50 Nos.), pineapple var. Banaras (50 Nos.) were planted on beds and fingerlings of rohu (300 Nos.), catla (300 Nos.), potti (400 Nos.) were introduced in the furrows of the system (Plate 45).

Technology application, capacity building, policy support and market intelligence to stakeholders

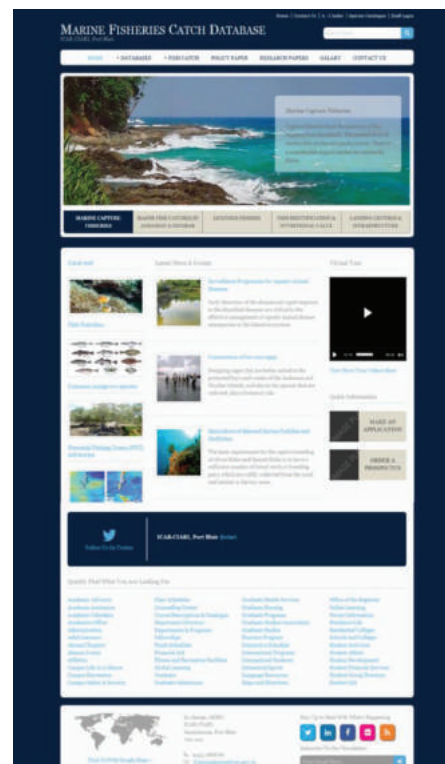
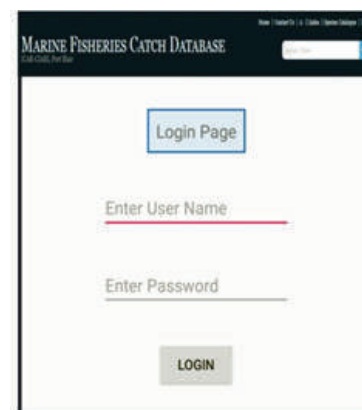
Agricultural Information Sharing and Knowledge Generation through Mobile Apps

Fish catch mobile app was developed to tap the potential of mobile communications and technology towards gathering the fishery data from different parts of the Islands. Since almost all the fishermen use android mobile phone, it was considered to be advantageous to develop a mobile app in which fishermen can update their daily catch records, which can be gathered all over the islands through a centralized server.

Survey were conducted at landing centers and meeting with Department of Fisheries, Andaman and Nicobar Administration officials to understand the current status, regulations, limits and control of fisheries. Records related to fishing details, major species landed, commercial value of species caught, vessel information and catch and efforts data were also reviewed. Other details like consumer level details, quality, preference, domestic and export markets and processing details were collected.

Based on the information collected from the stakeholders, few modules of an innovative fish catch mobile app was developed to systematically record real time marine fish catch data from 51 landing centers across three districts of Andaman and Nicobar Islands. User authentication login page was developed to allow registered users to *login to the site and update catch data. The app has the ability to collect species-wise total catch landed at landing center, vessel information, fisherman details, fishing effort and gear details.* The app is integrated with web server and MySQL data base server to store and retrieve data on real time. Images and main features of 35 commercially important fish species belonging to 3 different groups viz. Pelagic, demersal and oceanic fisheries are available in the app to identify the fishes.

Marine Fisheries Catch Database portal was designed to systematically store and access all fishery information of Andaman and Nicobar Islands. The database contains landing center details and infrastructure, boat owner's details, details of fishermen engaged in fishing, species-wise and gear wise daily catches landed at landing centre. This will facilitate bringing all scattered catch data under one roof so that researchers and planners can use this real time data for policy decision. This web application is developed using PHP scripting and MySQL database.



This portal also contains research findings from the projects carried out by the Fisheries Division of the Institute for the several decades. The information includes landing pattern of sharks, seaweed diversity of Andaman, aquaculture of marine fishes, stock assessment of tuna, inland aquatic biodiversity, breeding of ornamental fishes, PFZ Advisories, mari-culture of marine fishes, marine faunal biodiversity, open sea cage farming and many aspects of fisheries can access from this portal.

Assessment of on-farm demonstrations and farmer's feedback to technologies of IARI disseminated through National Extension Programme

1. Number of the village covered:10
2. Taluk/Tehsil: 03
3. District: 03
4. Type of farm situation: Rainfed
5. Type of soil: Sandy loam

Table 15: Performance of crop demonstration during Rabi 2018-19

Sl. No.	Crop	Variety	No. of Demo	Area (ha)	Yield obtained in demo (q/ha)			Local Check (q/ha)	Increase in yield (%)
					Highest	Lowest	Average		
(A) South Andaman district									
1.	Cauliflower	Pusa Meghna	7	0.05	-	-	78.4	67.5	16.14
2.	Brinjal	Pusa Uttam	7	0.05	-	-	191.1	117.7	62.3
3.	Moong	Pusa Vishal	9	0.05	5.20	4.1	4.7	3.6	30.6
(B) North & Middle Andaman									
1.	Palak	Pusa Bharti	7	0.01	Crop damaged due to heavy rains during initial stages of growth				
2.	Brinjal	Pusa Uttam	6	0.05	The variety is highly susceptible to bacterial wilt and is not successful.				
(C) Nicobar district									
1.	Palak	Pusa Bharti	3	0.01	Crop damaged due to heavy rains during initial stages of growth				
2.	Brinjal	Pusa Uttam	3	0.05	The variety is highly susceptible to bacterial wilt and is not successful.				

a) Economic impact of Moong var. Pusa Vishal

Variety	Average cost of cultivation (Rs/ha)		Average gross return (Rs/ha)		Average net return (Rs/ha)		Benefit cost ratio	
	Demo. plot	Local	Demo. plot	Local	Demo. plot	Local	Demo. plot	Local
Pusa Vishal	14,500	14,500	35,250	27,000	20,750	12,500	2.43	1.86

b) Economic impact of Cauliflower var. Pusa Meghna

Variety	Average cost of cultivation (Rs/ha)		Average gross return @ Rs.35 per kg (Rs/ha)		Average net return (Rs/ha)		Benefit cost ratio	
	Demo. plot	Local (White Veina)	Demo. plot	Local (White Veina)	Demo. plot	Local (White Veina)	Demo. plot	Local (White Veina)
Pusa Meghna	1,53,000	1,53,000	2,74,400	2,36,250	1,21,400	83,250	1.79	1.54

c) Economic impact of Brinjal var. Pusa Uttam

Variety	Average cost of cultivation (Rs/ha)		Average gross return @ Rs.15 per kg (Rs/ha)		Average net return (Rs/ha)		Benefit cost ratio	
	Demo. plot	Local (CIARI 1)	Demo. plot	Local (CIARI 1)	Demo. plot	Local (CIARI 1)	Demo. plot	Local (CIARI 1)
Pusa Uttam	1,48,000	1,48,000	2,86,650	1,76,550	1,38,650	28,550	1.94	1.19

Observation and farmers' feedback

- Farmers are willing to adopt Moong var. Pusa Vishal owing to synchronized maturity and yellow mosaic virus resistance.
- Cauliflower var. Pusa Meghna has good performance, tight curd formation than the local check White Veina.
- Brinjal var. Pusa Uttam has a smaller number of fruiting than CIARI Brinjal 1, but enjoys more market preference. It is susceptible to Fruit and Shoot Borer (FSB) than CIARI Brinjal-1, but ideal for round the year cultivation.



Plate 46 : Demonstration of Moong var. Pusa Vishal in South Andaman



Plate 47: Demonstration of Cauliflower var. Pusa Meghna in South Andaman

Table 16: Coverage status of IARI varieties in during Kharif 2019

Sl. No.	Crop and variety	Quantity received (Kg)	No. of demo.	Area under each demo. (ha)	Location	Total area covered (ha)
1.	Paddy var. PS-5	10	2	0.2	North & Middle Andaman	0.4
2.	Paddy var. P-1850	10	2	0.2	North & Middle Andaman	0.4
3.	Bottle Gourd var. Pusa Naveen	1	2	0.3	North & Middle Andaman	0.6
3.	Bottle Gourd var. Pusa Santushti	1	1	0.3	South Andaman	0.3
4.	Brinjal var. Pusa Uttam	0.48	3	0.2	South Andaman	0.2
5.	Palak var. Pusa All Green	0.50	2	0.2	South Andaman	0.2
6.	Palak var. Pusa Bharti	0.50	2	0.2	South Andaman	0.2
	Total	-	14	1.6	-	2.3

4.7 ICAR-CIARI, REGIONAL STATION, MINICOY, LAKSHADWEEP

Important activities conducted by ICAR-CIARI, Regional Station, Minicoy are as follows

- Scientific coconut plantation demonstrated against the high density planting practiced in Lakshadweep. World Coconut Germplasm block with 12 accessions of both local and exotic origin is being maintained.
- Performance analysis of vegetables like brinjal, okra, chilli, spinach, pumpkin, bitter gourd, ash gourd, snake gourd, and palak varieties in the interspaces of coconut plantation was undertaken. Fruit crops like sapota and papaya grown in the interspaces were found to be performing well.
- Quality seedlings of promising varieties of vegetables and fruits (field tested) are produced and distributed to farmers.
- Quality seedlings of Lakshadweep Ordinary Tall, Laccadive Orange Dwarf and Laccadive Green Dwarf are produced and supplied to islanders which are in high demand.
- Vermicompost production from dried coconut leaves standardized and organic fertilizer from fish processing waste are demonstrated.
- Station exhibits demonstration units of backyard farming of several veterinary components like Katakath chicken, Broad breasted white turkey, Kuttanad ducks, and hybrid goats.
- A demonstration unit for integrated farming of Kasaragod dwarf cattle in coconut plantation incurring zero weeding and feeding cost is being demonstrated.
- Field evaluation of CO5 hybrid Napier grass and Saba banana are currently undergoing.

Activities under different projects

- Documentation of indigenous fishing practices of the tribal fishermen in Lakshadweep islands is being carried out.
- Studies on the feeding and reproductive biology of *Caranx melampygus* from the reefs in Minicoy are currently in progress.
- Under the BIOTEC Kisan Hub project, a low cost egg incubator (Rs. 447 for an incubator that can hatch 50 chicken eggs) has been developed and the same is being evaluated.

Events and Exhibitions carried out

- A poultry farmers stakeholder meet was organized in collaboration with the AH Unit Minicoy to facilitate team activity and coordination among the poultry farmers whereby their products could fetch better and stable price.
- Stalls exhibiting CIARI RS activities and technologies developed by ICAR institutes were put up as a part of National Minicoy Fest in 2019 and 2020. Farm Animal Expo with promising poultry varieties was organized in both the years.
- The center participated in Coastal Agricultural Expo at ICAR-CCARI in Goa and demonstrated its technologies through its stall. The regional station facilitated the participation of farmers engaged in



agriculture and animal husbandry, fishermen, entrepreneurs engaged in value added agri and fishery products sponsored by ICAR in the Expo.

- The RS organized CIARI Livestock Expo '19 on 8th August 2019 and conducted competition in several livestock like Taurus bull, Zebu bull, cow etc. The winners were rewarded to promote healthy animal husbandry practices.

Technology Demonstrations and FLDs

- FLD of terrace farming at 03 farmer's houses.
- FLD on kitchen garden at 07 farmer's houses.
- Demonstration of backyard country poultry rearing at 02 farmer's field.
- Demonstration of community farming of vegetables at Jawahar Navodaya Vidhyalaya Minicoy, High School Minicoy, Naval Detachment Minicoy and Indian Coast Guard Station, Minicoy.
- FLD on protected cultivation of vegetables at Jawahar Navodaya Vidhyalaya Minicoy, Naval Detachment Minicoy and Indian Coast Guard Station, Minicoy.

Inputs supplied under STC

- 120 units snorkeling kit (mask + snorkel + fin) for fishermen of tuna fishing boats engaged in baitfish capture.
- 49 units fishing line (1 Kg monofilament line) for fishermen of smaller vessels engaged in line fishing.
- 30 units multivitamin liver tonic for poultry farmers (both layer and broiler).
- 300 units vegetable seed kits for popularization of backyard kitchen garden and terrace farming.

4.8 KRISHI VIGYAN KENDRA

The activities undertaken under three KVKs at Port Blair, Car Nicobar and Nimbudera are summarized here

4.8.1 ICAR-KVK-South Andaman

I. Training

Discipline	No. of Training	Male	Female	Total
Agronomy	06	61	81	142
Horticulture	06	58	94	152
Animal Science	06	51	110	161
Fisheries	01	03	08	11
Agril. Eng.	07	100	47	147
Plant Protection	06	52	123	175
Home Science	05	10	129	139
Total	37	335	592	927

II. Front Line Demonstration (FLD)

Discipline	No. of FLD
Agronomy	02
Horticulture	02
Animal Science	02
Fisheries	01
Agril. Eng.	03
Plant Protection	02
Home Science	03
Total	15

III. On Farm Trials (OFT)

Discipline	No. of OFT
Agronomy	02
Horticulture	02
Animal Science	02
Fisheries	01
Agril. Eng.	02
Plant Protection	02
Home Science	03
Total	14

4.8.2 ICAR-KVK, Nicobar

I. TRAINING

Discipline	No. of FLD	Male	Female	Total
Agronomy	06	98	82	180
Animal Science	06	118	57	175
Fisheries	03	63	24	87
Horticulture	05	215	110	325
Total	20	494	273	767

II. Front Line Demonstration (FLD)

Discipline	No. of FLD
Agronomy	4
Animal Science	2
Fisheries	-
Home Science	-
Total	06

III. On Farm Trials (OFT)

Discipline	No. of OFT
Agronomy	03
Animal Science	03
Fisheries	-
Home Science	-
Total	06

4.8.3 ICAR-KVK, North & Middle Andaman

I. Training

Discipline	No. of Training	Male	Female	Total
Agronomy	04	219	84	303
Animal Science	05	51	71	122
Fisheries	04	97	33	130
Home Science	04	08	108	116
Total	17	375	296	671

II. Front Line Demonstration (FLD)

Discipline	No. of FLD
Agronomy	03
Animal Science	03
Fisheries	02
Home Science	03
Total	11

III. On Farm Trials (OFT)

Discipline	No. of OFT
Agronomy	01
Animal Science	03
Fisheries	03
Home Science	02
Total	09

5. SCHEDULE TRIBE COMPONENT

Scheduled Tribe Component (STC) is a flagship programme under which our Institute is entrusted to promote the livelihood and income generation of tribal farmers through agriculture and allied sectors. Various initiatives such as capacity building programmes, distribution of inputs, and demonstration of technology and exposure visits were undertaken for the tribal farmers to improve their agriculture and allied activities.

(i) Capacity building programmes

Sl. No.	Title	Date	Venue	Number of participants		
				Male	Female	Total
1.	Importance of pregnant sows and piglets management	18 th May, 2019	Small Lapathy, Car Nicobar	30	20	50
2.	Cultivation of high yielding rice varieties in Nicobar Islands	22 nd May, 2019	Gandhi Nagar, Campbell Bay	27	20	47
3.	Cultivation of high yielding rice varieties in Nicobar Islands	24 th May, 2019	Govind Nagar, Campbell Bay	22	18	40
4.	Scientific pig farming to double the farmer's income	18 th - 27 th June, 2019	ICAR-CIARI, Port Blair	07	03	10
5.	Organic production technology of marigold and Palak as livelihood option for tribal farmers	6 th August, 2019	Campbell Bay, Great Nicobar	39	04	43
6.	Parthenium and its management	22 nd – 24 th August, 2019	Harminder Bay, Little Andaman	14	13	27
7.	Sensitization on tuna pole and line fishing	17 th September, 2019	Big Lapathy, Car Nicobar	50	-	50
8.	Sensitization on tuna pole and line fishing	18 th September, 2019	Sawai, Car Nicobar	28	22	50
9.	Farmers interactive meeting cum training programme on vegetable cultivation	15 th October, 2019	Car Nicobar	120	80	200
11.	Importance of feed additives to alleviate micronutrients deficiency in goats	16 th November, 2019	Harminder Bay, Little Andaman	13	17	30
13.	Drip irrigation for enhanced water productivity in tribal areas	10 th -12 th December, 2019	Car Nicobar	20	12	32
Total				370	209	579

(ii) Distribution of inputs

S. No.	Inputs	Quantity	Date	Venue	Number of beneficiaries		
					Male	Female	Total
1	Agrimin forte (1 Kg)	55	15 th - 18 th May, 2019	Small Lapathy, Car Nicobar	31	22	53
2	Vimeral solution (500 ml)	53					
3	Topicure herbal spray (250 ml)	55					
4	Himax ointment (50 g)	105					
5	Marigold and palak seeds	1 kg each	6 th Aug., 2019	Campbell Bay, Great Nicobar	39	4	43
6	Mineral mixtures	30 kg	16 th Nov., 2019	Harminder Bay, Little Andaman	13	17	30
7	Coconut climber	3	11 th Dec., 2019	Car Nicobar	3	-	3
8	Dehusker	10	11 th Dec., 2019	Car Nicobar	10	-	10
9	Spade	10	11 th Dec., 2019	Car Nicobar	8	2	10
10	Hose pipe	3	11 th Dec., 2019	Car Nicobar	2	1	3
11	Rose can	10	11 th Dec., 2019	Car Nicobar	3	7	10
12	Copra remover	5	11 th Dec., 2019	Car Nicobar	-	5	5
Total					109	58	167

(iii) Demonstration of technology

S. No.	Technology	Date	Venue	Number of participants		
				Male	Female	Total
1	Demonstration on biowaste decomposer preparation and method of application in horticultural crops	6 th Aug., 2019	Campbell Bay, Great Nicobar	39	4	43
2	CIARI Livestock Expo '19 at ICAR-CIARI Regional Station, Minicoy	8 th Aug., 2019	Minicoy, Lakshadweep Islands	290	70	360
3	Vermicomposting	23 rd Aug., 2019	Harminder Bay	14	13	27
4	Drip irrigation	11 th Dec., 2019	Car Nicobar	20	12	32
5	Water harvesting through lined ponds	12 th Dec., 2019	Car Nicobar	20	12	32
Total				383	111	494

(iv) Exposure visit

S. No.	Exposure visit with target group	Venue	Number of participants
1.	Exposure visit of Tribal Farmers from Tamaloo village of Car Nicobar to ICAR-CIARI, Port Blair	ICAR-CIARI, Port Blair	10

(v) Workshop cum Interaction meet

S. No.	Title	Date	Venue	Number of participants		
				Male	Female	Total
1.	Establishment of community based mini incubator	5 th December, 2019	Harminder Bay, Little Andaman	50	10	60

(vi) Success stories under STC**(a) Water resource creation through lined ponds at Car Nicobar**

Coconut is the major crop and main source of income for people at Car Nicobar and Harminder Bay. Tribal people grow tuber crops and vegetables in their kitchen garden only during the rainy season (May to November) for their home consumptions. During dry season (December to April), it is not possible to cultivate annual crops due to scarcity of water as there is no source for irrigation water. Hence, required vegetables are transported from mainland via Port Blair to meet their demands incurring huge cost. Therefore, an attempt was made to solve agricultural water crisis in tribal areas during dry period. Under the Scheduled Tribe Component (STC), six numbers of lined dug out ponds of 6 x 5 x 1.5 m size were constructed at Car Nicobar and Harminder Bay to harvest rain water (35 m³) to promote the cultivation of vegetables and other essential crops (Plate 48). The harvested rain water is being used successfully for the cultivation of vegetables like okra, brinjal, gourds and leafy vegetables in the kitchen garden of tribal farmers (Plate 49).



Plate 48: Rainwater harvesting in the lined ponds at Car Nicobar



Plate 49: Vegetable cultivation using water from lined ponds

(b) Success story of *Parthenium* control at Little Andaman

Parthenium popularly known as congress grass is amongst one of the most dreaded weeds of the world. It is a poisonous, problematic, allergic and aggressive weed posing serious threat to crops, pastures, livestock and human beings. In Andaman and Nicobar Islands, this weed is widely grown at Little Andaman and Car Nicobar Islands. It is presumed to have come from mainland to Port Blair along with food grains and sand. Farmers and general public of these Islands were unaware of its ill effects. In order to create awareness among the tribals and general public, NRM Division of ICAR-CIARI, Port Blair has started conducting awareness programme since 2014 at Harminder Bay, Little Andaman during *Parthenium* Awareness Week (3rd week of August). During the current year, farmers, students and general public were made aware of the ill effects of *parthenium*. They were given training and demonstration on *parthenium* management. As *parthenium* is rich in nutrients, the farmers were trained to make compost out of it. The farmers and students were voluntarily involved in eradication of *parthenium* through uprooting before flowering stage periodically (Plate 50). The competitive (*Cassia cerecia*, *C. tora*, *Abutilon indicum*) plants were allowed to grow to smother the *parthenium* weeds in roadsides and residential areas (Plate 51). Due to this intervention, most of the tribal people at Harminder Bay are well aware of *parthenium* and they get involved in periodical uprooting of the weeds.



Plate 50: Uprooting of *parthenium* by trials at Harminder Bay, Little Andaman



Plate 51: Competitive plant (*Cassia* spp.) to control *parthenium* weeds

(vii) Glimpses of interventions/ activities with tribal farmers



Plate 52: Glimpses of different activities under STC

6. WOMEN PARTICIPATION (SC/ST)

Thrust has been given for empowering women specially the SC/ST beneficiaries through various capacity building and a need based technological demonstration in agriculture and allied fields by the Institute. The women folks participated with lots of enthusiasm to harness the benefit of latest knowledge and skill in the field of pig farming, biowaste decomposer, disease of pig and sero surveillance, nutritious kitchen garden, pulses, HDMS, health management of livestock, importance of poultry seed, foldscope, scientific goat farming, Nicobari fowl etc.

The participation of women were 693 in the category of ST comprising from Nicobar District and Little Andaman, beside 633 from South Andaman & 552 from North & Middle Andaman District belong to other than SC & ST category.



Plate 53: Glimpses of different activities under women participation

7. TECHNOLOGIES TESTED, DEMONSTRATED & TRANSFERRED

- Demonstrated coconut climber and coconut dehusker to tribal farmers at Car Nicobar.
- Demonstrated vermicomposting technology to tribal farmers at Harminder bay.
- Demonstrated soilless cultivation of vegetables and vertical farming system to stakeholders.
- Water resource creation through lined ponds was demonstrated at Car Nicobar and Harminder Bay.
- Demonstrated preparation of Panchagavya, pest repellent and composting at Sippighat, Tushnabad and Neil Island.
- Total of 17 q seed of CIARI rice varieties viz. CARI Dhan 4, 5, 6, 7, 8 and 9 were disseminated among 204 farmers under FLDs at North and Middle Andaman district.
- Total of 3.5 q seed of CIARI Pulses varieties CIARI Mung 1, CIARI Mung 2, CIARI Mung 3 CIARI Mung 4, CIARI Mung 5, CIARI Urd 1 and CIARI Urd 2 were demonstrated through KVK, Nimbudera, North and Middle Andaman.
- The Application of CIARI Bio-consortia were demonstrated to 50 farmers of South and North Andaman Islands through demonstrations and field days.
- Carp grower feed to the Island were transferred to farmer through sale of feed and by conducting awareness programmes to achieve higher production.
- Oyster mushroom production technology transferred to 50 farmers of Mayabundar and Diglipur through demonstrations.
- Package of practices for Vanaraja chicks transferred.
- Horizontal dissemination for duckling production using mini incubator.
- Herbal eye drop for treatment of eye infection in poultry demonstrated.
- Air layering for multiplication of elite types in cinnamon was demonstrated to 20 budding entrepreneurs/ progressive farmers at South Andaman.
- Blood fruit was identified as potential crop for backyard cultivation in the islands and its cultivation was demonstrated in 21 home gardens in South, North and Middle Andaman.

7.1 Seed & Planting Material Produced

Particulars	Variety /Produced	Quantity (Nos. / Kg./ Quintal (q))
Nucleus Seed of rice	CARI Dhan 1, CARI Dhan 2, CARI Dhan 3, CARI Dhan 4, CARI Dhan 5, CARI Dhan 6, CARI Dhan 7, CARI Dhan 8 and CARI Dhan 9	26 kg
Breeder Seed of rice		157 kg
Truthfully Labelled (TFL) Seed of rice	CARI Dhan 2, 4, 5, 6 7, 8, 9, CSR36 and Gayatri	40.0 quintal
Breeder seed	Mung	.803 kg
Breeder seed	Urd	1.692 kg
TFL seed pulse	CIARI Mung 1, 2, 3 and 4) CIARI Urd 1 & CIARI Urd 2)	3.56 quintal
Mushroom spawn	CIARI Mushroom	172 packets
Carp grower feed	-	380 kg
Carp fish fry	-	1000 numbers
Vanaraja chicks and hatchable eggs produced	-	16709 Nos.
Dragon fruit	Rooted cuttings	500 Nos.
Marigold	Rooted cuttings	3000 Nos.
Heliconia	Suckers	100 Nos.
Coconut	Seedlings	1474 Nos
Noni	Seedlings	200 Nos.
Padauk	Seedling	1300 Nos.
Coconut	Seedlings	1474 Nos.
Arecanut	Polybag seedlings	5666 Nos.
Black pepper	Rooted cuttings	683 Nos.
Nutmeg	Seedlings	80 Nos.
Clove	Seedlings	142 Nos.
Elephant foot yam	Seed Tubers	415 kg.
Greater yam	Seed Tubers	115 kg.
Ginger	Mother rhizome	340 kg.
Cinnamon	Seedlings	307 Nos.
Colocasia	Seed tubers	104 kg
Native <i>Garcinia</i> species	Seedlings of identified elite types	1,250 Nos.
Blood fruit	Seedlings	522 Nos.
West Indian cherry	Rooted cuttings	170 Nos.
Mangosteen	Seedlings	25 Nos.
Malabar tamarind	Grafts of identified morphotypes	12 Nos.
Other underutilized species	Seedlings	48 Nos.
Woody pepper	Rooted cuttings Identified elite types	200 Nos.
Tejpat	Air layers of identified elite types	270 Nos.
Cinnamon	Air layers of identified elite types and Konkan Tej	250 Nos.
Black pepper	Rooted cuttings of P-1, P-2, P-5, IISR Sakthi, IISR Thevum	1,020 Nos.
Long pepper	Rooted cuttings	100 Nos.

7.2 Mera Gaon Mera Gaurav (My Village My Pride)

The Government of India's flagship programme "Mera Gaon Mera Gaurav" is being implemented by the Institute since 2015-16 to promote direct interface between Scientists and farmers. For the year 2019-20, 9 teams comprising 44 Scientists and Technical Officers have been formed to cover 37 villages across South Andaman district. The multi-disciplinary teams periodically visit their respective adopted villages and conduct meetings/*Goshties*, trainings and demonstrations; provide mobile based agro advisories, distribute planting materials and critical inputs to address the field-level problems in agriculture and allied sectors.

During the reporting period, the following activities were performed by the team:

Visit of adopted villages

The scientific team periodically visited the 37 adopted villages at South Andaman viz. Manarghat, Wrigthmeyo, Malapuram Shore Point, Chouldari, Badmaspahad, Creekabad, Port Mout, Humphrygunj, Mameyo, Hasmatabad, Wandoor, Hubdipur, Manpur, Collinpur, Templemeyo, Herpertabad, Wimberlygunj, Kanyapuram, Bambooflat, Hopetown, Manjeri, Dhanikhari, Guptapara, Nayasahar, Mithakhari, Ograbranj, Muslim Basthi, Namunaghar, Shoal Bay, Kalatang, Stewartgunj, Govindpuram, Ferrargunj, Caddlegunj, Aniket and Miletalak during the reporting period.

Facilitation for new varieties, seeds and technology

- Provided technical guidance for better pond management and fish feed management for harnessing maximum yield.
- Planting material of dragon fruit, passion fruit and coconut var. Surya were popularized.
- Introduced Microbe enriched Farm Yard Manure (MFYM) technology to 35 farmers.
- Saplings of native tree species of nutritional and medicinal importance were planted in the school premise.
- Conducted deworming in livestock of 31 farmers.
- Woody pepper - a novel spice was distributed for planting as mother plants along with planting material of blood fruits.

Goshtis/Meetings Conducted

- Awareness programme on Aquatic Fish Disease Management, Integrated Horticulture Development and JalSaktiAbhiyan at Chouldari on 01.08.2019 to 25 farmers.
- Awareness and Demonstration on use of CIARI-Bioconsortia for Plant Health Management at Collinpur on 09.08.2019 to 35 farmers.
- Awareness on 'Endemic underutilized species of Andaman and Nicobar Islands' at Bamboo flat on 16.07.2019 to 18 farmers.
- Awareness on "National surveillance programme for aquatic animal diseases (NSPAAD) & improved farming practices" on 27.09.2019 to 14 farmers.
- Sensitization cum awareness programme at Mitakhari on doubling farmers' income through Agri/Animal/Horticultural technologies on 27.07.2019 to 31 farmers.
- Training on "Balanced feeding for improving pig productivity and cultivation of fodder to increase livestock performance" at Ferrargunj on 15 & 16.07.2019 to 23 women farmers.

Mobile-Based Advisory

- Agriculture and allied sectors including climate data twice a week to 20 farmers.
- Rice cultivation, pond management, live fencing, crop production, plant protection, fisheries and livestock health care to 150 farmers.

Literature Support Provided

- Vaccination schedule folder - 10 copies to 10 farmers.
- Poultry farming practices - 10 copies to 10 farmers.
- Leaflet on fish disease management - 14 copies to 14 famers.
- Rice cultivation - 15 copies to 15 farmers.

Problems Diagnosed

General

- Internet non availability.
- Irrigation shortage.
- Lack of awareness about government schemes and crop insurance.
- Transportation.

Agricultural

- Non availability of quality banana planting material.
- Low yielding arecanut plantation.
- Bacterial wilt incidence in brinjal.
- Less body weight issues in goats and poultry.
- Non availability of organic inputs on time from depots as there is no much private sellers.
- Lack of awareness about recent agricultural technologies, importance of native species of the Islands & quality seeds.
- Poor quality of water in fish ponds.
- Non-availability of fish fingerlings and quality fish feed.
- Poor growth of pigs.
- Non availability of fish feed, seed and spawn.
- Lack of knowledge about cattle feed formula.
- Diarrhoea in cattle and goat.
- Insemination problem in livestock.
- Non availability of bull and buck.
- Non-availability of quality seed/planting materials of spices.
- Animal infertility problems.

General Awareness Created

- Reduction in yield of banana due to repeated ratooning.
- GoI's JalSakti Abhiyan Mission to 25 farmers.
- Vaccination, health management, fish feed and its importance in pisciculture to 25 farmers.
- Use of microbial products in plant health management and plant growth promotion to 35 farmers.
- Diversity of native underutilized species, their ethno-botanical importance and conservation strategies to 18 students and teachers.
- Common disease of fish and their management, challenges in pig farming, disease management in guava, coconut and arecanut; pond water quality testing, quality seed of pulses and brinjal varieties at CIARI to 20 farmers.
- Awareness created on regular vaccination for IBD and RD, biosecurity measures in poultry and use of Soil Health Card to 31 farmers.
- Scientific methods of fodder cultivation, animal feeding, pig reproductive health management, fish-cum-pig farming and government schemes for promoting livestock sector to 23 farmers.

Glimpses of activities



Inspection of banana plantation of
Shri Abubacker, Manarghat



Inspection of low yielding arecanut plantation in
the premises of Don Bosco School, Lalpahar



Team members explaining the importance of underutilized species



Tree plantation undertaken in the school premise



Interaction with Secretary, Guptapara Gram Panchayat



Sensitization cum awareness programme at Mithakhari



Distribution of critical inputs to the participants



Distribution of planting material of blood fruit and woody pepper

8. OTHER INFORMATION ON

8.1 Priority setting, Monitoring and Evaluation (PME) Cell

XII Institute Research Committee (IRC-2019) Meeting for Institute funded projects was held on 7th and 8th November, 2019 under the Chairmanship of Dr. B. Gangaiah, Director (Acting), CIARI. Dr. T.V.R.S. Sharma, Ex-Emeritus Scientist, ICAR-CIARI & Member to GB, ICAR, New Delhi, Dr. P. Mohan, Professor, Pondicherry University, Dr. K.A. Naveen, Senior Veterinary Officer, DAH&VS, Port Blair and Dr. Arun Kumar, Director, ANSWSM, Port Blair were the experts during the IRC. A total of 43 Institute funded projects were presented by the scientists, of which 06 were closed and 37 recommended to be continued. A total of 11 new projects were also recommended by the house.



Plate 54: IRC meeting 2019

PME Cell is involved in accomplishing time frame work like Institute Annual Report 2018-19, DARE/ICAR Annual Report 2019-20, EFC Memorandum 2020-2025, Parliament Standing committee on agriculture (2019-20), Cabinet Report (Every month), Half Yearly Performance Review, 100 days programme of the Government w.e.f 5th July to 15th October, 2019 (Weekly), 100 days programme ATR - submission every Thursday of the week, setting goals for the 100 days programme of ICAR, output-outcome matrix : (Quarterly Achievement for 2019-2020 1st&IInd Q), inputs for action plan for doubling income of farmers, setting up DARE/ICAR targets for 2025 and defining a roadmap to achieve those with time line, inputs on the processable varieties developed by the Institute. Besides, the parliamentary replies, press releases both to the Island and mainland press and other major technological dissemination events were coordinated like Institute foundation day, Agriculture Education Day etc.

The PME cell also maintains repository of RPFs/RPPs of the Institute funded projects along with the annual report, bulletins, folders, books and other related publication for ready reference.

8.2 Library

Library of the Institute has been involved with collection, documentation and dissemination of information in the form of books, magazines, journals and literature of varied interest and utility. Besides catering to the needs of scientific and non-scientific staff of the Institute, library also extends referencing facilities to visitors from local research and educational institutions. During reporting period, significant progress was made in digitization of journals and books database in the library. About 3,000 books and 387 journals have been entered in the database. Once completed, this would facilitate easy tracking of availability and issuing status of publications. Newspaper clipping service “The Glimpse” covering news items related to agriculture and allied sciences was also continued during the period. Hindi newspaper (Daily), competitive magazine for students and project staff of the Institute, monthly reference magazine for administrative staff, a popular science magazine and monthly digest of general interest were also added to the subscription schedule of library. Overall, 653 people visited the library during April to December, 2019.

During this period, 15 Institutional meetings including RAC, IRC *etc.* were organized at Dr. N.T. Singh Conference Hall of the Library. Besides these, a national training programme on “Sustainable integrated



farming systems for coastal ecosystems of India” for 22 days (23.09.2019-14.10.2019) and international hands on training programme on “Cutting edge molecular and bioinformatics tools for conservation” for 15 days (24.08.2019- 07.09.2019) were also conducted in the library hall.

8.3 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. Hindi Fortnight from 2nd September to 16th September, 2019 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.

8.4 Post Graduate Cell

Central Island Agricultural Research Institute is a premier institute engaged in research, extension, teaching and education. To facilitate use of the infrastructure by the M.Sc and Ph.D. scholars one Post Graduate Cell has been created. Every year the institute receives large number of application from various colleges and universities for seeking permission to undergo dissertation work. During the current year a total of 8 students (4 graduate and 4 post graduate students) have undergone internship/training at ICAR-CIARI Port Blair for a period of 1 to 3 months.

8.5 Institute Technology Management Unit (ITMU)

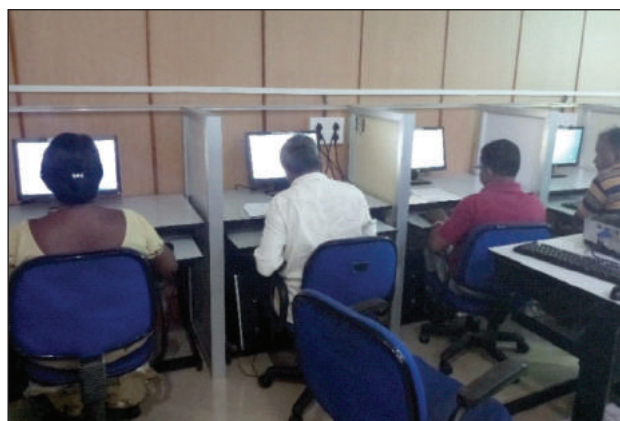
ITMU has organized three Institute Technology Management Committee (ITMC) meetings, first ITMC meeting was organized 10th May, 2019 to discuss about the proposal of Shri Hari Fabricator, Port Blair for collaborative work with CIARI for fabrication of Solar dryer technology. Second ITMC meeting was conducted on 4th September, 2019 to examine the commercialization of Solar Dryer Technology developed by NRM Division of ICAR-CIARI. Third ITMC meeting was conducted on 16th January 2020, at ICAR-CIARI to discuss about the renewal of MoU with Shri Hari Fabricators. ITMU Contacted with various private firms for the commercialization of Institute Technologies and varieties. ITMU also contacted with Agri-Innovate India for the registration of Institute Noni varieties. Sent the “technology disclosure form” and “technology valuation sheet” to all the concerned Divisions of the institute for the commercialization of their respective technology with Agri-Innovate India. A Capacity Building Programme on “Scientific Goat Farming” was conducted for farmers and stakeholders at ICAR-CIARI, Port Blair. ITMU also organized an exposure visit for school children on Agriculture and Allied activities at ICAR-CIARI, Port Blair on 7th December 2019. Total 83 school children and 5 teachers participated during the exposure visit. Moreover, good quality pictures of Institute technology and activities were collected for its onward submission SMD, Horticulture, New Delhi. Beside this, ITMU had sent an Action Taken Report for the general recommendations of the Workshop and Annual Review Meeting of ITMUs/ZTMCs/ABIs held during 4th to 5th October, 2019 at NASC, New Delhi.

8.6 Agriculture Knowledge Management Unit (AKMU)

Agricultural Knowledge Management Unit (AKMU) envisages providing online inter-connectivity between the different research institutes, national centers and state agricultural universities. This cell is responsible for maintaining computer hardware’s and software and provides IT related services to the scientists and other staff members of the Institute.

Activities of the Unit

- Maintenance of computer Hardware, Software, Servers, Local Area Network and provide internet connectivity.
- Maintenance of VSAT equipment and its accessories.
- Handling of Personnel Management Information System Network (PERMIS net-II) for updating personal records of ICAR-CIARI staff through online.
- Handling of Project Information & Management System (PIMS) to manage research projects.
- Conduct online examination for Agriculture Research Service (ARS) and National Eligibility Test (NET) through Agricultural Scientist Recruitment Board (ASRB), New Delhi.
- Provide technical support to administrative staff to handle online portals
- Updating institute publication like bulletins, books, technologies and leaflets in Krishi portal
- Installation of Statistical analysis software for data analysis in scientist desktops.
- Maintaining and updating Institute website (<https://ciari.icar.gov.in>) periodically by uploading the latest Institute progress in terms of research, technologies developed, tender notifications, recruitment notifications and other information.
- Prepare technical specification for procuring IT related items as and when required
- Providing audio-visual aid during various meeting/symposium/trainings etc.



This Unit also organized six days training program on “Hands-on training on Basic Computer Literacy (Skill Development Programme) for Skilled Supporting Staff” at ICAR-CIARI, Port Blair during 10th to 15th June, 2019. A total of nine staff have participated in this training programme. Participants got practical exposure on basic computer operations, Microsoft word, Microsoft Excel, use of Email and Hindi typing during this training.

8.7 Sports Activities

A team of three member sports contingent comprising of Smti. Minakshi Routray, Shri K. Pradhan and Shri Ravish Kataria from the Institute have participated in the ICAR Tournament for Eastern Zone (ICAR-TEZ-2019) held at ICAR-NRRI, Cuttack during 18th to 22nd November, 2019. The zonal sports tournament was attended by the participants from various ICAR Research Institutes from Eastern Zone. The team ICAR-CIARI was represented in the tournament with the coordination of Dr. Jai Sunder, Chairperson, Shri. S.K. Singh, Co-chairperson and Dr. K. Saravanan, Member Secretary of Sports Committee. Altogether, 1 silver medal and 2 bronze medals were secured by the CIARI team comprising of Smti. Minakshi Routray and Shri K. Pradhan (Table 1). The Director along with the sports committee members of ICAR-CIARI congratulated the participants for their excellent performance shown in the zonal sports tournament. The facilities for outdoor and indoor sports have been well maintained for the welfare of staff members at ICAR-CIARI.

Performance of ICAR-CIARI in ICAR Tournament for Eastern Zone (ICAR-TEZ-2019)

S. No.	Name of the player	Event	Medal
1.	Smti. Minakshi Routray	Shot put	Silver
2.	Smti. Minakshi Routray	High jump	Bronze
3.	Shri. K. Pradhan	Long jump	Bronze

Glimpses of sports activities



8.8 Women's Cell

During the reporting period, Women's Cell was actively involved in welfare of women employees belonging to various cadres. In coordination with Internal Women's complaints committee, issues raised by women employees were amicably sorted out in time bound manner. Further, necessary guidance and assistance was provided to women employees, who approached the Cell.



8.9 Swachh Bharat Abhiyan

Swachh Bharat Abhiyan was organised from 11th Sept. to 2nd Oct. 2019 during which nearly 500 persons were participated. It was started with a Swachta pledge and Shramdan by all the staff of ICAR-CIARI and KVK besides famers from different parts of the Islands. The Abhiyan was followed by display of banners, placards and distribution of pamphlets. During the programme various activities such as lecture on single use plastics, demonstration on composting and sanitation drive in public places where organised. Office order was issued banning single use plastics and polythene bags inside the CIARI campus. Awareness cum demonstration was organised by Animal Science Division on Health & Hygiene of farm animals and farmers. A special campaign was also organized for the eradication of *parthenium* at Little Andaman by NRM Division during the period under report.

Swachhta Pakhwada

The programme was organised during 16th -31st Dec 2019 in which, nearly 700 participants have participated. During the programme, several campaign and awareness programmes were conducted by CIARI. It started with Shramdan by all the CIARI and KVK staffs followed by weeding out of all old records, cleaning of laboratories, cleaning of office premises. Various programmes were also conducted at tribal villages for segregation of wastes, animal health and hygiene. On the occasion of Kisan Diwas, school students were taken to farmers field. Awareness campaigns were organised at beaches, markets and public roads. Fisheries science division conducted awareness cum demonstration on hygiene and health for fisher man community.



8.10 Round up of Institute Activities

Seminar on “Festival of Yoga and Wellbeing” to mark the International Day of Yoga

The ICAR -CIARI celebrated International day of Yoga (IDY) on 21st June, 2019 along with rest of the county by practicing the standardized Mass Yoga Demonstration based on the Common Yoga protocol (CYP) in the morning between 7-8 am in its guest house community hall. The staff of the institute participated in the programme. To make the event more inclusive, one day seminar on “Festival of Yoga And Wellbeing” was also organized to create awareness among those who are yet to initiate yoga and to inspire them. Dr. M.S. Kundu Nodal officer of Yoga welcome the guests and speakers present in the seminar. Dr. G. Sarkar, Professor and Head Biochemistry ANIIMS in his deliberation narrated different aspect of health, lifestyle and Yoga. He explained that practicing meditation early in the morning cured chronic disease which he experienced in his real life. Mr. P. Perumal Yoga teacher from Patanjali Yoga samity and Bharat Swabhiman (Trust) South Andaman and Dr Sudershan, Medical Officer from AYUSH described different advantages of yoga. Sister

Sarmista from the Prajapita Brahma Kumari Ishwariya Viswa Vidyalaya, Port Blair centre explained about the different aspect of Rajyoga and its effect on mind. She also gave demonstration of meditation to staff present in the seminar. Earlier, the Director Dr. A. Kundu, in his presidential address, opined that the yoga movement will solve the health problem of the society in the coming years as has been seen in case of green revolution to mitigate the food problem of India.



8th Research Advisory Committee Meeting

The Third meeting of the 8th Research Advisory Committee (RAC) of ICAR-Central Island Agricultural Research Institute, Port Blair was held under the Chairmanship of Prof. S.K. Sharma during 05th -06th July 2019. The other members present were Dr. W.S. Dhillon, Dr. H.K. Pradhan, Dr. V.R. Suresh, Dr. Manish Das, Dr. L.M.Garnayak, Dr. A.Kundu, Dr. Jai Sunder (Member Secretary). All Heads of Divisions/Section-in-Charges and Scientists of ICAR-CIARI, Subject Matter Specialists of KVKs were also present during the meeting.



Dr. Jai Sunder, Member Secretary, RAC presented the Action Taken Report on the recommendations of the 2nd Meeting of the 8th RAC meeting held during 06th -07th July 2018. Chairman and Members were satisfied with the action taken report submitted by the Institute and appreciated the efforts for implementation of the recommendations. The projects were reviewed by the RAC members and suggested important recommendations for the quality output and outcome from the projects. The Committee Members visited the experimental farms at Bloomsdale, Sippighat, Garacharma farm, Krishi Vigyan Kendra, Sippighat, farmer's field at South Andaman to see the transfer of technologies. The Committee interacted with the progressive farmers and witnessed the various farming system models at the farmer's field. The Committee was very happy with the performance and the activities of CIARI and KVK in the farmer's field and suggested to disseminate the technologies to other farmers.

International training for African researchers on cutting edge molecular and bioinformatics tools

ICAR-Central Island Agriculture Research Institute, Port Blair organized an International Hands-on Training on “*Cutting edge Molecular and Bioinformatics tools for conservation and productivity enhancement of indigenous animal genetic resources*” from 24th August 2019 to 07th September 2019. This Short Term Training Programme (STTP) was funded by Ministry of External Affairs under the India-Africa Forum Summit III (STTP-IAFSIII) at ICAR-CIARI which was one among the twelve training programmes to be organized by the different ICAR institutes this year. Nine delegates from six African countries namely Comoro (1), Eritrea (1), Kenya (3), Malagasy (1), Namibia (1), Nigeria (2) participated in the training programme.



National Training Programme with ANGRAU

ICAR-Central Island Agricultural Research Institute, Port Blair and ANGRAU organized Institutional Development Plan (IDP) under World Bank funded project on “National Training Programme on Sustainable Integrated Farming Systems for Coastal Eco-regions of India”. Thirty B.Sc (Ag.) students representing from Agricultural colleges, i.e Mahanadi (4 Nos), Agricultural College, Naira (6 Nos), Agricultural College, Bapatla (10 Nos.) and Dr. NTR College of Agricultural Engineering, Bapatla (10 Nos.) have attended the programme which was scheduled from 24th September, 2019 to 14th October, 2019.



Establishment of BIOTECH KISAN-HUB

ICAR-Central Island Agricultural Research Institute, Port Blair has launched the programme on Establishment of BIOTECH KISAN-HUB funded by DBT, Govt of India with the main aim for dissemination of Livestock and Poultry Production Technologies for Enhancing the Farmers Income of Andaman & Nicobar and Lakshadweep Islands. The objective of the programme is doubling the farmer's income through implementation of two activities viz., mini incubator for supply of chicks and improvement of goatery. The Hub will act as a Nodal centre to act as the platform for scientist-farmer's interaction of the A & N Islands as well as Lakshadweep Islands to address the issues of development of backyard poultry sector and goatery of the island farmers. Tinkering lab will be established to give a platform to the innovators farmers and other stakeholders to develop and transform the scientific aptitude into a technology mode. The lab will have the important basic scientific equipments and facilities wherein the farmers and stakeholders get chance to work and understand the science and technology. A communication cell will be established wherein the farmers can directly contact with the scientists for any field problems through telephone, mail and other electronic apps. Mini unit of incubator will be kept as a model for technology demonstration for the farmers and stakeholders at hub. The hub will be used as a training and demonstration center.



Facility to accommodate farmers in kisan hub hall



Interaction meet with GM, NABARD



Interactive session between scientists & trainees



Activities time line



Kisan hub

The inauguration of the Biotech Kisan Hub was done on 21.10.2019 along with initiation of 5 days capacity building programme on Delivery of Vaccines in poultry from 21st to 25th, October 2019 in association with ICAR-KVK, South Andaman.



Farmers Trainees

Celebration of 150th Birth Anniversary of Mahatma Gandhi

Institute has conducted various programs for the Celebration of 150th Birth Anniversary of Father of Nation- Mahatma Gandhi ji from 26th September, 2019 to 2nd October, 2019. The events included essay writing, painting, elocution and quiz competition for students and CIARI staff members. Besides, Swachh Bharat Abhiyan (11th Sep-2nd Oct., 2019) & Jal Shakti Abhiyan (9th Aug-3 Sept.2019) programmes were also organized followed by the valedictory function on 2nd October, 2019.



Interactive meeting cum training programme at Car Nicobar

An interactive meeting cum training programme was organized on 15th October 2019 by ICAR-CIARI joining with A & N administration, KVK-Car Nicobar and National Horticulture Board (NHB) with the aim to promote horticulture development in Nicobar Islands with special reference to vegetable cultivation in which over 200 participants including village headmen, farmers, officials of A&N administration, Department of Agriculture, A&N administration, officials from NHB, scientists from CIARI, KVK-Car Nicobar have actively participated. The programme was presided over by Dr. B. Gangaiah, Director and co-ordinated by Dr. B. A. Jerard, Head, Division of Horticulture and Forestry, ICAR-CIARI. During the interaction, Dr. Ariz Ahammed IAS, Managing Director, National Horticulture Board (NHB), New Delhi and Chief Guest of the programme has deliberated on the need to strengthen the vegetable sector in the Nicobar Islands highlighting

the nutritional requirement and the need to increase the local vegetable production for health and social benefits. He also enumerated the efforts of NHB in addressing the horticulture development in the country through various schemes. The NHB team along with CIARI, KVK team and DC, Nicobar have visited the tribal villages at car Nicobar and interacted with the people about the prospects of vegetable production.



Vigilance Awareness Week-2019

Vigilance Awareness Week-2019 with the theme “Integrity-A way of life” was organized befittingly at the Institute. The awareness programme commenced with the pledge ceremony on 28.10.2019 followed by different programmes like essay writing on the topic “Role of self-discipline to eradicate corruption in Nation” painting competition on the theme “Clean & Green India” and debate on “Need of the hour to make Nation corruption free” for the staff, school and college students. During the valedictory function of the week long programme, prizes were distributed for winners and participants of programme on 02.11.2019.

Visit of Quinquennial Review Team (QRT) for review of ICAR-KVKs

The Quinquennial Review Team (QRT) of ICAR-KVKs under Chairmanship of Dr. R.K. Samanta, Former VC, BCKV, Nadia, West Bengal along with members Prof. C. Satpathy, Former DEE, OUAT, Bhubaneswar, Dr. R.B. Sharma, Former DR & DEE, IGKV, Raipur and Dr. F.H. Rahman, Principal Scientist from ICAR-ATARI, Zone V, Kolkata visited Andaman & Nicobar Islands from 1st to 5th November, 2019.



During the visit, they interacted with the Director, ICAR-CIARI, Port Blair, HoDs and officials of three ICAR-Krishi Vigyan Kendras (KVKs) besides reviewing the activities of these KVKs through presentation by Heads of the KVKs on 1st November, 2019. QRT team has also interacted with Development Departments, progressive farmers of these Islands. In addition, the interaction meeting with farmers and training programmes was also conducted at Baratang and Swaraj Dweep on 2nd and 3rd

November, 2019, respectively. Field visit of QRT team to different farmer’s fields of South Andaman was organized on 4th November, 2019.

Rashtriya Ekta Diwas (National Unity Day)

In compliance with the instructions of Hon'ble Home Minister of India, New Delhi, Rashtriya Ekta Diwas was celebrated to observe the birth anniversary of Late Sardar Vallabhvai Patel. As per the directives, pledge taking ceremony was organized on 31st October, 2019. Dr. Debasis Bhattacharya, Pr. Scientist, Animal Science Division has coordinated the programme. A total of 59 staff of ICAR-CIARI and 35 school and college students participated in this pledge taking ceremony to reaffirm the inherent strength and resilience of our nation to withstand the actual and potential threats to the unity, integrity and security of our country.

Banner Programme on New Dimensions in Agricultural Marketing

ICAR-CIARI in association with CCS-National Institute of Agricultural Marketing, Jaipur conducted three-day Banner Program on New Dimensions in Agricultural Marketing: Focus Sector-Marketing of Organic Produce from 27th to 29th November 2019 in its Garacharma Campus. Around 25 Middle level officials of Development Departments *viz.* Agriculture, Fisheries, Animal Husbandry, National Cooperative Union of India; FPO officials, local Agripreneur and other related departments involved in agricultural marketing participated in the programme.



During the programme, faculty of NIAM Jaipur, MANAGE Hyderabad, CIARI and its KVKs deliberated upon recent agricultural reforms *viz.* Agriculture Produce Marketing and Livestock Act 2017, AGMARK Grades and Standards, Model Contract Farming Act 2018 and Warehouse Development and Regulation Act; flagship programmes *viz.* Rashtriya Krishi Vikas Yojana and Pradhan Mantri Fasal Bima Yojana; and issues related to challenges in value chain and marketing strategies of organic produce, market linkage through FPO, critical technologies for enhancing profitability in organic farming and NPOF/PGS Certification in organic

farming followed by visit to agri-enterprises, organic farms and climate resilient Integrated Farming Systems across South Andaman.

9. AWARDS AND RECOGNITION

Scientist	Award/ Recognition	Awarding Agency/ Organizing Society
B. Augustine Jerard	Vice President	Indian Society for Plantation Crops, ICAR-CPCRI for the years 2019 and 2020
	Member of the Editorial Board	Fiji Agriculture Journal, Ministry of Agriculture, Suva, Fiji
	Peer Reviewer	<ul style="list-style-type: none"> Journal of Plantation Crops from Indian Society for Plantation Crops, CPCRI, Kasaragod. Genetic Resources and Crop Evolution by Springer Publications. Indian Journal of Horticulture by Horticulture Society of India, New Delhi Journal of Spices and Aromatic Crops by Indian Society for Spices, ICAR-IISR, Kozhikode. African Journal of Biotechnology
	Chairman, State level Technical Committee for High Value Agriculture Development Agency (HVADA)	Department of Agriculture, A&N Administration
	Co-chairman	Technical session on crop improvement under AGM of 28 th Annual Group Meeting of AICRP on Palms held at TNAU, Coimbatore on 6 th -7 th June 2019
	Co-chairman	Technical session at Annual meeting of All India Network Project on Organic Farming held at ICAR-CIARI on 12 th November 2019
	Member	National Advisory Committee for 'National Conference on Climate smart agriculture for livelihood security: challenges and opportunities' to be held during 13 th to 14 th Sept. 2019 at ADAC&RI, TNAU, Thiruchirapalli.
	Chairman, Evaluation committee	Selection of best models and drawings by school children at Jal Shalthi Abhiyan programme held at Ograbraj on 3 rd September 2019
	Chairman cum convenor	Technical session on Hi-Tech Horticulture at National Conference on Climate smart agriculture for livelihood security: challenges and opportunities held at ADAC&RI, TNAU, Thiruchirapalli during 13 th to 14 th Sept. 2019. Delivered a lead talk on 'Climate Smart Coconut genetic resources'.
B Gangaiah	Best Research Scientist Fellow	Andhra Pradesh Akademi of Sciences, Amaravathi Ritunetsam Foundation, Andhra Pradesh

Scientist	Award/ Recognition	Awarding Agency/ Organizing Society
S. Dam Roy	Co-Chaired the Session on Cage culture in inland water in the International Symposium on Asia Pacific Aquaculture-2019	World Aquaculture Society and Tamil Nadu Dr.J. Jayalalitha Fisheries University
	Member QRT	ICAR-Indian Institute of Farming System Research (IIFSR), Meerut
	Member, Project Monitoring Committee	DBT New Delhi
	Peer Reviewer	Aquaculture and Wetland journals
	External expert, Ph.D., Thesis evaluation	Jadavpur University
R.K. Gautam	Fellow	Fellow, National Academy of Biological Sciences (NABS), Chennai.
A Velmurugan	Best research paper for 2018	Society of Remote Sensing and Springer
T.P.Swarnam	Best Oral presentation	At National Conference held at A.D. Agricultural College and Research Institute, TNAU, Tiruchirappalli during 13 th -14 th September 2019
	Peer Reviewer	<ul style="list-style-type: none"> • Archives of Agronomy and Soil Science • Agronomy Journal
V. Baskaran	Biodiversity conservation award– 2019	B. Vasantharaj David Foundation, Chennai
	Best scientist award - 2019 for Horticulture and Agricultural Extension	B. Vasantharaj David Foundation, Chennai
	Appreciation certificate for establishment of landscape garden and Modified planting system technology for vegetable production	Commander, Andaman and Nicobar Command, Brichgunj, Port Blair
K. Abirami	Best oral presentation award for research paper on Reproductive biology of red flesh dragon fruit (<i>Hylocereus costaricensis</i>) grown in Bay Islands	10 th International conference on Agriculture, Horticulture and Food Sciences held during 22-23, December, 2019 at New Delhi
	Outstanding Scientist Award	Society of Tropical Agriculture
	Appreciation letter for establishment of dragon fruit block	Commander, Andaman and Nicobar Command, Brichgunj, Port Blair

Scientist	Award/ Recognition	Awarding Agency/ Organizing Society
	Best Extension Scientist 2018 -19	ICAR-CIARI, Port Blair
R. Kiruba Sankar	Best Institutional building and Research Publication award	ICAR-CIARI, Port Blair
R. Kirubasankar, V. Baskaran, R.K. Gautam, K. Sakthivel & K. Abirami	Fakhruddin Ali Ahmed Award for Outstanding Research in Tribal Farming Systems 2018	ICAR, New Delhi
S. Swain	Best reviewer award- 2019	Asian Journal of Advanced Research and Reports
	Best book award- 2019	Indian Society of Agricultural Engineers (ISAE)
K. Sakthivel	Reviewer	<ul style="list-style-type: none"> Journal of Environmental Biology Journal of Mycology and Plant Pathology Indian Phytopathology
Ajit A. Waman	Editor	<ul style="list-style-type: none"> Current Agriculture Research Journal, India African Journal of Agricultural Research (Academic Journals)
	Reviewer	<ul style="list-style-type: none"> Scientific Reports (Springer- Nature) Journal of Applied Research on Medicinal and Aromatic Plants (Elsevier) the Indian Journal of Agricultural Sciences (ICAR) International Journal of Fruit Science (Taylor and Francis) Biodiversitas Journal of Biological Diversity, Indonesia Medicinal Plants: International Journal of Phytomedicines and Related Industries (Indian Journals) Pharmacognosy Research
	Best Publication Award (2019)	ICAR-CIARI, Port Blair
Pooja Bohra	Reviewer	<ul style="list-style-type: none"> Scientia Horticulturae (Elsevier) Journal of Food Science and Technology (Springer-Nature) Fruits (Cambridge University Press) Current Science, India Indian Journal of Biochemistry and Biophysics (NISCAIR) African Journal of Biotechnology (Academic Journals)
	Best Young Scientist (2019)	ICAR-CIARI, Port Blair
K. Saravanan	Sectoral Expert (Fish Health) for Kisan Call Centre	Andaman and Nicobar Administration

Scientist	Award/ Recognition	Awarding Agency/ Organizing Society
J Praveen Raj	Young scientist award	7 th Academic Achievement award, Education expo TV
K. Venkatesan	Reviewer	<ul style="list-style-type: none"> African Journal of Biochemistry Research Journal of Medicinal Plant Research
Harsha Haridas	Best Hindi publication award	ICAR-CIARI, Port Blair
	Reviewer	Aquaculture Journal, Elsevier and Journal of Fisheries Research
Srividya, S	Gold Medal under Dr. D.R. Thirunavukkarasau Award for best outstanding PhD student of the University – October 2019	TNAU, Coimbatore, Tamil Nadu
	Gold Medal under Hon'bl Dr. J.Jayalalitha Award Outstanding Research Scholar Award for Women Student in PhD - October 2019	
T.Sujatha, D.Bhattacharya, Jai Sunder, A.Kundu, Gayathri Samaddar and S.C. Mayuri	Certification of appreciation-oral presentation	Indian Poultry Science Association (IPSACON2019 during 11 th -13 th , December 2019)
S.C.Mayuri, Sujatha, T and Jai Sunder	Certification of appreciation-oral presentation	Indian Poultry Science Association (IPSACON2019 during 11 th -13 th , December 2019)
Sneha Bhowmick, Jai Sunder, Indranil Samanta and T.Sujatha	Certification of appreciation-oral presentation	Indian Poultry Science Association (IPSACON2019 during 11 th -13 th , December 2019)
Sirisha Adamala	Peer Reviewer	<ul style="list-style-type: none"> Indian Journal of Ecology Acta Geophysica
N. Bommayswamy	Best Ph.D thesis in Agronomy	Dr. SPPalaniappan award by Tamil Nadu Agricultural University, Coimbatore on 25 th October, 2019
	Best Ph.D., thesis in Rice	Brig. Anil Adlhaka award by Tamil Nadu Agricultural University, Coimbatore on 25 th October, 2019
	Best Ph.D., thesis in Rice Agronomy	Former Register Dr P. Subbian by Tamil Nadu Agricultural University, Coimbatore on 25 th October, 2019.
	Best Ph.D Crop Research in Agronomy	Dr. S. Subramanian by Tamil Nadu Agricultural University, Coimbatore on 25 th October
Bijaya Kumar Nanda	Peer reviewer	Journal on Water Resources Management

10. ONGOING RESEARCH PROJECTS

External Funded

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
DBT, New Delhi						
1	<i>In vitro</i> mass multiplication, characterization and habitat enrichment of two horticulturally important underutilized species from Andaman and Nicobar Islands	Pooja Bohra	Ajit A. Waman	16.72	2017	2020
2	Regeneration and molecular characterization of Andaman Padauk (<i>Pterocarpus dalbergioides</i>)	I. Jaisankar	B. Augutine Jerard & Nabanita Ganguly	43.11	2018	2021
3	Establishment of Biotech-Kisan Hub at ICAR-CIARI, Port Blair.	Jai Sunder (Hub Facilitator) A.Kundu (PI) T.Sujatha (PI) D. Bhattacharya (PI) A.K.De (PI) S.K.Zamir Ahmed (PI) R.Jayakumaravaradan (PI) L.B.Singh (PI, KVK,SA) Z.George (PI, KVK, Nicobar) S.K.Pandey (Co-PI, KVK, Nicobar) B.L.Kashinath (PI, KVK, Nimbudera) S.V.Lal (Co-PI, KVK, Nimbudera) & A.K.O.Rateesh (PI, RS, Lakshadweep)		134.23	2019	2021
PPV&FRA, New Delhi						
4	Development and standardization of DUS characteristics procedures for Noni (<i>Morinda citrifolia</i> L.)	I. Jaisankar	-	27.08	2013	2020

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
SAC, ISRO, Ahmadabad						
5	Mangrove community zonation and biophysical characterization for coast of Andaman and Nicobar Islands	I. Jaisankar	Bimal, K., Bhattacharya & Nikhil Lele	9.74	2019	2021
IMD (MoES)						
6	Integrated agromet advisory services for A&N Islands	A. Velmurugan	T. Subramani, T.P.Swarnam, A. Kundu, P.K. Singh, R. Kiruba Sankar, S.K. Zamir Ahmed, L.B.Singh, S.K.Pandey & S. Dam Roy	60.0	2008	2022
NFDB, Hyderabad						
7	National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) in Andaman and Nicobar Islands	K. Saravanan	J. Praveenraj	75.5	2015	2020
NABARD						
8	Evaluation and popularisation of value added compost and other organic inputs in Neil island	A. Velmurugan	I. Jaisanka, S.K. Zamir Ahmed & T.P. Swarnam	10.0	2017	2019
9	Establishment of duckling resource unit for N&M Andaman	T.Sujatha	A.Kundu, Jai Sunder & Shradul Vikram Lal	10.99	2017	2020

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
10	Enhancing on-farm production and promoting forward and backward linkages through technological intervention	S. K. Zamir Ahmed	A. Velmurugan, Amit Srivastava, B.L Kasinath & R. Jaya Kumaravaradan	9.99	2017	2020
11	Paddy / vegetable seed production and supply of quality seeds to Island farmers for increasing vegetable productivity and nutritional security of Island	B.L. Kasinath	D. Basantia, B.L. Meena, Shailesh Kumar, Pooja Kapoor, Manoj Kumar, Shardul Vikram Lal, Tanmay Paul & S. Dam Roy	10.65	2016	2019
12	Establishment of nursery for supply of quality planting materials to farmers for higher income generation through crop diversification	D. Basantia & Tanmai Paul	B.L.Kasinath, Shailesh Kumar, B.L. Meena, D. Basantia, Pooja Kapoor, Manoj Kumar, S.V. Lal, Ajit Waman & S.Dam Roy	9.99	2017	2019
13	Quality fish seed production for adoption of scientific fish farming for economic, Nutritional and Social upliftment of farmers in N&M Andaman”	Shailesh Kumar	B. L. Kasinath, Nagesh Ram, B. L. Meena, Pooja Kapoor, Manoj Kumar, D. Basantia, Tanmay Paul & S. Dam Roy	9.99	2016	2019
14	Quality fish Feed production for Nutritional and augmenting fish production in N&M Andaman”	Shailesh Kumar	B. L. Kasinath, Nagesh Ram, B. L. Meena, Sivaramakrishna N, Pooja Kapoor, Manoj Kumar & S. Dam Roy	9.99	2017	2019

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
15	Capacity building programme on advanced poultry production techniques for rural women in N & M Andaman	Sharadulal	T. Sujatha, Jai Sunder, B. L. Kasinath, T. Paul & A. Kundu	10.54	2019	2020
16	Development of rural backyard poultry by supplying mini-egg hatching units to gram panchayats/ SHG/ individual poultry Farmers	Sharadulal	T. Sujatha, Jai Sunder, B. L. Kasinath, T. Paul & A. Kundu	3.850	2019	2021
17	FPO North and Middle Andaman agricultural producers company	B.L.Kasinath	B.L. Meena, Shailesh Kumar, Pooja Kapoor, Manoj Kumar, Shardu Vikram Lal, D.Basantia, Prasant Pradhan & Tanmay Paul	9.09	2016	2019
18	On Farm Production Technology for mass production of Vesicular Arbuscular Mycorrhizal fungi for Plant health Management in Modern Sustainable Agriculture System	Vivek Kumar Pandey	L.B. Singh, B.K.Nanda, N,Bommayswamy, Harapriya Nayak & S.K. Zamir Ahmed	9.99	2019	2021
19	On Farm Production Technology for mass production of Bioinoculan for Plant Health Management at farmers field	Vivek Kumar Pandey	L.B. Singh, B.K.Nanda, N,Bommayswamy, Harapriya Nayak & S.K. Zamir Ahmed	9.99	2019	2021

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
20	Poultry Based Agro Farming System for Doubling Farm Income of Farm Women in Andaman Islands	Harapriya Nayak	L.B. Singh, B.K.Nanda, N,Bommayswamy, V K Pandey & Zachariah George	8.79	2019	2021
DST (GoI)						
21	Exploration and exploitation of seaweed associated Endophytic Bacteria for disease management and growth promotion in rice	K. Sakthivel	-	40.0	2019	2021
The National Academy of Sciences, India (NASI)						
22	Livelihood and nutritional security of tribal farming community of Andaman and Nicobar Islands exploring native animal genetics resources	P.A. Bala	A. Kundu, D. Bhattacharya, Jai Sunder, T. Sujatha, A.K. De, P. Perumal, K. Muniswamy & S.K. Zamir Ahmed	40.66	2018	2021
23	Security Livelihood of Nicobari tribal communities of A & N Islands through sustainable horticultural intervention	B.A. Jerard	V. Damodaran, S.K. Zamir Ahmed, R. Jaya Kumaravaradan V. Baskaran & S.K. Pandey	12.0	2019	2021
Bill and Melinda Gates Foundation						
24	Stress tolerant rice for poor farmers of Africa and South Asia	R.K. Gautam	P. K. Singh, S. K. Zamir Ahmed & A. Velmurugan	15.00	2014	2019

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
IRRI-ICAR						
25	The Global Rice Array: India partnership to strengthen global phenomics network	R.K. Gautam	P.K. Singh, K. Sakthivel & K. Venkatesan	7.00	2018	2022
RKVY, A&N Administration						
26	Study on the status of minerals profile in cattle Sera, its correlation with infertility and Production and development of area specific mineral mixture to augment productivity	Jai Sunder	T.Sujatha, M.S.Kundu, A.Kundu & P.A.Bala	32.02	2018	2020
DAC, Ministry of Welfare Agriculture and Farmers						
27	Monitoring of pesticide residues at national level	T.P.Swarnam	A Velmurugan	25	2011	2025
MOFPI						
28	Food Processing Training Centre (FPTC)	S. Swain	-	20.0	2014	2023
DST-SERB						
29	Genetic and management Interventions to identify the key role players in bull semenfreezability and to reduce the cryo injury on bull spermatozoa	Rafeeqe Rahman Alyethodi	--	32.11	2018	2021

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
A&N Administration, Port Blair						
30	Preparation of State Specific Action Plan (SSAP) for water sector, Andaman and Nicobar Islands (consultancy)	B. Gangaiah	Sirisha, Adamala, S. Swain, T. Subramani, B. K. Nanda, S. K. Pandey, P. A. Baala & Y. Gladston	20.01	2019	2020
DASD, Kozhikode						
31	CSS-MIDH (NHM) project	K. Abirami	V. Damodaran	7.30	2002	Contd..

ICAR Funded

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs) (2019-20)	Year of Start	Year of Completion
ICAR, New Delhi						
1	AICRP on integrated farming systems	T.P.Swarnam	A. Velmurugan, T. Subramani, S. Swain, M.S.Kundu, R. Kiruba Sankar, I. Jaisankar, A. Ajit A. Waman, B.K. Nanda, S.K. Pandey & Z. George		2010	2020
2	AICRP on management of salt affected soils and use of saline water in agriculture	A.Velmurugan	T.P. Swarnam & T. Subramani	11.5	2014	2020
3	AICRP on Goat improvement	Jai Sunder	A.Kundu, M.S.Kundu R.R.Aleythodi P.Perumal	26.62	2014	Contd.

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs) (2019-20)	Year of Start	Year of Completion
4	AICRP on ADMAS	Jai Sunder	T.Sujatha & D.Bhattacharya	3.50	2014	Contd.
5	AICRP on FMD	Jai Sunder	A.K.De D.Bhattacharya	3.50	2014	Contd
6	AICRP on Palms	Dr. Ajit Arun Waman	-	6.70	2015	Contd
7	AICRP on Fruits	K. Abirami	-	3.0	2015	Contd
8	AICRP on Floriculture	V. Baskaran	-	1.06	2016	Contd
9	AICRP on Tuber Crops	V. Damodaran	B. A. Jerard & L.B. Singh	5.0	2010	Contd
10	AICRP on Vegetable Crops	Soobedar Yadav	-	6.0	2005	Contd.
11	Poultry Seed Project	A.Kundu	T.Sujatha	37.00	2014	2020
12	AICRP on Pig	M.S.Kundu	A.Kundu Jai Sunder	32.5	2015	2020
ICAR-IARI						
13	National extension programme	S. K. Zamir Ahmed	P.K. Singh, A. Velmurugan, S. Yadav, R. Jaya Kumaravaradan, L.B. Singh, B.L. Meena, S.K. Pandey & B.L. Kasinath	-	2017	Continued
14	Technology Demonstration Components – National Initiative on Climate Resilient Agriculture	Dr. L. B. Singh	B K Nanda N.Bommayasamy Harapriya Nayak V.K.Pandey	80.00	2011	Continued
ICAR-DMR						
15	AICRP- Mushroom	K. Sakthivel	R.K. Gautam, V.K. Pandey S. Dam Roy	3.85 (for this financial year)	2015	-

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs) (2019-20)	Year of Start	Year of Completion
ICAR-CMFRI, Cochin						
16	All India Network Project on Mariculture	R. Kiruba Sankar	Gladston, Y, J.Praveenraj, K. Saravanan, Harsha Haridas & S. Dam Roy	50.0	March, 2018	2021
ICAR (IISR)						
17	ICAR Seed Project: Seed production in agricultural crops	P. K. Singh	R. K. Gautam	75.50	2006	2020
ICAR-CPCRI, Kasaragod						
18	Genetic resources management in coconut, arecanut and cocoa	B. Augustine Jerard	V. Damodaran	3.0	2018	2023
19	Genetic investigation and breeding in coconut, arecanut and cocoa	B. Augustine Jerard	V. Damodaran			

Institute Funded

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
Horticulture & Forestry						
1.	Conservation and utilization of coconut and arecanut genetic resources of Andaman & Nicobar and Lakshadweep Islands for high yield and product diversification	B. Augustine Jerard	V. Damodaran, I. Jaisankar & S.K. Zamir Ahmed	45.00	2018	2023
2.	Collection, conservation and evaluation of commercial fruit crops of Andaman and Nicobar Islands	K. Abirami	V. Baskaran, B. A. Jerard, K. Venkatesan & D. Basantia	40.00	2018	2022
3.	Collection, characterization, evaluation and mass multiplication of unconventional native and exotic fruit crops for Bay Islands	Pooja Bohra	Ajit Arun Waman, T. Bharathimeena & S.K. Zamir Ahmed	32.00	2015	2021

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
4.	Development of protocols for micropropagation of selected fruit crops for Bay Islands	Pooja Bohra	Ajit Arun Waman & L.B. Singh	35.00	2015	2020
5.	Improvement of vegetable and tuber crops for Andaman and Nicobar Islands	B. Augustine Jerard	Soobedar Yadav, I. Jaisankar, V. Damodaran, S.K. Zamir Ahmed, L. B. Singh & B.L. Kasinath	40.00	2018	2023
6.	Collection, characterization and utilization of natural diversity of important spice crops from Bay Islands and evaluation of their improved varieties	Ajit Arun Waman	Pooja Bohra, T. Sujatha, L.B. Singh & V. Damodaran	30.00	2015	2021
7.	Exploration, haracterization, micro-propagation and agro-technique standardization of an important rhizomatous species-mango ginger from Bay Islands	Ajit Arun Waman	Pooja Bohra, I. Jaisankar, D. Basantia & V. Damodaran	35.00	2015	2020
8.	Development of production technology of ornamental crops in Bay Islands	V. Baskaran	K. Abirami & A. Velmurugan	35.00	2011	2020
9.	Exploiting endemic and promising orchids of Andaman and Nicobar Islands for crop improvement	V. Baskaran	B. A. Jerard, K. Abirami & K. Venkatesan	35.00	2018	2022
10.	Planting material production in horticultural crops	B. Augustine Jerard	V. Baskaran, K. Abirami, V. Damodaran, I. Jaisankar, Ajit Arun Waman, Pooja Bohra, Soobedar Yadav & S.K.Zamir Ahmed	45.00	2018	2023

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
11.	Enriching coconut plantations of Andaman and Nicobar Islands through augmentation of indigenous multipurpose tree resources	I. Jaisankar	B. Augustine Jerard, T. P. Swarnam & V. Damodaran	30.00	2018	2023
12.	Collection, characterisation and evaluation of selected economically important aromatic crops in Andaman & Nicobar Island	Soobedar Yadav	K. Abirami, R. K. Gautam,	25.00	2017	2021
13.	Enhancing production and quality of rhizomatous spices through varietal, biotic stress and processing interventions in plantation based cropping system under island conditions	Soobedar Yadav	Ajit Arun Waman, V. Damodaran, K. Sakthivel & S. Swain	25.00	2017	2021
Field Crops Improvement & Protection						
1.	Augmenting rice productivity through varietal purification of popular land races	R.K. Gautam	P.K. Singh, S.K. Zamir Ahmed, K. Sakthivel, S. Swain & Pooja Kapoor	40.00	2012	2020
2.	Genetic improvement of rice for higher productivity in Andaman and Nicobar Islands conditions	P.K. Singh	R.K. Gautam, B. Gangaiah, K. Sakthivel, T.Bharathimeena, S.K. Zamir, Ahmed & B.L. Meena	18.00	2017	2021
3.	Characterization of viral diseases of important vegetable crops of Andaman and Nicobar islands and development of eco-friendly Integrated Disease Management (IDM) modules	K. Sakthivel	R.K. Gautam, P.K. Singh, K. Venkatesan, V.K. Pandey, V. Baskaran, T. Barathimeena & Soobedar Yadav	48.00	2018	2021

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
4.	Enhancing pulse productivity of Andaman and Nicobar Islands through development and promotion of high yielding and stress tolerant varieties	K. Venkatesan	R.K. Gautam, K. Sakthivel, P.K. Singh, B. Gangaiah & S.K. Zamir Ahmed	24.20	2018	2021
5.	Evaluation and popularization of native microbial formulations for plant disease management and growth promotion in Andaman and Nicobar Islands	K. Sakthivel	V.K. Pandey	-	2020	2022
6.	Evaluation of rice genotypes for high phosphorus efficiency in Andaman and Nicobar Island conditions	Joshitha Vijayan	R.K. Gautam, P.K. Singh, R. Rakesh B., Srividhya S., Kiran, K.R. & B. Gangaiah	26.61	2019	2022
7.	Development of high yielding and bacterial wilt resistant varieties of Tomato for Andaman and Nicobar Islands	Rakesh B.	K. Sakthivel, P.K. Singh, Joshitha Vijayan, V. Baskaran, & R.K. Gautam	24.20	2019	2022
Natural Resource Management						
1.	Vulnerability assessment and adaptation led mitigation strategies of Andaman and Nicobar Islands farming to climate change	B. Gangaiah	T. Subramani S. Swain, A. Velmurugan, B.K. Nanda, V. Damodaran & M.S. Kundu	40.00	2015	2020
2.	Assessment of post harvest losses in fruits and vegetables and strategies for their reduction in the islands	S. Swain	S.K. Zamir Ahmed, L.B Singh, Chandrika Ram, Manoj Kumar, Tauqueer Ahmed & P. Misra Sahoo	20.00	2015	2019

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
3.	Development of nutraceutical beverages from potential underutilized fruits and medicinal herbs of Andaman and Nicobar Islands	S. Swain	K.Abirami, Pooja Bohra & Pooja Kapoor	40.00	2015	2019
4.	Development of production technologies for high value vegetables in soil less culture	T. Subramani	B. Gangaiah, & V.Baskaran	34.29	2017	2020
5.	Organic farming studies for sustaining productivity of island cropping systems	Kiran K.R	B. Gangaiah, A. Velmurugan & K. Sakthivel	64.00	2018	2023
6.	Study of hydrological response for soil and water conservation in Island ecosystem	Sirisha Adamala	A. Velumurugan & B.L. Meena	46.00	2019	2022
Animal Science						
1.	Prevalence and economic impact of gastro-intestinal parasites of livestock in Andaman And Nicobar Island	D. Bhattacharya	M.S. Kundu, Jai Sunder, T. Sujatha, A.K. De, Zacharia George, Perumal P, Ajit Arun Waman & A. Kundu	25.00	2017	2020
2.	Molecular epidemiology of <i>Rhipicephalus microplus</i> complex in Andaman & Nicobar islands and screening for its acaricide resistance	D. Bhattacharya	Jai Sunder, K. Muniswamy, R.R. Alyethodi, Perumal, P., Arun Kumar De & A. Kundu	23.00	2018	2021
3.	Pharmaco-assessment of Ethno-veterinary medicinal plants of A&N Islands for poultry diseases	T.Sujatha	Jai Sunder, D.Bhattacharya, A.Kundu, K.Abirami & A. Puro	25.95	2017	2020
4.	Selection and breeding of Nicobari fowl for immunity and its evaluation under different seasons	T.Sujatha	Jai Sunder, D.Bhattacharya, A.Kundu & R.R.Alyethodi	26.50	2018	2021

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
5.	Gender identification in day old poultry by PCR based methodology	Arun Kumar De	T. Sujatha, Jai Sunder & A. Kundu	15.00	2017	2019
6.	Molecular signature of eco-sustainability of indigenous livestock breeds of Andaman and Nicobar islands and Lakshadweep	Arun Kumar De	Jai Sunder, M. S. Kundu, D. Bhattacharya & A. Kundu	45.00	2017	2019
7.	Evaluation of reproductive performance and egg quality of Nicobari fowl using molecular marker	Arun Kumar De	D. Bhattacharya, Jai Sunder, Perumal P, T. Sujatha & A. Kundu	40.00	2018	2021
8.	Studies on endocrinological and biochemical profiles of bovine species for enhancing fertility in Bay Islands	Perumal P.	M. S. Kundu, D. Bhattacharya, Jai Sunder, A. K. De, A. Kundu, Z. George, S. V. Lal & V.M. Abdul Gafoor	37.13	2017	2020
9.	Molecular Characterization of Immune System genes of Nicobari Fowl	K. Muniswamy	A. K. De, T. Sujatha, D. Bhattacharya, Jai Sunder & A. Kundu	37.13	2017	2020
10.	Supplementing Zinc and Chromium to ameliorate heat stress in poultry	P.A. Bala	J. Sunder, T. Sujatha, A. K. De, M.S. Kundu & A. Kundu	28.97	2019	2022
11.	Identification of Genome-wide molecular signatures responsible for higher fecundity in Andaman Local goats	Rafeeqe Rahman Alyethodi	A. Kundu, Jai Sunder, A.K De, K. Karunakaran, Perumal, A.P Bala & S.K Ravi	27.0	2019	2022

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
12.	Biochemical and molecular mining of hormonal profiles of buck under abiotic stressors and managerial intervention for its mitigation	Perumal P.	S.K. Ravi, A.K. De, R.R. Alyethodi, K. Muniswamy, Jai Sunder & A. Kundu	34.17	2018	2021
13.	Physical, biochemical and molecular characterization of semen in pigs of Bay Islands <i>Vis a Vis</i> study on feasibility of artificial insemination	S.K. Ravi	Perumal, P., M. S. Kundu, D.Bhattacharya, Jai Sunder, Arum Kumar De, R.R. Alyethodi & A. Kundu	21.90	2018	2021
Fisheries Science						
1.	Biology of Blue Fin Travelly (<i>Caranx melampygus</i>) from Andaman Waters	A.K.O. Ratheesh	S. Dam Roy & Kiruba Sankar, R		2017	2020
2.	Documentation of Indigenous Fishing Practices of Nicobari Tribes	A.K.O. Ratheesh	S. Dam Roy, Nagesh Ram, S.K. Zamir Ahmed & S.K. Pandey		2017	2020
3.	Evaluation of Suitable Aquaponics System Incorporating Fisheries and Agri Components under the Island conditions	Harsha Haridas	S. Dam Roy, T. Subramani, K. Saravanan, Benny Varghese & S. Murugesan	49.7	2018	2021
4.	Documentation of parasite infecting commercial marine and freshwater of Andaman Island	J. Praveenraj	S. Dam Roy, R. Kiruba Sankar, K. Saravanan & Gladston, Y.	11.0	2019	2022
5.	Seafood quality and safety assessment studies in commercial fish landings of Andaman Islands	Sreepriya Prakasan	S. Dam Roy, Deepitha R. P, K. Saravanan, Harsha Haridas & Gladston Y	57.3	2019	2022

Sl. No.	Project Title	PI	Co-PIs	Budget (Rs in lakhs)	Year of start	Year of completion
6.	Assessment of Elasmobranch fisheries of Andaman Islands	Gladston Y	S. Dam Roy, R. Kiruba Sankar, Ajina S. M, Deepitha R. P & Benny Varghese	55.16	2019	2022
7.	Biology and population dynamics of major perch fishes of Andaman Islands	Ajina S. M	S. Dam Roy, R. Gladston Y., A.K. O Ratheesh, Sreepriya Prakasan & S. Murugesan	48.14	2019	2022
8.	Exploring the post-harvest utilization and market potential for value added products from commercial fish landings of Andaman	Deepitha R P	Sreepriya Prakasan, Harsha Haridas, Ajina S.M., T. Sujatha & S. Dam Roy	54	2019	2022
Social Science						
1.	Indigenous adaptation strategies of tribal <i>vis-a-vis</i> non-tribal farmers and impact of CIARI technologies in mitigating climate change effects on agriculture in Andaman & Nicobar Islands	R. Jaya Kumaravaradan	S.K. Zamir Ahmed, B. Augustine Jerard, B.L. Kasinath, L.B. Singh, S.K. Pandey, Amit Srivastava & A. Kundu	32.00	2018	2021
2.	Agricultural Information Sharing and Knowledge Generation Towards Sustainable Management of Island Ecosystem with Special Reference to Fishery by Developing Mobile Apps	D. Karunakaran	R. Kiruba Sankar	32.00	2018	2021

11. PUBLICATIONS

Research Article

- Abirami, K., Sachidananda Swain., Piya Xaxa., V. Baskaran., K. Sakthivel and Binku Mondal (2019). Phytochemical profile and antimicrobial activity of turmeric grown in Andaman Islands. *Journal of Pharmacognosy and Phytochemistry*, 8(6): 9-13. (NAAS Rating: 5.21)
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- Ain KU, Biswas SK, Inbaraj S, Chand K, Saxena A, Ramakrishnan MA, Sunder J, Kundu A, Pandey AB. (2019) Deciphering type-specific neutralizing antibodies to bluetongue virus in goats of Andaman and Nicobar Islands, India. *Tropical Animal Health and Production*, 52(5):2715-2719. doi: 10.1007/s11250-020-02237-2. Epub 2020 Feb 26. PMID: 32100170. (NAAS Rating: 7.09)
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- Balamurugan, V., Varghese, B. , Muthuchelvan, D., Kumar, S.S., Kumar, K.V., Suresh, K.P., Govindaraj, G., Sunder, J., Hemadri, D. & Roy, P. (2019). Cross-sectional seroprevalence study of peste des petits ruminants in goats in Andaman and Nicobar Islands, India. *Small Ruminant Research*, Doi.org/10.1016/j.smallrumres.2019.08.013 (NAAS Rating: 7.21)
- Basantia, D., Debhabrata, Basantia., Sashikala Beura and B.L.Kasinath (2019). Commercial floriculture in Andaman & Nicobar Islands: A Review. *The Orissa Journal of Horticulture*, 46 (1&2): 50-54.
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- Baskaran, V., K. Abirami., A. Velmurugan and D. R. Singh (2019). Media for growth and yield of Calla lily (*Zantedeschia elliotiana*) in Andaman and Nicobar Islands. *Indian Journal of Agricultural Sciences*, 89(10): 1737-1739. (NAAS Rating: 6.23)
- Bohra, Pooja., Ajit Arun Waman and B.A. Jerard (2019). Seed germination and storage studies in seed fertile *Musa indandamanensis* and its conservation. *South African Journal of Botany*, 128: 161-166. (NAAS Rating : 7.50)

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Sl. No.	IC Number	Scientific name	Collectors Name
1	626093	<i>Amorphophallus hirsutus</i>	JPJ
2	626094	<i>Semecarpus prainii</i>	JPJ
3	626095	<i>Rhopaloblaste augusta</i>	JPJ
4	626096	<i>Horsfieldia glabra</i>	JPJ
5	626097	<i>Myristica andamanica</i>	JPJ
6	626098	<i>Colocasia esculenta</i>	JPJ

Sl. No.	IC Number	Scientific name	Collectors Name
7	626099	<i>Curcuma rubescens</i>	JPJ
8	626100	<i>Alpinia conchigera</i>	JPJ
9	626101	<i>Curcuma longa</i>	JPJ
10	626102	<i>Myristica andamanica</i>	JPJ
11	626103	<i>Horsfieldia glabra</i>	JPJ
12	626104	<i>Curcuma rubescens</i>	JPJ
13	626105	<i>Piper pedicelloseum</i>	JPJ
14	626106	<i>Jasminum elongatum</i>	JPJ
15	626107	<i>Colocasia esculenta</i>	JPJ
16	626108	<i>Piper sarmentosum</i>	JPJ
17	626369	<i>Andrographis paniculata</i>	JPJ
18	626370	<i>Macaranga nicobarica</i>	JPJ
19	626371	<i>Aristolochia tagala</i>	JPJ
20	626372	<i>Dendrolobium umbellatum</i>	JPJ
21	626373	<i>Ocimum tenuiflorum</i>	JPJ
22	626374	<i>Ocimum tenuiflorum</i>	JPJ
23	626375	<i>Lawsonia inermis</i>	JPJ
24	626376	<i>Ficus subulatum</i>	JPJ
25	626377	<i>Leucas aspera</i>	JPJ
26	626378	<i>Leucaena pulverulenta</i>	JPJ
27	626379	<i>Pennisetum pedicellatum</i>	JPJ
28	626380	<i>Gossypium barbadense var. acuminatum</i>	JPJ
29	626491	<i>Cajanus scarabaeoides</i>	JPJ
30	627289	<i>Cucumis melo subsp. agrestis</i>	JPJ
31	627290	<i>Trichosanthes tricuspidata</i>	JPJ
32	627291	<i>Cucumis melo subsp. agrestis</i>	JPJ
33	627292	<i>Solanum melongena</i>	JPJ
34	627293	<i>Solanum melongena</i>	JPJ
35	627294	<i>Trichosanthes quinquangulata</i>	JPJ
36	627295	<i>Solanum torvum</i>	JPJ
37	627296	<i>Solanum virginicum</i>	JPJ
38	631167	<i>Cucumis melo var. agrestis</i>	JPJ
39	631168	<i>Passiflora suberosa</i>	JPJ
40	631169	<i>Trichosanthes quinquangulata</i>	JPJ
41	631170	<i>Trichosanthes tricuspidata</i>	JPJ
42	631171	<i>Abelmoschus moschatus</i>	JPJ

Sl. No.	IC Number	Scientific name	Collectors Name
43	631172	<i>Luffa aegyptiaca</i>	JPJ
44	631173	<i>Solanum lasiocarpum</i>	JPJ
45	631174	<i>Solanum melongena</i>	JPJ
46	631175	<i>Corchorus aestuans</i>	JPJ
47	630940	<i>Dioscorea glabra</i>	JPJ
48	630941	<i>Colocasia esculenta</i>	JPJ
49	630942	<i>Colocasia esculenta</i>	JPJ
50	630943	<i>Xanthosoma sagittifolium</i>	JPJ
51	630944	<i>Colocasia esculenta</i>	JPJ
52	630945	<i>Zingiber cassumunar</i>	JPJ
53	630946	<i>Dioscorea glabra</i>	JPJ
54	630947	<i>Curcuma longa</i>	JPJ
55	630948	<i>Colocasia esculenta</i>	JPJ
56	630949	<i>Alocasia macrorrhiza</i>	JPJ
57	630950	<i>Syzygium claviflorum</i>	JPJ
58	630951	<i>Syzygium jambos</i>	JPJ
59	630952	<i>Alpinia conchigera</i>	JPJ
60	630953	<i>Dioscorea bulbifera</i>	JPJ
61	630954	<i>Garcinia speciosa</i>	JPJ
62	630955	<i>Zingiber cassumunar</i>	JPJ
63	630956	<i>Sterculia cordata</i>	JPJ
64	630957	<i>Garcinia speciosa</i>	JPJ
65	630958	<i>Cordia grandis</i>	JPJ
66	630959	<i>Garcinia speciosa</i>	JPJ
67	630960	<i>Colocasia esculenta</i>	JPJ
68	630961	<i>Artocarpus teysmannii</i>	JPJ
69	630962	<i>Garcinia speciosa</i>	JPJ
70	630963	<i>Garcinia speciosa</i>	JPJ
71	630964	<i>Artocarpus gomezianus</i>	JPJ
72	630965	<i>Artocarpus communis</i>	JPJ
73	630966	<i>Zingiber officinale</i>	JPJ
74	630967	<i>Curcuma longa</i>	JPJ
75	630968	<i>Curcuma amada</i>	JPJ
76	630969	<i>Zingiber zerumbet</i>	JPJ
77	630970	<i>Zingiber zerumbet</i>	JPJ
78	630971	<i>Mangifera nicobarica</i>	JPJ

Sl. No.	IC Number	Scientific name	Collectors Name
79	630972	<i>Dimocarpus longan</i>	JPJ
80	630973	<i>Dioscorea piscatorum</i>	JPJ
81	630974	<i>Alocasia macrorrhiza</i>	JPJ
82	630975	<i>Colocasia esculenta</i>	JPJ
83	630976	<i>Colocasia esculenta</i>	JPJ
84	630977	<i>Xanthosoma sagittifolium</i>	JPJ
85	630978	<i>Acorus calamus</i>	JPJ
86	630979	<i>Curcuma rubescens</i>	JPJ
87	630980	<i>Colocasia esculenta</i>	JPJ
88	630981	<i>Orophea katschallica</i>	JPJ
89	630982	<i>Dioscorea esculenta</i>	JPJ
90	630983	<i>Dioscorea bulbifera</i>	JPJ
91	630984	<i>Dioscorea alata</i>	JPJ
92	630985	<i>Dioscorea alata</i>	JPJ
93	630986	<i>Dioscorea alata</i>	JPJ
94	630987	<i>Artocarpus chaplasha</i>	JPJ
95	630988	<i>Cordia subcordata</i>	JPJ
96	630989	<i>Triphasia trifolia</i>	JPJ
97	630990	<i>Garcinia speciosa</i>	JPJ
98	630991	<i>Syzygium sp.</i>	JPJ
99	630992	<i>Musa balbisiana var. andamanica</i>	JPJ
100	630993	<i>Artocarpus teysmannii</i>	JPJ
101	630994	<i>Tinospora crispa</i>	JPJ
102	631280	<i>Morinda citrifolia</i>	JPJ
103	631281	<i>Passiflora suberosa</i>	JPJ
104	631282	<i>Amaranthus dubius</i>	JPJ
105	631283	<i>Scopellaria marginata</i>	JPJ
106	631284	<i>Sesbania sericea</i>	JPJ
107	631285	<i>Sesbania cannabina</i>	JPJ
108	631286	<i>Indigofera colutea</i>	JPJ
109	631287	<i>Benincasa hispida</i>	JPJ
110	631288	<i>Blumea balsamifera</i>	JPJ
111	631679	<i>Cajanus scarabaeoides</i>	JPJ
112	631680	<i>Vigna trinervia</i>	JPJ
113	631681	<i>Cajanus scarabaeoides</i>	JPJ
114	631682	<i>Rhynchosia suaveolens</i>	JPJ

Sl. No.	IC Number	Scientific name	Collectors Name
115	632660	<i>Eclipta alba</i>	JPJ
116	631289	<i>Ocimum sanctum</i>	JPJN
117	631290	<i>Coix lacryma-jobi</i>	JPJN
118	631291	<i>Celosia argentea</i>	JPJN
119	631292	<i>Mucuna monosperma</i>	JPJN
120	631165	<i>Corchorus aestuans</i>	JPJN
121	631683	<i>Vigna trinervia</i>	JPJN
122	632109	<i>Abelmoschus moschatus</i>	JPJN
123	632110	<i>Solanum torvum</i>	JPJN
124	632656	<i>Eclipta alba</i>	JPJN
125	632657	<i>Eclipta alba</i>	JPJN
126	632658	<i>Eclipta alba</i>	JPJN
127	632659	<i>Eclipta alba</i>	JPJN
128	632661	<i>Eclipta prostrata</i>	JPJN
129	631112	<i>Curcuma longa</i>	AJJPN
130	631113	<i>Dioscorea glabra</i>	AJJPN
131	631114	<i>Dioscorea alata</i>	AJJPN
132	631115	<i>Dioscorea alata</i>	AJJPN
133	631116	<i>Dioscorea glabra</i>	AJJPN
134	631117	<i>Vanilla albida</i>	AJJPN
135	631118	<i>Dioscorea serpenticola</i>	AJJPN
136	631119	<i>Zingiber odoriferum</i>	AJJPN
137	631120	<i>Curcuma mangga</i>	AJJPN
138	631121	<i>Piper sarmentosum</i>	AJJPN
139	631122	<i>Dioscorea alata</i>	AJJPN
140	631123	<i>Zingiber pseudosquarrosus</i>	AJJPN
141	631124	<i>Curcuma amada</i>	AJJPN
142	631125	<i>Curcuma longa</i>	AJJPN
143	631126	<i>Musa acuminata ssp. burmannica</i>	AJJPN
144	631127	<i>Musa acuminata ssp. burmannica</i>	AJJPN
145	631128	<i>Curcuma aeruginosa</i>	AJJPN
146	631129	<i>Dioscorea alata</i>	AJJPN
147	631130	<i>Curcuma petiolata</i>	AJJPN
148	631131	<i>Etlingera sp.</i>	AJJPN
149	631132	<i>Piper betle</i>	AJJPN
150	631133	<i>Amomum andamanicum</i>	AJJPN

Sl. No.	IC Number	Scientific name	Collectors Name
151	631134	<i>Dioscorea alata</i>	AJJPJN
152	631135	<i>Manilkara littoralis</i>	AJJPJN
153	631136	<i>Zingiber officinale</i>	AJJPJN
154	631137	<i>Vanilla andamanica</i>	AJJPJN
155	631138	<i>Grewia calophylla</i>	AJJPJN
156	631139	<i>Tinospora cordifolia</i>	AJJPJN
157	631140	<i>Dioscorea pentaphylla</i>	AJJPJN
158	631141	<i>Curcuma amada</i>	AJJPJN
159	631142	<i>Tinospora cordifolia</i>	AJJPJN
160	631143	<i>Cissus repens</i>	AJJPJN
161	631144	<i>Myristica andamanica</i>	AJJPJN
162	631145	<i>Musa indandamanensis</i>	AJJPJN
163	631146	<i>Dioscorea bulbifera</i>	AJJPJN
164	631147	<i>Tinospora cordifolia</i>	AJJPJN
165	631148	<i>Alpinia conchigera</i>	AJJPJN
166	631149	<i>Curcuma rubescens</i>	AJJPJN
167	631150	<i>Cissus repens</i>	AJJPJN
168	631151	<i>Alpinia conchigera</i>	AJJPJN
169	631152	<i>Myristica andamanica</i>	AJJPJN
170	631153	<i>Myristica andamanica</i>	AJJPJN
171	631154	<i>Musa acuminata</i>	AJJPJN
172	631155	<i>Etlintera fenzlii</i>	AJJPJN
173	631156	<i>Citrus limon</i>	AJJPJN
174	631157	<i>Citrus aurantifolia</i>	AJJPJN
175	631158	<i>Dracontomelon dao</i>	AJJPJN
176	631159	<i>Artocarpus sp.</i>	AJJPJN
177	631160	<i>Dioscorea glabra</i>	AJJPJN
178	631161	<i>Zingiber zerumbet</i>	AJJPJN
179	631162	<i>Musa indandamanensis</i>	AJJPJN
180	631163	<i>Musa indandamanensis</i>	AJJPJN
181	631164	<i>Moringa oleifera</i>	AJJPJN
182	631166	<i>Corchorus aestuans</i>	AJJPJN
183	631685	<i>Vigna marina</i>	AJJPJN
184	631686	<i>Vigna marina</i>	AJJPJN
185	631687	<i>Vigna marina</i>	AJJPJN
186	631293	<i>Ocimum sanctum</i>	AJJPJN

Sl. No.	IC Number	Scientific name	Collectors Name
187	631294	<i>Ocimum sanctum</i>	AJJP
188	631295	<i>Aristolochia tagala</i>	AJJP
189	631296	<i>Colubrina asiatica</i>	AJJP
190	631297	<i>Tephrosia purpurea</i>	AJJP
191	632655	<i>Eclipta alba</i>	AJJP
192	628643	<i>Curcuma mangga(1)</i>	WB
193	628644	<i>Myristica andamanica(1)</i>	WB
194	628645	<i>Horsfieldia glabra(1)</i>	WB
195	628646	<i>Garcinia andamanica(1)</i>	WB
196	628647	<i>Garcinia kydia(2)</i>	WB
197	628649	<i>Garcinia kydia(2)</i>	WBA
198	628648	<i>Garcinia dulcis(1)</i>	WB
199	628650	<i>Musa paramjitiana(1)</i>	WB

Collectors Name

- J : Dr. K Joseph John, Principal Scientist, NBPGR Regional Station- Thrissur, Kerala.
- P : Dr. K. Pradheep, Principal Scientist, NBPGR Regional Station- Thrissur, Kerala.
- A : Dr. B. Augustine Jerard, Principal Scientist and Head, Div of Horticulture and Forestry, Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands,
- J : Dr. I. Jaisankar, Scientist, Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands.
- N : Mr. Muhammed Nissar, Scientist, Indian Institute of Spices Research, Calicut, Kerala.
- W : Dr. Ajit Arun Waman, Scientist, ICAR-CIARI, Port Blair
- B : Dr. Pooja Bohra, Scientist, ICAR-CIARI, Port Blair

Gene Bank Accession Number

Sl No.	Accession No.	Description
1.	MN865073-082	De, A.K., Ponraj, P., K., Sawhne, S. and Bhattacharya, D. (2019) <i>Capra hircus</i> isolate (Breed: Andaman Local Goat) D-looppartial sequence; mitochondrial

12. PARTICIPATION IN CONFERENCE/ SEMINAR/ SYMPOSIUM/ MEETINGS

Sl.No	Scientist	Programme	Venue	Date/ duration
1.	S. Dam Roy	IGNOU Convocation	IGNOU Regional Centre, Port Blair	3 rd April 2019
2.	P.K. Singh	Joint Annual Group Meeting of National Seed Project (Crops) and ICAR Seed Project	CCS, Haryana Agricultural University, Hisar, Haryana	7 th to 9 th April, 2019
3.	B. Augustine Jerard	Interactive meeting with Dr. Ramesh Goel, VC, Delhi Pharmaceutical Sciences Research University (DPSRU) and delegates on developing research proposals on medicinal plants of Andaman Islands	ICAR-CIARI	20 th April, 2019
4.	I.Jaisankar	PPV&FRA review meeting	NAAS complex, New Delhi	25 th - 26 th April, 2019
5.	B. Augustine Jerard	Inter coordination meeting with officials of Department of Agriculture, A& N Administration	ICAR-CIARI	13 th May , 2019
6.	Harsha Haridas & Deepitha R P	Training of trainers on common yoga protocol	Directorate of health service, A&N state AYUSH Society and A&N Administration	03 rd - 08 th June, 2019
7.	I.Jaisankar	Workshop on Island Biodiversity	ZSI, Port Blair	05 th June, 2019
8.	B. Augustine Jerard	28 th Annual Group Meeting of AICRP on Palms.	TNAU, Coimbatore	6 th -7 th June, 2019
9.	Ajit Arun Waman	Annual General Meeting of AICRP on Palms	TNAU, Coimbatore, Tamil Nadu	06 th - 08 th June 2019
10.	V. Baskaran	Annual Review meeting of CSS-NHM project on spices	OUAT, Bhubaneshwar	11 th -12 th June, 2019
11.	V. Damodaran	19 th Annual Group Meeting of AICRP on tuber crops	ICAR- CTCRI, Thiruvananthapuram	13 th - 15 th June, 2019
12.	S Dam Roy, K K. Saravanan & J. J. Praveenraj	International Conference on Asian-Pacific Aquaculture 2019 held at Chennai	World Aquaculture Society, USA and TNJFU, Tamil Nadu	19 th -21 st June, 2019
13.	Soobedar Yadav	XXXVII AICRP (Vegetable crops) Annual meet	TNAU, Coimbatore	22 nd - 25 th June, 2019
14.	I.Jaisankar	Scientist interaction meeting on the work plan of Mangrove mapping project	SAC, ISRO, Ahmadabad	15 th - 17 th July 2019

Sl.No	Scientist	Programme	Venue	Date/ duration
15.	Pooja Bohra	Review Meeting of DBT-BioCARE Project	Department of Biotechnology, New Delhi	26 th July, 2019
16.	T.P.Swarnam	XIII Annual Workshop of MPRNL project	Kerala Agricultural University, Trivandrum	2 nd August 2019
17.	R KirubaSankar, K. Saravanan, Harsha Haridas, Gladston Y & Ajina S. M.	National workshop on Seaweed Farming and Open Sea Cage Culture – A way forward for Andaman and Nicobar Islands held at Port Blair	Department of Fisheries, Andaman and Nicobar Administration	08 th -09 th August, 2019
18.	Jai Sunder	Annual Review Scientist meeting of AICRP- FMD	Hebbal, Bengaluru	30 th -31 st August, 2019
19.	Ajit Arun Waman	Workshop on World Coconut Day- 2019	Department of Industries, Port Blair	02 nd Sept., 2019
20.	B. Augustine Jerard	JalShakthiAbhiyan programme	Ograbraj, South Andaman	3 rd Sept., 2019
21.	T.P.Swarnam	National Conference on Climate Smart Agriculture for Livelihood Security: Challenges and Opportunities	AnbilDharmalingam Agricultural College and Research Institute, TNAU, Tiruchirappalli	13 th -14 th Sept., 2019
22.	B. Gangaiah	KVK review meet	NASC, New Delhi	18 th -20 th Sept., 2019
23.	I.Jaisankar	All India Coordinated Research Programme on Agro-forestry workshop	Forest College and Research Institute, TNAU, Mettupalayam	18 th to 20 th Sept., 2019
24.	R. Jaya Kumaravaradan	Summer School on Quantitative Methods for Social Sciences	ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi	21 st Sept.,- 11 th Oct., 2019
25.	Gladston Y	Inception workshop on state specific action plan (Water Sector), Andaman and Nicobar Islands	Andaman and Nicobar State Water and Sanitation Mission	27 th Sept., 2019
26.	K. Sakthivel	National seminar on Mushrooms – Rise of Research and Retreats for Humanity	Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore	30 th Sept., 2019

Sl.No	Scientist	Programme	Venue	Date/ duration
27.	I.Jaisankar	Research Advisory Committee meeting on Mangrove Community Zonation and Biophysical Characterization for Coast of Andaman and Nicobar Islands	Department of Environment and Forest, Port Blair	03 rd Oct.,2019
28.	V. Baskaran	Attended the group meeting of AICRP on Floriculture	KAU, Thrissur	4 th -6 th , Oct., 2019
29.	T.P.Swarnam	XIV Annual Group Meeting of All India Network Programme on Organic Farming	ICAR- Central Island Agricultural Research Institute, Port Blair	12 th - 14 th Nov., 2019
30.	B. Augustine Jerard	Brainstorming session on organic farming	ICAR-CIARI	14 th Nov., 2019
31.	V. Baskaran	National Conference on “Trends in Higher Education, Taxonomy, Agriculture, Biotechnology and Toxicology”	Chennai, Tamil Nadu	17 th Nov., 2019
32.	Jai Sunder	Annual Review Scientist Meet of AICRP-Goat Improvement	New Delhi	20 th -21 st Nov., 2020
33.	B. Augustine Jerard	Executive Committee meeting of Indian Society for Plantation Crops as Vice President of the Society.	ICAR-CPCRI, Kasaragod	22 nd Nov., 2019
34.	Sirisha Adamala	Concept Development for Climate Change Project for State Government Officials	Bankers Institute of Rural Development (BIRD), Port Blair	25 th - 29 th Nov., 2019
35.	R. Jaya Kumaravaradan	Workshop on Concept Development for Climate Change Project for State Government Officials	Conducted by Bankers Institute of Rural Development, Lucknow at Port Blair	25 th - 29 th Nov., 2019
36.	Gladston Y	Training programme on Concept Development for Climate change Project for State Government Officials at Port Blair, Andaman and Nicobar	Bankers Institute of Rural Development, Lucknow	25 th - 29 th Nov., 2019
37.	Soobedar Yadav	Concept development for climate project proposal	NABARD,Port Blair	25 th - 29 th Nov., 2019
38.	Harsha Haridas	Winter school on Precision fish farming: Automation principles and technological solutions for sustainable aquaculture production and productivity	ICAR-Central Institute of Fisheries Education	26 th Nov. – 16 th Dec., 2019

Sl.No	Scientist	Programme	Venue	Date/ duration
39.	B. Gangaiah	Andhra Pradesh Akademi of Sciences Meet-2019	Srikakulam, Andhra Pradesh	27 th - 29 th Nov., 2019
40.	B. Augustine Jerard	Review meeting of QRT of AICRP on Tuber Crops	ICAR-CTCRI (RS), Bhubaneswar	27 th Nov.,2019
41.	S. Dam Roy	XIV Annual Group Meeting of All India Network programme on Organic Farming and Brainstorming of the technologies for promotion of Organic and Natural Farming practices in Islands	ICAR-IIFSR, Meerut	27 th – 29 th Nov., 2019
42.	A. Velmurugan	Bi-annual review meeting of AICRP-IFS	Junagarh, Gujarat	28 th -30 th Nov., 2019
43.	D. Karunakaran	4 th National workshop of Officer In-charge, Data Management (Krishi Portal)	NASC Complex, New Delhi	10 th to 11 th Dec., 2019
44.	T.Sujatha	IPSACON 2019	College of Veterinary Science & Animal Husbandry, Durg, Chattisgarh	11 th -13 th Dec., 2019
45.	B.L.Kasinath Senior Scientist & Head	International Conference on Extension for Strengthening Agricultural Research and Development	ICAR-ATARI, BENGALURU At Mysuru	14 th -16 th Dec., 2019
46.	T. Subramani	Annual review meeting of GKMS Project	Gwalior	18 th -20 th Dec., 2019
47.	Perumal P.	International Symposium (ISSAR) on Global Perspectives to Enhance Livestock Fertility through Modern Reproductive Techniques for Doubling Farmer's Income	TANUVAS-Veterinary College and Research Institute, Namakkal, Tamil Nadu	18 th -20 th Dec., 2019
48.	T. Subramani	International Conference on Agriculture, horticulture and food sciences	New Delhi	21 st -22 nd Dec., 2019
49.	K. Abirami	10 th International Conference on Agriculture, Horticulture and Food Sciences held during	New Delhi	22 nd -23 rd Dec., 2019

13. HUMAN RESOURCES DEVELOPMENT OF STAKEHOLDERS

a) Training to stakeholders

Sl. No.	Training	Period	Participants (No.)	Type of participants	Venue	Conducted by
1.	Hands-on training on Basic Computer Literacy (Skill Development Programme)	10 th - 15 th June, 2019	9	Skilled Supporting Staff	ICAR-CIARI	ICAR-CIARI, Port Blair
2.	Scientific Goat Farming	28 th June, 2019	30	Farmers	ICAR-CIARI, Port Blair	AICRP on Goat Improvement
3.	Balanced feeding for improving pig productivity and cultivation of fodder to increase livestock performance	15 th - 16 th July, 2019	25	Farmers	Ferrargunj	Institute
4.	Inputs preparation for organic farming	2 nd August, 2019	35	Farmers	Tushnabad, South Andaman	NRM Division
5.	International Training on Cutting edge Molecular and Bioinformatics tools for Conservation and Productivity Enhancement of Indigenous Animal Genetic Resources	24 th Aug., - 07 th Sept., 2019	09	Faculties of African Research institutes	ICAR-CIARI, Port Blair	Ministry of External Affairs, Govt. of India, New Delhi & ICAR-CIARI
6.	Institutional Development Plan (IDP) - National Training Programme on Sustainable Integrated Farming Systems for Coastal Eco-regions of India	23 rd Sept., - 14 th Oct., 2019	30	Student	ICAR-CIARI	NRM
7.	Sustainable Integrated Farming Systems for Coastal Eco-regions of India	24 th Sept., to 14 th Oct., 2019	30	Students	ICAR-CIARI, Port Blair	NRM Division

Sl. No.	Training	Period	Participants (No.)	Type of participants	Venue	Conducted by
8.	Training programme: Capacity development on Delivery of Vaccines in Poultry	18 th to 23 rd Oct., 2019	35	Farmers	ICAR-CIARI, Port Blair	DBT, Govt. of India, New Delhi
9.	XIV Annual Group Meeting of All India Network Programme on Organic Farming	12 th - 14 th Nov., 2019	50	Scientists, Researchers from ICAR and SAU's	ICAR-CIARI	ICAR-IIFSR & ICAR-CIARI
10.	Banner Programme on New Dimensions in Agricultural Marketing: Focus Sector – Marketing of Organic Produce	27 th to 29 th Nov., 2019	25	Farmers and stakeholders	CIARI	ICAR-CIARI
11.	Drip irrigation for enhanced water productivity in tribal areas	10 th -12 th Dec., 2019	32	Farmers	Car Nicobar	NRM and KVK, Car Nicobar
12.	Pulses cultivation in Rice-fallow lowlands of Andaman Islands	28 th Dec., 2019	35	Farmers of North Andaman	Ramnagar Gram Panchayat, N & M Andaman	FCI&P
13.	Good laboratory practices ⁷	23 rd Dec., 2019	15	Projects staffs and scholars	ICAR-CIARI, Port Blair	ICAR-CIARI
14.	Sustainable integrated farming systems for coastal ecosystems of India	23 rd Sept., - 14 th Oct., 2019	21	College students	ICAR-CIARI, Port Blair	ANGRAU
15.	Advances in village chicken production system	20 th – 25 th Nov., 2019	25	Farmers	Nimbudera	DBT, Govt. of India, New Delhi
16.	Certificate course in poultry farming	26 th – 30 th , Nov., 2019	6	Cadets of Army unit-Brichgunj	ICAR-CIARI, Port Blair	IGNOU, Port Blair
Total			412			

b) Field/Seed Day

Sl. No	Title	Period	Participants (Nos.)	Venue	Conducted by
1.	Field day cum distribution of planting materials of Ginger, Turmeric, Cassava, Greater yam and Elephant foot yam" Awareness programme on Importance of native underutilized species of ANI	9 th April, 2019	15	ICAR-CIARI	Division of Horticulture & Forestry
2.	Technology dissemination of promising High Yielding Varieties (HYVs) of Rice at North and Middle Andaman through FLD during Kharif 2019 in Participatory mode	14 th June, 2019	204	Kishorinagar, North and Middle Andaman	Division of Field Crops Improvement & Protection, Social Science Section & KVK, Nimbudera
3.	Field day cum distribution of planting materials of Ginger, Turmeric, Cassava, Greater yam and Elephant foot yam and Awareness programme on Importance of native underutilized species of ANI	16 th July, 2019	16	Students and teachers, GSSS, Bambooflat	Division of Horticulture & Forestry
4.	Year round cultivation of marigold in Andaman and Nicobar Islands	01 st Oct., 2019	22	ICAR-CIARI	Division of Horticulture & Forestry
5.	High yielding varieties of rice	22 nd Nov., 2019	18	Madhupur Gram Panchayat, N & M Andaman	Division of Field Crops Improvement & Protection and & KVK, Nimbudera
6.	Cultivation of marigold and its success story	19 th Dec., 2019	40	Farmer field, Caddlegunj	H&F
Total			315		

c) Interaction Meet

Sl. No	Title	Period	Participants (Nos.)	Venue	Conducted by
1.	Farmers Interactive meeting cum training programme on vegetable cultivation	15 th Oct., 2019	200	Car Nicobar	Horticulture and Forestry, NHB, New Delhi, A&N Administration, KVK-Car Nicobar
Total			200		

d) Field Demonstration

Sl. No.	Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
1.	Coir pith composting	06 th Dec., 2019	30	Farmers	ICAR-CIARI, Port Blair	Division of Horticulture & Forestry
2.	Water harvesting through lined ponds	12 Dec., 2019	32	Farmers	Car Nicobar	NRM and KVK, C/ Nicobar
3.	Vermicomposting	23 Dec., 2019	27	Farmers	Harminder Bay	Division of NRM
Total			89			

e) World Coconut day

Sl. No.	Title	Period	Participants (Nos.)	Type of participants	Venue	Conducted by
1.	World Coconut Day and Workshop on promotion of coconut and coir based enterprises in A & N islands	02 nd Sept., 2019	200	Farmers, entrepreneurs and officials of line departments	Directorate of Industries, Middle point, Port Blair	UT Departments of Industries, Agriculture, ICAR-CIARI, NABARD, ANIIDCO, CDB, ACCI
Total			200			

f) Workshop

Sl. No.	Title	Period	Participants (Nos.)	Type of participants	Venue	Conducted by
1.	Spices and Plantation Crops based Entrepreneurship Development in the Islands	19 th to 21 st Sept., 2019	20	Farmers, students & entrepreneurs	ICAR-CIARI, Port Blair	Division of Horticulture & Forestry
Total			20			

g) Awareness campaigns

Sl. No.	Title	Participants (Nos.)	Period	Venue
1.	Cultivation of High Yielding Rice Varieties in Nicobar Islands	40	22 nd May, 2019	Govind Nagar, Campbell Bay, Great Nicobar
2.	Cultivation of High Yielding Rice Varieties in Nicobar Islands	47	24 th May, 2019	Gandhi Nagar, Campbell Bay, Great Nicobar
3.	National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) in Andaman and Nicobar Islands	16	01 st June, 2019	Badmaspahad, South Andaman,
4.	Doubling the farmers income through goat farming	31	27 th July, 2019	Mithakhari, South Andaman
5.	NSPAAD and Integrated Horticulture Development	21	01 st Aug., 2019	Chouldari, South Andaman
6.	Parthenium	16	20 th Aug., 2019	School line, Port Blair
7.	Parthenium and its management	27	22 nd -24 th Aug., 2019	Harminder Bay
8.	National Surveillance programme for aquatic animal diseases (NSPAAD) and improved farming practices	14	27 th Sept., 2019	Guptapara, South Andaman
9.	Importance of feed additives to alleviate micronutrient deficiency in goats	30	16 th Nov., 2019	Hermindar Bay, Little Andaman (under TSP)
10.	Importance of conservation of crop genetic resources	43	21 st Nov., 2019	Lucknow village, Mayabunder, North and Middle Andaman
11.	Farmers participatory seed production of pulses	22	22 nd Nov., 2019	Keralapuram village, Diglipur, North and Middle Andaman
12.	NSPAAD	26	21 st Dec., 2019	Mithakhari, South Andaman

h) Health Camp

Sl. No.	Title	Participants (Nos.)	Period	Venue
Camp				
1.	Filed day cum health camp	7 (Cattle 25, goats 45, poultry 120)	13 th Aug.,2019	Port Mort, South Andaman

i) Exposure visit to ICAR-CIARI

Sl. No.	Name of the School / Department	Participants (Nos.)	Date
I	Students		
1.	Don Bosco School, Lalpahar	200	03 rd August, 2019
2.	Govt. Senior Secondary School, Kadamtala	3	12 th Sept., 2019
3.	Ummat Public School, Port Blair	7	20 th Sept., 2019
4.	Bethany Children Home, Bathubasti	54	31 st Oct., 2019
5.	Govt. Sr. Sec. School, Port Mout	29	18 th Nov., 2019
6.	Govt. Model. School, Humfrygunj	70	30 th Nov., 2019
7.	Carmel Senior Secondary School, Port Blair on	106	06 th Dec., 2019
8.	Govt. Model School, Dollygunj	59	07 th Dec., 2019
9.	Govt. Senior Sec. School, Mannarghaton	68	21 st Dec., 2019
II	Professionals		
1.	Trainees of Bankers Institute of Rural Development, Manglore	36	19 th Sept., 2019
2.	Trainees of Integrated Development Programme on Coastal Agriculture	30	24 th Sept., 2019
3.	Trainees of Bankers Institute of Rural Development, Lucknow	40	26 th Nov., 2019
4.	Trainees of International training on cutting edge molecular and bioinformatics tools	4	26 th Nov., 2019
	Total	706	

j) Radio Talks

Sl. No.	Title	Date of broadcast	Expert
1.	Eco-friendly disease management in vegetable crops in Island conditions	04 th June, 2019	Vivekumar Pandey
2.	GKMS and Climate change	26 th June, 2019	A. Velmurugan
3.	धानकीनर्सरीकीदेखभाल	8 th July, 2019	P. K. Singh
4.	Integrated weed management in paddy	10 th July, 2019	B. Gangaiah
5.	Paddy cum dhaincha seeding	29 th July, 2019	N. Bommayasamy
6.	Live phone-in programme on Coconut cultivation	02 nd Sept., 2019	B. Augustine Jerard
7.	World Coconut Day	02 nd Sept., 2019	Ajit Arun Waman
8.	Cultivation of blood fruit in Andaman islands	05 th Sept., 2019	Pooja Bohra
9.	Role of KrishiVigyan Kendra in Island Agriculture-Tamil Live	07 th Oct., 2019	N. Bommayasamy
10.	Plantation based intercropping systems	10 th Oct., 2019	V. Damodaran

11.	World Food Day	14 th Oct., 2019	S.K. Zamir Ahmed
12.	Prospects of mushroom cultivation in islands	18 th Nov.,2019	K. Sakthivel
13.	World Soil Day – relevance to Island	5 th Dec.,2019	A.Velmurugan
14.	Interview on Kisan Diwas	23 rd Dec.,2019	B. Augustine Jerard

k) Doordarshan Interview

Sl.No.	Title	Date of broadcast	Expert
1.	Livelihood to Animal Husbandry Livestock animal Technology in Bay Island	17 th April, 2019	A. Kundu
2.	Integrated farming system-Live	24 th April, 2019	Vivek kumar Pandey
3.	Parthenium weed management in the Islands	1 st May, 2019	B. Gangaiah
4.	Disease & Pest Management in Vegetable crops	02 nd May, 2019	Vivek kumar Pandey
5.	Product Diversification and value addition of Mango, Pine apple and Bael	22 nd May, 2019	S.Swain
6.	Role of ATARI in Development of Agriculture	02 nd June, 2019	Vivek kumar Pandey
7.	Integrated farming system-Live	03 rd June, 2019	N. Bommayasamy
8.	IFS for low land Area	25 th June, 2019	A.Velmurugan
9.	Indigenous livestock and Nicobari fowl of A&N Islands by Vigyan Prasar (Department of Science & Technology, Govt. of /India), C-24, Qutub Institutional Area, New Delhi on Staff from Eureka for Rajyashava TV”, New Delhi	26 th June, 2019	A.Kundu
10.	Deepo me dhankikheti	26 th June, 2019	N. Bommayasamy
11.	IFS and Climate change adaptation	26 th June, 2019	A.Velmurugan
12.	Climate and Integrated farming system	1 st July, 2019	A.Velmurugan
13.	Dairy Cattle Management	17 th July, 2019	S.K. Ravi
14.	Deepo me dhan ki unnat kheti	24 th July, 2019	P. K. Singh
15.	Gai palan ki jarurat evam sambhavnayein	31 st July, 2019	P.A.Bala
16.	Live phone-in programme on <i>Jaiphal ki kheti ko laabhdhaya kaise banayein</i>	21 st Aug., 2019	Ajit Arun Waman

17.	Post harvest processing and value addition of plantation crops	28 th August, 2019	S.Swain
18.	फसलों में चूहा नियन्त्रण	4 th Sept., 2019	P. K. Singh
19.	Live phone in programme on Dragon fruit cultivation in Andaman and Nicobar Islands	18 th Sept., 2019	K. Abirami
20.	Mud crab culture and fattening	23 rd Sept., 2019	S. Dam Roy
21.	धान की जैवविविधता का उपयोग	25 th Sept., 2019	R. K. Gautam
22.	Bio-formulation in vegetable production.	4 th Oct., 2019	A.Velmurugan
23.	Fish processing and value addition for women empowerment and small-scale industries	14 th Oct., 2019	Deepitha R P
24.	Kritrim Garbhdhan-Suvar Palan me eknaya Aayam	16 th Oct., 2019	S.K. Ravi
25.	Fish waste utilization and its potential for by product development.	21 st Oct., 2019	Sreepriya Prakasan
26.	Technology for increasing income of the farmers	23 rd Oct., 2019	S.K. Zamir Ahmed
27.	Post harvest processing and value addition in spices	20 th Nov., 2019	S.Swain
28.	Dwipon me pashuo ke liye chara utpadan ki avashkta".	20 th Nov., 2019	P.A.Bala
29.	द्वीपों में दालों की उन्नत खेती	9 th Dec., 2019	P. K. Singh
30.	Diseases of backyard poultry and its control	11 th Dec., 2019	A.Kundu
31.	Calathea- A potential flower crop in Andaman	16 th Dec., 2019	V. Baskaran
32.	Paddy seed production technologies in farmer field	16 th Dec., 2019	B. L. Meena
33.	Pond Seed Production	16 th Dec., 2019	Shailesh Kumar
34.	Paddy Seed Production in KVK Farm	16 th Dec., 2019	Tanmai Paul
35.	Nursery Seedling/Planting Material Production	16 th Dec., 2019	Tanmai Paul
36.	Brown manuring on rice	03 rd July, 2019	N. Bommayasamy

14. TRAINING AND CAPACITY BUILDING

Sl. No	Name of the employee	Designation	Discipline / Section	Name of the training programme attended	Duration (Days)	Organizing Institution
Category: Scientific staff						
1	K.Abirami	Sr.Scientist	H&F Division	Emotional Intelligence at workplace for women Scientist and technologist	5	CoD, Hyderabad
2	B. L Kasinath	Sr. Scientist & Head	KVK Nimbhudera	International Conference on Extension for Strengthening Agricultural Research and Development	3	ICAR-ATARI, Bengaluru at Mysuru,
3	R.Jaya Kumaravaradan	Scientist	Social Science	Summer School an Quantitative methods for Social Sciences	21	NIAP, New Delhi
4	P.A. Bala, R.Jaya Kumaravaradan, Sirisha Adamala, Y. Gladston, Zachariah George & Soobedar Yadav	-	-	Development for climate change Project for state government Officials-Andaman & Nicobar Islands	5	NABARD, PortBlair
5	Rakesh.B	Scientist	FCIP	Recent Advances in Comparative Genomics Plant Genetic Resources for Traits Dissection and utilization in Solanaceous Crops	21	College of Horticulture UHS campus, Bangalore
6	Harsha Haridas	Scientist	FSD	Precision Fish Farming : Automation Principles and Technological Solutions for Sustainable Aquaculture Production and Productivity	8	CIFE, Mumbai

Sl. No	Name of the employee	Designation	Discipline / Section	Name of the training programme attended	Duration (Days)	Organizing Institution
7	Jai Sunder	Pr Scientist	Animal Science Division	Hands on training on Solid Phase Competitive ELISA	7	ICAR-PD-FMD, Bengaluru
Category: Technical Staff						
1	Harapriya Nayak	SMS (Home Science)	KVK, Port Blair	International conference on sustainable agriculture development in changing global scenario	3	BHU, Varanasi
				ASCI ToT training programme on job role of small poultry Farmer	3	WBUAFS, Kolkata
2	Shardul Vikram Lal	SMS(Animal Science)	KVK, Nimbhudera	Concept Development on Climate Change Project	5	BIRD, Lucknow
				Certified Livestock Advisor Programme	17	MANAGE, Hyderabad
3	Lakhan Singh	Technical Assistant	NRM Division	16 th Advance Level training in soil testing, plant Analysis and water quality Assessment.	1	ICAR-CPCRI Kasaragod
Category : Administrative staff						
1	Shibani Sengupta	DDO	Administrative	Off-Campus Refresher Course on Administrative and Finance management	5	ICAR- CIFT Cochin
2	S.K. Biswas	AAO				
3	Prakash Mondal	Sr.Clerk	Bill and Cash			

15. MOMENTS TO CHERISH

Impression of distinguished visitors

Delegates	Impression
Dr. S.K. Tyagi, PC-AICRP (PHET), CIPHET, Ludhiana	The work conducted by the Institute is very wide and impressive. I am very happy to see. The improvement of effort depicting.
Dr. R.K. Singh Director, ICAR-CIPHET, Ludhiana	The small and beautiful Institute is giving many farmers friendly technologies pertaining in crop cultivation, fisheries and NRM. I am really proud to be here in this Institute where many legends visited. NRM and Social Science Division may be strengthened in view of resource conservation. Hats off to the working scientists and staff here for the care of farmers and nation.
Dr. Swaraj Rajkhowa, Director, ICAR-NRC on Pig, Guahati, Assam	A very beautiful well planned Institute depicting almost all aspects of coastal agriculture. The museum is so well managed that it will attract the attention of all visitors. I appreciated the works of all the staff in maintaining the Institute so nicely.
Dr. Pravu Charan Lenka, Rtd. Prof & Head Horticulture & DPME OUAT, Bhubaneswar – 751 003	Great pleasure to visit the Institute. Dedicated labour of the scientists and co-workers are transmitted to the farming community. Preservation of indigenous germplasm of the Island is unique.
Mr. S. George, Chief Finance & Accounts Officer, ICAR-NAARM, Hyderabad. Ex-FAO, ICAR-CIARI, Port Blair (1989 to 1996)	It rekindles my old memories association with the Institute. It is well maintained and lot of development at the Institute since 1996
Prof. Ramesh K. Goyal, Vice Chancellor, DPSR University, Delhi	Impressive work carried out – not only to explore biodiversity of A & N Island but excellent work to get valuable flora and fauna for the welfare of habitants and bring social improvement and impact to people here
V. Mashar, OIC, NABARD, Port Blair	Visited CIARI Centre, Museum and had a detailed discussion with scientists. I wish Director and all the scientists a great success on their scientific field. Look forward for more collaboration.
Mr. Kuldeep Rai Sharma, MP, A & N Islands	It was really a pleasure to be at CIARI and to see the overall performance of new technological ideas done by the scientists. I wish these type of hard and dedicated work done by the team will benefit the islanders. I wish them all success in future
Fr. Deva Anbu, Principal, Don Bosco school, Lalpahar, Chouldari, South Andaman	It is interesting and enriching to learn about our land and its wealth. A word of appreciation to the CIARI Team for the fantastic contribution towards the development of these Islands.
RutuWaenui , Kenya Agricultural & Livestock Research Organization, Kenya	Very impressed. Good work.

Delegates	Impression
RakotoAlsonUeronique, MAEP,	Congratulations very interesting work. Thank you.
RoselyneNelinaLuvafu, Laboratory Technologist	I am grateful to have this opportunity to visit CIARI, India. I have met many Scientists, have enjoyed interacting with you and the directive's welcome. Thank you so much.
Dr. Martin Kiojora, Kenya Agricultural & Livestock Research Organization, Biotechnology Research Institute, Narobi, Kenya	This is excellent work! It's very well done. Congratulations.
P.R.M. Ravichandran, B.Sc., Member, Board of Management, Tamil Nadu Agricultural University, Coimbatore, Thandigudi (PO), Kodaikanal, Tamil Nadu	Excellent contribution to planters of Andaman and Nicobar Islands. My heartiest congratulation to ICAR-CIARI, Andaman.
Mr. Bala Subramanian, DGM/ FM, Banker & Institute of Rural Development (NABARD), Mangalore	We are a group 36 people consisting of senior officers from various commercial bank and Cooperative Banks and NGOs from various states (Part of NRM trainees of BIRD). Happy and privileged to see the excellent work done by the Institute.
Dr. V. Prasanna Kumari, Associate Professor & Co-ordinator , Agriculture college, Baotla, ANGRAU, IDP training programme for students of ANGRAU	Out students are excited about the information provided and got good idea about different Agriculture and allied sectors working at CIARI, Port Blair. Thank you for all your enthusiasm in explaining our students.
Rambir Yadav, GM, MCCB, M.Garh, Haryana	I have liked very much this Institution of Andaman & Nicobar Islands. The varieties are very good and good efforts have been made to improve the agriculture here but there is further scope of drip irrigation in dry season here.
Dr. V. Muralidharan, Former Director, NRCG(DGR), Junagadh,	I appreciate the documentation of genetic diversity in coconut and other crops in nutshell for easy understanding to everyone. The efforts of research scientist are commendable. The Indian Oil economy is mainly depend on coconut. Popularization of elite and released varieties in coconut, arecanut and noni in mainland needs attention.
Dr. V. Damodarn Naidu, VC, ANGARAU, Guntur,A.P.	I happened to visit CIARI on training to our students under IDP. The information centre is very well with different IFS activities going on in CIARI. Research results must be very helpful to the farmers of A & N Island. I wish all the best to the scientists of CIARI who have been doing wonderful job in giving useful technologies in different areas of Agriculture, Horticulture, Aquaculture, Dairy. Goatery, piggery etc.

Delegates	Impression
Bani Singh, Dy. Director, National Horticulture Board, Min. of Agriculture, Govt. of India, Gurgaon-122 015 (Haryana)	Visit to CIARI, Port Blair today, met with Director, Dr.Gangaiah, Dr.Varadan & Dr. Subramani of the Institute. They took me all around the Institute and shared me their various activities including Hydropinic/vertical garden, animal husbandry, coconut relating research etc. Institute has done a commendable works in agriculture in Andaman & Nicobar Islands.
Pushpha Pandey & Dr. Diwakar Hegde, Faculty Members, Bankers Institute of Rural Development, UP	We organized a field visit of the participants of a program Development of Project concept Note for climate change projects” being conducted by us in Port Blair from 25 th 29 th November, 2019. The participants included government department officials from number of states dealing with climate change in their respective states. The participants got a very good input on climate change aspects and the contribution of CIARI in post –tsunami phase and also in development of Agriculture and allied activities in A & N Islands.
Ch. S. Soumya G.T.T. from G.M.S. Humfrygunj	Visited CIARI along with the 69 students including 6 teachers on a study tour to make the students aware about the activities and different methods which are useful. Some of the staff assisted us for explaining the various aspects.
Revamasodda, Scientist, IIPR, Kanpur	Got opportunity to visit CIARI Institute today and got impressed with Institute ambience, research
Nutan Ramesh, Carmel Sr. Sec. School	First detailed visit to CIARI. Excellent ambience, well organised trip for our children. Very well explained by scientists. For us to understand. Many fields of research brought under one roof. A real boon for these islands and the farmers of these islands at large. Keep up your good work .Thank you very much for your cooperation.
Ms. Ashika , GSS , Mannarghat	Visited CIARI with 9 staff and 68 students. Officials interacted with students. Seen different kind of plants.

Glimpses of visits



Students visiting the vegetable nursery



Students visiting the fisheries museum



Students visiting Dweep Krishi Darpan



Trainees of IDP on coastal Agriculture visiting Dweep Krishi Darpan



Shri Kuldeep Rai Sharma, MP, A&N CON Lok Sabha Constituency visited the Institute on 23.06.2019



Dr. R.K. Singh, Director, CIPHET, Ludhiana visited the Institute on 12.04.2019



Dr. K.C. Gummagolmath, Director (Monitoring & Evaluation), MANAGE interacting with contact farmers of CIARI on 28.11.2019



Trainees of BIRD, Lucknow visiting the Horticulture farm on 26.11.2019

16. LINKAGE AND COLLABORATION

ICAR-CIARI has developed three types of linkages.

- Research collaborations with different institutes for betterment of island agriculture
- Linkage with different development departments, NGOs and bankers for transfer of improved technologies
- Academic exchange with Agricultural Universities (OUAT, WBUAFS, BCKV and TNFU)

Research Collaboration

- ICAR-CSSRI, Karnal
- ICAR-IIHR, Bengaluru, Karnataka
- ICAR-IARI, New Delhi
- ICAR-IISR, Kozhikode, Kerala
- ICAR-NBPGR, New Delhi
- ICAR-CPCRI, Kasaragod, Kerala
- ICAR-NRCB, Tiruchirapalli, Tamil Nadu
- ICAR-DFR, Pune
- ICAR-Central Potato Research Institute, Shimla
- ICAR Research Complex for NE Hill Region, Tripura centre
- ICAR-CIBA, Chennai
- ICAR-NFDB, Hyderabad
- ICAR-NBFGR, Lucknow
- ICAR-CMFRI, Kochi
- ICAR-CIFT, Kochi
- Regional Remote Sensing Center, Nagpur
- ICAR-Indian Institute of Pulses Research, Kanpur
- ICAR-DMR, Solan
- ICAR-IARI, New Delhi
- ICAR-NBAIM, Mau, UP
- ICAR-IISR, Mau, UP

- NBAIR, Bengaluru
- ICAR-NBPGR, New Delhi
- IIRR, Hyderabad
- RMRC, ICMR, Port Blair
- ICAR Institutes; IVRI, PD-ADMAS, CIRG, DPR, D-FMD
- ICAR-AICRP on Palms, Floriculture, Fruits, Vegetables, Tuber crops, PHET
- India Meteorological Department, Pune
- ICAR-NAARM, Hyderabad

Academic exchange with Agricultural Universities

- TNJFU, Nagapattinam, Tamil Nadu
- BCKVV, West Bengal
- WBUAFS, West Bengal
- OUAT, Odisha

Linkage with different development departments

- Department of Agriculture, A&N Islands
- Department of Animal Husbandry & Veterinary Science, A & N Islands
- Department of Fisheries, A & N Islands
- NABARD
- National Horticulture Board, Gurugram
- Coconut Development Board, Kochi
- DASD, Kozhikode
- Natural Academy of Sciences, India (NASI), Prayagraj

17. PERSONNEL

Director (Acting)

Dr. A. Kundu upto 31.08.2019
Dr. B. Gangaiah w.e.f. 01.09.2019
to 05.12.2019
Dr. B. Augustine Jerard w.e.f. 06.12.2019

Head / Incharge Divisions / Section/ KVK

Head, Division of Horticulture & Forestry	Dr. B. Augustine Jerard
Head I/c, Division of Field Crop Improvement & Protection	Dr. P.K. Singh
Head, Division of Natural Resource Management	Dr. B. Gangaiah
Head / Acting Head, Division of Animal Science	Dr. A. Kundu upto 31st August 2019 Acting Head w.e.f. 01 st Sept., 2019
Head I/c, Division of Fisheries/ Scientist Incharge	Dr. S. Dam Roy upto 7 th Dec. 2019 Dr. R. Kiruba Sankar w.e.f. 8 th Dec., 2019
In charge, Social Science Section	Dr. S.K. Zamir Ahmed
Senior Scientist & Head, KVK, N & M Andaman	Dr. B.L. Kasinath
Head I/c, KVK, South Andaman	Dr. L.B. Singh
Head I/c, KVK Nicobar	Dr. S.K. Pandey
Head of Office & Senior Administrative Officer	Mr. Sushil Kumar Singh
Finance & Accounts Officer	Shri P.P. Anil Kumar
Incharge, Priority setting, Monitoring & Evaluation Cell	Dr. S.K. Zamir Ahmed upto 31 st Aug. 2019 Dr. Jai Sunder w.e.f. 1 st Sept., 2019
Incharge, AKMU	Shri D. Karunakaran
Incharge, Library	Dr. Pooja Bohra w.e.f. 29 th August, 2019
Incharge, Central Instrumentation Facility	Dr. Jai Sunder upto 31 st Aug., 2019 Dr. Joshita Vijaya w.e.f. 1 st Sept., 2019
Incharge, Estate Section	Er. S.L. Paik
Incharge, Workshop	Er. M. Arul Selvam
Incharge, Guest House	Mr. A.K. Tripathi
Incharge, Security Officer	Dr. V.K. Pandey
Incharge, Sipigaht Farm	Dr. V. Baskaran
Incharge, Bloomsdale Farm	Dr. P.K. Singh

Coordinator, Bio-Informatics Centre	Dr. A.K. De
Incharge, ITMU	Dr. Jai Sunder
Incharge PG Cell	Dr. Jai Sunder
Assistant Director (OL) I/c	Mr. Amit Srivastava
Nodal Officer, Regional Centre, Minicoy	Dr. B. Gangaiah
Incharge Head, Regional Station, Minicoy	Mr. Arun Kumar Oppoottil Ratheesh
Farm Managers	
Garacharma	Mr. A.K. Tripathi
Sippighat	Dr. V. Damodaran
Bloomsdale Farm	Shri Lakhan Singh

Vigilance Officer	Dr. Debasis Bhattacharya
Transparency Officer	Dr. R.K. Gautam upto 10 th Dec. 2019
Nodal Officer, HRD	Dr. R.K. Gautam upto 10 th Dec. 2019
Central Public Information Officer	Dr. R. Kiruba Sankar
Nodal Officer online HYPM	Dr. S.K. Zamir Ahmed upto 31 st Aug. 2019 Dr. Jai Sunder w.e.f 1 st Sept., 2019
Nodal Officer, PIMS, PERMISnet, ASRB Online & Krishi Kosh	Mr. D. Karunakaran
Nodal Officer, CPGRAMS	Mr. Sushil Kumar Singh
Nodal Officer, Court Case Monitoring System	Mr. Amit Srivastava
Nodal Officer, Swachh Bharat Abhiyan	Dr. A. Velmurugan
Nodal Officer, MGMG, SCSP	Dr. S.K. Zamir Ahmed
Nodal Officer, TSP	Dr. K. Saravanan

Division of Horticulture & Forestry

Dr. B. Augustine Jerard, Principal Scientist (Horticulture) and Head

Dr. V. Baskaran, Principal Scientist (Horticulture)

Dr. (Mrs) K. Abirami, Senior Scientist (Fruit Science)

Dr. I. Jaisankar, Senior Scientist (Forestry)

Dr. (Ms). Pooja Bohra, Scientist (Fruit Science)

Dr. Ajit Arun Waman, Scientist (SPMA)

Dr. Soobedar Yadav, Scientist (SPMA)



Division of Field Crops Improvement & Protection

- Dr. Pankaj Kumar Singh, Principal Scientist & Head (I/c)
Dr. R.K. Gautam, Principal Scientist (Plant Breeding) upto 10th Dec., 2019
Dr. Venkatesan, K., Scientist (Economic Botany)
Dr. K. Sakthivel, Scientist (Plant Pathology) upto 9th Dec., 2019
Dr. T. Bharathimeena, Scientist (Entomology) (on leave)
Dr. S. Srividhya, Scientist (Plant Physiology) upto 30th Nov., 2019
Dr. Joshitha Vijayan, Scientist (Agricultural Biotechnology)
Dr. B. Rakesh, Scientist (Plant Breeding)

Division of Natural Resource Management

- Dr. B. Gangaiah, Principal Scientist (Agronomy) & Head
Dr. A. Velmurugan, Principal Scientist (Chemistry, Fertility & Microbiology)
Dr. T.P. Swarnam, Principal Scientist (Agronomy)
Dr. T. Subramani, Scientist (Agronomy)
Dr. Sachidananda Swain, Scientist (Ag. Structure & Process Engineering) upto 16th Dec., 2019
Shri. K.R. Kiran, Scientist (Soil Science)
Dr. Sirisha Adamala, Scientist (Land & Water Management Engineering)

Division of Animal Science

- Dr. A. Kundu, Principal Scientist (Poultry Science) & Head upto 31st Aug 2019; Head (Acting) w.e.f. 1st Sept., 2019
Dr. D. Bhattacharya, Principal Scientist (Veterinary Parasitology)
Dr. Jai Sunder, Principal Scientist (Veterinary Microbiology)
Dr. M.S. Kundu, Principal Scientist (Animal Nutrition) upto 9th Sept., 2019
Dr. T. Sujatha, Sr.Scientist (Poultry Science)
Dr. P. A.Bala, Sr.Scientist (Animal Nutrition)
Dr. P. Perumal, Scientist (Animal Reproduction & Gyneacology)
Dr. S.K.Ravi, Scientist (Animal Reproduction & Gyneacology)
Dr. A.K. De, Scientist (Animal Biotechnology)
Dr. K. Muniswamy, Scientist (Animal Biotechnology)
Dr. Rafeeqe Rahman Alyethodi, Scientist (Animal Genetics & Breeding)

Division of Fisheries Science

Dr. S. Dam Roy, Principal Scientist & Head I/c (Fish & Fisheries Science) upto 7th Dec., 2019

Dr. R. Kiruba Sankar, Scientist (Fish & Fisheries Science) & I/c w.e.f. 8th Dec., 2019

Dr. K. Saravanan, Scientist (Fish Health)

Mr. J. Praveenraj, Scientist (Fish Health)

Mr. Arun Kumar Oppoottil Ratheesh, Scientist (Fisheries Resource Management)

Mrs. Harsha Haridas, Scientist (Aquaculture)

Mr. Gladston Y., Scientist (Fisheries Resource Management)

Ms. Sreepriya Prakasan, Scientist (Fish Processing Technology)

Mrs. Ajina S.M., Scientist (Fisheries Resource Management)

Ms. Deepitha R. P., Scientist (Fish Processing Technology)

Social Science Section

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

Mr. D. Karunakaran, Scientist (Computer Application in Agriculture)

Dr. R. Jaya Kumaravaradan, Scientist (Agricultural Economics)

Krishi Vigyan Kendra, Port Blair

Dr. L.B. Singh, Subject Matter Specialist (Horticulture) & I/c Head

Er. Bijaya Kumar Nanda, Subject Matter Specialist (Agri. Engineering)

Mrs. Harapriya Nayak, Subject Matter Specialist (Home Science)

Mr. N. Bommayswamy, Subject Matter Specialist (Horticulture)

Dr. Vivek Kr. Pandey, Subject Matter Specialist (Plant Protection)

Krishi Vigyan Kendra, Nicobar

Mr. Sanjay Kumar Pandey, Subject Matter Specialist (Agronomy) & Head I/c

Dr. Zachariah George, Subject Matter Specialist (Animal Science)

Krishi Vigyan Kendra, North & Middle Andaman

Dr. B.L. Kasinath, Senior Scientist & Head

Dr. Pooja Kapoor, Subject Matter Specialist (Home Science)

Er. Manoj Kumar, Subject Matter Specialist, (Agricultural Engineering)

Mr. Debabrata Basantia, Subject Matter Specialist (Horticulture)

Mr. BattiLal Meena, Subject Matter Specialist (Agronomy)

Dr. Shardul Vikram Lal, Subject Matter Specialist (Animal Science)

Dr. Shailesh Kumar, Subject Matter Specialist (Fisheries)



18. NEW ENTRANTS / TRANSFER / PROMOTION/ RETIREMENT/ DEATH

Promotion /Assessment

Scientist

- Dr. K. Abirami, Scientist to Sr. Scientist w.e.f. 14th July, 2015
Dr. T. Subramani, Scientist to Sr. Scientist w.e.f. 26th June, 2017
Dr. (Mrs.) T. Sijatha, Scientist Sr. Scientist w.e.f. 26th June, 2018
Dr. I. Jaisankar, Scientist to Sr. Scientist w.e.f. 7th January, 2018
Dr. K. Sakthivel, Scientist to Scientist (Sr. Scale) w.e.f. 15th September, 2016
Dr. K. Saravanan, Scientist to Scientist (Sr. Scale) w.e.f. 1st January, 2018
Dr. Ajit Arun Waman, Scientist to Scientist (Sr. Scale) w.e.f. 1st January, 2018
Dr. Pooja Borah, Scientist, Scientist to Scientist (Sr. Scale) w.e.f. 1st January, 2018
Dr. Nagesh Ram, Ex-Sr. Scientist to RGP of Rs. 9000/- w.e.f. 4th May, 2014

Retirement

- Shri K. Ramachandra, SSS on 31st May, 2019
Smt. Lucy Thomas, PS to Director on 31st Dec.,2019

Deputation

- Dr. M.S. Kundu, Director(Extension Education) at Dr. Rajendra Prasad Central Agricultural University (RPCAU), Pusa (Samastipur), Bihar on 09th Sept.,2019

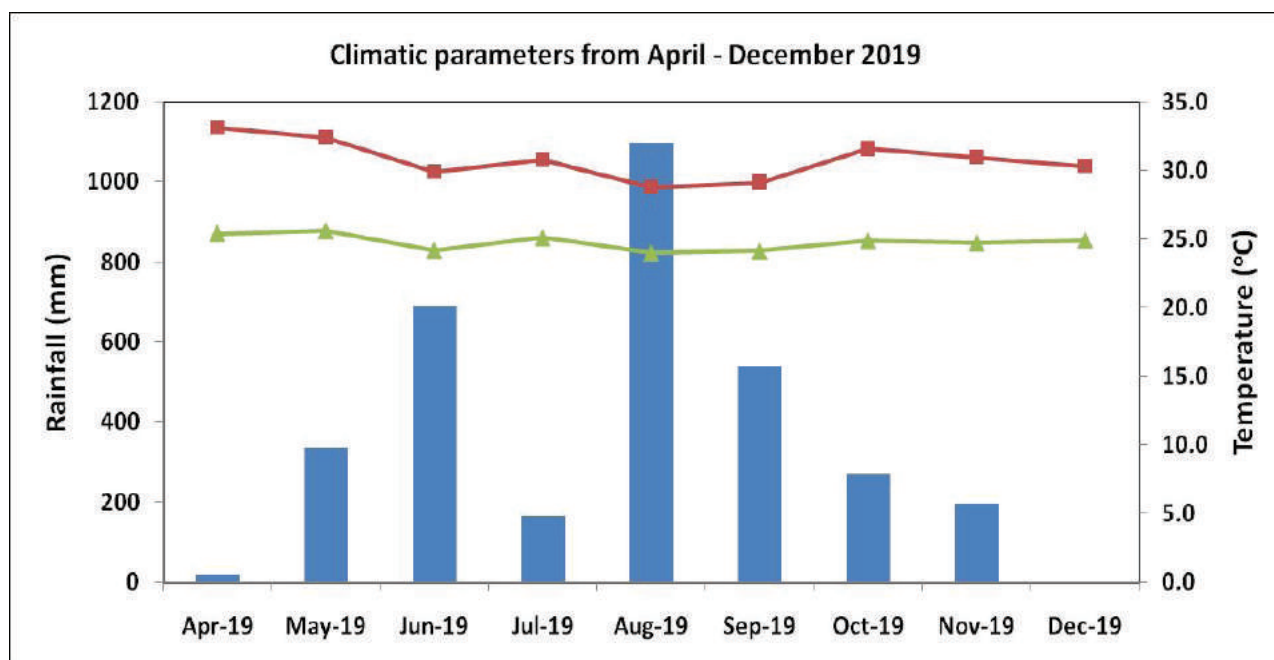
Transferred from CIARI

- Dr. Srividhya, S., Scientist from ICAR- CIARI to ICAR-IIMR, Hyderabad on 30th Nov.,2019.
Dr. S. Dam Roy, Pr. Scientist, ICARI-CIARI to CIFRI, Barrackpore on 07th Dec.,2019
Dr. K. Sakthivel, Scientist, ICARI-CIARI to ICAR-IIOR, Hyderabad on 09th Dec.,2019
Dr. R.K. Gautam, Pr. Scientist from ICAR-CIARI to ICAR-NBPGR on 10th Dec., 2019
Dr. Sachidananda Swain, Scientist, ICAR-CIARI to ICAR-CIWA, Bhubaneswar on 16th Dec.,2019

Left to heavenly abode

- Shri Tapan Kumar Mondal, Ex-SSS on 28th May, 2019
Shri B. Laxminarayan, Ex-TSM on 09th Sept., 2019

19. WEATHER PARAMETER - 2019



Month	Rainfall (Total mm)	Temperature (Av)		No. of R.D.	RH (%)
		Maximum (°C)	Minimum (°C)		
Apr-19	17.9	33.1	25.4	2	67
May-19	336.6	32.4	25.6	17	79
Jun-19	691	29.9	24.2	23	89
Jul-19	165.6	30.8	25.1	16	84
Aug-19	1098.8	28.8	24.0	29	92
Sep-19	540	29.1	24.1	23	88
Oct-19	270.2	31.6	24.9	10	75
Nov-19	194.5	31.0	24.7	10	73
Dec-19	1.8	30.3	24.9	0	68
Jan-20	2.6	30.2	24.2	0	66
Feb-20	0	30.7	23.6	0	70
Mar-20	0	31.5	24.1	0	66

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