ANNUAL REPORT 2017-18

IS/ISO 9001: 2008 Certified

ICAR-Central Island Agricultural Research Institute

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

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(Indian Council of Agricultural Research)

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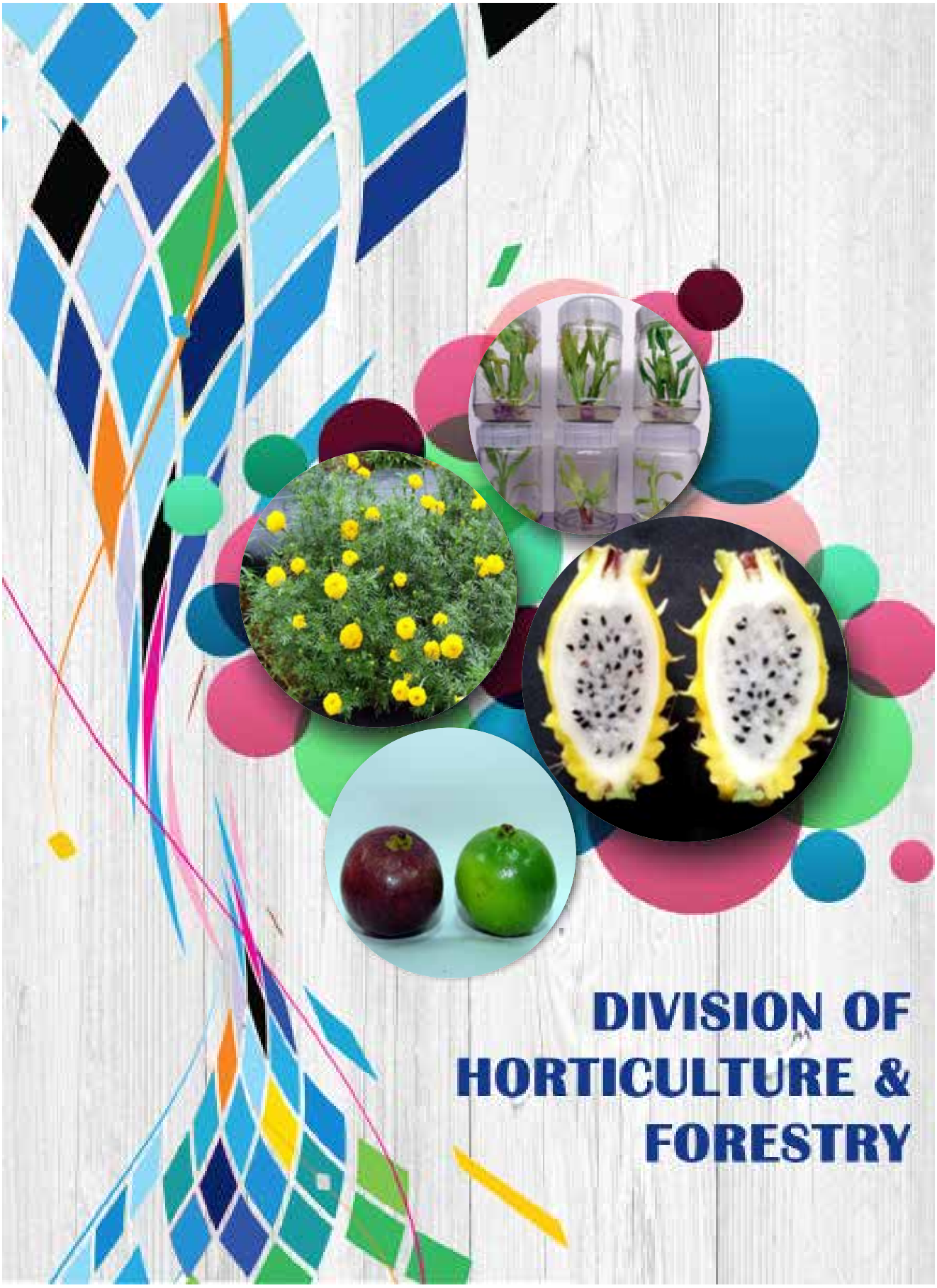
RESEARCH PROGRAMMES



DIVISION OF HORTICULTURE & FORESTRY

Collection, Characterization and Agro-Technique Standardization of fruit crops of Andaman & Nicobar Islands

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

Augmentation and evaluation of germplasm of fruit crops

Mango

Wild Mango – The wild mango accessions (*Mangifera andamanica, Mangifera camptosperma, Mangifera griffithi*) are maintained in the germplasm block of the experimental farm at Garacharma field (Plate 1). Growth observations recorded after 18 months of planting revealed maximum vegetative growth in *Mangifera andamanica* with plant height (234.4 cm), girth (11.7 cm) and number of branches (9.3).

Plate 1: *Mangifera andamanica, Mangifera camptosperma, Mangifera griffithi*conserved at the Institute

Germplasm collections of *Mangifera indica*

The varieties maintained in germplasm block (Plate 2) are Lalima, Surya, Himsagar, Gulabkhas, Baramasi, Exotic collection 1(EC 1), Exotic collection 2 (EC 2) and Exotic collection 3 (EC 3). The vegetative growth parameters recorded six months after planting reveal that maximum plant height (158.2 cm), girth (10.3 cm) and number of branches (8.5) were recorded in the variety EC 2.

Plate 2: Field view of germplasm collections of *Mangifera indica* varieties

Guava

The varieties of guava maintained in the germplasm block (Plate 3) are Allahabad Safeda, Lucknow 47, Exotic collection (EC1), Arka Mridula, Hisar Surkha, Arka Kiran and Arka Rashmi. The growth observations 8 months after planting reveal that maximum plant height (129.5 cm), girth (12.3 cm) and number of branches (11.6) were recorded in the variety Arka Mridula.

Plate 3: Field view of guava germplasm block

Incidence of bark eating caterpillar (Plate 4) was noticed in the month of March in varieties Allahabad Safeda and Arka Rashmi. The caterpillars were killed physically and treated with Dichlorvos 0.25%.

Plate 4: Bark eating caterpillar damage in guava

Seed germination and seedling growth studies in wild mango accessions

The stones of the three wild mango accessions *Mangifera andamanica, Mangifera camptosperma, Mangifera griffithi* were collected during the month of June, 2017 and their seed germination and seedling growth behaviour were studied in comparison with control *Mangifera indica* accession (Neil mango).The growth observations recorded six month after sowing seeds reveal that maximum plant height (30.1 cm), girth (0.52 cm), number of leaves (6.3), leaf length (15.9 cm) and leaf breadth (3.1 cm) were observed in *Mangifera camptosperma* among the wild accessions. However, the seedling growth of Neil mango was vigorous, when compared to the wild mango accessions with plant height (43.1 cm), girth (0.93 cm), number of leaves (8.7), leaf length (18.5 cm) and leaf breadth (6.3 cm) respectively.

Phytochemical analysis in wild mango (*Mangifera andamanica*)

The phytochemical analysis of wild mango (*Mangifera andamanica*) pulp was done in different extract like aqueous, acetone. methanol and ethanol and the results are given in the table 1. The phenolic content was highest in the methonolic extract (968.18 mg GAE/100 mg) and the flavonoid content was highest in the ethanolic extract (153.75 mg rutin/100g). The antioxidant activity of the pulp were done using different methods like DPPH, ABTS, NO, OH, MCA and H_2O_2 in different extracts. The antioxidant activity showed highest values in the OH method in acetone extract (576.7 mg BHT/100 g).

Table 1: Phytochemical composition of *Mangifera andamanica* pulp

Extract	Phenol (mg GAE /100g)	Flavonoids (mg rutin /100g)	DPPH (mg BHT/ 100 g	ABTS (mM trolox / 100 g	FRAP (mg Fe+2/g)	NO (mg Vit-C /g	OH (mg BHT/ 100g)	MCA (mg EDTA/ 100 g)	H_2O_2 (mg Vit-C/ g	RP (mg BHT/ 100 g
Acetone	186.36	230	381.66	229.03	11.56	7.05	615	90	4.23	93
Ethanol	325	153.75	215	379.52	12.5	8.85	576.66	115	2.4	54
Methanol	968.18	73.75	388.3	352.24	61.56	7.05	515	30	2.17	98
Aqueous	597.72	101.25	475	277.82	5.62	5.55	498.3	82.5	3.62	62

Collection, conservation, evaluation and agro-technique standardization of Dragon fruit

Four germplasm accessions of Dragon fruit (*Hylocereus sp)* maintained at the Institute is characterized based on the descriptors and is presented in the table 2 and plate 5.The fruit set percentage was high in DGF 3 (86.3%) followed by DGF1 (80.8%), whereas the fruit set percentage was less in DG 2 (60.5%). In the second year harvest, maximum yield was recorded in accession DGF 1 (8 Kg/pole) and minimum yield was recorded in DGF (2Kg/pole).

Table 2: Morpho-descriptors of dragon fruit accessions

Dragon fruit accessions	DGF 1	DGF 2	DGF 3	DGF 4
Stem Characteristics				
Length of segments (cm)	73.9	75.9	60.1	36.2
Width of stem (cm)	3.9	3.8	3.5	5.3
Arch height of stem (cm)	0.6	0.4	0.2	0.2
Margin ribs of stem	Convex	Convex	Concave	Convex
Distance between Areoles (cm)	3.8	3.5	4.0	3.4
No. of spines	4	4	2	4
Length of Areoles	0.3	0.4	0.1	0.1

Dragon fruit accessions	DGF 1	DGF 2	DGF 3	DGF 4
Flower Characteristics				
Flower bud shape	Elliptic	Ovate	Elliptic	Elliptic
Shape of Apex	Rounded	Acute	Rounded	Rounded
Flower bud length (cm)	2.5	2.6	2.1	2.5
Flower bud width (cm)	1.2	1.4	0.9	1.6
Fruit characteristics				
Fruit shape	Moderately elongated	Medium	Elongated	Medium
Fruit length (cm)	15.2	13.9	8.9	10.1
Fruit diameter (cm)	10.9	9.6	4.2	9.3
Total fruit weight (g)	419.3	267.4	26.5	106
Peel weight (g)	160.5	97.3	16.3	45.6
Pulp weight (g)	258.8	170.1	10.3	61.9
Fruit width	Narrow	Broad	Narrow	Medium
No. of bracts	37	33	59	27
Length of the apex bracts (cm)	6.2	2.9	2.1	4.7
Position towards the peel	Slightly held out	Strongly held out	Slightly held out	Held towards the peel
TSS (°B)	11.2	12.1	18.3	9.1
Width of the base of the bract (cm)	4.7	3.2	0.8	2.3
Colour of pulp	White	Dark pink	White	Purple
Colour of peel	Pinkish green	Pinkish red	Yellow	Pink
Distance between bract to bract (cm)	5.1	3.7	1	4.1

Plate 5: Fruit colour variation in Dragon fruits

Disease incidence in dragon fruit

The fungal leaf spot or blight symptoms that occurred in dragon fruit were studied. The fungal isolate and the pathogenicity was confirmed (Plate 6). The pathogen identity was confirmed using multi-gene analysis. For multi gene analysis seven genes *viz.*, internal transcribed spacer (ITS); actin (ACT), calmodulin (CAL); chalcone synthetase (CHS); glyceraldehyde-3-phosphate dehydrogenase (GAPDH), histone (H3); tubulin (TUB) were analysed. The sequence analysis revealed 99% - 100% sequence comparison with *Colletotrichum siamense* of NCBI and the original sequences was submitted to NCBI GenBank with the following Accession Nos. KY745898 (ITS); MG561761 (ACT); MG561762 (CAL); MG561763 (CHS); MG561764 (GAPDH); MG561765 (H3) and MG561766 (TUB).

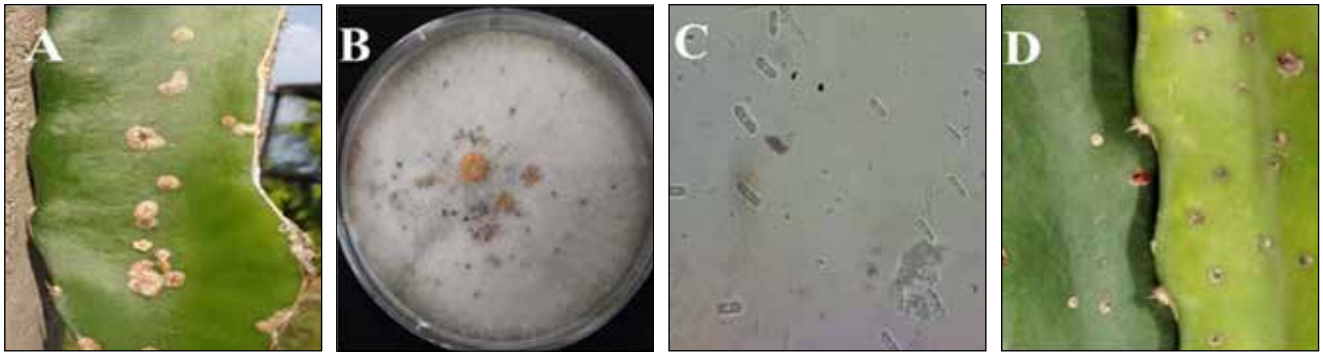


Plate 6 :(a) Natural symptoms of anthracnose disease on *dragon fruit* (b) Mycelial character of*Colletotrichum siamense*(c) Spores morphology (d) Pathogenicity confirmation

Feasibility studies on strawberry cultivation

Luxurious vegetative growth was observed in the feasibility studies on growing strawberry wherein runner shoots planted at a spacing of 60 x 30 cm during the month of November.

All India Coordinated Research Project (AICRP) on Fruits

K. Abirami

Observational trial on evaluation of banana cultivars in non-traditional banana growing regions

The commercial varieties of banana selected were Grand Naine, Poovan, Ney Poovan, Red Banana and Monthan. With the objective to identify the climate resilience potential of commercial banana cultivars. The treatments included three planting seasons like February-March, June -July and October – November. Planting of the five banana varieties procured from National Research Centre for Banana (NRCB), Tiruchirapalli are planted in the experimental field

in two seasons, October-November and February- March. The experiment is at initial stage, however the growth parameters recorded for the different varieties planted during October-November reveal that maximum plant height (96.6 cm), girth (22.5 cm) and number of leaves (8.8) were recorded in the variety Ney Poovan (Plate 7).

Plate 7: Experimental field view of banana varieties

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

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

Physicochemical analysis in underutilized fruitspecies

Garcinia is an important genus distributed in the Andaman and Nicobar Islands and comprises of both native and introduced species. Most of these species have not been studied in detail for horticultural traits and hence, studies were undertaken in these lines. Physicochemical analysis of *Garcinia* species grown in the islands including two endemic species was carried out (Table 3). *G. mangostana*and *G. gummi-gutta* are being promoted as commercial crops in the islands, whereas considering the edible fruits in the native species they could be promoted for cultivation in farm bunds and backyards. This would also assist in conservation of these fast disappearing endemic species. Seedlings of *G. andamanica* and *G. dulcis*are being raised, while other species have been maintained in the germplasm block of the Institute (Plate 8).

Table 3 : hysicochemical characteristics of selected *Garcinia* species of Andaman

Parameters	*G. dhanikhariensis*	*G. andamanica*	*G. dulcis*	*G. mangostana*	*G. gummi-gutta*
Status	Native (endemic)	Native (endemic)	Native	Introduced	Introduced
Fruit colour	Red	Yellow	Lemon yellow	Dark red to purple	Yellow
Pedicel length (cm)	0.2-0.4	1.7 -1.9	2.2-3.0		3.1- 5.9
Fruit surface	Smooth	Smooth	Smooth	Smooth	Ridged
Fruit length (cm)	3.2-3.8	5.0-5.5	5.5-6.3	3.4- 4.0	4.9-5.5
Fruit weight (g)	32.4- 59.2	-	68.6-111.2	34.1 – 73.0	87.2-114.2

Parameters	*G. dhanikhariensis*	*G. andamanica*	*G. dulcis*	*G. mangostana*	*G. gummi-gutta*
TSS (°B)	8.0 (rind), 10.0-12.5 (pulp)	-	9.0	20.7-22.1	6.6- 8.8 (rind), 9.7-10.1
Taste	Acidic	Acidic	Acidic	Sweet	Acidic
Economic part	Rind and pulp	Rind	Rind	Pulp	Rind

Plate 8: Fruits of *Garcinia dhanikhariensis, G. andamanica* and *G. dulcis*

Comparison of methods for extraction of photosynthetic pigments from minor fruits

Photosynthetic pigments play a pivotal role in the primary metabolism of any plant species and hence, are required to be determined in a number of studies. Considering this, two methods i.e. acetone and dimethylsulphoxide (DMSO) were compared in fifteen underutilized fruit species *viz*. *Dillenia indica, Artocarpus altilis, Syzygium jambos, Ardisia solanacea, Morinda citrifolia, Averrhoa bilimbi, Averrhoa carambola, Flacourtia indica, Aegle marmelos, Chrysophylum cainito, Eugenia uniflora, Nephelium lappaceum, Psidium cattleianum, Diospyros blancoi* and *Malphigia glabra.* Except *Morinda citrifolia*, *Dillenia indica*, *Artocarpus altilis*, *Syzygium jambos* and *Ardisia solanacea*, higher amount of chlorophyll was extracted from DMSO method than in 80% acetone method. However, this increase was not similar in all the cases and varied between 1.24 times in case of *Flacourtia indica* and 5.69 times in case of *Nephelium lappaceum* (Table 4).

Table 4: Comparative efficacy of two methods on extraction of total chlorophyll content in fifteen minor fruit species

Species	Solvent		Change (times over first method)
	80%Acetone	DMSO	
Dillenia indica	1.275 ± 0.008	0.408 ± 0.004	0.32
Artocarpus altilis	1.312 ± 0.005	0.294 ± 0.004	0.22
Syzygium jambos	0.692 ± 0.019	0.261 ± 0.006	0.38
Ardisia solanacea	0.631 ± 0.010	0.303 ± 0.004	0.48
Morinda citrifolia	0.917 ± 0.027	0.266 ± 0.010	0.29
Averrhoa bilimbi	0.143 ± 0.017	0.444 ± 0.003	3.11
Averrhoa carambola	0.147 ± 0.011	0.771 ± 0.017	5.25
Flacourtia indica	0.439 ± 0.031	0.543 ± 0.007	1.24
Aegle marmelos	0.162 ±0.017	0.456 ± 0.008	2.82

Chrysophylum cainito	0.166 ± 0.002	0.314 ± 0.007	1.89
Eugenia uniflora	0.119 ± 0.004	0.501 ± 0.012	4.21
Nephelium lappaceum	0.128 ± 0.040	0.728 ± 0.030	5.69
Psidium cattleianum	0.128 ± 0.009	0.330 ± 0.003	2.58
Diospyros blancoi	0.200 ± 0.007	0.394 ± 0.005	1.97
Malphigia glabra	0.138 ± 0.007	0.484 ± 0.006	3.51

Evaluation of native and exotic fruit crops under island condition

Annona hybrid 'Arka Sahan' is being evaluated at normal and closer spacing under island condition and flowering has been noticed in few plants. Carambola is being evaluated at three different spacing (3.5 ×3.5 m, 3.5 × 2.5 m and 3.5 × 1.5 m) and flowering was observed in few plants.

Underutilized fruits germplasm block

Avocado, longan and watery rose apple were added to the underutilized fruits germplasm block of the institute. Seedlings of hog plum and bael have been raised for planting. Flowering was noticed in strawberry guava. Planting material of West Indian Cherry, Malabar tamarind, *G. dhanikhariensis* is being multiplied.

Occurrence of polyembryony

Polyembryony is a phenomenon in which two or more seedlings arise from a single seed. During regular nursery and seed germination studies, this phenomenon(Plate 9) was observed in *Haematocarpus validus* (0.60%), *Aegle marmelos* (0.61%) and *Syzygium claviflorum* (6.67%).

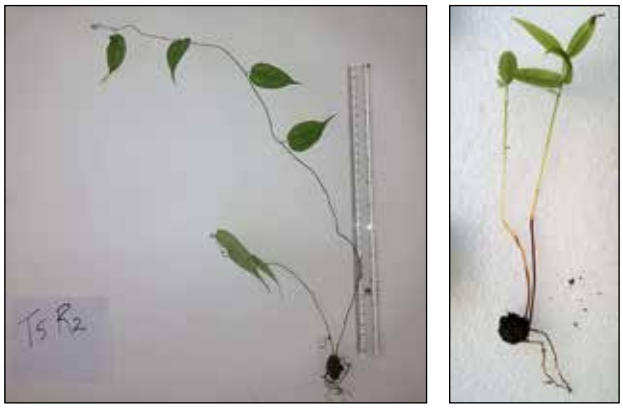


Plate 9: Occurrence of polyembryony in *Haematocarpus validus* and *Syzygium claviflorum*

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

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

Being one of the major fruit crops grown in the Islands, several locally popular banana varieties are grown for meeting the domestic demand. Studies were initiated to optimize efficient multiplication protocol for Korangi- a delicious variety of banana. While observing higher level of spoilage of cultures due to contamination owing to the relative humidity and long rainy spells, the following methodology was found to be efficient for obtaining 95.83% aseptic culture establishment.

Healthy sword suckers were selected from elite mother plants and cured for 72 hours. The adhering soil was washed away, and outer layer of tissues was removed. Such prepared explant blocks were soaked in solution containing Carbendazim (1.75%) + Streptocyclin (600 mg/L) for 24 hours. It was followed by removal of outermost layer of tissues, washing in running tap water, removal of another layer and treatment with 5% Dettol® solution for 15 minutes. The explant blocks were then treated with ascorbic acid solution (500 mg/L; 15 min.), followed by removal of outer layer of tissues in laminar air flow. Two step surface sterilization procedure was followed in which explants were treated with NaOCl (12.5%; 12 min.) followed by HgCl2 (0.1%; 12 min.). After 3-4 washings with sterilized deionized water, the explants were scooped out of the block and initiated onto culture medium containing MS basal salts supplemented with BAP (3 mg/L), NAA (0.5 mg/L NAA) and chloramphenicol (200 mg/L).

In vitro mass multiplication, characterization and habitat enrichment of two horticulturally important underutilized species from Andaman and Nicobar Islands

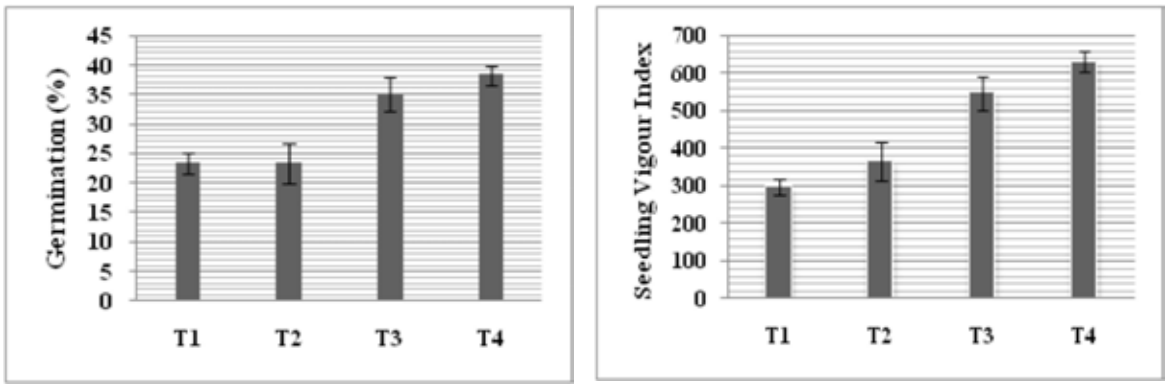
Pooja Bohra and Ajit Arun Waman

Studies in wild banana species

(i) Musa paramjitiana

A new endemic species of seeded wild banana *viz*. *Musa paramjitiana* L.J. Singh has recently been reported from Andaman Islands. Fruits of this species were studied for physicochemical parameters and the results revealed fruit weight of 57.22 to 96.23 g, fruit length of 9.7-12.7 cm, pedicel length of 1.6-2.0 cm and175-526 seeds per fruit. The fruits had 37.97- 43.40% of pulp content with 21-22 °B total soluble solids.

Threats posed by human interventions and damage by elephants have led to categorization of the species as 'Critically Endangered'. Hence, chemical treatments and mechanical scarification were studied for improving seed germination in this species. A total of 23.33% germination was reported in untreated control, which remained statistically similar with water soaking treatment. Soaking with GA_3 (35.00%) and KNO_3 (38.33%) efficiently improved the germination percentage over control (Fig. 1 & Plate 10). Seedling length, leaf production and seedling vigour index were significantly improved in treated seeds over control. Seed treatment with 0.1% KNO_3 for 24 h could be recommended for raising vigorous seedlings, which could help in conservation of this threatened species and its subsequent utilization.



(A) **(B)**

Fig. 1: Germination percentage (a) and Seedling Vigour Index (b) in *Musa paramjitiana* as influenced by different seed treatments*viz*. T_1: untreated control; T_2: water soaking (24 h); T_3: GA3 (500 mg/L, 24 h) and T_4: KNO3 (0.1%, 24 h)

Plate 10: Fruits of wild endemic seedy bananas of Andaman Islands: *Musa paramjitiana* and *Musa indandamanensis*

(ii) *Musa indandamanensis*

A new wild banana species characterized by the presence of green bract was identified from the Andaman Islands by the Botanical Survey of India, Port Blair during 2014. To conserve and characterize the species, systematic studies were taken up. Fruits of the species weighed between 73.02 and 88.09 g with length of 12.6 to 13.5 cm. Pedicel were 2.1-2.7 cm long. There were 211 to 262 seeds in each fruit. The fruits had orange coloured edible pulp (31.00-34.42 %) with 16.2-16.5 °B total soluble solids.

Seed germination studies were undertaken to assist the regeneration of this 'Critically Endangered' species (Plate 11). Three substrates *viz*. soil, vermicompost and soil: vermicompost: coir pith compost (1:1:1, v/v) were compared along with six seed pre-treatments. Pre-treatment of seeds assisted in improving the germination percentage as the values increased from 42.71% in untreated control+ vermicompost to 91.67% in treatment involving KNO3 (0.1%, 24 h) + vermicompost.

Plate 11: Successfully regenerated seedlings of wild banana species

Studies on Blood fruit (*Haematocarpus validus)*

Two methods of photosynthetic pigment determination were compared for identification of superior method in blood fruit. Results revealed that method involving incubation of leaf tissues in dimethylsulphoxide (DMSO) for 48 h was superior for estimation of chlorophylls as well as total carotenoid content from the leaves. All the parameters studied *viz*. Chl a, Chl b, total Chl content, Chl a: Chl b ratio and total carotenoid contents were found to be significantly lower in acetone method (0.087 mg/g, 0.036 mg/g, 0.123 mg/g, 2.402 and 0.038 mg/g), when compared with DMSO method of extraction (0.405 mg/g, 0.132 mg/g, 0.537 mg/g, 3.059 and 0.071 mg/g) respectively.

To promote conservation and homestead cultivation of blood fruit, awareness programmes were conducted (Plate 12). Seedlings regenerated during previous year were used for habitat enrichment activities during which the 30 seedlings were planted in Garacharmacampus of the institute. Further, seedlings were planted in the premises of UT Department of Agriculture (Sippighat and Chitrakoot), Botanical Survey of India, DEGCA, Dhanikhari, UT Forest Department (Rangat), Government Senior Secondary School, Swadeshnagar and farmers' fields in South and Middle Andaman.

Plate 12: Involvement of school students (left) and farmers (right) in blood fruit conservation programme

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

I.Jaisankar and Awnindra K. Singh

Four released noni varieties *viz*., CIARI-Sampada, CIARI- Sanjivini, CIARI-Samridhi and CIARI-Rakshak (Plate 13) were maintained by following standard silvicultural practices. The trees of four varieties maintained at the institute have been declared as mother block for DUS characterization of noni by the PPV&FRA, New Delhi. DUS characteristics *viz.*, bark colour, branching pattern, crown shape, leaf shape, leaf size, number of fruits per tree, fruit colour, fruit texture, fruit size, fruit shape, number of seeds per fruit and size of seeds were recorded for all the four varieties.

Plate 13: Improved Noni varieties maintained at ICAR-CIARI

Analysis of data revealed that CIARI Samridhi recorded highest fruit yield of 32 kg/tree followed by CIARI Sampada (30 kg/tree), CIARI Sanjivini (27 kg/tree) and CIARI Rakshak (13 kg/tree). In order tostudy the growth and development of seedlings, 15000 elite seedlings were produced from the plus trees maintained in the mother block. To study the growth and yield potential as border plantation, 70 seedlings of CIARI Sampada were planted surrounding the vegetable block at the Institute. Further, two new accessions of Noni were collected from Afra Bay and Galathea forest area of Great Nicobar and conserved at CIARI germplasm block for further observations. Nematode infestation was observed in noni seedlings affecting the growth and development in a farmer's garden. The affected root samples were submitted for identification of the nematode so that suitable management measures could be suggested in future.

All India Coordinated Research Project on Vegetable Crops

Soobedar Yadav

Vegetable crops *viz*., Tomato (Tomato (TOLCV)- AVT- II, Tomato Determinate AVT-II, Cherry Tomato – AVT-I, Tomato hybrid Determinate- AVT-I, Tomato Determinate- IET-I and Tomato hybrid Determinate- IET-I), Brinjal (Brinjal Long - AVT-I, Brinjal Round - AVT-I, Brinjal Bacterial Wilt - AVT-I, Brinjal Long - IET, Brinjal Round - IET and Brinjal Small Round - IET), Green Pea (Pea (Early) – AVT 1, Pea (Mid) – AVT- 1 and Pea (Mid) – IET- 1) were evaluated during the year 2017-18 (Plate 14).

Tomato(ToLCV) AVT-II: Among the five entries with two check varieties, maximum ToLCV infection was recorded in 2015/TOCLV RES-5 (56.34 %), while minimum infection recorded in 2015/TOCLV RES-2 (27.44%). However, maximum projected fruit yield of 178.62 q/ha was recorded in 2015/TOCLV RES-2, it was significant with 2015/ TOCLV RES-1 (164.87 q/ha), while lowest was observed in 2015/TOCLV RES-4 (110.33 q/ha).

Tomato (Determinate) AVT-I : Among 12 entries evaluated, the maximum projected fruit yield of 185.267q/ha was recorded in 2016/TOVDAR-3.

Cherry Tomato AVT-I: Among five entries, 2016/TOCVAR-4 recorded the maximum projected fruit yield of 125.1 q/ha followed by2016/TOCVAR-3 (46.55 q/ha).

Tomato Hybrid Determinate AVT-1: Among the seven entries evaluated the maximum projectedfruit yield of 358.793 q/hawas recorded in 2016/TODHYB-7 followed by 2016/TODHYB-6 (324.5 q/ha).

Tomato (Determinate) IET*:* Among ten entries evaluated, 2017/TODVAR-7 recorded maximum projected fruit yield of 236.28 q/ha followed by 2017/TODVAR-5 (180.66 q/ha) and least projected yield was recorded in 2017/TODVAR-9 (114.26 q/ha) in Tomato Determinate IET.

Tomato Hybrid Determinate IET: Among the six entries evaluated the maximum projected fruit yield of 211.11 was recorded in 2017/TODHYB-3 followed by 2017/TODHYB-1 (191.047 q/ha).

Brinjal (Long) AVT-I: Among nine entries evaluated, the maximumprojected fruit yield (212.32 q/ha) was recorded in 2016/BRLVAR-9,followed by 2016/BRLVAR-6 (186.123 q/ha) and the leastprojected fruit yield of 122.11 q/ha was recorded in 2016/BRLVAR-3.

Brinjal (Round) AVT-I: Among nine entries evaluated, the maximum projected fruit yield of 213.01 q/ha was recorded in 2016/BRRVAR-6 followed by 2016/BRRVAR-5 (192.37 q/ha).

Brinjal Bacterial Wilt – AVT-1*:* Out of eight entries evaluated,maximum bacterial wilt infection was recorded in 2016/ BRBW-4 (90.79 %), while minimum infection observed in 2016/ BRBW-1 (22.4). Maximumprojected fruit yield of 145.85 (q/ha) in 2016/ BRBW-2, while lowest in 2016/ BRBW-4 (15.86 q/ha) was estimated.

Brinjal (Long) IET: Out ofnine entries evaluated, the maximum projectedfruit yield (165.85 q/ha) was recorded in 2017/BRLWAR-3,followed by 2017/BRLWAR-8 (145.39 q/ha) and the leastprojected fruit yield of 35.97 q/ha was recorded in 2017/BRLWAR-9.

Plate 14 : Performance of Brinjal lines under AICRP trials

Brinjal (Round) IET: Out of eight entries evaluated, the maximum projected fruit yield of 182.53 q/ha was recorded in 2017/BRRVAR-12 followed by 2017/BRRVAR-5 (172.25 q/ha) and lowest projected fruit yield of 64.19 q/ha was estimated in 2017/BRRVAR-11.

Brinjal Small Round - IET: Out of seven entries evaluated, 2017/BRSRVAR-4 wasrecorded the maximum projectedfruit yield of 145.85 (q/ha) followed by 2017/BRSRVAR-5 (110.40 q/ha). However, lowestprojected fruit yield of 65.427(q/ha) was recorded in 2017/BRSRVAR-2.

Pea: Among the eight green pea entries in the Pea (Early) AVT-I trial, the highest green pea yield was recorded in 2016/PEVAR-6 (31.86 q/ha) while lowest 10.31 (q/ha) was recorded in 2016/PEVAR-7. In Pea (Mid) AVT-I trial, the highest projected green pea yield was recorded in 2016/PMVAR-3 (31.55 q/ha) whereas the lowest yield was recorded in 2016/PMVAR-5 (18.34) q/ha. Among the five green pea entries in the Pea (Mid) IET-I trial, the highest projected green pea yield was recorded in 2017/PMVAR-1 (33.60 q/ha) followed by 2017/PMVAR-7 (25.94 q/ha).

Feasibility trial on heat tolerant lines and varieties of potato

Soobedar Yadav and V. Baskaran

Eight heat tolerant genotypes (AICRP P-25, AICRP P-42, AICRP-C-13, AICRP-C-14, AICRP-C-16, AICRP-C-17, AICRP-C-20 and AICRP-C-P1) of potato were evaluated under Andaman conditions. The highest tuber size (4.5cm) was recorded AICRP P-42, followed by AICRP C-42 (3.78cm), while lowest was observed in in AICRP -14 (2.4 cm). Disease occurrence in potato (ie., Bacterial wilt) was recorded. Maximum bacterial wilt (42%) was reported in AICRP -C-20, followed by AICRP- P - 42 (37%), while lowest in AICRP- 25 (17%). Maximum tuber rottage (25 %) was observed in AICRP- P-42 at the time of harvesting while minimum in AICRP-C-13 (8 %). AICRP P- 42 showed the flowering behaviour in island climate, which is generally observed under cold climate. From the studies, it is concluded that there is scope for cultivating potato in tropical humid conditions of Andaman and Nicobar Islands but repeated evaluation may be required to find out suitable varieties (Plate 15).

Indigenous biodiversity of Chilli in Andaman & Nicobar Island

Fifty genotypes of chilli were collected from Andaman & Nicobar Island. Characterization on fruit morphology and biochemical parameters was undertaken. Highest fruit length (75.35 mm) was observed in AC-32 followed by AC-

34- 73.54mm, while, lowest (11.26 mm) in AC-8 followed by AC-23 (17.41 mm). Highest fruit width was recorded in AC-7 (60.43mm) whereas it was lowest recorded in Ac-45 (3.38mm). Some genotypes exhibited unique characteristics eg. AC-15 (Purple colour), AC-10 (Small conical shape), AC-17 (Blackish green and conical shape) AC-6 (Dark green conical shape), AC-6 (Dark purple), AC-25 (Cylindrical purple green) and AC-1(Dark green round) respectively (Table 5).

Plate 15: Performance of Potato lines under Island condition

Table 5 : Characterization of Fruit morphology in chilli collections

Genotype	Fruit Length(mm)	Fruit Width(mm)	Fruit colour
AC-1	21.64	20.16	Green
AC-2	50.30	10.75	Green
AC-3	35.37	16.45	Dark greeen
AC-4	34.49	13.93	Green
AC-5	35.73	24.39	Black green
AC-6	60.50	26.98	Green
AC-7	60.51	60.43	Blackish Green
AC-8	11.26	11.35	Green
AC-9	66.39	66.56	Purple
AC-10	38.61	22.69	Green
AC-11	76.96	10.00	Green
AC-12	41.58	11.41	Pale yellow
AC-13	48.49	15.13	Green black
AC-14	40.19	13.36	Green
AC-15	65.29	9.46	Purple white
AC-16	36.67	14.51	Green
AC-17	38.76	16.08	Green
AC-18	43.23	10.51	Yellowish green
AC-19	64.34	11.62	Green
AC-20	43.66	22.90	Green

Genotype	Fruit Length(mm)	Fruit Width(mm)	Fruit colour
AC-21	51.33	**8.37**	Dark green
AC-22	42.84	11.37	Light green
AC-23	17.41	17.72	Green
AC-24	46.58	22.80	Green
AC-25	37.71	13.50	Green
AC-26	60.60	9.47	Black
AC-27	65.97	13.30	Light green
AC-28	73.10	8.53	Green
AC-29	45.69	10.60	Green
AC-30	54.23	11.52	Green
AC-31	70.59	14.46	Green
AC-32	75.35	11.03	Green
AC-33	36.28	11.71	Greenish black
AC-34	73.54	7.41	Green
AC-35	42.47	10.67	Green
AC-36	35.56	11.46	Green
AC-37	66.80	7.67	Green
AC-38	48.79	7.83	Green
AC-39	59.53	8.37	Green
AC-40	37.77	13.88	Green
AC-41	59.42	9.27	Green
AC-42	61.17	9.03	Black
AC-43	27.53	9.48	Green
AC-44	51.58	4.40	Green
AC-45	25.57	3.38	Green
AC-46	58.78	6.20	Green
AC-47	39.58	7.43	Green
AC-48	43.62	12.17	Green
AC-49	65.52	8.58	Orange
AC-50	54.14	6.25	Black
C.D.	0.67	0.74	
SE(m)	0.24	0.26	
C.V.	0.84	3.17	

AICRP on Tuber Crops

V. Damodaran, B. Augustine Jerard and L.B. Singh

Collection, Conservation, Cataloguing and evaluation of genetic resources of tuber crops

Tuber crop exploration trips were made in Rutland, Baludera of South Andaman, Pillow Panja, Pillow Bao, Macca Chua of Little Nicobar, Afra Bay, Mount Thuliar, Kophen Hear and Campbell Bay areas of Great Nicobar along with NBPGR exploration team during January, 2018 and collected ten germplasm of tuber crops. Two collections each was made in *Dioscorea*sp, *Tacca*sp and *Colocasia*. A total of 109 accessions are being maintained in the gene bank at the Institute.

MLT on Colocasia (1st year)

Six entries of colocasia were evaluated at three locations for growth and yield parameters under Island conditions. Among the entries, TTr 12-8 recorded maximum number of cormel per plant (12.2) and maximum weight of cormel/ plant (342 g) followed by TTr 12-7. With regards tocormel yield, TTr 12-8 recorded higher yield (12.7 t/ha) followed by TTr-7 while the lowest cormel yield (6.2 t/ha) was recorded in TTr 12-1. The entries TTr-12-7 and TTr 12-8 also recorded long keeping quality of tubers and exhibited better cooking quality and taste score as compared to the other entries.

Farming system studies in tribal areas

The Nicobari tribal communities mainly rely on coconut, tuber crops, pigs and marine fisheries for their livelihood. They grow and prefer mostly Nicobar Aloo (A greater yam type) mainly for food and use to work for one hour daily in their garden. The employment generation in their traditional cropping system was estimated to be only 32 to 35 man-days/year. Considering the successful intervention of tuber crop-based farming system, six farmers each have adopted the tuber crop-based farming system at Harminder Bay and Kamorta during 2017-18. The model comprises of 300 m^2 of fenced area near the tribal settlement integrated with piggery unit (Plate 16). Farmers were distributed with planting materials of tuber crops (Elephant Foot Yam, Colocasia, Sweet potato), Ginger and Piglets. From the tuber crop-based farming systems, the average income generated from crop and animal components were Rs. 18,694 and Rs. 40,750 respectively at Harminder bay. At Kamorta, the net income generated from crop and animal component was Rs 15,233 and Rs 28,700 respectively (Table 6 and 7). In tuber crops-based farming systems, they worked 2-3 hours per day and employment generation has increased to 89 days/year and 95 days/year respectively at Kamorta and Harminder Bay as compared to their traditional system of Nicobari aloo cultivation alone. With the success of this system, more tribal youths have come forward to adopt the tuber crops-based farming system as their livelihood options.

Area of the Model: 0.03 ha

Table 6: Prior to intervention

Crops/Other components	Area (ha)	Yield (kg)	Gross income (Rs)	Expenditure involved (Rs)	Net income (Rs)	B:C ratio
Harminder Bay, Hut Bay	0.03	280	14,000	6,350	7,650	1.21
Kamorta	0.03	310	15,500	6,900	8,600	1.25

Employment generation (days): HarminderBay : 35; Kamorta : 32

Table 7: After intervention

Location	Area (ha)	Crop/other component	Yield (kg)	Gross income (Rs)	Expenditure involved (Rs)	Net income (Rs)	B:C ratio
Harminder Bay, Hut Bay	0.03	Ginger	61.2	12233	3842	8391	2.18
		Tuber crops	372.2	17128	6825	10303	1.51
		Pig	290.8	58167	17417	40750	2.34
		Total	**724.2**	**87529**	**28084**	**59444**	**2.12**
Kamorta	0.03	Ginger	52.0	10400	3358	7042	2.09
		Tuber crops	294.3	14183	5992	8191	1.37
		Pig	162.5	40625	11925	28700	2.41
		Total	**508.8**	**65208**	**21275**	**43933**	**2.06**

Employment generation (days): Harminder Bay: 95; Kamorta : 89

Plate 16: Tuber crop based farming system at Harminder Bay

Development of Production Technology for Ornamental Crops in Bay Islands

V. Baskaran and K. Abirami

Effect of rooting media in planting material production of marigold

The loose flower, marigold is in high demand in the Island throughout the year. The multiplication of the crop through terminal cuttings is the commercial propagation method. Hence for fast multiplication, uniform growth and disease-free planting material production, two microbial consortia CARI bioconsortia and Arka fermented cocopeat were evaluated as rooting media with the control (soil). Wilt incidence was noticed when soil was used as the media and the planting material were disease free in both the microbial consortia treatments. However, maximum root length (12.58 cm) and root weight (4.34 g) were recorded in the treatment CARI bioconsortia, whereas the maximum shoot length (36.44 cm) and shoot weight (17.82 g) were recorded in Arka fermented cocopeat (Plate 17).

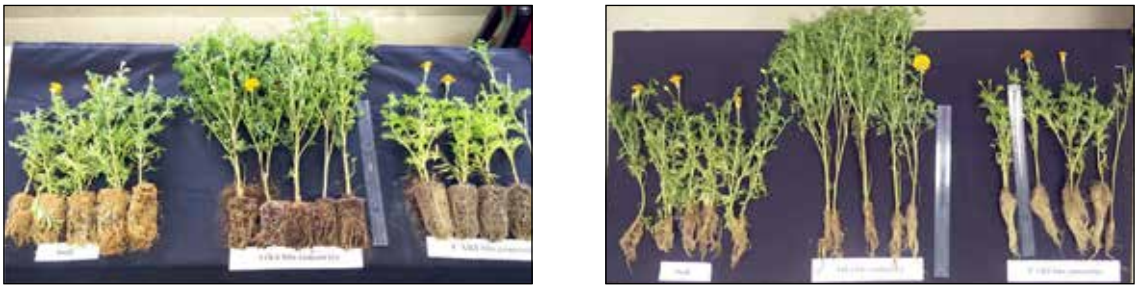


Plate 17: Effect of rooting media in propagation of marigold

Effect of organic treatments on growth and yield of marigold

Among the different organic treatments tested in marigold, variety Siracole, maximum plant height (84.7 cm), number of flowers (126.2), flower size (6.6 cm) and single flower weight (12.4 g), were observed in the treatment T 9 (CARI bioconsortia) (Plate 18).

Plate 18: Performance of marigold with CARI bioconsortia

Evaluation of new entries of marigold

Three new entries of marigold namely Arka Agni, Arka Bangara-1 and Arka Bangara-2 were evaluated for their growth performance and yield. Arka Bangara 2 (Plate 19) performed well when compared to other varieties with maximum plant height (45.2 cm), number of secondary branches (9.3), number of flowers per plant (38.6), flower size (2.9cm) and single flower weight (13.7g).

Plate 19: Good performance of Arka Bangara 2

Collection, conservation and multiplication of leather leaf fern (*Rumohra adiantiformis*)

During exploratory survey, a unique, high value cut foliage fern (*Rumohra adiantiformis)*was identified in South Andaman group of Islands.This fern is distributed throughout the Andaman group of Islands but is underexploited. It is commonly known as 'leather leaf fern' or 'climbing shield fern' and possess great aesthetic value because of its elegant fronds. Generally, ferns are propagated through spores but this fern does not produce spores. The propagation of 'Leather Leaf fern' was attempted by using cuttings of different portion with different media. Terminal cuttings of 10 cm size in sand media gave better results with higher sprouting (82.5%) among the other treatmental combinations (Plate 20).

Plate 20: Propagation of leather leaf fern through cuttings

All India co-ordinated Research Project on flowers

V. Baskaran

Evaluation of new entries of china aster

Improved china aster varieties *viz.,*Arka Aadhya, Arka Archana, Arka Kamini and Arka Poornima (with different flower colours) were evaluated with check varieties Local Pink and Local White. The seed germination was found to be very poor in china aster varieties sown during rainy season. However, *in vitro* germination was achieved in Agar media (with 96% germination) and the germinated seedlings could be transplanted in polybags (Plate 21). After better establishment, transplanted in main field for further evaluation.

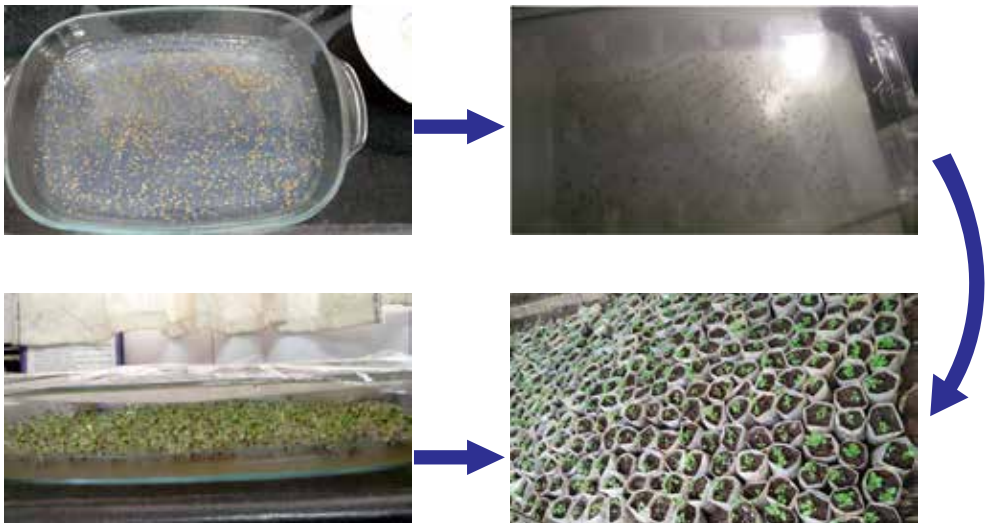


Plate 21: China aster seeds germinated agar media and transplanted in poly bags

Good germination (85% germination) was noticed when china aster seeds were sown in raised nursery beds under shade nets during October, 2017. Germination initiated 7 days after sowing in nursery bed whereas seeds germinated in 3 days in agar media. In the nursery bed, the germination was very poor in the variety ArkaAdhiya (5%) in nursery bed whereas 90% seed germination was observed when seeds germinated *in vitro*.

The nurseryproduced seedlings were ready for transplanting in 30 days after sowing whereas the *in vitro* produced seedlings were ready for transplanting in 25 days after sowing. In addition, uniform growth of seedlings was observed under *in vitro* production of seedlings.

Evaluation of the different china aster entries under field conditions revealed (Plate 22) early flowering in Check Local white (37.5 DAT) followed by Arka Archana and Arka Kamini (39 DAT). Late flowering was observed in Arka Poornima (54.3 DAT). Maximum plant height was observed in Arka Poornima (61.6 cm) and minimum plant height (34.3 cm) observed in Local White. Maximum number of flowers per plant was recorded in Local Pink (12.3) followed by Poornima (10.2).

Plate 22: Field evaluation of China aster varieties

Floriculture Based Sustainable Livelihood Model for Tropical Island Condition

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

Intensive cultivation of flower crops like tuberose, marigold and jasmine was undertaken in polyhouse at farmers' field at Ograbraj and New Bimblitan, South Andaman (Plate 23). Three crops of marigold were harvested in farmers' field. whereas average income of Rs 57000/year (3 crops per year) was earned through marigold and Rs 10000/year through sale of tuberose in the second year after planting. The planting material of *Jasminum sambac* were multiplied through cuttings and about 1800 nos of saplings were produced in the year. Planting material of marigold (5000 Nos) were produced through rooting of terminal cuttings. These planting materialswere distributed to five farmers (Plate 24) in different parts of South Andaman for demonstration.

Plate 23: Field visit of NABARD officials at Farmers' field


Plate 24: Planting material production and distribution to the farmers

CSS-(MIDH) National Horticulture Mission Scheme on Spices

K. Abirami and V. Damodaran

Production of planting material of spices

Multiplied, produced and distributed the quality planting materials of black pepper (15000), clove (2000), Cinnamon (3500), ginger (600 kg) and turmeric (1250 Kg) to the farmers in different parts of Islands.

The grafts of the released varieties of nutmeg Keralashree and Viswashree were procured from Indian Institute of Spices Research (IISR), Kozhikode and planted at Sipighat farm (Plate 25) for establishment of mother block of nutmeg.




Plate 25: Established nutmeg varieties at the Institute

Technology demonstration programmes


Plate 26a: Front line demonstrations in ginger

Plate 26b: Front line demonstrations in turmeric

Front line demonstration programmes were taken up in farmers' field on organic production of ginger and turmeric in Andaman group of Islands. 14 FLDs on organic cultivation of ginger and turmeric (Plate 26a & b) were conducted and on an average, a yield of about 80- 10 t/ha of ginger and 12-15 t/ha of turmeric were recorded.

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

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

Studies in wild nutmeg- Myristica andamanica

Myristica andamanica is an endemic wild nutmeg species of economic and ecological significance. Being a wild relative of cultivated nutmeg, systematic studies could help in identification of useful traits in the species. The species has been categorized as vulnerable by IUCN and hence, conscious efforts for conservation and sustainable utilization are required. Seed germination studies were conducted which revealed that water-sinking and non- rattling seeds should be used for propagation purpose. Effects of hull removal/ retention and pre-treatments were also studied. It was noticed that if remained undisturbed in nature and congenial environmental conditions are available; the species can regenerate on its own. No artificial assistance was required for inducing germination as highest seed germination (76.25%) and seedling vigour index (2,944.78) was observed in treatment with hull retention and water soaking treatment, which simulates rains. However, to avoid loss due to non-congenial environment during seed shedding period and seed damage due to pests/ pathogens, nursery raising would be beneficial.

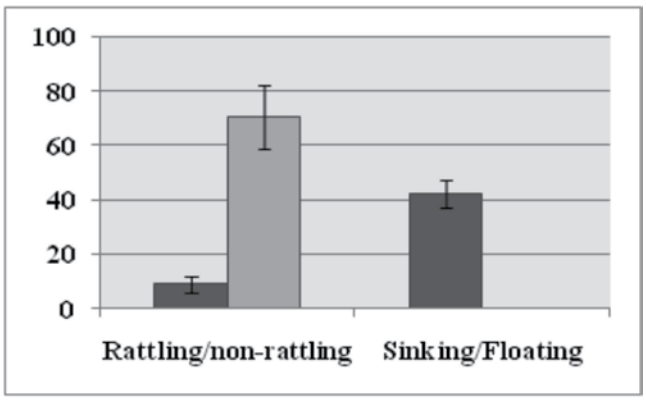


Fig. 2: Comparative germination percentage in rattling/ non-rattling and sinking/ floating seeds of *M. andamanica*

During the course of present study, one fruit with two seeds was encountered (Plate 27). The twin seed was 4.53 cm long, 2.66 cm wide and weighed 24.51 g, when compared with normal seeds (4.66 cm, 2.29 cm and 14.42 g, respectively). Further, polyembryony i.e. occurrence of more than one seedling from a single seed, was also observed for the first time in this species.

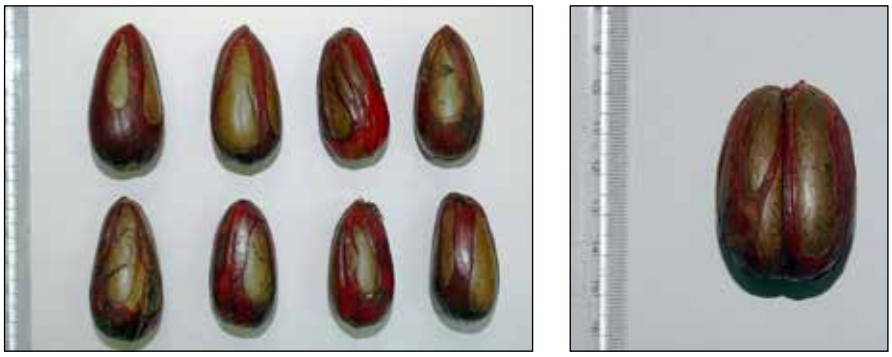


Plate 27: Normal and twin seed of *Myristica andamanica*

Seed viability study in wild nutmeg

Seeds of an unidentified wild nutmeg species were collected from the Garacharma farm of the institute and studied for their viability. Results revealed significant reduction in seed viability with decreasing moisture content. Freshly harvested seeds had 24.31 % moisture content, whereas it decreased to 2.73% after 12 days of storage at room temperature. Highest germination (50.0 %) was noticed after 3 days of storage, while it decreased to 2.5% after 12 days of storage.

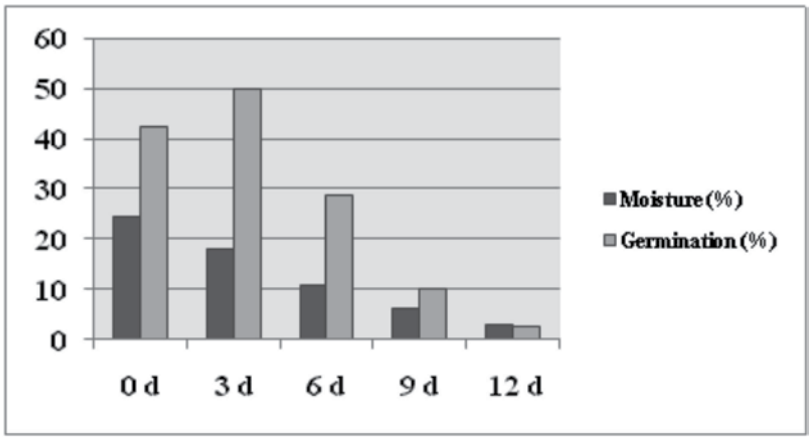


Fig. 3: Moisture content and seed germination in wild nutmeg species as affected by storage

Pepper wood: a potential spice for the islands

Pepper wood (*Piper ribesioides*) was identified as a potential crop for commercial cultivation in the islands (Plate 28). This species is naturally distributed in the forests of North and Middle Andaman, South Andaman and Little Andaman Island. Bengali settler community of the islands employs the inner wood segments in culinary preparation to impart pungency and unique flavor. Stem are cut into pieces of 20-25 cm, bundled and sold in local markets of North and Middle Andaman. Price of the produce in Middle Andaman and Little Andaman market has increased from Rs. 150/- per kg during 2015 to Rs. 300 to 450/- per kg in 2017, indicating its increasing popularity. Being shade tolerant, the species could be easily incorporated in the existing plantation-based cropping systems in the islands.

Plate 28 : A vine of pepper wood growing with support of mango tree in home garden (left) and stem pieces sold in the local market (right)

Black pepper varietal evaluation trial

Twelve improved varieties/ hybrids of Black Pepper were planted on glyricidia standard to evaluate and identify the suitable variety for Island conditions. Flowering was observed in few plants of three varieties *viz*. Panniyur 6, Malabar Excel and Panchami and initial green berry yields of 112.3 g, 134.8 g and 14.0 g respectively were observed in these varieties.

Spice quality analysis

Spice samples *viz*. nutmeg, clove, cinnamon and black pepper were collected from various parts of South Andaman, Little Andaman, Middle and North Andaman and Nicobar Islands along with mainland India and essential oils were extracted from clove and nutmeg samples. The results could help in establishing the superiority of island spices or otherwise over produce of mainland India, which could help in taking policy decisions pertaining to spice marketing in the islands. It would also help in drafting the guidelines for maintaining the quality of spices. During the quality analysis of nutmeg, a few seeds were found to be infested with a storage pest which was identified as *Aracerus fasiculatus*. It has been reported as a polyphagous pest elsewhere having wide host range including species which are commercial in the islands.

Collection, maintenance and utilization of wild relatives of spice crops

Myristica andamanica, *Knema andamanica*, *Horsfieldia glabra*, *Myristica beddomie* and an unidentified wild nutmeg species are being conserved in the bunds of cultivated fields. Extracts of two ecotypes of *Myristica andamanica* were prepared using different solvents and their antibacterial activity was studied in pathogenic *Salmonella* sp. infecting poultry. Dose dependent response of extracts of both the ecotypes was noticed as revealed by the zone of inhibition.

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

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

Effect of size of rhizome on yield and quality parameters

mangga is a medicinally important multipurpose species grown in tropical Asian countries and is known as a source of curcumin and essential oil. Considering the scope for commercial cultivation under Andaman Islands,

experiments were conducted during 2015 to 2017 to study the effect of different size of seed rhizome on yield and quality parameters. Based on the pooled data for both the cropping years, superior growth parameters (Table 8), higher dry matter recovery (24.44%), oil yield (17.57 ml/m^2) (Fig 4) and curcumin content (0.46%)(Table 9) were observed with use of seed rhizomes of 20-25 g size and hence could be recommended for producing raw material meant for aromatic and pharmaceutical industries. However, for processing and value addition purposes, use of seed rhizomes of 15-20 g size would be optimum. GC-MS analysis revealed β- myrcene and β- pinene as dominant constituents of its essential oil (Fig.5). Findings of present study would be helpful for large scale production of raw material required by flavor, food and pharmaceutical industries.

Table 8: Yield parameters in *Curcuma mangga* as influenced by size of seed rhizome (pooled data for two years)

Treatment	Yield per plant (g)	Weight of primary rhizomes (g)	Weight of secondary rhizomes (g)	Primary rhizomes/ clump	Secondary rhizomes/ clump
T_1 (5-10 g)	463.97 b	32.00 b	14.55 c	3.39 ab	17.17 a
T_2 (10-15 g)	398.53 b	28.07 b	15.58 bc	2.72 b	13.06 b
T_3 (15-20 g)	695.03 a	39.22 a	19.05 ab	4.33 a	17.94 a
T_4 (20-25 g)	636.19 a	39.30 a	22.58 a	3.78 a	18.28 a

Values followed by same alphabet in a column represent non-significant differences at 5% level of significance using least significant differences

Table 9: Curcumin content (%) in different types of rhizomes as influenced by size of seed rhizome

Size of rhizome	Mother rhizome	Primaryrhizome	Secondaryrhizome	Mean
T_1 (5-10 g)	0.32	0.30	0.48	0.36
T_2 (10-15 g)	0.18	0.29	0.48	0.31
T_3 (15-20 g)	0.41	0.26	0.46	0.38
T_4 (20-25 g)	0.50	0.48	0.38	0.46
Mean	0.35	0.34	0.45	

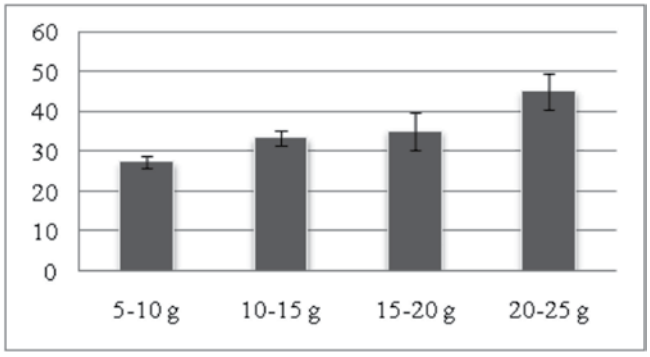


Fig. 4: Mean essential oil yield (ml) per plot (2 m^2) as influenced by size of seed rhizome

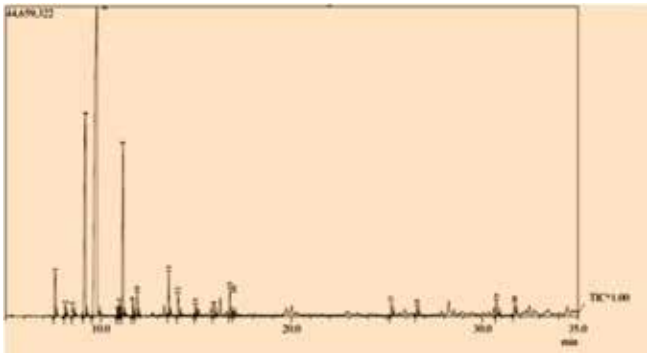


Fig. 5: GC-MS chromatogram of essential oil from *C. mangga* mother rhizome

Optimization of micropropagation protocol

In order to optimize reliable and rapid micropropagation protocol, effect of kind and concentration of carbon source was studied. Results revealed that higher concentration (3 %) of carbon source was found to support better multiplication rate than that of 1% carbon source (Fig. 5). Further, use of dextrose was found to be better carbon source for *C. mangga* than that of sucrose and fructose. Effect of these treatments were studied on leaf pigment analysis which revealed that irrespective of carbon source used, 3% level was superior for chlorophyll accumulation, which improves the quality of regenerated plantlets. Mean concentrations of 1.775 mg/g (chlorophyll a), 0.540 mg/g (chlorophyll b) and 2.315 mg/g (total chlorophylls) were reported from shoots obtained from cultures multiplied on dextrose (3%) supplemented medium. Hence, dextrose (3%) could be recommended as a carbon source for *in vitro* multiplication of mango ginger (Plate 29).

Plate 29: *In vitro* multiplication in *C. mangga* as influenced by carbon source and their concentration. Top row, left to right: dextrose (3%), fructose (3%), sucrose (3%) and bottom row, left to right: dextrose (1%), fructose (1%), sucrose (1%)

Collection and conservation of germplasm

Germplasm of *Curcuma mangga* and *C. amada* collected from different parts of islands and other parts of country were collected and seven of them are conserved in the germplasm block of the institute.

Collection, Characterisation and Evaluation of Selected Economically Important Aromatic Crops in Andaman & Nicobar Island

Soobedar Yadav, K. Abirami and R. K. Gautam

Twenty collections of *Ocimum*, five collections of Lemongrass and two collections of *Mentha* species made from Andaman & Nicobar Island and conserved. Among the Ocimum types, maximum plant height was observed in AO-7(80.65cm) which was at par (78.34 cm) with AO -13. Lowest plant height (35 cm) was observed in AO-4.

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. Sakhtivel and S. Swain

Collected fifteen genotypes (AT-1, AT-2, AT-3, AT-4, AT-5, AT-6, AT-7, AT-8, AT-9, AT-10, AT-11, AT-12, AT-13, AT-14 and AT-15) of turmeric from Andaman Island were evaluated the performance of growth and yield parameters. Highest numbers of primary and secondary fingers were recorded in AT -3 (8.54 and 13.24, respectively) which were at par with AT-3 (8.10 and 12.85 respectively). The minimum numbers of primary and secondary finger were recorded in AT-11 (5.40 and 6.92, respectively). The fresh rhizome yield per hectare differed significantly among different turmeric genotype. Genotype AT-3 (20.4 t ha^{-1}) registered highest projected fresh rhizome yields which was significantly different from AT-3 (17.23 t ha^{-1}), while lowest yield of fresh rhizome yield was found with cultivar AT-8 (9.26 t ha^{-1})

Ten improved varieties (Prabha, Kranti, Sobha, Suverna, Kedaram, IISR- Pratibha, Aleppy Supreme, Sugana Sona and Sudarshani) of turmeric were collected and evaluated for growth and yield characters in South Andaman. In the present study, the highest projected yield offresh rhizome (32.4 ton /ha) was recorded in IISR Pratibaha, followed by Alleppy Supreme 27.52 t /ha whereas the lowest fresh rhizome yield was recorded by Sona (13.86 t/ha).

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

B. Augustine Jerard, V. Damodaran and K. Abirami

During the year, a total of 2333 female flowers were pollinated in 7 dwarf cross combinations and recorded the overall setting percentage of 19.8 %. The highest setting percentage of 24.6 was recorded in the cross AGD x AOD followed by AYD x AOD. Inter-se- mating was carried out in 10 selected Pacific Ocean accessions and a total of 3154 female flowers were *inter se* mated and recorded setting percentage of 16.2%. Twenty-four F_1 seedlings have been transplanted and maintained in the field for further evaluation of growth and yield parameters (Plate 30). Initial evaluation of hybrids revealed that, AOD x CARI Annapurna recorded maximum girth of stem (76 cm), longest leaf (261 cm) and more number of leaflets on one side (66) followed by AYD x AGD (Table.1).

Table 10: Growth performance of hybrid coconuts

Cross	Plant height (cm)	Stem Girth (cm)	No. of leaves	Petiole length (cm)	Length of leaf (cm)	No. of leaflets (one side)	Length of leaflet (cm)	Width of leaflet (cm)
Annapurna x ADOT	255.0	28.0	7.0	116.0	145.0	43	63.0	3.9
AOD x AGD	283.0	48.2	7.4	90.2	155.8	42	61.8	3.4
AOD x Annapurna	474.0	76.0	9.0	143.0	261.0	66	78.0	4.9
AOD X AYD	144.5	21.5	5.0	66.5	110.0	26	62.5	2.6
AGD x AGD	148.5	22.0	5.0	65.0	89.5	35	45.0	2.8
AGD x AYD	370.0	55.5	8.5	111.0	176.5	60	64.5	3.7
AGD x AOD	152.5	25.5	4.5	47.0	90.0	31	43.5	2.3
AOD x AYD	225.0	25.0	6.0	72.0	131.0	29	68.0	2.9

Cross	Plant height (cm)	Stem Girth (cm)	No. of leaves	Petiole length (cm)	Length of leaf (cm)	No. of leaflets (one side)	Length of leaflet (cm)	Width of leaflet (cm)
AYD x AOD	267.0	20.3	6.0	61.0	93.0	28	47.6	2.6
AYD x AGD	342.0	69.0	9.0	89.5	206.0	62	69.0	3.0
Nicobar Dwarf	155.0	25.0	5.0	45.0	83.0	28	48.0	2.6
Tall	235.0	26.0	6.0	73.0	107.0	43	49.0	3.6

About 180 pollinated seed nuts were sent to ICAR- CPCRI for characterization and conservation at field gene banks of CPCRI, Kasaragod.

AGD X AYD | AOD X AGD | AOD X Annapurna | AYD X AGD

Plate 30: Field planted coconut hybrids

All India Coordinated Research Project on Palms

Ajit Arun Waman

Arecanut based cropping system models

Arecanut is a major plantation crop that is getting popular amongst the island farmers. However, most of the area under arecanut cultivation is under monocropping. With the aim of identifying island suitable intercrops, which could help the farmers in getting additional returns from their farms, arecanut based cropping system models were developed. Experimental models comprise of black pepper, ginger, banana and elephant foot yam as intercrops and all of these crops were grown using organic inputs. Growth parameters such as plant height and number of leaves per palm in arecanut were not influenced by incorporation of component crops. Growth observations in case of black pepper in different models were significantly influenced by crop combinations and the highest plant height (289.8 cm) and number of leaves (49.2) were observed in arecanut + black pepper + elephant foot yam combination.

Significant differences were noticed in the arecanut chali yield in different models. Mean yield of 22.3 kg/plot of chali was obtained in sole cropping, which increased to 22.8 kg/plot, 25.9 kg/ plot and 31.1 kg/ plot in T_2, T_3 and T_4, respectively. Black pepper is in juvenile stage in all the treatments. Intercropping in arecanut could help in getting additional yields of banana (88.7 kg/ plot), ginger (8.2 kg/plot) and elephant foot yam (20.8 kg/ plot) in T_2, T_3 and T_4, respectively (Table 11).

Table 11: Yield of arecanut and intercrops under organic arecanut cropping systems

Treatment	Crops	Yield (kg/plot)
T_1	Arecanut	22.3 ± 2.32
T_2	Arecanut	22.8 ± 2.85
	Black pepper	In juvenile stage
	Banana	88.7 ± 2.96
T_3	Arecanut	25.9 ± 3.03
	Black pepper	In juvenile stage
	Ginger	8.2 ± 0.72
T_4	Arecanut	31.1 ± 4.81
	Black pepper	In juvenile stage
	EFY	20.8 ± 2.22

Coconut based cropping system models

Four intercropping models *viz*. T_1 (coconut alone), T_2 (coconut + black pepper + ginger + banana), T_3 (coconut + black pepper + ginger + pineapple) and T_4 (coconut + black pepper + ginger + elephant foot yam) were established to test their profitability under island condition. All the crops and intercrops are being grown using organic inputs. Coconut yield obtained from different cropping system models did not differ significantly as about 21.00-21.95 nuts per palm were obtained from one harvest. Yield of ginger per plot varied amongst the models and 6.61, 7.43 and 7.28 kg produce was obtained from T2, T3 and T4, respectively. Additionally, banana (120.16 kg/ plot) and elephant foot yam (13.4 to 18.3 kg/ plot) were obtained from T_2 and T_4, respectively. Black pepper and pineapple are yet to flower and hence, no yields were obtained.

Establishment of nucleus seed gardens

A nucleus seed garden was established in the Garacharma farm of the Institute for seed production in improved varieties of coconut and arecanut in future. Seedlings of four varieties of coconut *viz*. CARI- Annapurna, CARI-Omkar, CARI- Surya and CARI- Chandan along with arecanut variety Samruddhi were planted (Plate 31).

Plate 31: Nucleus seed garden of arecanut and coconut varieties at Garacharma farm

Development and Evaluation of Horti - Silvipastoral System in Tropical Island Condition

I. Jaisankar, B. Augustine Jerard, T.P. Swarnam and V. Damodaran

The ongoing project to evaluate the biomass production potential of different horti - silvipasture systems was continued. Under three growing conditions *viz.,* intercrop in coconut garden, casuarina and open, four fodder trees combinations were planted such as *Sesbania grandiflora* and *Leuceana leucocephala, Bauhinia spp and Dendrolobium umbellatum* with three replications (Plate 32). The initial biometric observations of all the trees were recorded at bimonthly intervals. The height of the coconut tree ranged from 12 m to 15m and casuarina 4.9 m to 5.8 m. Among the fodder trees the maximum value of mean height was recorded in *Sesbania grandiflora* (304 cm to 332 cm) followed by *Leuceana leucocephala* (66.9 cm to 68.19 cm) and the least value of mean height was recorded in *Bauhinia*spp (52 cm to 59 cm). The initial soil samples were collected and analysed for the NPK content so as to study the impact of horti - silvipasture systems on soil properties. The results revealed that the soil available nitrogen in the experimental area ranged from 176.8 kg/ha to 193.4 kg/ha, phosphorous ranged from 15.2 kg/ha to 16.8 kg/ha and potassium ranged from 86.6 kg/ha to 99.5 kg/ha respectively.

Plate 32: Field view of Horti Silvi Pasture system at Garacharma farm

Studies on Effect of Biowaste Decomposer on Horticultural Crops

V. Baskaran and K. Abirami

Feasibility studies were undertaken to test the efficacy of Bio waste decomposer developed by NCOF, Government of India on selected flowers and vegetables. The preliminary observations are as follows.

Effect in flower crops

Biowaste decomposer (1:3 ratio) was used as a spray treatment in flower crops (jasmine, tuberose and eulophia) at an interval of 15 days. A positive effect of the biowaste decomposer spray was observed in growth and flowering when compared to control. In jasmine, an increase in plant height (60.2 cm), number of branches (8.0) and plant spread

(58/47 cm) were observed after 3 months of treatment whereas in control the plant height, number of branches and plant spread were 47.4 cm, 6.0 and 42/48 cm respectively.

In tuberose there was an increase in number of leaves (13.3), spike length (145.0 cm) and number of florets per spike (56.7) whereas in control the number of leaves, spike length and number of florets per spike were 11.1, 138.6 cm and 49.7 respectively. Early flowering was noticed in the plants treated with biowaste decomposer spray when compared with control (Plate 33).

Biowaster decomposer treatment Control

Plate 33: Early flowering in Tuberose

In *Eulophia andamanensis*, spike length (121.2 cm) and number of florets per spike (28.5) were maximum in the biowaste decomposer imposed treatments. The control treatments recorded spike length of 112 cm and number of florets per spike (26.4).

Biowaster decomposer treatment Control

Plate 34: Better growth and development in *Eulophia*

Organic Vegetable Cultivation Using Biowaste Decomposer

Vegetables like tomato, chilli, cluster bean, brinjal and bhendi were grown in grow bags and modified planting system with biowaste decomposer spray at regular intervals. There was no application of fertilizers and plant protection chemicals. The treatments were initiated during vegetative stage of the crops. There was an increased yield in the biowaste decomposer treated plants. In chillies, yield of 520 g fruits/plant were obtained when compared to control (287 g/plant). In tomato, 3.12 Kg/plant yield was obtained when compared to control (2.26 Kg/plant) (Plate 35 and 36).

Treated Control

Plate 35: Effect of biowaste decomposer spray on growth and yield of tomato

Plate 36: Effect of biowaste decomposer spray on growth and yield of chillies

DIVISION OF FIELD CROP IMPROVEMENT & PROTECTION

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

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

Molecular introgression of resistance genes in CARI Dhan 5

A total of 355 BC_3F_1 plants of cross CARI Dhan 5 x IRBB60 were transplanted in field. Among them, 62 plants were found to be highly resistant to bacterial blight (BB) with score of 1 following artificial inoculation. The leaves of these resistant plants were collected for DNA extraction. Genomic DNA was extracted using CTAB method. The extracted DNA samples were screened in 0.8% agarose gel by using Gel documentation unit. The DNA samples were subjected to foreground selection for the presence of *Xa4*, *xa5*, *xa13* and *Xa21* genes by using linked markers. The PCR was run by initial denaturation at 95ºC for 5 minutes (35 cycles), 95ºC for 30 seconds, 55ºC for 30 seconds, 72ºC for 1 minute and final extension of 7 minutes. Further, the PCR products were screened in 2% agarose gel for the *xa5*, *xa13* and *Xa21* gene linked markers and 3% agarose gel for *Xa4* gene linked marker.

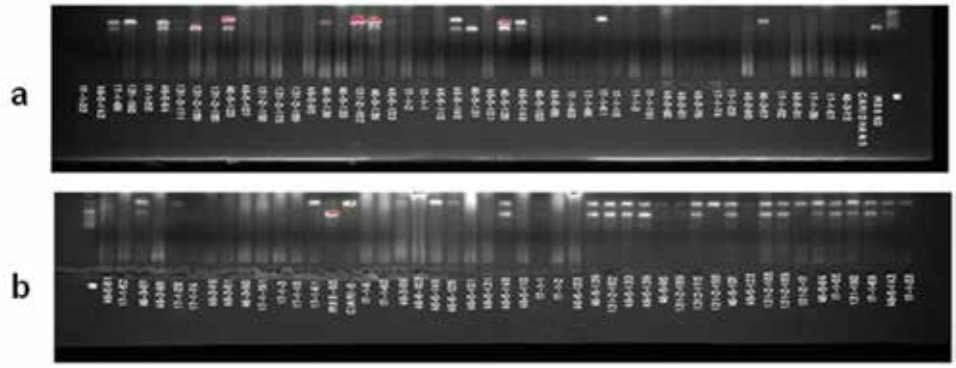


Plate 37: Molecular detection of genes in resistant plants of CARI Dhan 5 a) *Xa21* (1000bp) and b) *xa13* (500bp)

Based on the presence of 4 resistance genes (*Xa4, xa5, xa13 and xa21*), 75 BC_4F_1 seeds were obtained from plant number 46-5-148. In addition, sufficient number of selfed seeds from 4 BC_3F_1 plants [all these 4 plants carry 4 resistance genes (*Xa4, xa5, xa13 and xa21*)] have been obtained during 2017 (Plate 37). The foreground selection was performed in BC_3F_1 generation in order to ensure the presence of all four BB resistance gene and only progenies having the resistance genes were subjected to background selection (BC_3F_1). To know the relative amount of the recurrent parental genome in the back-crossed derived segregants, background SSR markers akin to CARI Dhan 5 were used to genotype background selection in BC_3F_1 generation. The total genomic DNA of two parents and the four individual progeny plant (namely plant no. 17-1-69,131-2-190, 46-5-139 and 46-5-148) was isolated and subjected to PCR based SSR molecular marker analysis. For this a total of 48 SSR marker were used and the similarity between recipient and progeny plant was checked in 2% agarose gel under UV light gel documentation. Plant number 131-2-190 exhibited 50% genomic similarity followed by plant number 131-2-182 (44.4% resemblance) whereas plant number 46-5-139 and 46-5-148 showed 38.8% resemblance.

Molecular introgression of Xa genes in CARI Dhan 8

A total of 220 plants of BC_2F_1 cross CARI Dhan 8 x IRBB60 were grown and artificially infected with BB pathogen. Out of 220 plants, only 23 plants showed strong resistance (BB score 1). Out of these, 6 plant samples *viz*., C14-8-125-1, C14-8-125-2, C14-8-125-4, C14-8-125-5, C14-8-93-11 and C14-8-93-13 found to have *Xa 4, xa 5, xa 13 and Xa 21* genes based upon linked markers (Plate 38) were selected for making back-cross. A total of 227 BC_3F_1 seeds obtained from CARI Dhan 8 x IRBB60 cross from the progenies of C14-8-125 plants having four resistance genes were harvested for further generation advancement and resistance gene transfer in CARI Dhan 8 during Kharif 2018 (Table 12).

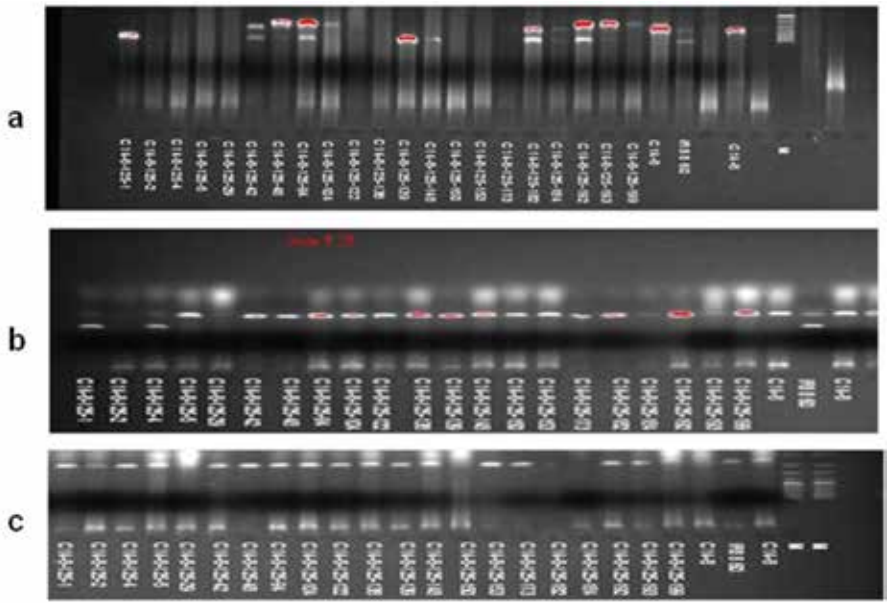


Plate 38: Molecular detection of genes in resistant plants of CARI Dhan 8
a) *Xa21* (1000bp) b) *Xa13* (500bp) and c) *xa5* (300bp)

Table 12: Selection of 4-gene pyramided and BB resistant CARI Dhan 8 back-cross progenies (CARI Dhan 8/IRBB60, BC2F1s) for back-crossing during Dec. 2017

Plant No.	*Xa4*	*Xa5*	*Xa13*	*Xa21*	No. of BC_3F_1 crossed seeds (CARI Dhan 8/IRBB60) obtained in Dec.2017
C14-8-125-1	+	+	+	+	46
C14-8-125-2	+	+	+	+	40
C14-8-125-4	+	+	+	+	92
C14-8-125-5	+	+	+	+	49
Total					227

Stress Tolerant Rice for Poor Farmers of Africa and South Asia (Bill & Melinda Gates Foundation funded through IRRI Philippines)

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

The Salinity Tolerance Breeding Network (STBN) trial was conducted at Creekabad village, Chouldari, Port Blair, South Andaman under salinity stress (ECe~6.94 dS/m) during 2017-18. A total of 102 rice entries (including 5 checks *viz.* CARI Dhan 5, CST 7-1, CSR 10, CSR36 and Pusa 44) were evaluated in Augmented Block Design. The latitude and longitude of the field were $11^0$39.11" N and $92^0$44.44" E, respectively with the elevation of 4 m from the mean sea level. The gross plot size of 2.52 m^2 was followed by planting on 28th July, 2017 with a row spacing of 20 cm and plant spacing of 15 cm. The recommended dose of NPK was applied @ 90 kg/ha N, 60 kg/ha P_2O_5 and 40 kg/ha K_2O during the crop growth period (from transplanting to harvest). Data were recorded on days to 50% flowering, plant height (cm), panicle length, tillers/plant, productive tillers/plant, filled grains, spikelet fertility (%), 1000 grain weight (g), SES Score of reproductive stage, grain yield (kg/ha) and bacterial blight (BB) score. The best 11 rice entries among them on basis of grain yield and block-wise performance of checks are presented in Table 13 and 14, respectively. The

grain yield data revealed that genotypes *viz.* CSR2016 18-15 (2.97 t/ha) and CSR2016-IR18-2 (2.69 t/ha) were found to be promising followed by CR2851-S-B-1-B-B-1, CR2851-5-1-6-B-B-4, CSR-IRLON-01-IR165 over best check CSR-10 (2.57 t/ha) (Plate 39). Therefore, the above mentioned genotypes gave more than 2.5 t/ha grain yield under the tested coastal salinity stress conditions of the Andaman & Nicobar Island.

Table 13: Performance of best 11 rice genotypes under STBN Trial during *Kharif* 2017

Designation	DF	PH	PL	TP	PTP	FGP	SF	TSW	SES	GY	BB
CSR2016IR 18-15	98	91	24	9	8	108	75	24	3	2.97	7
CSR2016-IR18-2	93	98	25	9	8	88	85	28	1	2.69	1
CR2851-S-B-1-B-B-1	122	102	23	10	8	65	63	19	5	2.57	3
CR 2851-S-1-6-B-B-4	122	109	21	9	7	68	63	26	5	2.57	5
CSR RILON-01-IR165	93	100	27	10	9	79	82	26	1	2.57	9
KS- 12	102	96	21	9	8	77	48	23	3	2.48	3
CR 3904-162-1-5-1	107	100	25	8	7	65	62	25	5	2.48	3
CSR2016-IRLON 18-12	99	96	24	10	8	44	71	34	3	2.46	7
NDRK11-24	98	100	23	7	6	61	81	24	3	2.46	3
PR-320-4-3-1	122	90	23	8	7	107	85	16	3	2.38	1
CR3884-244-8-5-11-1-4	93	109	25	5	5	72	63	21	3	2.38	5

DF= Days to flowering (50%), PH=Plant Height (cm), Panicle length (cm), TP= tillers per plant, PTP=Productive tillers per plant, FGP=Filled grains per panicle, SF=Spikelet fertility (%), TWS= 1000 grain weight (g), SES= Salinity Score of reproductive Stage, GY= Grain yield (t/ha) and BB= Bacterial blight score.

Table 14: Block-wise performance of checks under STBN-2017 rice trial

Checks	B 1	B2	B3	Mean
CARI Dhan 5	2.18	2.38	1.98	2.18
CSR 36	1.38	2.50	0.99	1.62
CSR 10	2.38	2.57	2.77	2.57
Pusa 44	0.38	1.38	1.78	1.18
CST7-1	1.98	2.18	1.79	1.98

Plate 39: Poor survival of salt sensitive rice variety Pusa 44 in STBN-2017 at Port Blair, South Andaman

Seed Production in Agricultural Crops

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

Seed production

A total of 77 kg of Nucleus Seed of 9 rice varieties (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) and 176 kg of Breeder Seed of 12 varieties were produced at Bloomsdale Research Farm, CIARI, Port Blair (Plate 40a). In addition, 59.42 quintal Truthfully Labelled (TFL) seeds of 8 rice varieties (CARI Dhan 4, 5, 6 7, 8, 9, CSR36 and Gayatri), besides 2.68 quintal TFL of 6 pulse [Mungbean (CIARI Mung 1, CIARI Mung 3, ANM 11-15) and Urdbean (CIARI Urd 1, CIARI Urd 2 and ANU 11-19)] varieties were produced under farmers participatory mode at Diglipur during Kharif and Rabi 2017. Total 2.5 Kg TFL seed of CARI Brinjal 1 was produced during *Rabi* season at Bloomsdale Research Farm, CIARI, Port Blair (Plate 40 b&c).

Plate 40: Seed production of Rice and Brinjal of CARI varieties a) Field view of Breeder seed of rice, b) Storage of rice TFL seed and c) TFL Seed Production of CARI Brinjal 1

Trainings imparted

Three trainings and one field day were conducted on various aspects of quality seed production and management of rice and brinjal in South and North & Middle Andaman during 2016-17 (Plate 41). Totally, 205 farmers participated and got benefited from these trainings.

Plate 41: Field day on farmer's participatory seed production (a) and trainings (b and c)

Seed sale and distribution

A total of 2.5 q Truthfully Labelled Seed and 70 Kg breeder seed of HYVs of CIARI were supplied to the Department of Agriculture, Andaman & Nicobar Administration. Further, 20 q TFL seed of rice were sold to the ORC, Diglipur. Moreover, 10q rice seed of four rice varieties (CARI Dhan 4, CARI Dhan 5, CARI Dhan 6 and CSR 36) and 0.5 Kg TFL seed of bacterial wilt resistant brinjal variety, CARI Brinjal 1 were also distributed to tribal dominated areas of Nicobar and Little Andaman during 2017-18.

AICRP on Mushrooms

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

The hybrid oyster mushroom strains obtained from Directorate of Mushroom Research (DMR), Solan were evaluated for yield efficacy under different island field conditions. Out of four hybrid strains tested, PL-02-17 showed better performance in case of yield and bio-efficacy which is followed by PL-04-17, PL-03-17 and Pl-01-17 (Plate 42). In case of disease resistance and quality performance, all four strains performed on par with each other. A total of five training-cum-demonstration programs were conducted, in which around 300 farmers benefitted. In addition, first private spawn production unit (M/s. Mahalasa Pvt. Ltd) of the islands has been developed to meet future spawn requirements of the islanders. Around 445 Nos. of spawns of CIARI Mushroom 1 (250), CIARI Mushroom 2 (101), CIARI Mushroom 3 (94) were distributed to island farmers through Institute spawn production unit.

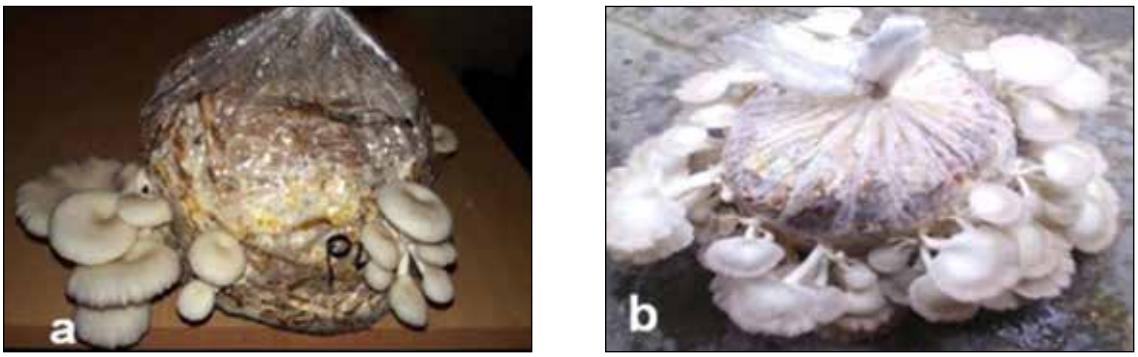


Plate 42: Mushroom strains a) PL-01-17 and b) PL-02-17

All India network Project on Vertebrate Pest Management

K. Sakthivel

Surveillance and population ecology of rodent pests in predominant cropping systems

The survey of rodent infestation in coconut plantations was conducted in different villages of South and North Andaman. The results revealed that the rodent infestations were severe in the Islands and it ranged from 14 to 52% percent indicating the intensity of their problem. The maximum rodent infestation was observed in Calicut and Burmanalla villages of South Andaman and Dasarathpur and Rangat areas of Middle Andaman Islands.

Sensitization of the farmers on rodent management in coconut plantations

Training programmes on rodent management in coconut plantations were organized by ICAR-Central Island Agricultural Research Institute, funded by All India Network Project on Vertebrate Pest Management along with KVK, Nimbudera. Five on-farm demonstrations of rodenticide applications were conducted to Island farmers and altogether 60 farmers were benefited (Plate 43).

Plate 43: Rodent management in coconut plantations of Andaman Islands

Augmenting Rice Productivity through Varietal Purification of Popular Land Races

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

Evaluation of selected progenies of Black Burma rice

A total of 10 selected lines of Black Burma traditional rice variety were evaluated across two locations (Port Blair in South Andaman and Mayabunder in Middle Andaman) during *Kharif* 2017 with two improved check varieties *viz.* Ranjeet and CARI Dhan 5 (Plate 44a). The observations on yield data over 2 locations revealed highest grain yield in rice line BB 13-31 (4.2 t/ha) followed by BB 13-1 (4.0 t/ha) and BB 13-79 (3.7 t/ha) (Table 15).

Evaluation of selected progenies of Khusbuyya rice

A total of 10 selected lines of Khusbuyya rice variety were evaluated across two locations (Port Blair in South Andaman and Mayabunder in Middle Andaman) during *Kharif* 2017 with two check varieties *viz.* Ranjeet and CARI Dhan 5 (Plate 44b). The observations on yield data over 2 locations revealed highest grain yield in rice line KU 13-10 (5.4 t/ha.), followed by KU 13-76 (4.9 t/ha.) and KU 13-94 (4.8 t/ha.) (Table 16).

Plate 44: Field view of rice lines at CIARI Bloomsdale Research Farm, Port Blair a) Black Burma and b) Khusbuyya

Table 15: Yield performance of 10 selected Black Burma rice lines over check varieties in two locations during 2017

Genotypes	Grain Yield T/ha		Avg. Yield (T/ha)	Advantage over the Best Check
	Port Blair S/ Andaman	Mayabunder N&M Andaman		
BB13-1	4.2	3.79	4.0	0
BB13-6	3.8	3.41	3.6	-10
BB13-20	3.9	2.37	3.1	-22.5
BB13-30	3.9	2.40	3.2	-20.0
BB13-31	4.0	4.42	4.2	5.0
BB13-40	3.5	3.47	3.5	-12.5
BB13-50	3.9	3.09	3.5	-12.5
BB13-62	3.5	3.54	3.5	-12.5
BB13-78	3.9	3.28	3.6	-10.0
BB13-79	4.1	3.22	3.7	-7.5
Ranjeet (Check)	3.7	3.28	3.5	-12.5

Genotypes	Grain Yield T/ha		Avg. Yield (T/ha)	Advantage over the Best Check
	Port Blair S/ Andaman	Mayabunder N&M Andaman		
CARI Dhan 5 (Check)	4.4	3.60	4.0	0
Mean	**3.9**	**3.3**	**3.6**	
Std Err	**0.08**	**0.16**	**0.09**	
Std Dev	**0.26**	**0.56**	**0.32**	
CV	**6.74**	**16.74**	**8.89**	

Table 16: Yield performance of 10 selected Khusbuyya rice lines over check varieties in two locations during 2017

Genotypes	Grain Yield T/ha		Avg. Yield (T/ha)	Advantage over the Best Check
	Port Blair S/ Andaman	Mayabundear N&M Andaman		
KU 13-10	5.0	5.9	5.4	12.5
KU 13-41	4.5	4.1	4.3	-10.4
KU 13-43	5.0	3.9	4.4	-8.3
KU 13-48	5.2	3.9	4.5	-6.25
KU 13-51	5.3	3.7	4.5	-6.25
KU 13-63	5.3	3.8	4.6	-4.25
KU 13-65	5.2	4.3	4.7	-2.0
KU 13-76	5.0	4.7	4.9	2.08
KU 13-92	4.8	3.9	4.3	-10.4
KU 13-94	4.8	4.7	4.8	0.00
Ranjeet (Check)	4.5	3.8	4.2	-12.5
CARI Dhan 5 (Check)	4.4	5.1	4.8	0
Mean	**4.9**	**4.3**	**4.6**	
Std Err	**0.09**	**0.19**	**0.09**	
Std Dev	**0.32**	**0.67**	**0.33**	
CV	**6.48**	**15.46**	**7.20**	

Farmer's evaluation on CARI Dhan 8 and 9

The Front Line Demonstration of CARI Dhan 8 (7 nos.) and CARI Dhan 9 (5 nos.) were conducted in Middle Andaman with popular cultivar, C14-8 as check variety. Farmers preference about CARI varieties on visual performance of crop, disease/pest problem, lodging, grain type and grain yield etc., were recorded on 0 to 9 scale, where 0 as best and 9 as poor except grain yield. The grain yield of developed varieties (CARI Dhan 9 (3.79 t/ha); CARI Dhan 8 (3.97 t/ha) were found better over check (Table 17).

Table 17: Farmers evaluation on CARI Dhan 8 and 9 over popular cultivar C14-8

Characters	CARI Dhan 9	C14-8 (Check)	CARI Dhan 8	C14-8 (Check)
Visual performance of crop	2.71±0.29	4.71±0.29	3.80±0.82	5.00±0.0
Disease/pest problem	3.68±0.57	3.28±0.29	3.50±2.19	3.40±0.40
Lodging	7.28±0.81	8.14±0.59	7.00±1.12	8.20±0.49
Grain type	2.71±0.28	4.71±0.29	3.40±0.98	3.80±0.49
Grain Yield (t/ha)	3.79±0.23	3.20±0.10	3.97±0.45	3.27±0.25

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 and B.L. Meena

Development of multi-parental crosses

Total of 300 multi-parental crosses were made between Gayatri/ IRBB 60/ CSR 36/ IRLON 26 x SPS 26/ IRLON 50/ GSR 33/ Khushbyya (Plate 45). The F_1 crossed seeds have been harvested for growing F_1 progenies. Similarly, F_1 seed of Gayatri/ IRBB 60/ CSR 36/ IRLON 26 and SPS 26/ IRLON 50/ GSR 33/ Khushbyya harvested for growing F_2 progenies.

Plate 45: Multi-parental crosses of rice

Evaluation of elite rice lines under rainfed lowland conditions

Total of 18 improved lines of rice received from IRRI, Philippines were evaluated under rainfed lowland conditions at Bloomsdale Research Farm, Port Blair during Kharif 2017. The experiment was conducted in RBD design with two checks (CARI Dhan 6 and CARI Dhan 7) and planting was done at the spacing of 20 x 15 cm in the month of July. Observations were recorded for plant height, days to flowering (50%), panicle length (cm), tillers/plant, grain yield (t/ha). Scoring was done for major pest and disease. All rice lines under study were medium duration and medium-statured, except ANR 41 (131cm). The panicle length was recorded from 22 to 24 cm with average tillers/plant of 7.39. The highest grain yield (t/ha) was recorded for ANR 53 (5.63) followed by ANR 59 (5.33) and ANR 56 (5.29) compared to best check CARI Dhan 7 (5.18) (Table 18). However, ANR 43, ANR 48, ANR 49, ANR 56 and ANR 59 showed multiple resistances for leaf folder, false smut and BLB.

Table 18: The performance of elite rice lines on agronomic, yield and pest resistance parameters

Genotypes	PH	DF	PL	NT	GY	LF	FS	BB	PAccP
ANR 41	131	86	24	7	4.72	3	1	5	1
ANR 42	117	87	24	8	4.46	3	3	5	1
ANR 43	103	89	23	7	5.24	3	3	1	1
ANR 44	116	90	23	7	4.36	3	9	5	1
ANR 45	103	87	22	7	4.13	3	5	5	1
ANR 46	108	83	22	7	4.44	3	1	5	1
ANR 47	113	90	22	8	5.23	3	5	3	1
ANR 48	107	90	23	7	5.12	3	7	3	1
ANR 49	109	88	22	8	4.29	5	7	9	1
ANR 50	108	89	23	9	4.88	5	9	5	1
ANR 51	109	89	23	7	4.94	1	9	5	1
ANR 52	107	84	23	7	4.77	7	5	7	7
ANR 53	110	84	22	7	5.63	3	3	9	5
ANR 54	116	86	23	7	5.28	3	5	5	1
ANR 55	123	85	23	7	4.76	1	1	7	3
ANR 56	116	85	24	7	5.29	3	3	3	3
ANR 57	115	86	24	7	4.65	3	3	7	5
ANR 58	115	85	23	8	5.33	3	1	3	1
CARI Dhan 7	120	95	26	7	5.18	1	1	3	1
CARI Dhan6	121	89	25	7	4.81	3	1	3	3
Mean	**113.42**	**87.38**	**23.15**	**7.39**	**4.87**				

PH= Plant height (cm); DF= Days to flowering (50%); PL= Panicle length (cm); NT= Tillers/ plant; GY= Grain Yield (t/ha); LF= Leaf folder; FS= False Smut; BB= Bacterial leaf Blight; PAccP= Phenotypic acceptability

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

P.K. Singh and K. Sakthivel

Field evaluation of bacterial wilt resistant brinjal lines

A total of 3 bacterial wilt resistant brinjal lines were evaluated with 2 checks *viz.* CARI Brinjal 1 (resistant check) and Pusa Uttam (susceptible check) in the field conditions during *Rabi* 2017-18. The experimental design, RBD was used with 3 replications. The planting was done with the following inter-row and plant spacing as 70 and 60 cm, respectively. Observations were recorded for yield and yield attributing characters, while observations on mortality due to bacterial wilt disease recorded in 15 days interval. All three improved brinjal lines under evaluation were found superior for fruit yield than susceptible check variety, Pusa Uttam (Plate 46). CARI Brinjal 2 gave highest fruit yield/ plant (650.5g) compared to check varieties (Table 19). Bacterial wilt disease incidence was recorded at fortnightly interval from 15 days of planting to 105 days. No disease incidence was recorded in CARI Brinjal 3 followed by resistant check variety CARI Brinjal 1 (DI as 1.66%), whereas, almost 100 % recorded in the susceptible check, Pusa Uttam (DI as 99.0%). Comparatively, low disease index (DI) was recorded in CARI Brinjal 2 (9.63%) and CARI Brinjal 3 (9.8%) (Table 19).

Plate 46: Field view of Brinjal lines (a) Improved resistant lines and (b) Susceptible check variety, Pusa Uttam

Table 19: Performance of improved brinjal lines in field during Rabi 2017-18

Varieties	PH	PBr	SBr	F/P	AFW	FY/P	DI (%)
CIARI Brinjal 2	78	6.0	17.3	6.6	85.9	650.5	9.63
CIARI Brinjal 3	89	5.5	14.5	5.5	90.5	452.5	9.80
CIARI Brinjal 4	77	4.3	16.5	6.3	100.5	600.5	0.00
CIARI Brinjal 1 (Resistant)	99	5.0	20.5	2.7	250.4	645.3	1.66
Pusa Uttam (Susceptible Check)	90	5.0	16.2	4.5	136.3	450.5	99.0
Mean	**86.6**	**5.16**	**17**	**5.12**	**132.72**	**559.86**	
C.D.	**3.50**	**1.25**	**3.52**	**2.12**	**75.25**	**158.24**	**-**
C.V.	**3.24**	**6.54**	**6.24**	**5.43**	**7.83.59**	**10.6**	**-**

PH= Plant height (cm), PBr= Number of primary branches, SBr=Number of secondary branches, F/P= Number of fruits/plant, AFW=Average fruit weight (g), FY/P=Fruit yield/plant (g) and DI= Disease index.

Notification of rice varieties

Two rice varieties *viz*., CARI Dhan 1 and CARI Dhan 5 developed by ICAR-CIARI, Port Blair for Andaman and Nicobar Islands were notified during 2017-18 (Plate 47)

1. CARI Dhan 1 (IET 25029): It is a medium duration rice variety (120 days) having plant height of 115 cm, with 7-8 panicle bearing tillers. It gives 4.0-4.5 t/ha yields in normal soils of Andaman and Nicobar Islands and possesses medium bold grains.
2. CARI Dhan 5 (IET 16885): It is a long duration (150 days) variety for saline soils with medium stature (110.0 cm). It bears 9-10 tillers per plant with panicle length of 24 cm. Its grain yield ranges from 4.4 to 4.7 t/ha in normal soils and 3.2 to 3.7 in saline soil conditions and possesses medium bold grains.

Plate 47: Field view of CARI rice varieties (a) CARI Dhan 1 and (b) CARI Dhan 5

DIVISION OF NATURAL RESOURCE MANAGEMENT

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

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

The rainfall pattern is ever changing in lieu of changing climate in the islands. There has been prolonged rain free season from December month onwards escalating moisture stress induced crop production limitations including curtailing the chances of crop rotations. The high and continuous rains from South-West monsoon have made the farmers to cultivate photosensitive long duration rice crop (C-14-8) in lowlands. As crop rotations are not possible with long duration popular rice variety 'C-14-8', an attempt was made to bring intensification in this system by assessing the possibility of taking dual harvest (fodder harvest to support the livestock and grain harvest from the ratoon). In this direction, a field study with five fodder harvest schedules (Table 20) was made in RBD with 4 replications.

The data (Table 20) revealed that fodder yield (both green and dry) of rice increased as the time of harvest increased from 30 to 75 days after transplanting (DAT). Harvesting of rice for fodder has resulted in production of more number of tillers than its control. Further, the plant height is also reduced due to fodder harvest leading to decreased lodging. In treatment where fodder harvest is taken at 75 DAT, lodging was <30%. Fodder harvests taken at 30 and 45 DAT of rice being at par with each other have significantly increased the grain yield of rice over no fodder harvest treatment. There were no grain yield differences between control and 60 and 75 DAT fodder harvest treatments. However, there was 17.3 and 22.9 t/ha of additional green fodder yield. Based on grain and fodder yields, C-14-8 rice cultivation for grain by taking fodder harvest at 45 DAT was promising.

Table 20: Impact of fodder harvests on rice productivity

Treatment	Plant height (cm) at harvest for fodder	Green (dry) fodder yield (t/ha)	Plant height (cm) harvest for grain	No. of panicles/ m^2	Grain yield (t/ha)
Fodder harvest at 30 DAT	93.3	6.23 (1.74)	218.6	302.5	2.14
Fodder harvest at 45 DAT	118.9	11.82 (3.37)	215.4	290.0	2.00
Fodder harvest at 60 DAT	173.7	17.28 (5.06)	202.6	285.0	1.90
Fodder harvest at 75 DAT	199.4	22.90 (6.64)	191.0	272.5	1.79
No fodder harvest (control)	-	-	230.0	255.0	1.74
SEm±	-	0.68	3.34	6.2	0.075
CD (P=0.05)	-	2.10	10.3	19.1	0.23

All India Coordinated Rice Improvement Project (AICRIP) : Multi Location Trial of Hybrids

B. Gangaiah

A field study was made at Bloomsdale farm during *kharif* -2017 season to assess the comparative performance of 20 hybrids along with a local check (CARI Dhan 6) of rice in Randomised Block Design with two replications. A recommended fertilizer dose 100-60-60 Kg/ha N- P_2O_5 and K_2O was used in the study. Entire P and K was applied as basal while N was applied in 3 equal splits on 5, 27 and 47th day after transplanting. The crop was grown as irrigated crop.

The data (Table 21) revealed that among the 7 MLT entries (MLT3501, 3504, 3507, 3508, 3514, 3516 and 3520) have markedly higher yield than local check variety. Among these 7 hybrids, MLT-3516 gave highest yield (3910 kg/ha). Other MLT hybrids had at par yields as that of local check CARI Dhan 6.

Table 21: MLT rice hybrids grain yield (t/ha) performance in islands

MLT Hybrid	Plant height (cm) at harvest	Grain yield (t/ha)
3501	134.5	3545
3502	131.1	3125
3503	122.4	3326
3504	128.3	3821
3505	129.2	3356
3506	122.0	2895
3507	125.8	3755
3508	130.7	3625
3509	127.4	3258
3510	125.1	3352
3511	132.6	3100
3512	126.3	3125
3514	127.1	3598
3515	131.1	3388
3516	132.6	3910
3517	131.4	3358
3518	114.5	3125
3520	123.7	3675
3521	123.0	3452
CARI Dhan 6	115.3	3100
SEm±	3.49	127.1
CD (P=0.05)	10.3	375

Restoration of Agriculture in Tsunami Affected Lands of Andaman and Nicobar Islands

B. Gangaiah, A. Anuraj, M.S. Kundu, T. Subramani, S. Swain, A. Velmurugan, L.B. Singh, S.K. Pandey and B.L. Meena

Through Participatory Approach, the current status of tsunami devastated lands utility was assessed at Mithakhari, Namunagarh and Ograbraj in South Andaman, Rampur in N& M Andaman and Tapoiming in Nicobar district. An interaction meeting with farmers owning tsunami affected lands was organized and four beneficiaries for intervention (2 at Ograbraj, 1 at Rampur and 1 at Tapoiming) were identified.

Pre-intervention socio-economic survey of beneficiaries was done. Broad bed and Furrow intervention was made at Ograbraj at Shri. Abdul Khader (Plate 48 a & b) and Malabar Coocnut Cooperative Society (Plate 49a & b). Fish pond intervention was made at Rampur (Plate 50 a & b).

Plate 48 a : Shri. Abdul Khader farm (Ograbraj) before the intervention

Plate 48 b: Shri. Abdul Khader farm (Ograbraj) after making of Broad Bed and Furrow

Plate 49 a: Malabar Coconut Coopeartaive Society site at Ograbraj before intrevention

Plate 49 b: Malabar Coconut Coopeartaive Society site Ograbraj after BBF intrevention

Plate 50 a : Rampur, Mayabumder site before the intervention

Plate 50 b: Rampur, Mayabumder site after intervention of fish pond

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

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

The coastal areas of Andaman and Nicobar Islands face the twin problems of waterlogging during monsoon season and water scarcity for fresh water during post-monsoon season. Further, due to sea water intrusions, the coastal land and ground water has become saline. At the same time the demand for irrigation water for vegetables during dry season and intensification of agriculture has been increasing. A study was initiated to assess and characterize the salt affected coastal soils, spatio-temporal variations in water quality and development of alternate land management strategies for island ecosystem.

Soil salinity status

The analysis of soil samples collected from all the three districts indicated that soil pH varied from 3.5 -10.4, 4.2-7.8 and 6.2-8.3 respectively in South, North & Middle and Nicobar District (Table 22). In general, soil salinity measured as EC was low but in some low lying areas it was as high as 10.1 (dS/m). In some locations, acid saline soils were also noticed. In summary, the soil salinity status of Andaman and Nicobar islands showed that 34% of the samples were non-saline while 47 % of samples were saline and 18.7% samples were slightly saline. Only 14% of the samples were strongly saline and however, there is no RSC in the soil. Among the three districts, 39%, 36% and 26% of samples from South Andaman, North & Middle Andaman and Nicobar, respectively were found to be non-saline whereas, only 12%, 11% and 19% are found to be strongly saline.

Table 22: Soil salinity status of Andaman and Nicobar Islands

Parameters	South Andaman		N & M Andaman		Nicobar	
	Range	Average	Range	Average	Range	Average
pH	3.5 -10.4	6.8	4.2-7.8	6.4	6.2-8.3	7.4
EC (dS/m)	0.5 -9.1	2.5	0.6-10.1	3.9	0.03-0.4	0.2
Ca^{2+} (meq/L)	1.5 -72.0	23.1	10.1-66.0	31.8	51.0-62.0	62.3
Mg^{2+} (meq/L)	4.5-58.0	23.7	24.2-58.0	76.3	6.2-75.5	21.9
Na^{+} (meq/L)	6.0-158.2	69.0	18.0-74.3	20.2	0.1-124.3	7.3
K^{+} (meq/L)	0.7-89.7	40.7	1.5-92.6	51.4	1.3 – 53.7	21.8
$CO_3 + HCO_3^-$(meq/L)	0.0-0.9	0.5	7.25-40.0	21.1	12.5-66.6	56.3
Cl^- (meq/L)	1.6-118.9	17.7	18.0-74.3	31.9	1.40-85.8	122.8
SO_4^{2-} (meq/L)	0.2-3.0	0.8	0.1-5.6	0.9	0.06-1.05	0.4
RSC (meq/L)	0.0	0.0	0.0	0.0	0.0	0.0
SAR (meq/L)	1.8-8.1	4.6	0.3-5.1	2.1	0-.0-0.88	0.1

Utilization of saline tolerant microbes

Fifteen salinity tolerant microbes were isolated from the rhizosphere soils of selected plants growing in saline environment and characterised for hydrolytic properties. Four most promising isolates (SM2, 1D, CHI, NW1) were further characterised for zinc solubilizing ability and maintained by sub-culturing. These isolates were inoculated and incubated for 7 days with tris minimal agar medium supplemented with zinc oxide and zinc phosphate. The clearing zone around the colony was recorded. All the four isolates produced halo around the colony which was due to the solubilizing effect of the isolates (Plate 51). The maximum solubilization of 2.3 cm was observed for CHI followed by SM2 (1.8 cm), NW1 (1.5 cm) and ID (1.2 cm). These isolates can be a potential biofertilizer for Zn solubilization under moderate saline conditions (5 dSm^{-1}).

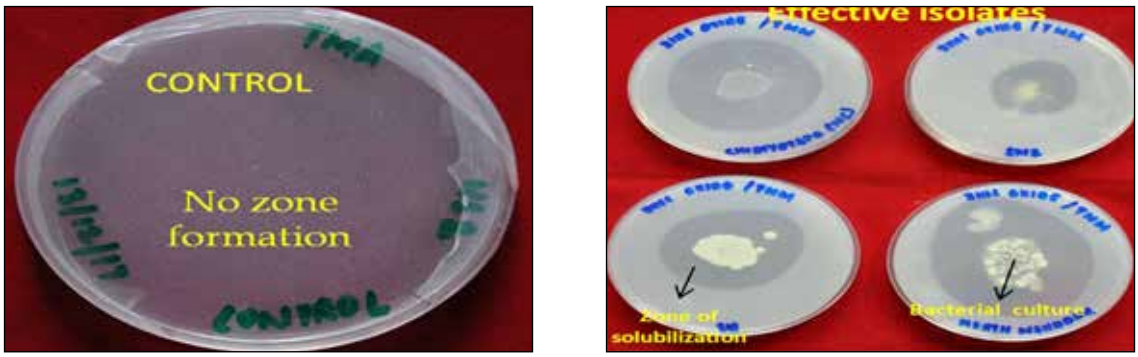


Plate 51: Zn solubilisation by the salinity tolerant bacterial isolates

Alternate practices

In order to identify and utilize the salinity tolerant wild or land races of different crops which are adapted to the saline conditions are documented. Some of the potential plants are given in the Table 23 which are observed in its natural habitats. Soil samples were also collected and analysed for the salinity status.

Table 23: Salinity tolerant crops / varieties suitable for Andaman and Nicobar condition

Underutilized species/Wild plants	Botanical name	Salinity tolerance level (dSm^{-1})	Average yield	Desirable traits
Khaari phal	*Ardisia solanaceae* Roxb., A. *andamanica* Kurz.	2-5	2 kg / tree	Salinity tolerant, grows even in waterlogged soils
Khaari khajoor	*Phoenix paludosa*	2-5	2 kg / tree	Salinity tolerant
Pond apple	*Annona glabra*	2-4	15 kg /tree	Salinity tolerant, can be used as root stock
Noni- rakshak	*Morinda citrifolia*	2-4	15 kg/tree	Salinity tolerant and adapted to hot, humid conditions
Wild nutmeg	*Knema andamanica*	2-5	-	Can be used as salt tolerant root stock for nutmeg
Jamun (local collection)	*Syzygium claviflorum*	2-3	40-60 kg/tree	Successfully grows near sea shores
Seashore mangosteen	*Garcinia hombroniana*	2-4	-	Could be used as salt tolerant rootstock for other Garcinia species
Rice land race	*Oryza sativa* Sub sp *indica*	2-4	2.5 – 3.5 t/ha	Suitable for lowlying saline areas
Pandanus- orange and yellow	*Pandanus tectorius*	2-8	40-50 kg/tree	Grows well in the coastal, saline soils, act as a bioshield

Integrated Agromet Advisory Services (Gramin Krishi Mousam Seva)

A. Velmurugan (P.I.), T. Subramani (Co-ordintor)
Advisory team: T.P. Swarnam, A. Kundu, P.K. Singh, R. Kiruba Sankar, Nagesh Ram,
S.K. Zamir Ahmed and S. Dam Roy

Andaman and Nicobar Islands experiences tropical climate and receives rainfall from both South-West and North-East monsoons. As these Islands are rainfed, agricultural production and water resources are largely dependent on the performance of monsoon. The on-going Integrated Agromet Advisory Service (IAAS) started in 23rd June, 2008 provides district wise weather based agro-advisory twice a week which are disseminated through print and electronic media for the benefit of farming community and other stakeholders.

Integrated agromet advisory

During the period (2017-18) the Agro-Meteorological Field Unit (AMFU) at ICARI-CIARI, Port Blair has issued 104 agromet bulletins covering all the aspects of agriculture production based on the weather forecast received from IMD, Pune through print and electronic media. It was aimed at minimizing the production losses and aid in timely decision making in farm operations. The agromet unit effectively utilized the services of Doordarshan, All India Radio (AIR), KVK, VRC and other means to reach out to the farmers even in remote islands.

mKISAN and SMS service

AMFU Port Blair has activated mKISAN portal of Department of Agriculture, GOI, on 24th June 2014 since then 10,708 farmers have been registered covering all the blocks of Andaman and Nicobar Islands. The registered farmers regularly receives agro advisories which are specific to their block and crops through SMS on every Tuesday and Friday both in Hindi and English. AMFU, Port Blair has sent 463 SMS and in terms of per cent of coverage of farmers and their response, GKMS, Port Blair stood first in the country (Fig. 6).

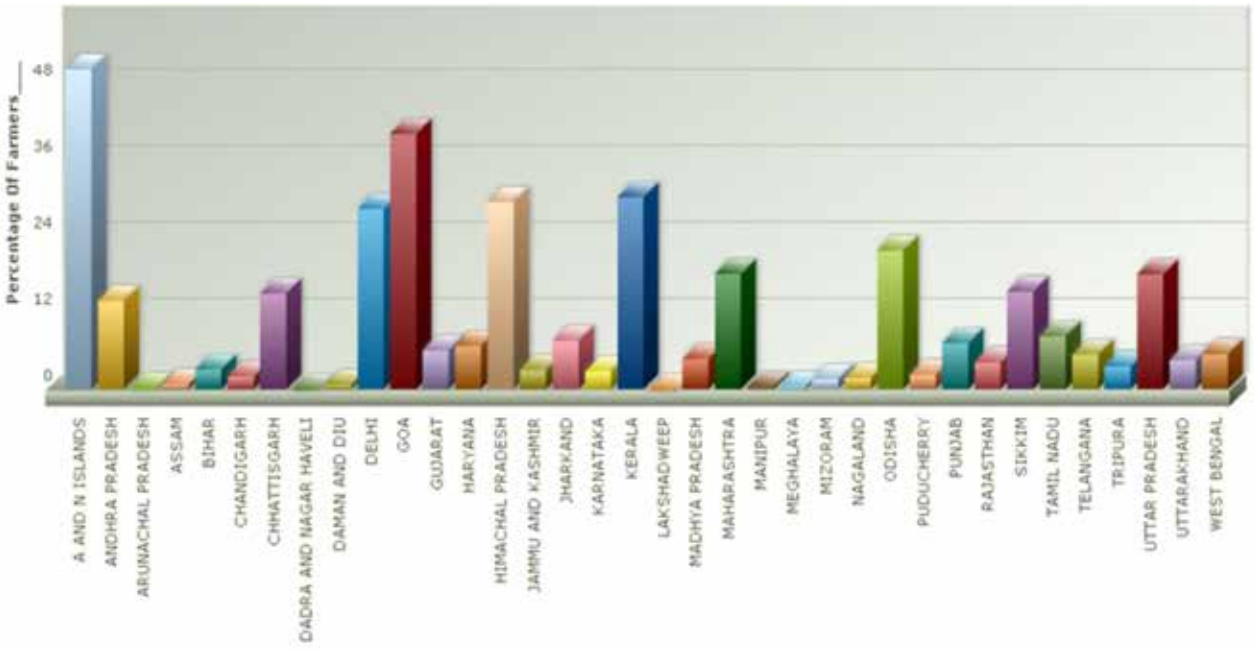


Fig. 6: Performance of AMFU, Port Blair interms of coverage of farmers

Verification of forecast

Verification of forecasted and observed values of rainfall in the islands was carried out for pre–monsoon, monsoon and post-monsoon period (Table 24). The results revealed that on an average forecasted and observed values of rainfall were matching to the tune of 65.5% for pre monsoon, 62.0% for monsoon and 68.5% for post-monsoon period. Forecast for Andaman Islands was more accurate than Nicobar Islands. Concurrently monsoon and post-monsoon seasonal forecast and advisories were also issued for long-term planning of agricultural and land improvement activities through mass media.

Table 24: Verification of forecast

Sl.No.	Particulars	State	Pre Monsoon (April to May 2017)	Monsoon (June to Nov 2017)	Post Monsoon (Dec 2017 to March 2018)
1	No. of day when rain was forecasted and also observed (YY)	Andaman	28	127	27
		Nicobar	34	99	26
2	No. of day when rain was observed but not forecasted (YN)	Andaman	2	0	6
		Nicobar	0	1	1
3	No. of day when rain was not observed but forecasted (NY)	Andaman	20	56	47
		Nicobar	20	82	77
4	No. of day when rain was not observed and also not forecasted (NN)	Andaman	11	0	41
		Nicobar	7	1	17
5	No. of matching case (YY+NN)	Andaman	39	127	68
		Nicobar	41	100	43
6	Skill score or ratio score in rainfall	Andaman	63.9	69.4	83.9
		Nicobar	67.2	54.6	53.1

Farmers awareness programme

AMFU, Port Blair, has organized awareness programme on weather forecast and organic inputs use at Neil Island in collaboration with NABARD, R.O. Port Blair and Agricultural Department on 5th April 2017, during which the farmers were apprised of moisture stress management in plantation crops, rain water harvesting and its efficient use for various crops during dry season.

SMS services during dry period

Coconut slug caterpillar infestation has become wide spread during May to June, 2017 (dry weather) at Neil island. Gramin Krishi Mausam Seva of ICAR-CIARI, Port Blair has taken initiative to manage the pest and recover the plantation by timely advices given through SMS, TV, Radio, News paper and personal contacts (Plate 52). Besides an awareness campaign cum demonstration was conducted at farmers field in Neil Island.

Plate 52: Agromet advisories issued during the pest infestation period

Evaluation and Popularisation of Value Added Compost and other Organic Inputs in Neil Island

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

In recent years increased importance is given to composting and organic waste recycling due to the occurrence of multi nutrient deficiencies in the intensively cultivated areas and environmental hazards associated with the use of agrochemicals. This necessitates the use of organic inputs in the agricultural production system. Neil island, South Andaman has been declared as organic island therefore, it is imperative to support the farmers to meet the challenges of organic farming. A project was initiated to evaluate the potential of organic waste recycling through improved method of composting and popularise the preparation of value added compost and other organic inputs at Neil Island.

Ten responsive farmers were selected after an awareness programme followed by field campaign from 7 settlements / villages located in Neil island representing farmers from all category. Ten vermicompost tanks were constructed and the farmers were given demonstration to prepare value added compost (Plate 53). Further, farmers were supplied with microbial consortia for faster decomposition and nutrient mobilization. Two field campaigns were conducted to popularise the organic inputs for plant protection, growth promotion and nutrient mobilization. The initial results indicated that composting is faster in microbial consortia added tanks as compared to the farmers practice. Use of growth promoter has increased the growth and flowering in tomato and brinjal. During the reporting period awareness on organic inputs and improved composting has been created through demonstrations, Island mela, field visit, SMS and mass media.


Plate 53: Vermicompost tank at farmers field

All India Coordinated Research Project on Integrated Farming Systems

T.P. Swarnam (P.I), A. Velmurugan, T. Subramani, S. Swain, M.S. Kundu, R. Kiruba Sankar, I. Jaisankar, Ajit Arun Waman, B.K. Nanda, S.K. Pandey and Zacharia George

Farming system approach has been widely recognized as one of the tool for harmonious use of inputs and their compounded response to make the production system sustainable. It has a greater scope for ensuring livelihood security of marginal and small farm holdings. Two site specific farming system models were evaluated over the years. The results showed that besides improving the farm production and total farm income, these IFS models also found to give income throughout the year. The temporal distribution of farm income from different components are calculated and presented below.

Economics of rice and dairy based IFS

The analysis of data (2014-2017) revealed that the IFS model improved the total farm production and enhanced the livelihood security of marginal and small farmers by way of regular income and employment generation throughout the year. The average monthly gross return and total recurring cost from the system is Rs.38300/- and Rs.21900/- respectively, indicating a well distributed net return almost throughout the year (Fig 7). The system had generated a total employment of 365 man days in a year with mean monthly employment generation of 30 man days.

Fig. 7:Month wise economic analysis of IFS

Periodicity of net income from different components of IFS

The month wise returns calculated as average of 2016-18 from different components indicated that dairy and vegetable cultivation in BBF recorded net income for more than 8 months in a year. The milk production from the livestock component ensured a well distributed net income for most part of the year. Similarly cultivation of vegetables in BBF resulted in diversification of crop cultivation and income generation for most part of the year in contrast to rice based cropping system which is seasonal (Table 25).

Table 25: Periodicity of net income from different components of IFS

Components	Monthly Net returns (Rs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RBCS*	-	-	12090	18543	12400	11400	-	-	-	-	-	22542
BBF**	6990	9999	13168	11535	6450	-	-	-	10343	9580	-	4445
Livestock	16811	2601	-	-	-	13017	18141	17861	11911	6591	12191	3861
Compost	9886	-	-	-	-	-	-	-	-	-	-	-

* Rice based cropping system, ** Broad bed and furrow

Monitoring of Pesticides Residues at National Level

A.K.Singh, T.P.Swarnam and A.Velmurugan

During the reporting period 210 vegetable samples comprising cowpea, brinjal, okra, bitter gourd, cucumber, cauliflower, cabbage, ridge gourd, bottle gourd, coriander leaf and green chilly were collected from farm gate (105), vendors of South, Middle & North Andaman vegetable markets (105) at fifteen days intervals (Plate 54). The samples were sent to Regional Plant Quarantine Station, Chennai for analysis of residues of organo chlorines, organo phosphorous, synthetic pyrethroids, neo nicotinoids and carbamate pesticides including herbicides. Besides vegetables, other major crops like pulses (10) and rice (6) were also collected from farmers and sent for the residue analysis.

Plate 54: Glimpses of vegetable sample collection from farmers

Development of Production Technologies for High Value Vegetables in Soilless Culture

T. Subramani, B. Gangaiah and V. Baskaran

An experiment on Standardization of growth media for soilless culture of high value vegetables (tomato, potato and onion) was initiated with eight treatments i.e. cocopeat + vermiculite (1:1) (T_1), cocopeat + perlite (1:1) (T_2), cocopeat + sand (1:1) (T_3), cocopeat + saw dust (1:1) (T_4), cocopeat + vermiculite +saw dust (1:1: 2) (T_5), cocopeat + perlite +saw dust (1:1: 2) (T_6), cocopeat + sand +saw dust (1:1: 2) (T_7) and soil + farmyard manure (FYM) (3:1) (T_8). The experiment was laid out in CRD with 6 replications. The seedlings of tomato (Arka Rakshak) was raised in protrays and transplanted in grow bag consisting of growth media as per the treatment schedule. Recommended package of practices and need based plant protection measures were adopted. The parameters such as plant height, number of branches and days to first flowering were recorded. Among different growth media combinations, cocopeat + saw dust (1:1 v/v) recorded higher plant height (151 cm) followed by cocopeat + sand +saw dust (1:1: 2) and soil +FYM (3:1). The number of branches was not influenced by the growth media. The early flowering was observed in plants grown in soil +FYM followed by cocopeat + vermiculite + saw dust and cocopeat + saw dust. The crop is in fruit initiation stage (Plate 55).

Similarly, onion and potato are also being grown under different media. However, the performance of both the crops is not good due to hot weather. The growth media combination of cocopeat + vermiculite (1:1) recorded higher plant height of onion (36.50 cm) and potato (56.80 cm) as compared to other treatments.

Plate 55: Soilless culture of tomato, potato and onion

Further, a hydroponic system was procured to study the performance of leafy vegetables under hydroponics and spinach was sown for the study (Plate 56).

Plate 56: Hydroponic system

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

Sachidananda Swain, K Abirami, Pooja Bohra and Pooja Kapoor

Changes in total phenol, flavonoid content and free radical scavenging activity of Noni *(Morinda citrifolia L.)* during four phenological stages

Noni fruit has been used as both food and folk medicine in tropical regions. The recent use of noni as a dietary supplement has increased greatly and is reported to have a broad range of therapeutic effects. The study investigated phenolic, flavonoid content and free radical scavenging activity of noni fruit at four phonological stages [S-1 (35 days) to S-4 (140 days)] (Plate 57). The samples of four stages were collected from Garacharma farm and cut into slices. After drying, the slices were grinded into powder form by using high speed blender. One gram sample was mixed with each 50 ml of 80% methanol solvent (kept for 1-2 day followed by centrifugation at 8000rpm for 10 min. This was repeated till the powder was devoid of color and filtered through Whattman No. 1 filter paper.

Stage-1 (35 days) | Stage -2 (70 days) | Stage-3 (105 days) | Stage-4 (140 days)

Plate 57: Phenological stages of Noni

Analysis of phenolics and flavonoid content

Highest phenolic content (6.8 mg of Gallic acid eq./g) was found in S-4 followed by S-3, S-1 and S-2 (Table 26). In comparison to S-1 stage, the phenolic content decreased by 2.4% in S-2 stage and thereafter increased by 19.8 and 48.4% during S-3 and S-4 stage. Highest flavonoid content was estimated at S-2 (8.01 mg quercetin/g) and least in S-4 (4.24) indicating the highest phenolic content may not be tentamount to highest level of flavonoid content though the flavonoids are the subclasses of total phenolic content. Compared to S-1, the flavonoid content increased by 58.7% followed by decrease in 3.1 and 15.8 % as the fruit goes into maturity. The reason may be tropical growing climate in the Islands where high phenolic compounds might have synthesized in the plant to defend against oxidative stress vis-à-vis reactive oxygen species (free radicals).

Change in Free Radical Scavenging Activity (FRSA)

Highest free radical scavenging activity (DPPH, ABTS, hydroxyl radical ($OH^{\cdot}$)) was observed in fully ripe stage (S-4) except FRAP, NO, MCA, H_2O_2 and RP. It is interesting to note than the S-1 stage fruit contains high NO (320 mg vit-C/g), H_2O_2 (670 mg vit-C/g), MCA (9.4 mg EDTA/g) activity with highest reducing power (12.25 mg BHT/g). During developmental stage, (35-140 days), with respect to S-1 stage DPPH and ABTS activity increased by 257%, 45.7%. It was also observed that FRAP, NO, H_2O_2 and MCA activity decreased during phonological stages (S-1 to S-4) with significant ($p<0.05$) changes in H_2O_2 activity (79.2%) and MCA (40.4%). So, it is of industrial importance that fruit may be harvested at early maturity stage for making drugs/nutraceutical compounds to curb against NO, H_2O_2 and MCA related/mediated free radicals instead of current practice of fully ripen stage.

Table 26: Phytochemicals in four stages of Noni

Stages	Phenol (mg/g) GAE	Flavonoids (mg/g) quercetin	DPPH (mg/g) BHT	ABTS mM trolox/g	FRAP (mM Fe+2/g	NO mg/g Vit-C	H_2O_2 mg/g Vit-C	OH (mg/g) BHA	MCA (mg/g) EDTA	RP (mg/g) BHT
S-1	4.38	5.04	2.64	18.15	6.3	3.20	6.70	1.97	9.4	12.25
S-2	4.27	8.01	4.15	13.55	6.18	9.6	3.77	1.84	8.4	12.7
S-3	5.25	4.88	3.4	13.5	6.37	2.04	2.09	1.92	7.6	9.9
S-4	6.50	4.24	9.45	26.45	5.45	2.84	1.37	2.19	5.6	11.45

(DPPH: 2,2- diphenyl-1-picrylhydrazyl; ABTS: 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid); FRAP:Ferric Reducing Ability of Plasma; NO: Nitric Oxide; MCA: Metal Chelating Activity)

With the increase in the concentration of extracts, the scavenging activity increased reflecting their dose dependent potential. Highest radical scavenging activity was observed in DPPH (70.33 -83.17%) and ABTS radicals (54.16 -86.17%) potential whereas non-significant differences were found in ferrous ion reducing potential (FRAP) and hydroxyl radical ($OH^{\cdot}$) scavenging activity (Fig. 8).

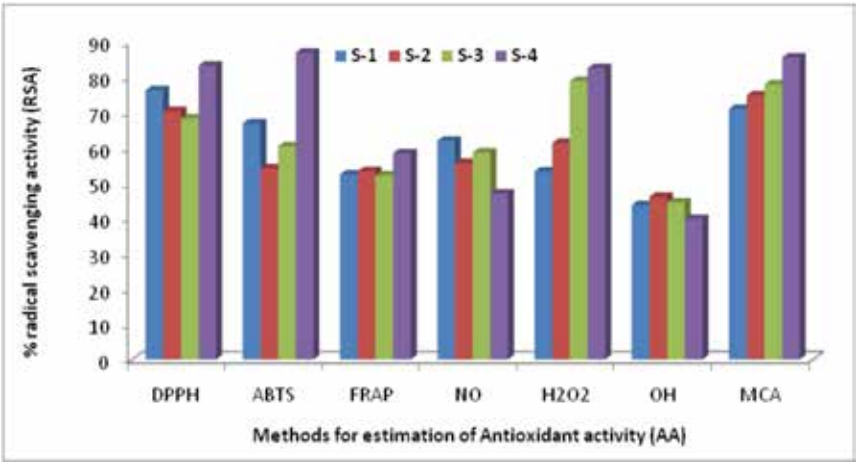


Fig. 8: Scavenging activity of noni

However, the extracts were strong in DPPH, ABTS and H_2O_2 scavenging activity indicating as a viable source of antioxidant. Since reactive oxygen species are thought to be associated with food deterioration, the pathogenesis of chronic infections, and inflammatory diseases, the observed inhibitory potential may partially explain the helpful effects of noni fruit in treating different disease conditions.

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

Sachidananda Swain, S. K. Zamir Ahmed, L. B Singh, Chandrika Ram, Manoj Kumar, Tauqueer Ahmed and P. Misra Sahoo

Post Harvest losses in marketing of fruits and vegetables

The study was conducted in four marketed places (Neil Islands, Hut bay, Chouldari and Junglighat market) and selected villages (Bharatpur, RK Pur, Rabindra Nagar, Namunaghar, Hashmatabad and Ferrargunj) to analyse the market chain of fruits and vegetables (Plate 58 & 59) .

Improper handling of fruits during transportation

Among the interviewed, more than thirty six (72 %) of the respondents received improper packed commodities except tomato and mango from Neil Islands. Forty two (84 %) of the respondents received dusty fruits and none of them washed it before selling. Twenty nine (58 %) of the respondents received physically injured fruits from the distributors. In addition 39 (78 %) of them received both physically healthy and spoiled fruits in the same container (Table 27).

Table 27: Interview results related to fruit transportation

Interview statement	Response (%)		
	Always	Sometimes	Never
Have you ever received muddy and dusty fruits/vegetables from the distributors?	8	42 (84)	-
Have you ever received physically injured fruits/vegetables from the distributors?	29 (58)	13 (26)	8
Have you ever received both spoiled and healthy fruits in the same container from the distributers?	39 (78)	11	-
Have you ever received fruits in packed form?	36 (72)	14	-

Problems related to marketing area

The interview results indicated that forty four (88 %) of fruit/vegetable shops do not wash the fruits before selling and even they do not have the problems (86%) for selling those injured commodities. 92% of the shops never store physically injured and spoiled fruits separately which is the major cause of losses. Even, they are not lowering a single price for the minor spoilaged commodities rather throwing to the municipal vehicles next day. Twenty nine (58 %) of the vendors responded that their clients always touch fruits by their hands for sorting (Table 28).

Table 28: Problems related to marketing area/shop

Interview statement	Response (%)		
	Always	Sometimes	Never
Have you ever washed fruits before selling?	1	5	44 (88)
Is fruit loss due to spoilage and physical injury a problem to you?	-	7	43 (86)
Have you stored injured spoiled and healthy fruits separately?	-	4	46 (92)
Do other people touch by hand for sorting during marketing?	29 (58)	15	6
Do you use the measuring balance for other commodities also?	38 (76)	7	5

Majority of fruit vendors 38 (76 %) used the beam balance for weighting other commodities The results indicated that majority of the fruit vendors had with inadequate knowledge about whether fruits are cause of food born disease, cause of spoilage, the effect of spoiled fruits on the healthy fruits and cross contamination of fruits. This might be due to the educational background and lack of information. Vehicles and containers used to transport fruits and vegetables could be a source of potential contamination. In all fruit marketing areas there were inadequacies regarding to handling practice especially in storage conditions, using measuring balance and manipulating of fruits. Animal dung are the main reservoir for many pathogenic microorganisms.

Table 29, shows the contribution of different market functions to loss of produce. About 73.3 % of the respondents had the opinion that the major function causing the loss of the produce was inappropriate packaging and poor handling. Whereas, 23.3 % opined the lack of cold storage facility and 3.4% opined poor quality of the produce as the major cause of post harvest loss of the horticultural produce. From these observations, it is evident that the major factor causing the loss of the produce was inappropriate packaging and poor handling followed by lack of cold storage facility and finally poor quality of the produce.

Table 29: Contribution of different market functions to loss of the produce as ranked by the wholesalers at three major wholesale markets (Hut bay, Junglighat and Neil Islands) n=30

Market functions	Responses	
	Number of respondents	% of respondents
Lack of cold storage facility		
Ranked 1st	7	23.3
Ranked 2nd	14	46.7
Ranked 3rd	9	30.0
Total	30	100
Inappropriate packaging and poor handling		
Ranked 1st	22	73.3
Ranked 2nd	7	23.3
Ranked 3rd	1	3.34
Total	30	100
Poor quality of the produce		
Ranked 1st	1	3.4
Ranked 2nd	9	30.0
Ranked 3rd	20	66.6
Total	30	100

Features of post harvest deterioration of commodities (Mango, Banana, Pine apple and Vegetables)

Softening and microbial decay were the main features of losses accounting for 15.4 and 12.9 % of the total postharvest losses at the wholesale market stage (Table 30). Microbial decay of 1.6 % and 4.9 % during harvesting and transportation stage were the main deterioration features during transport and harvesting stages, respectively.

Table 30: Features of post harvest damage during harvesting, transportation and wholesale marketing stages

Damage feature (%)	Harvest stage	Transportation stage	Wholesale market stage
Mechanical Injury	0.8^{a}	6.8^{b}	0.1^{c}
Softening	0.0^{b}	1.6^{b}	15.4^{a}
Microbial decay	1.6^{b}	4.9^{a}	12.9^{c}

(Means of same letters within row are non-significant according to Turkey-HSD test)

Degree of post harvest losses in selected commodities

The losses occurring during harvest, post harvest handling, and storage were calculated at farmers, whole sellers and retailers stage and the result indicated highest post harvest losses in banana (26%) followed by mango (22%), tomato (20%) and vegetables (19%).


Plate 58: Data collected from farmers and farmers' meet at Rabindra Nagar (Hut Bay)


Plate 59: Post harvest losses at retailer level (Bathubasti and Hut Bay)

Food Processing Training Centre (FPTC)

Sachidananda Swain

Training and demonstration for the development of value added products from mango, pine apple and bael

As per norm of FPTC, a training-cum-demonstration on value addition of mango, pine apple, bael and coconut were conducted (Plate 60) wherein 34 participants including 32 females got benefitted from the programme. Trainees learnt about the scope and status of post harvest processing of food crops, their effective utilization, orchard management, application of organic input for quality fruit production, maturity index, value addition, insect and pest management during storage and economic analysis of setting up small scale food processing plant. Demonstration of RTS juice, squash, jam, jelly and candy from mango, bael were imparted.


Plate 60: Training and demonstration on value added products to the SHG's/rural women and youths

DIVISION OF ANIMAL SCIENCE

Poultry Seed Project

A.Kundu and T.Sujatha

Breeding performance of Gramapriya breeders (Third Batch)

The third batch of 340 female and 60 male Vanaraja breeder chicks were procured from Directorate of Poultry Research (DPR) Hyderabad in November, 2016. During the year 2017-18, a total of 268 female and 34 male Gramapriya breeders (Parent stock) entered into breeding stage, wherein 14578 numbers of hatchable eggs were produced during the period from 24 to 71 weeks of age. The age at sexual maturity (ASM) was 170 days with average egg weight of 34.06±18.6 g and the egg weight of 58 g reached at 35 weeks of age. The age at 5% and 50% egg production were 26 and 38 weeks respectively (Table 31). During breeding period, average feed allowance was 145 g per bird per day. The body weight during the period of 24 to 45 weeks of age ranged from 2581±58.62g to 3075±46.3g for males and 1736±45.3 to 2573±26.2g for females respectively.

Table 31: Production and reproductive performance (mean±SD) of Gramapriya breeders

Weeks	Percent Hen Day Egg Production	Egg weight (g)	Percent Hatchability
23-26	29.63 ± 12.56	35.62 ± 1.71	46.22
27-30	31.61± 18.15	37.63± 2.36	47.48
31-34	36.22± 22.64	45.86± 2.25	57.58
35-38	38.15± 23.14	58.49± 2.36	54.88
39-42	27.71± 15.26	58.14± 1.63	37.91
43-46	23.35± 14.48	59.67± 1.10	43.1
47-50	20.44± 15.43	56.03± 1.06	
51-54	20.93± 21.46	58.28± 1.93	
55-58	20.21± 19.56	57.8± 1.48	
59-62	22.71± 17.43	57.95± 2.06	

Growth performance of Vanaraja breeders (Fourth Batch)

Six hundred twenty seven Vanaraja chicks including 565 female and 62 male were brought from DPR, Hyderabad and the standard managemental practices were followed for the parent stock. The cemented brooding area was covered with paddy husk and standard brooding arrangement was made by providing with uniform brooding facilities using 60 W incandescent bulbs. Floor space of 675 cm^2 . Growth performance of Vanaraja breeders up to 4 weeks of age is presented in Table 32.

Table 32: Growth performance (Mean±SEM) of Vanaraja breeders

Age in weeks	Body Weight (g)	
	Male	Female
0 day	35.6 ± 1.37	34.9 ± 1.34
4	306.7 ± 3.36	165.8 ± 2.17

Propagation and distribution of poultry germplasm

During the reporting period 839 Vanaraja chicks, 1268 Gramapriya chicks, 4002 Vanaraja hatchable eggs and a total of 4650 Gramapriya hatchable eggs were distributed (Plate 61) (Table 33).

Hatched out chicks were sold at 3 weeks of age gained average body weight of 550 g at 8 weeks in the field.

Plate 61: Distribution of Vanaraja chicks

Table 33: Details of poultry germplasm propagation and distribution

Germplasm distribution including hatchable eggs (Nos.)	Revenue generation (Rs.)	Beneficiaries (Nos.)
10,759	1,96,365.00	170

Establishment of Duckling Resource Unit for Sustainable Duck Production in North and Middle Andaman

T.Sujatha, A.Kundu, Jai Sunder and Shardul Lal

A baseline survey (Table 34) was conducted in Nimbudera in collaboration with KVK, Nimbudera to select the target farmers to establish demonstration units. A survey proforma was developed for this purpose. A total of 40 woman farmers were interviewed. A total of five farmers were selected based on their involvement in the hatchery operation and presence of pond so that elevated house can be constructed over the pond which is highly essential for duck farming (Plate 62). However, the major constraint was found to be unavailability of ducklings on routine basis.

Table 34: Baseline survey on duck farming at North and Middle Andaman

S.No.	Parameter	Particulars
1.	Average Land holding	30 Bigha
2.	Average size of family	4 members
3.	Education status	VIII – XII
4.	Type of birds	Duck, mainly local ducks and other desi birds
5.	Average No. of hatchings per year	3

S.No.	Parameter	Particulars
6.	Male Female Ratio	1:5 (1 to 15)
7.	Average egg production %	180 eggs / duck / year
8.	Hatchability %	40 - 70% natural hatching using broody hen
9.	Feeding to duck	Rice & Wheat only
10.	Feeding and watering management	No knowledge on protein feeding
11.	Brooding	Natural brooding
12.	Housing	Crude type / no housing
13.	Mortality	Severe mortality due to outbreak of diseases 2-3 times in a year
14.	Utilisation pattern of eggs	Hatching/household consumption/few eggs are sold
15	Income from duck	Good
16	Major constraint	Unavailability of ducklings for small scale production of ducks

Based on the report from baseline survey, the following package of scientific technologies, concept and practice were formulated for scientific interventions.

- **Practice of elevated housing**: This practice of elevated housing will be helpful to address the issues of water logging to avoid unhygienic condition of duck rearing.
- **Feeding technology on balanced plan of nutrition:** Balanced plan of nutrition will reduce protein, vitamin and mineral deficiency.
- **Concept of 'by farmers to farmers' using mini incubator for artificial incubation:** Natural incubation provides less number of ducklings. The concept of "**by farmers to farmers"** using mini incubator will increase the production of ducklings. A linkage will be established among the farmers that are self-sustained for the ducklings.

Capacity building and establishment of initial units and Mini Incubator

- Training programme was conducted for 21 farmers on various technologies suitable for duct rearing (Plate 63).
- Three elevated sheds were constructed adjacent to the pond in a farmers' participatory mode (Plate 64). Subsequently, a total of 150 ducks with feed were distributed (Plate 65).
- Mini incubator was installed and demonstration on incubator operation was conducted among target farmers (Plate 66).

Plate 62: Field survey and selection of farmers with KVK, Nimbudera

Plate 63: Training-cum-demonstration


Plate 64 & 65: Establishment of small duck breeder unit at farmer field and distribution of ducklings

Plate 66: Installation of mini incubator cum setting of eggs

Impact of the work

1. **Balanced feeding:** farmers started preparing their own feed mix of rice, wheat, coconut and calcium supplementation

Age (weeks)	Body weight (kg.)		Liability (%)	Male : Female ratio
	Drake (kg)	Duck (kg)		
14	1.330	1.259		1.5

2. **Growth rate : Table 5 may be referred**

Table 35: Growth parameters of ducks

3. **Production performance**

a. Age of sexual maturity : 180 to 200 days

b. Egg production (Table 36)

Table 36: Egg production of ducks

Farmer	Ducks (No.)	Eggs (No.)	Period
Farmer 1	20 ducks : 5 drakes	110	20 days
Farmer 2	20 ducks : 5 drakes	280	22 days
Farmer 3	17 ducks : 6 drakes	387	80 days

4. **Hatchability performance (Table 37)**

Table 37: Hatchability performance of ducks

Batch	Eggs set (No.)	Ducklings (Nos.)	Hatchability %
First batch	50	15	30.0
Second batch	120	57	47.5
Third batch	120	67	55.8

Hatching performance has improved in the third batch that indicated farmers were empowered to manage the duck farming scientifically. They also acquired the skill of handling the mini incubator.

5. **Economics**

By selling 70 excess males, the farmers earned an amount of Rs. 28000/- and could produce 139 ducklings in 84 days.

6. **Implementation of concept ‘’by farmers to farmers”**

Under concept of “by farmers to farmers’’, farmers were producing, setting the eggs and hatching out the ducklings using knowledge and skill of handling mini incubator and selling ducklings to other farmers. In this way, self-sustained concept of ‘’by farmers to farmers” has become successful (Plate 67 & 68).

Concept of 'By farmers to farmers'

Plate 67: Production, setting of duck eggs and production of ducklings by farmers

Plate 68: Supply of ducklings to other farmers

AICRP on Goat Improvement- Andaman Local Goat

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

Three clusters have been established in different villages of South Andaman, Baratang and Nimbudera of North & Middle Andaman District. Baseline information of the farmers and data on the body weight and performance of the goats were recorded. Sixty new farmers with 486 goats were registered and added in the total flock of 3359 goats during the year. During the period 1041 newborn kids were also recorded with a population growth of 108 %. The overall least square mean of body weight (kg) at birth, 3, 6, 9 and 12 months of age were 1.43±0.02, 5.62±0.16, 9.92±0.48, 13.14±0.42 and 16.41±0.23(Table 38). During the period the mortality rate was 6.5% and a total of 233 goats died. The cause of death was mainly due to bloat, diarrhoea, dog bite, accidents etc. Age at first mating, weight at first mating, age at first kidding, weight at first kidding, kidding interval, service period and gestation period were 252.65 ± 0.72 days, 11.71 ± 0.18 kg, 407.53 ± 2.86 days, 16.38 ± 0.09 kg, 273.55 ± 1.21 days, 98.69 ±1.46 days and 146.29 ± 0.26 days, respectively. The kidding percentage of 153.77% on the basis of does kidded and the kidding rate of 1.54 was recorded in the present stock of Andaman local goats (Table 9).

The farmers were also given the health tonics, mineral mixtures and other antibiotics for totalitarian health management of their flocks. During the year a total of eight superior bucks in South Andaman district and eight superior bucks and one doe in North & Middle Andaman district were distributed to the farmers for genetic improvement of the local goats and breeding purpose. Eleven trainings exposure visits/health camps were conducted during the year. Though 225 farmers were benefitted (Plate 69, 70 & 71). The average body weight of adult doe increased to 16.57±0.05kg from 16.10±0.12kg. Mineral mixtures and other health tonics were provided to 4161 goats in the field at three clusters of ICAR-CIARI unit. Special concentrate such as wheat and rice bran was also provided to pregnant does. Mineral mixtures were provided to the pregnant does in the last stages of pregnancy and there was reduction in the kid mortality and an improvement in the overall health of the kid and the doe. The mortality during the period was reduced to 3.59 % from 8.60 %. Timely deworming was advised and practised for 2521 goats. The new born kids were also given more care by providing the vitamin tonic and sufficient milk of the does. The weaning weight of the goat kids increased from 5.91 kg to 6.02 kg. Abortion problems were also reduced from 4.2% to 3.2%. Twelve bucks were also exchanged among the farmers of 12 villages in South Andaman cluster. To bring scientific awareness, leaflets on "*Scientific goat farming*" in English and "*Dweepon mein bakri palan*" in Hindi were prepared and distributed to all the farmers in all the three clusters. The overall economic growth of the farmers was 52 % after the implementation of scientific intervention through the project. Most of the selected farmers have increased their share of income from goat to the total family income.

Table 38: Biometric Dimensions (Least Square Mean of Body Weight Growth in Andaman local goats)

Factor	Weight (kg)				
	Birth	3 month	6 month	9 month	12 month
2015-16	1.40±0.01 (n=106)	5.58±0.08 (n=307)	9.61±0.23 (n=280)	13.21±0.17 (n=303)	16.07±0.04 (n=217)
2016-17	1.42±0.54 (n=378)	5.59±0.10 (n=328)	9.63±0.04 (n=411)	13.24±0.19 (n=326)	16.10±0.12 (n=460)
2017-18	1.43±0.01 (n=797)	5.64±0.02 (n=880)	9.68±0.04 (n=886)	13.26±0.03 (n=753)	16.56±0.03 (n=686)
Overall mean (2015-2018) (all clusters)	1.43±0.02 (n=1333)	5.62±0.16 (n=1587)	9.92±0.48 (n=1618)	13.14±0.42 (n=1411)	16.41±0.23 (n=1385)

Data have been presented as mean±SEM , n=number

Table 39: Reproductive Performance in Andaman Local Goat

S.No	Particulars	2014	2015	2016	2017
1	No. of available does for breeding (X)	1078	1043	543	843
2	No. of does available during kidding of those available for breeding (A)	1040	543	310	526
3	No. of does bred (Y)	-	-	427	683
4	Tupping % (Yx100)/X	-	-	78.63	81.0
5	Tupped does available at kidding (B)	-	-	345	677
6	Does Kidded	83	416	345	677

S.No	Particulars	2014	2015	2016	2017
7	Single (C)	33	242	176	375
8	Twins (D)	98	324	324	648
9	Triplet (E)	3	27	21	18
10	More > 3 (F)	-	12	-	
11	No. of abortion (G)	22	14	9	22
12	No. of still Birth (H)	14	7	NIL	8
13	Breeding efficiency/fertility				
	a) On the basis of does tupped (C+D+E+F+G*100)/B	-	-	153.62	157.01
	b) On the basis of does available (C+D+E+F+G*100)/A	-	-	170.96	202.09
14	Actual live birth (I)	134	605	521	1041
15	Kidding (%)(on the basis of does kidded) (I*100/B)	161.4	145.43	151.01	153.77
16	Kidding Rate (Litter Size) (I/B)	1.61	1.45	1.51	1.54


Plate 69: Awareness on scientific goat rearing


Plate 70: Health management for scientific goat farming (Left) &
Plate 71: Distribution of elite goat germplasm for genetic upliftment (Right)

AICRP on Pig

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

The unit started with 20 breedable stock with 9 female and 11 male. At present the herd strength is 42. The herd dynamics has been given in Table 40. During the reporting period five farrowing has been recorded with 27 piglets. Salient parameters like litter size at birth (No.), litter weight at birth (kg) and litter size at weaning (no.), were recorded as 5.4 ± 1.4, 9.92 ± 1.74 and 5.0 ± 1.49, respectively. Piglet mortality had been reduced substantially at pre weaning stage (7.4%) and post weaning stage (9.52) (Table 41) which was well below the national average (10%). The details of performances have been given in Table 42.

Table 40: Herd dynamics of pigs maintained at ICAR-CIARI

Details (Nos.)	Andaman local pigs		
	Male	Female	Total
Opening balance (as on 31/3/2017)	11	8	19
Birth during 1/4/2017 to 31/3/2018	22	22	44
Total	33	30	63
Mortality	7	1	8
Sold	10	3	13
Total	17	4	21
Closing balance as on 31/3/2018	16	26	42

Table 41: Pre and post weaning mortality status of pigs

Details (Nos.)	Pre weaning mortality			Post weaning mortality		
	Male	Female	Total	Male	Female	Total
Total animals	14	13	27	33	30	63
Animals died	02	0	2	5	1	6
Mortality %	14.28	0	7.4	15.0	3.3	9.52

Table 42: Growth performance (Mean±SEM) of Andaman Local Pigs

Traits	Mean ± SE		
	Male	Female	Total
Litter size at birth (No.)	2.8 ±0.73	2.57 ± 0.43	5.4 ±1.4
Litter weight at birth (kg)	5.82 ± 1.55	4.5 ± 0.82	9.92 ± 1.74
Litter size at weaning (no.)	2.4 ± 0.81	2.6 ±0.67	5.0 ±1.49
Litter weight at weaning (kg)	49.32 ± 13.39	46.12 ± 9.42	92.45 ± 13.76
Avg. individual weight at birth (kg)	1.53 ± 0.10	1.31 ± 0.09	1.42 ± 0.10
Avg. individual weight at weaning(kg)	13.90 ± 0.53	14.25 ± 0.33	14.01 ± 0.45

No. of days for weaning	56	56	56
Pre weaning mortality rate (%)	14.28	0	7.40
Post weaning mortality rate (%)	15	3.3	9.52
Pre weaning growth rate (kg/d)	0.29 ± 0.01	0.31 ± 1.56	0.35 ± 0.00
Post weaning growth rate (kg/d)	0.36 ± 0.01	0.37 ± 0.008	0.36 ± 0.01
Overall growth rate (kg/d)	0.35 ± 0.01	0.41 ± 0.031	0.39 ± 2.50
Body weight at different ages (kg)			
At birth	1.53 ± 0.10	1.31 ± 0.09	1.42 ± 0.10
At 1 month	5.67 ± 0.15	5.96 ± 0.2	5.82 ± 0.11
At 2 month	14.23 ± 0.37	15.13 ± 0.33	14.15 ± 0.23
At 3 month	19.41 ± 0.95	20.42 ± 0.51	19.05 ± 0.48
At 4 month	28.25 ± 0.25	27.25 ± 0.25	28.62 ± 0.23
At 5 month	44.40 ± 2.13	41.93 ± 4.25	43.78 ± 3.25
At 6 month	58.40 ± 3.15	57.93 ± 5.31	58.87 ± 4.52
At 37 month	75.45 ± 2.13	70.81 ± 4.25	72.25 ± 3.25
At 8 month	85.40 ± 3.27	75.45 ± 9.45	78.5 ± 6.89
At 9 month	80.50 ± 5.56	78.93 ± 6.35	79.78 ± 5.26

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

Jai Sunder and Arun Kumar De

Sero-surveillance and monitoring of Foot and Mouth disease (FMD) in cattle, buffalo and goats were conducted during 2017-18. Under the National FMD sero-surveillance, 533 pre-vaccinated and 376 post-vaccinated sera samples were collected from different villages of South Andaman district during 21st and 22nd rounds of vaccination. The last outbreak of FMD was reported in the year 2005 with serotype O, since then no clinical case of FMD has been reported from any farm animal in A & N Islands. For conducting routine monitoring of animals for presence of any traces of FMD virus, DIVA (differentiating vaccinated from infected animals) ELISA tests were conducted. During the year, 463 random sera samples collected from different areas of A & N Islands were screened by DIVA- ELISA. The result indicated that only 6 (1.29%) of the tested sera samples showed positive results (Fig. 9). However, the clinical examinations of the positive animals did not exhibit any signs and symptoms of FMD infection. The trend of the test result during the last six years indicated that there is sharp decline in the number of positive samples which indicates that there is less chance of circulation of FMD virus among the population.

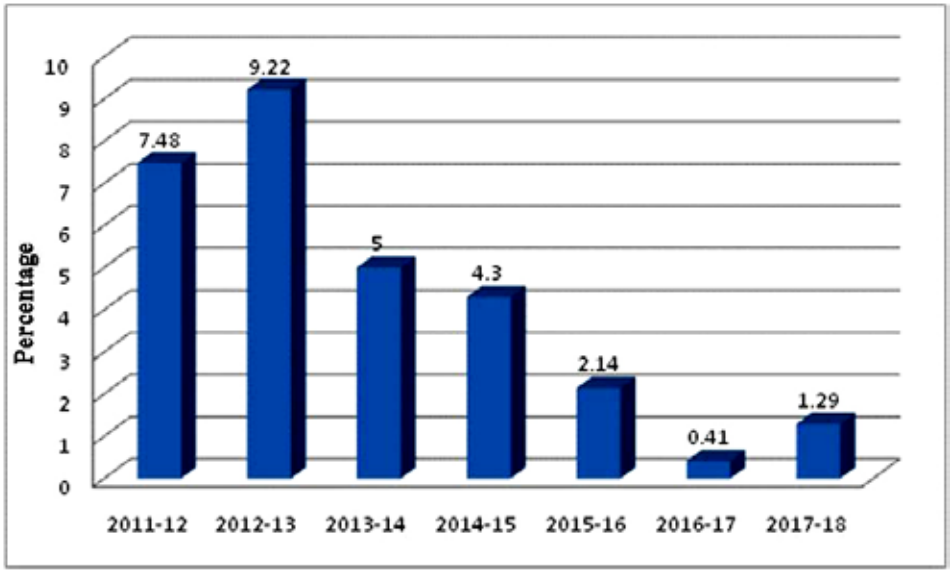


Fig 9: Trend of DIVA-ELISA percent positivity since 2011-12

AICRP on Animal Disease Monitoring and Surveillance

Jai Sunder and T. Sujatha

No major disease outbreak was recorded in livestock during the year 2017-18 except clinical cases of contagious ecthyma (orf) in goat. During the year 18521 clinical cases of various parasitic, bacterial and viral disease were reported. Parasitic diseases (99%) were the major problem followed by bacterial and viral diseases (Table 43). The main parasitic infections reported were ascariasis, fasioliasis, and Amphistomiasis (Table 43).

Table 43: Status of diseases reported in 2017-18

Disease	No. of Cases	In percent
Parasitic		
Fascioliasis	5267	28.61
Ascariasis	4915	26.70
Amphistome	5132	27.88
Strongyloids	1604	8.71
Stephanofilariasis	153	0.83
Round worms	729	3.96
Haemonchus contortus	25	0.14
Moniezia	109	0.59

Paramphistomiasis	206	1.12
Coccidia	270	1.47
Babesiosis	92	0.50
Total parasitic cases	**18502**	
Bacterial		
Leptospirosis	14	0.90
Salmanellosis	5	
Viral		
Orf	149	
Grand total	**18670**	

Temporal distribution

Fasioliasis: Monthly average incidence of fascioliasis was 236 in cattle, 47 in buffaloes and 136 in goats. The overall percent prevalence was found to be high in buffaloes (7.2%) followed by cattle (4.3%) with no specific trend (Fig. 10).

Amphistomiasis: The average number of recorded cases per month was 89 in cattle, 12 in buffaloes and 256 in goats. The percent prevalence was found to be high in goats (6.7%) followed by buffaloes (1.9%) with fluctuating frequency trends (Fig. 10).

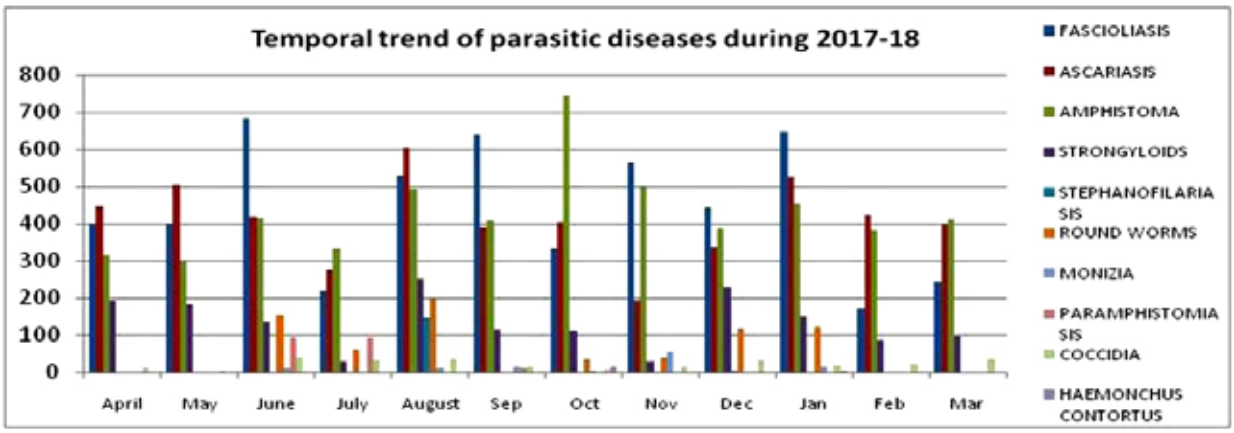


Fig 10 : Temporal disease pattern of parasitic diseases during 2017-18

Spatial distribution of major parasitic diseases

Occurrence of parasitic diseases was comparatively more in South Andaman (72%) followed by North & Middle Andaman (22%) and Nicobar (6 %) which was calculated on the basis of proportion of livestock population density and distribution (Fig. 11). *Ascariasis*: The average number of recorded cases per month was 132 in bovine, 29 in bubaline and 216 in caprine. The percent prevalence was found to be high in caprine (5.7%) followed by bubaline (4.4%) (Fig. 10).

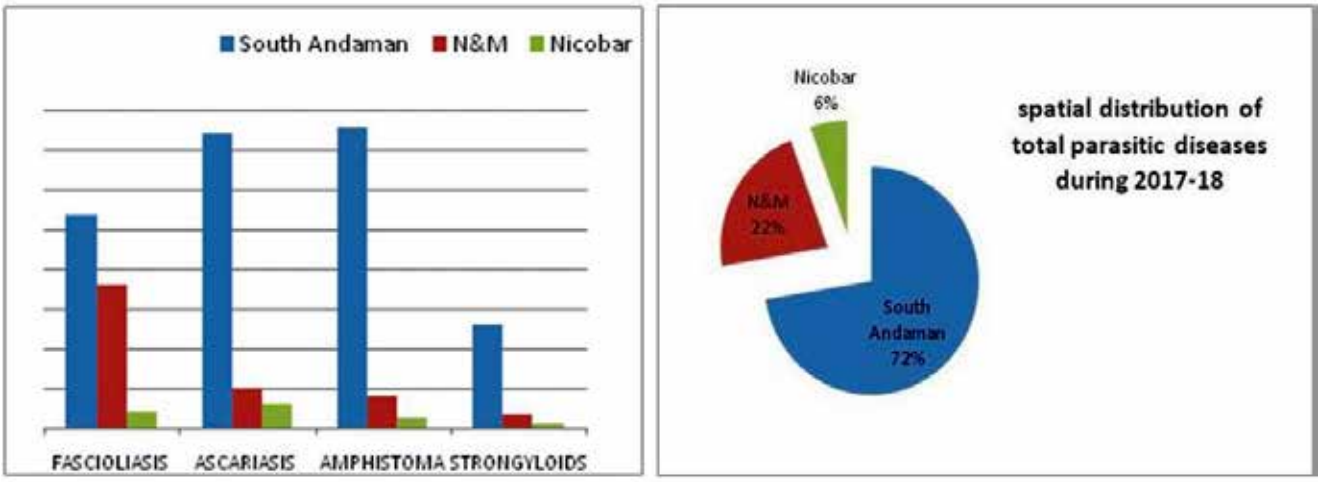


Fig. 11: Spatial distribution of major parasitic diseases during 2017-18

Sero-surveillance of important viral and bacterial diseases

During the year, a total of 392 sera samples were collected from goat from South, N & M Andaman and Nicobar Islands. The samples were screened for presence of antibodies against *Peste des petits ruminants* (PPR), blue tongue and *Brucella*. The results revealed that out of 302 sera sample 161 (53.31%) showed antibodies against PPR virus. Screening of serum samples by ELISA for brucellosis was negative in all the 378 goat samples. Serological evaluation by rapid test card for Avian Influenza Virus Ag was negative in all the 50 cloacal swabs collected from Nicobari fowl, broilers, layers, desi birds and Gramapriya dual purpose breeds. Sero screening by ELISA kit Bovine blue tongue was negative in all the 180 cattle sera samples. Sero screening by rapid test card for Bovine tuberculosis was negative in all the 79 cattle sera samples (Table 44).

Table 44: Sero-surveillance of important diseases

Diseases	Total sample screened	% Positive
PPR	302	53.31%
Bovine Blue tongue	180	0 %
Goat Brucellosis	378	0 %
Bovine tuberculosis	79	0%
Avian Influenza virus	50	0%

Detection of Orf virus from an outbreak in goat

Orf (*contagious pustular dermatitis or contagious ecthyma*) is one of the most widespread, benign or contagious, communicable, zoonotic, economically important viral disease caused by parapox virus of the subfamily Chordopoxvirinae, family Poxviridae. This detection of orf virus by molecular method is the first of its kind in Andaman and Nicobar Islands. During the year a total of 149 clinical cases of orf were reported in goats in the A & N Islands. The clinical symptoms observed were mainly erythematous spots or swellings followed by formation of papules and then scab in and around the mouth (Plate 72), tongue, gums, inner thigh. The morbidity of the disease was found to be more than 75%. However mortality was less than 10%. The attack rate in the population was found to be 27.8 %.

Plate 72: Showing pustular lesion of orf

An attempt was made to confirm the orf virus by PCR based assay targeting the major envelope membrane glycoprotein (B2L) gene of the orf virus. A total of 9 scab samples were collected from the affected goats. DNA was isolated using Quiagen Pathogen Kit followed by processing for molecular detection of virus by nested PCR. A set of three primers pair in a semi nested PCR format was used. During the first step a set of pan-parapox primer (PPP-1) and pan-parapox primer (PPP-4) primers was used to generate the product. Later in semi nested PCR a set of inner primer PPP-3 was used with PPP-4 for amplification of 235 bp fragment (Lane 5, Fig. 12).

The analysis of the PCR product revealed the confirmation of the Orf virus in the scab samples collected from nine goats. The product size of 235 bp was amplified from the scab samples by semi-nested PCR. However, multiple bands were produced in the first PCR using PPP1 and PPP4 primers. The result confirmed the presence of orf virus in the scab sample collected from the goat.

Virus	Gene	Sequence (5'-3')	Predicted Size
Orf	PPP-1 PPP-3 PPP-4	5'gtc gtccacgatgagcagct-3' 5'-gcgagtccgagaagaatacg-3' 5'-tacgtgggaagcgcctcgct-3'	235bp

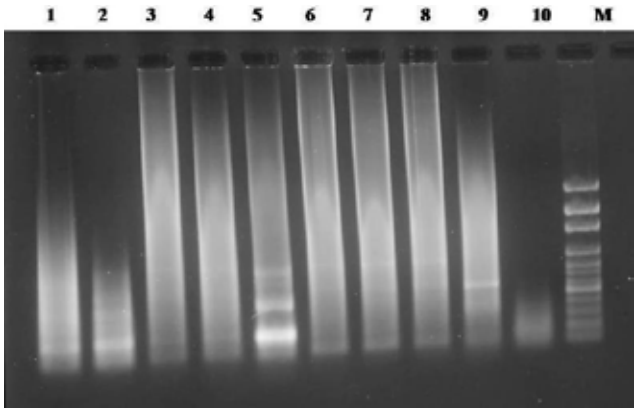


Fig 12 : Showing 235 bp amplicon of major envelope membrane glycoprotein (B2L) of orf virus (Lane 1-4, 6-9 negative samples; lane 5: positive sample; M=100 bp ladder (arrows from the bottom 100 bp, 200 bp, 300 bp, 400 bp, 500 bp ladder).

Distribution of Antimicrobial resistance genes in *Escherichia coli* isolates from poultry under farming systems of A&N Islands

A total of 126 faecal samples were collected by cloacal swabs from poultry of Government farm, commercial farm and free range desi birds. *E.coli* isolates were identified based on colonial morphology on EMB and MacConkey Agar plates and biochemical tests. These isolates were tested against 18 antimicrobial agents such as Amoxycillin, Tetracycline, Cephalexin, Erythromycin, Cloaxacillin, Co-trimaxazole, Clindamycin, Ciprofloaxcin, Fusidic Acid, Gentamycin, Penicillin-G, Trimethoprim, Sulphamethoxazole, Ampicillin, Carbenicillin, Cephatoxime, Chloramphenicol and Oxacillin to determine the prevalence of multiple antimicrobial resistances among them. Genomic DNA was extracted from *E.coli* using a Genomic DNA purification kit according to the manufacturer's instructions. The presence of genes associated with resistance to tetracycline (*tet A*), cefotaxime (*CTX*-M) and Gentamycin (aac(3)-IV) were determined by PCR. The primer details is presented in Table 45.

Table 45: *Escherichia coli* antimicrobial resistant genes and primer sequences used for PCR identification

Agent	Gene	Primer Sequence	Predicted Size
Tetracycline	tet A	5'-GTAATTCTGAGCACTGTCGC-3' 5'-CTGCCTGGACAACATTGCTT-3	500 bp
Gentamicin	aac(3)-IV	5'-AGTTGACCCAGGGCTGTCGC-3' 5'-GTGTGCTGCTGGTCCACAGC-3'	300 bp
Cefotaxime	CTX-M1	5'- CCATGGTTAAAAAATCACTGCG-3' 5'-GGGTRAARTARGTSACCAGAAYSAGCGG-3'	836 bp

The results revealed that the mean of 40% of the *E.coli* isolates from poultry under various farming systems were multiple antimicrobial resistant (Table 46).

Table 46: Percent resistance to Antibiotic - Disc method

	Commercial	Organised	Desi (Backyard)
Mean% resistance	45	36	40
Co-trimoxazole & oxacillin	71.8	42.85	65.0
Gentamycin, Erythromycin & Cloxacillin	59.0	45.24	50.0
Penicillin derivative	43.0	38.5	40.0
Presence of antibiotic resistance gene in % of isolates			
	Commercial	**Organised**	**Desi (Backyard)**
CTX-M1	16.6	42.8	38
aac(3)-IV	19	45.2	28

In general, these results indicated a high level of multi-drug resistance is emerging even in desi birds. It is suggested that an antimicrobial resistance surveillance program is needed in A&N Islands in order to detect bacterial resistance among rural poultry production as the 80 percentage of total poultry population belong to desi birds. Presence of Gentamicin and Cefotaxime resistance genes (CTX-M1, aac(3)-IV) was detected in PCR (Fig. 13).

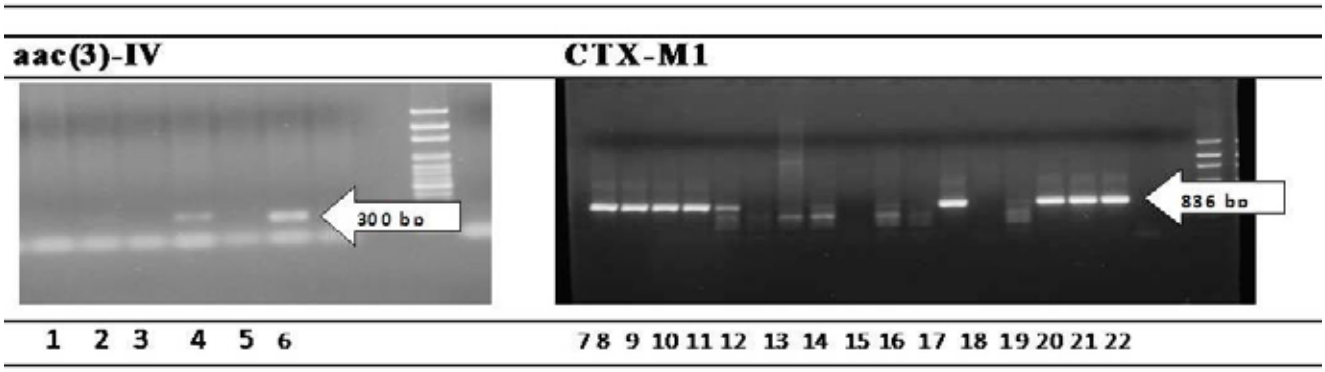


Fig 13. Showing a 300 bp fragment [aac(3)-IV] (Lane: 4 & 6) and 836 bp fragment (CTX-M1) (Lane:7-11; 18; 20-22)

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 and A. Kundu

During the period under report a total of 148 faecal samples of goat were collected and screened from South Andaman to evaluate the quantum of parasitic infection. By coproscopy four types of nematode ova (Trichostrongyles, *Strongyloides*, *Nematodirus* and *Trichuris*) and eimerian oocysts were detected. The highest eggs per gram of faeces (EPG) of strongyles were seen in the month of October, 2017 (118.8±34.54) and the lowest EPG for this group of worm was seen in the month of December, 2017 (9.47±6.51). Egg count of *Strongyloides* was the maximum in the month of September, 2017 (508.7±343.7) followed by the month of October, 2017 (143.1± 65.07), January, 2018 (4.44± 2.09), December, 2017 (3.15± 2.17) and November, 2017 (1.00± 1.00). The mean EPG of *Nematodirus* and *Trichuris* ranged between 0 to 2.60 ± 1.8 and 0 to 0.65± 0.65, respectively. So far the eimerian oocyts count was concerned having the highest oocysts per gram of faeces (OPG) was seen in the month of November, 2017(5812±2337) and the lowest OPG was recorded in the month of January, 2018 (147.8±48.49) (Table 47, Fig.14). A total of four species of eimerian oocysts were identified on the basis of shape index of *Eimeria* oocyts and the species were *E. arloingi* (Fig.15a), *E. parva* (Fig. 15 b), *E. pallida* (Fig. 15 c) and *E. faurei* (Fig. 15 d).

Table 47: Month-wise prevalence of parasitic infection (mean±SEM) in goats

Eggs per gram of faeces/Oocysts per gram of faeces (range)					
Month	**Strongyles**	***Strongyloides***	***Nematodirus***	***Trichuris***	***Eimeria***
September,2017 (n=23)	11.74±5.57 (0-120)	508.7±343.7 (0-7800)	2.60 ± 1.8 (0-30)	Nil	1362±1302 (0-30000)
October, 2017 (n=48)	118.8±34.54 (0-1260)	143.1±65.07 (0-2610)	Nil	0.65±0.65 (0-30)	943.3±177.0 (0-5310)
November, 2017 (n=31)	16.45±4.58 (0-90)	1.00 ± 1.00 (0-30)	0.96±0.96 (0-30)	Nil	5812±2337 (0-50000)
December,2017 (n=19)	9.47±6.51 (0-120)	3.15 ± 2.17 (0-30)	Nil	Nil	311.1±149.2 (0-2400)
January, 2018 (n=27)	34.44±15.08 (0-360)	4.44± 2.09 (0-30)	Nil	Nil	147.8±48.49 (0-1200)

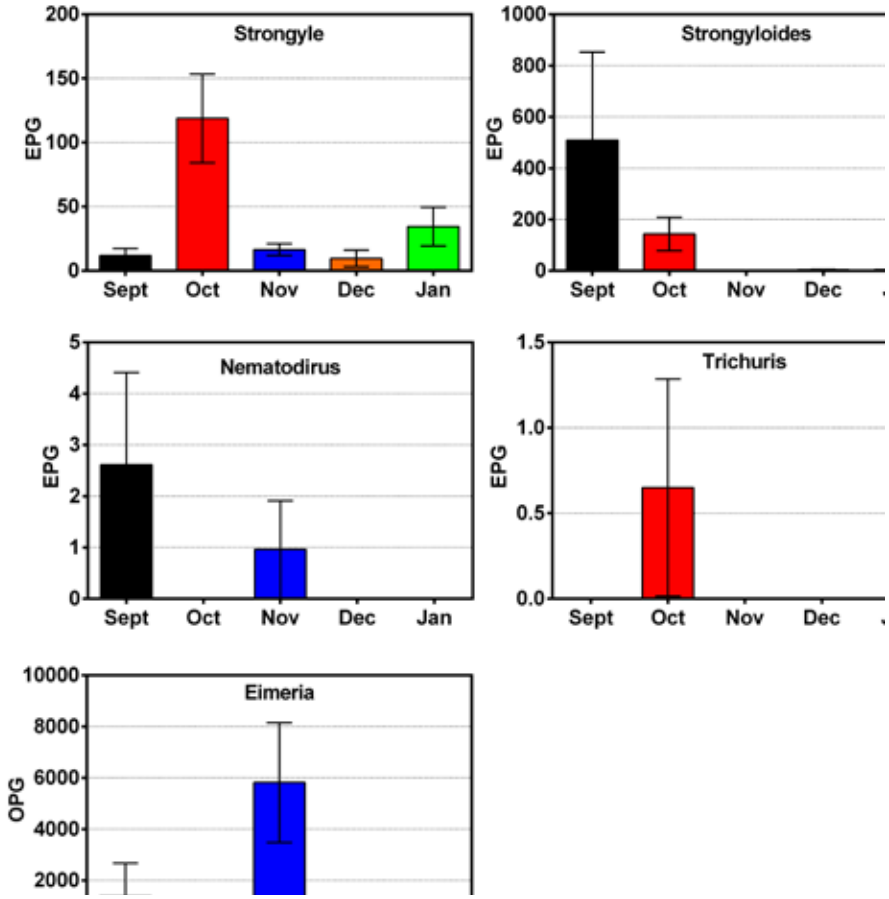


Fig. 14: Month wise (Sept. to Jan) prevalence of various types off parasitic infection in goats.

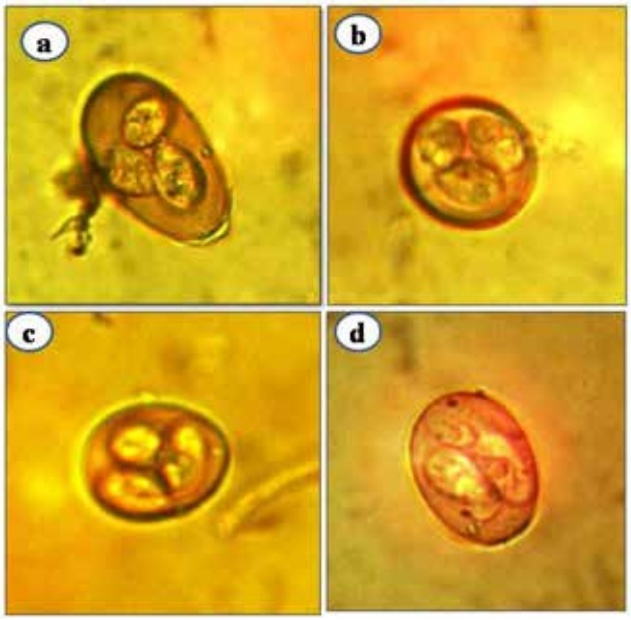


Fig. 15: Oocysts of *Eimeria* (a) *E. arloingi,* (b) *E. parva*, (c) *E. pallida* and (d) *E. faurei*

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

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

Performance evaluation of popular varieties of different fodders under Andaman and Nicobar Island

Fodder grasses Napier bajra hybrids (NBH), and a multi cut fodder sorghum were cultivated for evaluation of performances under rain fed conditions for the third year. The treatments comprised of three different cultivars of hybrid Napier *viz.* CO-4, CO-5, DHN 6 and one variety of sorghum (Co-FS 29) planted at the onset of monsoon during the month of May in the year 2015. The root slips were planted at a spacing of 60 x 60 cm for hybrid Napier and seed were sown for sorghum. Randomized block designs (RBD) and three replications. The first harvest was taken at 65 days after onset of monsoon and subsequently harvests were taken at 50 days of interval. Total four harvests were made. Bio-mass yield from each plot was recorded (Table 48) immediately after cutting and expressed in ton/ha. Dry weight was recorded by randomly selecting five plants from each plot and drying them at 80 ± 5°C for 24 h until constant weight was achieved (Table 49). The protein content of the fodder was also estimated as per the standard procedure. The average protein content was recorded (Table 50) to be significantly higher ($P<0.05$) in NBH CO-5 and fodder sorghum variety in the second harvest as compared to other varieties. Overall there was no significant difference in the protein content among the varieties. No significant differences on average green fodder yield were found among the two Napier bajra hybrids (i.e DHN6 and CO-4) and sorghum. However, CO-5 variety of NBH showed significantly lower yield than the other cultivars. In conclusion, among these four cultivars NBH (DHN6) was found superior with respect to total bio-mass yield; however, NBH CO-5 was found to be superior in terms of quality of the fodder.

Table 48: Green fodder yield of different cultivars of four harvests (ton/ha).

Cultivars Fodder crops (Cultivars)	Harvest -1	Harvest -2	Harvest -3	Harvest -4	Total yield (ton/ha)
Green					
NBH (DHN-6)	45.4^{b}	54.22^{b}	52.04^{a}	51.22^{a}	202.9^{a}
NBH (CO-4)	43.6^{b}	52.30^{b}	58.43^{a}	41.50^{b}	195.9^{a}
NBH (CO-5)	31.1^{c}	36.33^{c}	37.84^{b}	21.66^{d}	127.0^{b}
Perennial Sorghum (CO-FS- 29)	50.2^{a}	60.39^{a}	56.46^{a}	33.04^{c}	200.1^{a}
SEM ±	0.91	0.82	1.09	2.24	5.1
CD (P=0.05)	3.20	2.89	3.81	7.80	17.7

Means having different superscripts within a column differ significantly with each other at $p \leq 0.05$.

Table 49: Moisture content of different cultivars of fodder of four harvests in percentage

Cultivars Fodder crops (Cultivars)	Harvest -1	Harvest -2	Harvest -3	Harvest -4	Average moisture content
NBH (DHN-6)	68.81	65.49	67.57	67.79	67.41
NBH (CO-4)	67.99	66.34	65.81	66.01	66.54
NBH (CO-5)	66.76	67.85	66.05	64.88	66.38
Perennial Sorghum (CO-FS- 29)	67.51	66.76	65.39	66.15	66.45
SEM ±	1.18	0.63	1.30	1.70	1.85
CD (P=0.05)	4.15	2.21	4.56	5.93	6.47

Table 50: Protein content of different cultivars of fodder (%DM basis)

Cultivars Fodder crops (Cultivars)	Harvest -1	Harvest -2	Harvest -3	Harvest -4	Average protein content
NBH (DHN-6)	9.1	8.27^{ab}	8.10	8.90	8.4
NBH (CO-4)	8.6	7.43^{a}	8.73	8.13	8.1
NBH (CO-5)	9.4	9.30^{b}	8.90	8.37	8.9
Perennial Sorghum (CO-FS- 29)	8.8	9.06^{b}	8.50	8.00	8.5
SEM ±	0.47	0.37	0.67	0.61	0.6
CD (P=0.05)	1.67	1.32	2.35	2.14	1.9

Means having different superscripts within a column differ significantly with each other at p≤0.05.

Pharmaco-Assessment of Ethno-Veterinary Medicinal Plants of A&N Islands for Poultry Diseases

T Sujatha, Jai Sunder, A. Kundu, D. Bhattacharya, Arun Kumar De, K. Abirami and Puro

Screening, sorting and collection of Ethno Veterinary Medicinal (EVM) plants with regard to gut, respiratory and eye problems of poultry in Andaman group of Islands

Leaf, stem and roots of *Zingeber spectabile, Cissus quadrangularis, Costus pictus, Centella asiatica, Costus speciosus* and *Piper betle* were sorted based on previous documentation of medicinal plants and selected for pharmaco-assessment as ethno veterinary medicinal plants that are abundantly available in South Andaman. A total of each 6 eye swabs were collected from birds with conjunctivitis and diarrhoea. Isolated organisms were identified as Salmonella on the basis of morphology and biochemical tests.

Extracts of selected medicinal plants were prepared. In brief, samples were washed, shade dried and grinded. Subsequently, samples were soaked in methanol (1: 10) for 3 days. Further, the suspension was filtered and incubated at 50^{0}C in water bath until methanol was completely evaporated. Subsequently, extracts were diluted with 5 ml of Dimethyl Sulfoxide (DMSO). Extracts were then stored in glass vials at 4^{0}C till further use.

Antibacterial sensitivity of herbal extracts

Antibiogram of EVM plants against isolates was performed using conventional disc diffusion method and zone of inhibition was recorded. The detail profile of zone of inhibition has been depicted through Plate 73 and Table 51.

Plate 73: Antibiogram of Ethno Veterinary Medicinal plants

Centella asiatica *Piper betle* *Zingeber spectabile (leaf)*

Table 51: Antibacterial sensitivity of herbal extracts

Extract	Clinical Sample	Zone of Inhibition (mm)			
		10µl	20 µl	30 µl	Ofloxacin (Standard)
Zingeber spectabile (leaf)	Eye swab	10	11	11	15
	Faecal swab	10	12	13	15
Centella asiatica	Eye swab	Nil	10	12	15
	Faecal swab	Nil	Nil	10	15
Piper betle	Eye swab	Nil	Nil	Nil	15
	Faecal swab	10	11	11	15
Zingeber spectabile (stem & root)	Eye and Faecal	Nil	Nil	Nil	15
Cissus quadrangularis	Eye and Faecal	Nil	Nil	Nil	15
Costus pictus	Eye and Faecal	Nil	Nil	Nil	15
Costus speciosus	Eye and Faecal	Nil	Nil	Nil	15

Concluding remarks: The leaf of *Zingeber spectabile* has antibacterial sensitivity towards isolates of both conjunctivitis and diarrhoea but not its stem and root. *Piper betle* has antibacterial sensitivity towards isolates of diarrhoea. *However, Cissusqua drangularis, Costuspictus and Costus spacious* did not show antibacterial sensitivity towards the isolates.

Efficacy of *Eupatorium* and *Vitex trifolia* as herbal egg sanitizers

Microbial contamination of egg shells is common in poultry parent flocks under both slats and deep litter systems of rearing resulting in depression in hatchability of eggs. Hence, the purpose of this study was to investigate the efficacy of two medicinal plants viz., *Eupatorium* and *Vitex trifolia* to control the microbial contamination of hatching eggs. Aqueous extracts of these two medicinal plants were prepared @1:4 ratio. A total of 1030 hatchable eggs were assigned to each of the treatments such as., T1: control without cleaning (negative control); T2: cleaning with plain water (negative control); T3: cleaning with regular disinfectant (positive control); T4: cleaning with *Eupatorium* extract (test sample 1); T5: Cleaning with *Vitex* extract (test sample 2). Hatchable eggs were cleaned and disinfected with the respective treatments after collection and stored at 15^0 C for four days till setting. On the day of setting, egg surface swab samples were collected and isolates were identified through colony formation and biochemical tests (Table 52).

Table 52: Efficacy of *Eupatorium* and *Vitex trifolia* as herbal egg sanitizers

Treatments	Total bacterial count (cfu) on egg surface	Percent egg burst	Percent hatchability
Control (without cleaning)	368.4	7.1	44.28
Cleaning with plain water	253.6***	6.3**	79.83**
Cleaning with regular disinfectant	161.3***	4.5***	83.33***
Cleaning with *Eupatorium* extract	315.3***	4.6***	80.26***
Cleaning with *Vitex* extract	227.8***	0	84.48***

One-way analysis of variance (ANOVA) followed by Dunnett post-test was performed to find out significant difference among control and treatments. *** signifies significant difference at $p<0.001$, ** signifies significant difference at $p<0.01$

Concluding remarks: It is inferred that *Vitex trifolia was the most potent* medicinal plant followed by *Eupatorium* for the p0reparation of herbal egg sanitizers in the poultry hatchery to address the issue of health hazards by synthetic disinfectants.

Anti coccidial effect of herbal extracts

Eimeria tenella was isolated from caecum of broilers and desi birds (Plate 74). Unsporulated oocysts were treated with herbal extracts as mentioned below. Differential counting of sporulated and unsporulated oocysts was done following modified M'C Master technique.

- **Treatment**: Mixture of 100µl of sample + 100 µl Potassium dichromate+ 100 µl Herbal extract was prepared in a vial and covered with aluminium foil made with pores and incubated for 48 hrs.
- **Control:** 100µl of sample + 100 µl Potassium dichromate+ 100µl Distilled water put in vial and keep it for 48 hrs.

The detailed profile of sporulation has been mentioned in Table 53.

Plate 74: *Eimeria tenella* infected caecum of broiler

Table 53: Detail profile of sporulated and unsporulated oocysts of *Eimeria tenella* after treatment of herbal preparations in broiler

Part of GI tract of broiler	Treatment	Unsporulated	Sporulated	Percent Sporulation
Intestine	Control	4	28	87.50
Intestine	*Zingiber spectabile (leaf)*	39	28	41.79
Intestine	*Zingiber spectabile (Stem)*	63	12	16.00
Intestine	*Zingiber spectabile (Stem)*	63	12	16.00
Intestine	*Zingiber spectabile (Root)*	34	6	15.00
Intestine	Methanol	40	25	38.460
Intestine	*Cissus quadrangularis*	29	2	6.450
Intestine	*Centella asiatica*	20	2	9.09
Intestine	*Piper*	1	nil	0
Caecum	*Zingiber spectabile (leaf)*	18	6	25.00
Caecum	*Centella asiatica*	46	6	11.54
Caecum	*Piper*	>100	>60	<37.5

- Inference: The extracts of *Piper*, *Zingiber spectabile, Cissus quadrangularis and Centella asiatica* have anti coccidial effect against sporulation of oocysts of poultry.

Scientific identification of novel ethnoveterinary medicinal plants of tribal farming community of Nicobar Islands

A total of 11 ethno veterinary medicinal plants / practices were identified (Table 54 and Plate 75) on the basis of interview of tribal community of Nicobar Island which was not known previously by the scientific community.

Table 54: list of ethno veterinary medicinal plants with vernacular name and their use

Sl.No	Local name	Use
1.	TANFÃTö, TUMLö	Treatment of bone diseases
2.	TöKURòTòNG	Treatment gastro intestinal problems
3.	PANRÃPö + Töngãv-el Kúi	Anti inflammatory
4.	ÔLKA + TACHUHÚRÒi HANöHMISõKKö- HiNYôYö	Anti inflammatory
5.	SôKha-un	Appetizer
6.	Hötliök	Anti inflammatory
7.	MANÚLöTö-iSOH + Pööcho + Raneul + Mufut + Hingot + Amra	Dewormer
8.	Raneúl (2 parts) + Amra (1 part)	Treatment of ophthalmic infection & dewormer
9.	KUYAVö	Treatment of respiratory problem
10.	TANRóNgö	Treatment of respiratory problem
11.	Tokurotong- 9, Kuyavo – 5, Chamrevo- 3, Tokiteuny- ½	Treatment of dysentery

HANöHMISõKKö

SôKha-un

HiNYôYö

TACHUHÚRÒi

Mufut

TöKURòTòNG

Hötliök

TUMLö

PANRÃPö

MANÚLöTö-iSOH

KUYAVö

Tokiteuny

Pööcho

Chamrevo

Amra

Hingot

Raneul

TANRóNgö

Plate 75 : Ethno veterinary medicinal plants used by Nicobari tribal farming community

Molecular Characterization of Immune System Genes of Nicobari Fowl

K. Muniswamy, T. Sujatha; A. K. De, Jai Sunder and A. Kundu

Mitochondrial DNA (MtDNA) is widely used in phylogenetic studies because of its variability, lack of recombination and maternal inheritance. This marker (MtDNA) is also used for identification of wild ancestors. Most of the MtDNA studies target the hyper-variable control region (D-loop) sequences for establishing the relation between mitochondrial haplogroups. The present study targeted MtDNA control region to identify haplogroups and phylogeny of Nicobari fowl native to Andaman & Nicobar Islands. Blood samples were collected from wing vein of Nicobari fowl and DNA was isolated using DNeasy Blood & Tissue Kit (Qiagen) as per manufacturer's protocol. Two sets of primers were designed based on the available sequence information of chicken in centralised repositories of public database for amplification of control region. The annealing temperature of one set of control region primer producing 702 bp specific product was optimized based on thermal gradient PCR. Based on temperature gradient PCR, the annealing temperature of 51°C was selected for PCR amplification of 702 bp specific product of control region DNA fragment. The reaction condition of PCR was 0.4 µM primers (Forward primer – 5'-AGTCATATTATTCCCGCTTGGTT-3' and Reverse primer – 5'-CGCGATCACGGACTAAAGA-3'), 1.25 units *Taq* DNA Polymerase (NEB), 5X *Taq* standard reaction buffer, DNA template and 200 µM dNTPs (NEB) to a total reaction volume of 50 µl. The thermocycling condition was initial denaturation of 94°C for 1 minute; 35 cycles of 94°C for 30 seconds, 46-55°C for 30 seconds, 68°C for 1 minute; and final extension of 68°C for 5 minutes in a thermocycler (Eppendorf). The PCR products were electrophoresed in a 2% agarose gel and visualized using ethidium bromide in a UV gel documentation system (Fig. 16).

Fig 16: Amplicon of control region MtDNA fragment,
(Lane M-50bp, DNA ladder, Lane 1-10: Amplified products by temperature gradient from 46 to 55°C.

Molecular Signature of Eco-sustainability of Indigenous Livestock Breeds of Andaman and Nicobar Islands and Lakswadeep

Arun Kumar De, Jai Sunder, M. S. Kundu, D. Bhattacharaya and *A. Kundu*

Effect of heat stress on expression profiles of heat shock protein (HSP) genes in an *in vitro* model of Nicobari pig

In the present study, the impact of thermal stress on the expression of heat shock protein genes of Nicobari pig was evaluated in an *in vitro* model. Peripheral blood mononuclear cells (PBMCs) were isolated from blood samples of

three healthy Nicobari pigs maintained in our institute farm. Isolated PBMCs were either incubated at 37°C (control) or exposed to 42°C (T1) or 45°C (T2) for 1 h. Following stress exposure, the cells were plated at a concentration of 1 X 10^6 viable cells/ml in 24 well tissue culture plates and incubated at 37°C in a CO_2 incubator under 5% CO_2 in air for 0-8 hour recovery time. Expression profiles of four HSP genes (*Hsp 40, Hsp 60, Hsp 70 and Hsp 90*) were studied at different recovery time of 0, 2, 4, 6 and 8 h. A significant up-regulation of all the HSP genes in the initial hours after heat treatment (both in T1 and T2) of PBMC was observed. The expression levels of the genes came to normal after 6 h of treatment (Fig. 17).

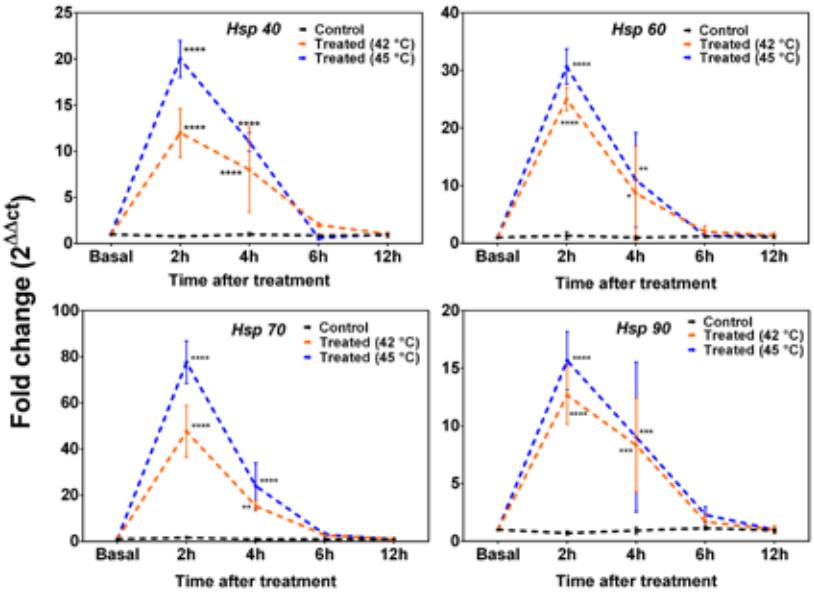


Fig. 17: Effect of *in vitro* heat stress on expression profiles of heat shock protein (HSP) genes in PBMCs of Nicobari pig. Data are shown as mean ± SD. ** denotes p≤0.01; *** denotes p≤0.001; **** denotes p≤0.0001.

Heat stress triggers apoptosis and modulates the expression profiles of apoptosis related genes in PBMC of Nicobari pig

The present experiment was designed to investigate the effect of heat stress on apoptosis and regulation of apoptosis related genes in PBMCs of Nicobari pig. PBMCs were isolated from blood samples of three healthy Nicobari pigs and were either incubated at 37°C (control) or exposed to 42°C (T1) or 45°C (T2) for 1 hour. After that, percentage of apoptotic cells was recorded and expression levels of six apoptosis related genes (*BAX, BAK, TP53, CASP-3, BCL-2 and MCL-1*) were measured. It was found that *in vitro* heat stress induced apoptosis of PBMCs as the percentage of apoptotic cells in both T1 and T2 increased significantly as compared to control (Fig. 18). Study also revealed that heat stress induced significant up-regulation of pro-apoptotic genes (BAX,BAK, CASP-3, TP53) and down-regulation of anti-apoptotic genes (BCL-2, MCL-1) which indicates that heat stress triggers apoptosis of cells (Fig. 19).

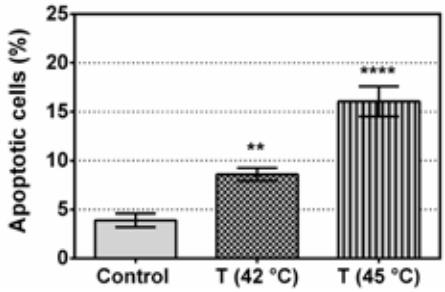


Fig. 18: Effect of *in vitro* thermal stress on apoptosis of PBMCs of Nicobari pig. Data are shown as mean ± SD. ** denotes p≤0.01; *** denotes p≤0.001

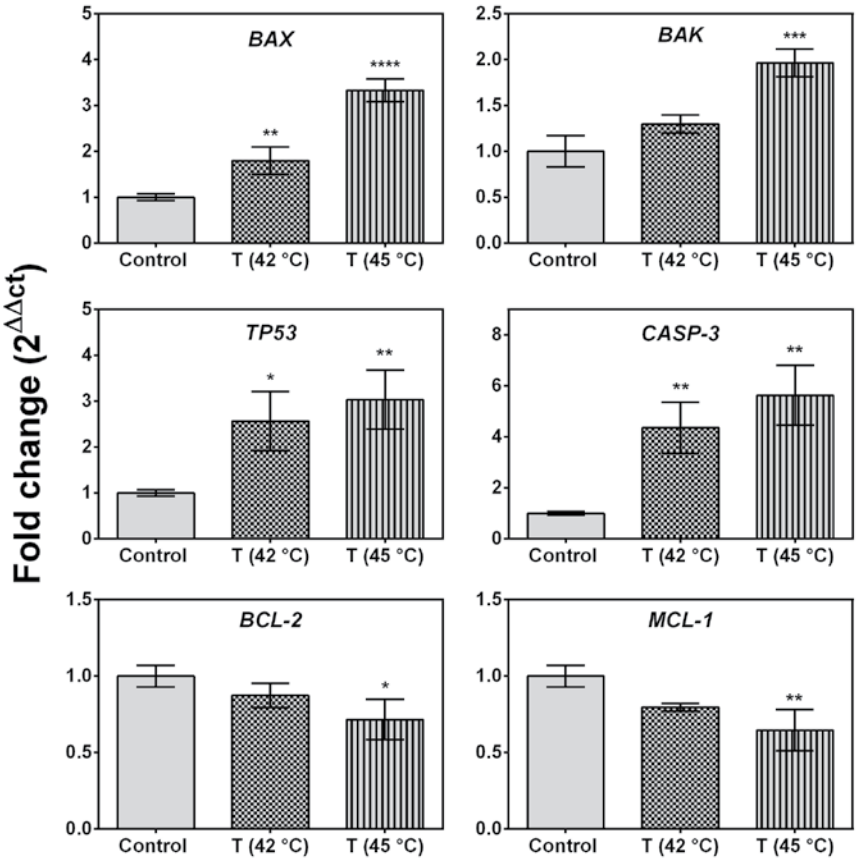


Fig. 19: Effect of *in vitro* thermal stress on regulation of apoptosis related genes PBMCs of Nicobari pig. Data are shown as mean ± SD. * denotes $p<0.05$, ** denotes $p\leq0.01$

Impact of season on haematological profiles, heat shock proteins and inflammatory cytokine expression in indigenous goat breeds of Andaman and Nicobar Islands, India: Study of an organized farm

The objective of the current study was to investigate the impact of two seasons *viz.* summer (January-February) and monsoon (June-August) on the haematological parameters and expression of serum heat shock proteins and inflammatory cytokines in two indigenous goat breeds of Andaman and Nicobar Islands, India maintained in our institute farm. The weather parameters of the study periods have been shown in Table 55. Forty eight serum samples (n=12/ season/breed) from two indigenous goat breeds namely Andaman local goat (AL) and Teressa goat were analyzed. Serum haematological parameters were analyzed using a automatic haematology analyzer. Heat shock proteins and inflammatory cytokines were analyzed by commercial ELISA kits. No significant effect of either breed or season on haematological parameters of Andaman local goat and Teressa goat was observed. Increased levels of Hsp 90, IL-4 and TNF-α was observed in Teressa goat in summer season as compared to those of Andaman local goat (Fig. 20). The levels of HSP 90, HSP 70 and HSP 27 were found significantly higher in summer season as compared to monsoon season in both the goat breeds which is indicative of heat stress during summer season (Fig. 21). It was found that IL-2 and IL-6 were significantly down-regulated during summer season as compared to monsoon season in both the breeds, whereas IL-4 was up-regulated in Summer season in only Teressa goat (Fig. 21). A significant up-regulation of TNF-α in Teressa goat was observed in Summer season as compared to Monsoon season (Fig. 21). On the other hand, level of IFN-γ was significantly higher in summer season as compared to monsoon season in both the goat breeds (Fig. 21).

Table 55: Weather parameters (Mean±SD) during the study period (February to August, 2016)

Month	Temperature (□ C)		Humidity (%)	Total rainfall (mm)
	Max	Min		
June, 2017	30.0 ± 1.59	25.0 ± 1.17	87.13 ± 6.39	495.9 ± 23.78
July, 2017	30.6 ± 1.29	25.2 ± 1.54	85.95 ± 5.82	425.3 ± 27.07
August, 2017	31.0 ± 0.79	25.2 ± 1.51	84.35 ± 4.95	325.3 ± 32.59
January, 2018	33.9 ± 0.68	29.2 ± 1.52	71.05 ± 6.8	0.0
February, 2018	34.9 ± 0.68	28.2 ± 1.52	71.05 ± 6.8	0.0

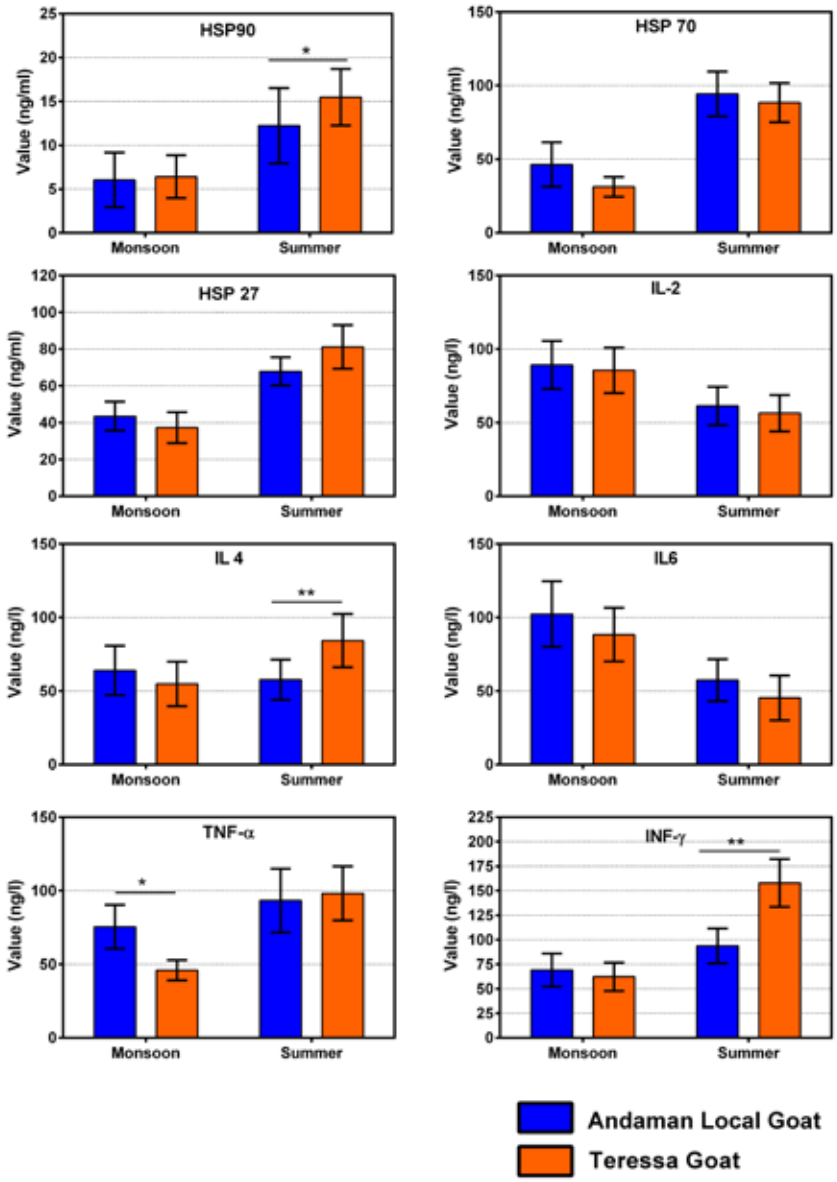


Fig. 20: Effect of breed on levels of serum heat shock proteins and inflammatory cytokines. Data are shown as mean ± SD. * denotes $p<0.05$, ** denotes $p\leq0.01$

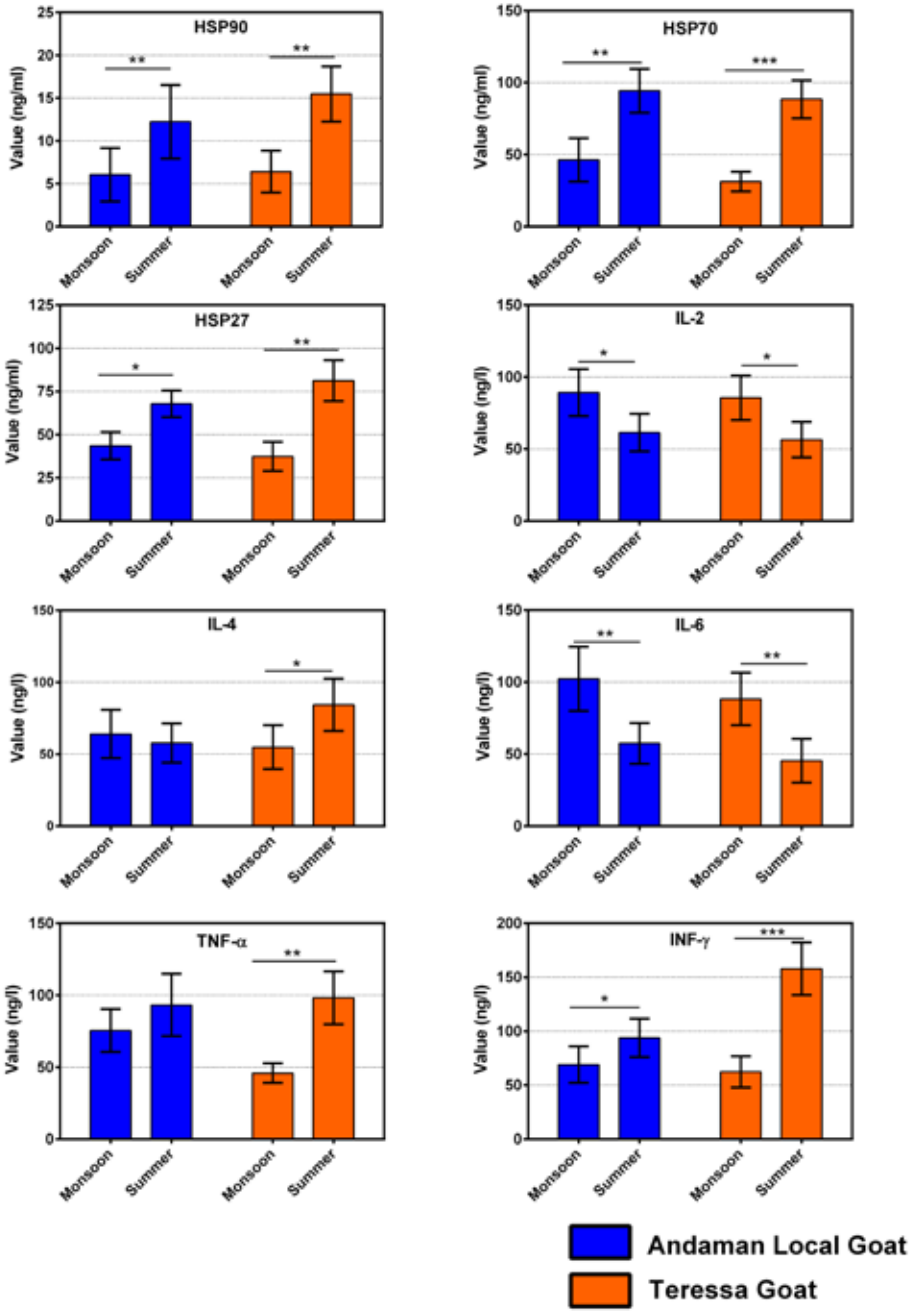


Fig. 21: Effect of season on levels of serum heat shock proteins and inflammatory cytokines in two indigenous goat breeds of Andaman. Data are shown as mean ± SD. * denotes $p<0.05$, ** denotes $p\leq0.01$, *** denotes $p\leq0.001$

Effect of summer stress on expression of serum heat shock proteins and inflammatory cytokine in goat: A field level study

The present study was designed to investigate the impact of two seasons *viz.* Summer (January-February) and Monsoon (June-August) (Table 55) on the levels of serum heat shock proteins and inflammatory cytokines in goats reared under open grazing condition. Forty goat serum samples (n=20/season) were collected from farmers' field of

Indiranagar village, South Andaman. Serum levels of three heat shock proteins (Hsp 90, Hsp 70 and Hsp 27) and five inflammatory cytokines (IL-2, IL-4, IL-6, TNF-α and IFN-γ) were analyzed by commercial ELISA kits. Significant increased levels of serum Hsp 90 and Hsp 27 were detected in summer season as compared to those of Monsoon season whereas no significant difference in serum Hsp 70 level was detected between the two seasons (Fig. 22). Among serum inflammatory cytokines, IL-4, IL-6 and TNF-α increased significantly in summer season than those of Monsoon season whereas no changes in levels of IL-2 and IFN-γ were detected between the two seasons (Fig. 22). In conclusion, summer season induces stress in goat which in turn dis-regulates inflammatory cytokine expression.

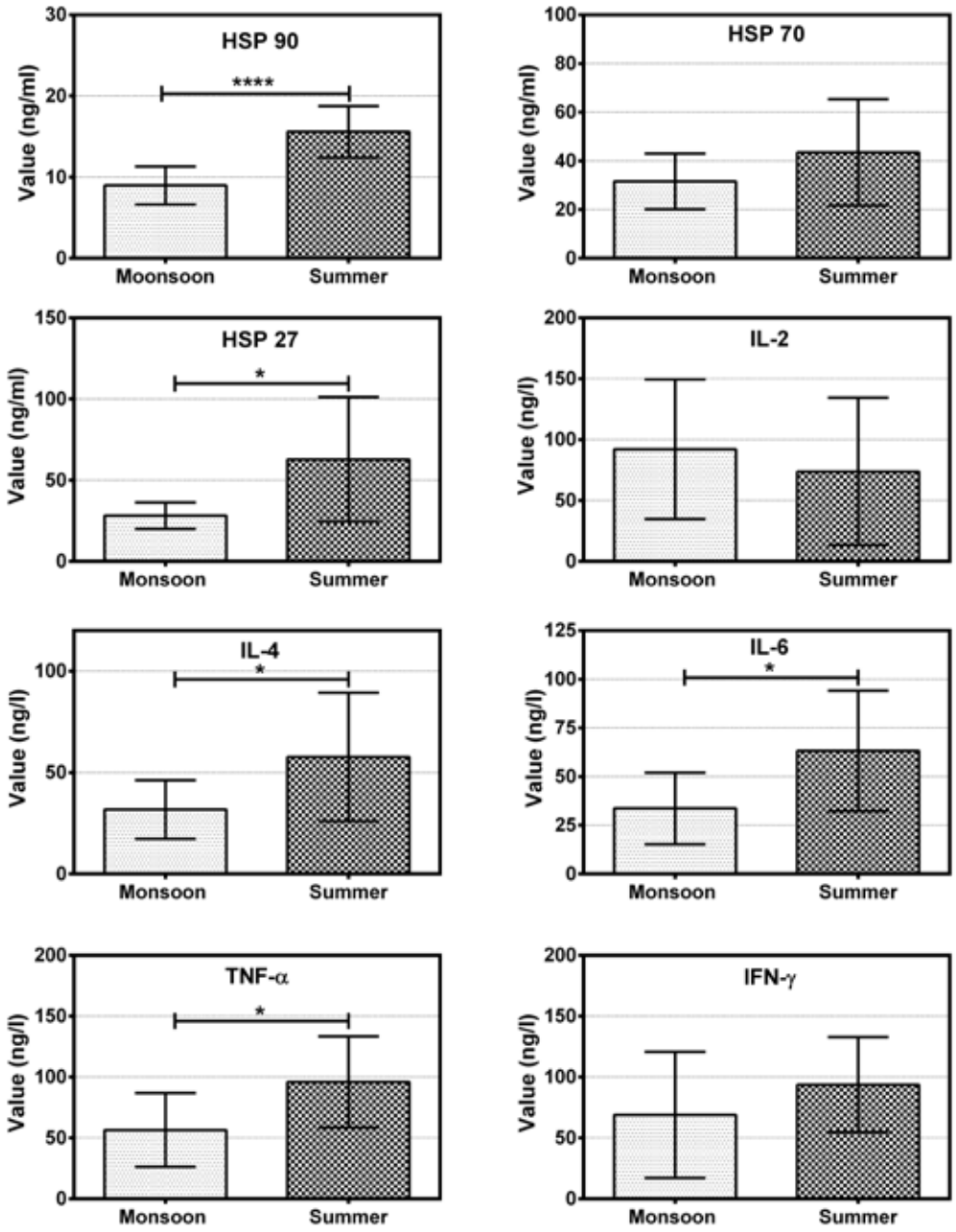


Fig. 22: Effect of season on levels of serum heat shock proteins and inflammatory cytokines in goats reared under open grazing condition. Data are shown as mean ± SD. * denotes $p<0.05$, *** denotes $p\leq0.001$

Gender Identification in Day Old Poultry by PCR Based Methodology

Arun Kumar De, T. Sujatha, A. Kundu and Jai Sunder

Accurate sex identification of poultry in their early age has significant economic importance. It reduces the feeding, management and labour cost by disposing unwanted sex. It is generally done by manual processes like vent sexing or feather sexing but the accuracy is less. Therefore, a PCR based methodology for accurate sex determination of the indigenous poultry germplasm of these islands will be very helpful. PCR based sex determination methodology for Nicobari fowl, Vanaraja and Andaman Local Duck has not been studied yet. In the present study, it is proposed to use a PCR based methodology of sex determination by direct amplification of sex specific fragments from whole blood, feather and dried blood spots on filter paper. Primers have been designed using the sequence of chicken W chromosome using Primer 3 software (Table 56).

Table 56: Sequence of the primers

Name	Nucleotide sequences
P2	5′-TCTGCATCGCTAAATCCTTT-3′
P8	5′-CTCCCAAGGATGAGRAAYTG-3′
2550F	5′-GTTACTGATTCGTCTACGAGA-3′
2718R	5′-ATTGAAATGATCCAGTGCTTG-3′
1237L	5′-GAGAAACTGTGCAAAACAG-3′
1272H	5′-TCCAGAATATCTTCTGCTCC-3′

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

Perumal P, M.S. Kundu, D. Bhattacharya, Jai Sunder, Arun Kumar De, A. Kundu, Zacharia George, Shardul Vikram Lal and V.M. Abdul Gafoor

A study on calving pattern and birth weight of crossbred dairy calves reared under semi-intensive system in Andaman and Nicobar Islands

Sex ratio, birth weight of new born and birth season are the important factors of any dairy herd in replacing low performing animals, in maintaining proper herd strength and in achieving sustainable production & reproduction to increase profitability of dairy farm. Therefore, a retrospective study was conducted to assess the effect of month, season and year on calving pattern, sex ratio and birth weight of crossbred dairy calves reared under semi-intensive system in Andaman and Nicobar Islands was analysed. Data of 207 calves born during the year 1999 to 2016 maintained at ICAR-CIARI, Port Blair, A & N Islands were analysed. Frequency and percentage of calving and birth weight of calves under different months (January to December), seasons (wet and dry season) and years (1999 to 2016) were calculated. Relative female ratio (RFR) and secondary sex ratio (SSR) were also calculated to assess the sex ratio of the calves in the dairy farm. Result revealed the highest birth rate in the month of April (14%), August (13.52%) and May (13.04%), intermediate during January (6.76%), February (7.24%), October (9.66%), November (8.69%) & December (7.24%) and lowest in the month of March (5.79%), June (4.34%), July (3.86%) and September (5.79%) (Table 57). Year-wise birth rate showed a non-cyclical fluctuation throughout the experimental period (Table 58). Birth weight was non-significant between sexes, seasons (Table 59), months (Table 60) and years (Table 61). Non-significantly higher birth weight was observed in male compared to female, wet than dry season. Maximum calving was during wet season and minimum was recorded during the dry season (Table 62). In conclusion, sex ratio and birth weight did not differ

between months, seasons and years. However, wet season or months were found to be most conducive for breeding of cattle under semi-intensive system in A & N Islands.

Table 57: Month-wise birth rate and sex ratio of crossbred calves reared under semi-intensive system in A & N Islands

Month	Sex-wise frequency (%)		Total calving Frequency (%)	RFR	SSR
	Male	Female			
Jan	10 (71.42)	4 (28.58)	14 (6.76)	0.40	1:0.40
Feb	7 (46.66)	8 (53.34)	15 (7.24)	1.14	1:1.14
March	4 (33.33)	8 (66.67)	12 (5.79)	2.00	1:2.00
April	15 (51.72)	14 (48.28)	29 (14.00)	0.93	1:0.93
May	16 (59.25)	11 (40.75)	27 (13.04)	0.68	1:0.68
June	1 (11.11)	8 (88.89)	9 (4.34)	8.00	1:8.00
July	4 (50.00)	4 (50.00)	8 (3.86)	1.00	1:1.00
August	13 (46.42)	15 (53.58)	28 (13.52)	1.15	1:1.15
September	7 (58.33)	5 (41.67)	12 (5.79)	0.71	1:0.71
October	8 (40.00)	12 (60.00)	20 (9.66)	1.50	1:1.50
November	10 (55.55)	8 (44.45)	18 (8.69)	0.80	1:0.80
December	9 (60.00)	6 (40.00)	15 (7.24)	0.66	1:0.66
Average	103 (49.75)	104 (50.25)	207 (100)	1.00	1.01

RFR: Relative female ratio, SSR: Secondary sex ratio

Table 58: Year-wise birth rate and sex ratio of crossbred calves reared under semi-intensive farming system in A & N Islands

Year	Sex-wise frequency (%)		Total calving frequency (%)	RFR	SSR
	Male	Female			
1999	3 (75.00)	1 (25.00)	4 (1.93)	0.33	1:0.33
2000	6 (60.00)	4 (40.00)	10 (4.83)	0.66	1:0.66
2001	8 (80.00)	2 (20.00)	10 (4.83)	0.25	1:0.25
2002	5 (45.45)	6 (54.55)	11 (5.31)	1.20	1:1.20
2003	4 (33.33)	8 (66.67)	12 (5.80)	2.00	1:2.00
2004	10 (66.66)	5 (33.34)	15 (7.25)	0.50	1:0.50
2005	5 (38.46)	8 (61.54)	13 (6.28)	1.60	1:1.60
2006	2 (15.38)	11 (84.62)	13 (6.28)	5.50	1:5.50
2007	4 (50.00)	4 (50.00)	8 (3.86)	1.00	1:1.00
2008	6 (66.66)	3 (33.34)	9 (4.35)	0.50	1:0.50
2009	9 (64.28)	5 (35.72)	14 (6.76)	0.55	1:0.55
2010	10 (55.55)	8 (44.45)	18 (8.70)	0.80	1:0.80
2011	5 (38.46)	8 (61.54)	13 (6.28)	1.60	1:1.60
2012	8 (57.14)	6 (42.86)	14 (6.76)	0.75	1:0.75

2013	3 (42.85)	4 (57.15)	7 (3.38)	1.33	1:1.33
2014	6 (54.54)	5 (45.46)	11 (5.31)	0.83	1:0.83
2015	8 (66.66)	4 (33.34)	12 (5.80)	0.50	1:0.50
2016	2 (16.66)	10 (83.34)	12 (5.80)	5.00	1:5.00
Average	103 (49.75)	104 (50.25)	207 (100.00)	1.00	1:1.01

RFR: Relative female ratio, SSR: Secondary sex ratio

Table 59: Season-wise birth rate and sex ratio of crossbred calves reared under semi-intensive system in A & N Islands

Season	Sex-wise frequency (%)		Total calving frequency (%)	RFR	SSR
	Male	Female			
Wet	74 (49.01)	77 (50.99)	151 (72.94)	1.04	1:1.04
Dry	30 (53.57)	26 (46.43)	56 (27.06)	0.86	1:0.86

RFR: Relative female ratio, SSR: Secondary sex ratio

Table 60: Month-wise birth weight (mean ± S.E.M.) of crossbred calves reared under semi-intensive system in A & N Islands

Month	Male	Female	Average
January	19.73 ± 0.64	23.25 ± 0.50	21.49 ± 0.55
February	22.91 ± 0.29	19.93 ± 0.25	21.42 ± 0.52
March	22.25 ± 1.21	20.06 ± 0.77	21.16 ± 0.65
April	22.40 ± 0.61	21.79 ± 0.61	22.09 ± 0.43
May	23.89 ± 0.56	22.35 ± 0.61	23.12 ± 0.41
June	20.32 ± 0.64	19.49 ± 0.68	19.90 ± 0.63
July	22.00 ± 1.18	18.63 ± 0.52	20.31 ± 0.72
August	21.69 ± 0.55	20.87 ± 0.49	21.28 ± 0.36
September	23.29 ± 0.63	21.80 ± 0.69	22.54 ± 0.46
October	24.99 ± 0.83	22.72 ± 0.43	23.85 ± 0.46
November	23.14 ± 0.81	21.83 ± 0.79	22.48 ± 0.57
December	21.83 ± 0.79	22.17 ± 0.97	22.00 ± 0.61
Overall	22.52 ± 0.22	21.09 ± 0.19	21.81 ± 0.14

Table 61: Year-wise birth weight (mean ± S.E.M.) of crossbred calves reared under semi-intensive system in A & N Islands

Year	Male	Female	Average
1999	21.33 ± 1.22	21.03 ± 1.88	21.21 ± 0.97
2000	18.84 ± 0.81	27.50 ± 1.06	22.34 ± 0.76
2001	21.87 ± 0.84	23.43 ± 1.32	22.21 ± 0.72
2002	19.82 ± 0.80	21.51 ± 0.61	20.72 ± 0.53
2003	22.75 ± 0.97	22.18 ± 0.89	22.37 ± 0.67

2004	21.29 ± 0.58	19.12 ± 0.64	20.52 ± 0.46
2005	20.72 ± 1.15	19.67 ± 0.35	19.38 ± 0.63
2006	25.50 ± 1.32	21.90 ± 0.62	22.46 ± 0.57
2007	19.00 ± 0.70	19.37 ± 0.92	19.18 ± 0.63
2008	24.13 ± 0.96	21.00 ± 1.09	22.42 ± 0.83
2009	23.38 ± 0.80	23.04 ± 0.91	23.26 ± 0.62
2010	20.72 ± 0.67	20.67 ± 0.70	20.76 ± 0.48
2011	22.22 ± 1.21	21.91 ± 0.57	22.03 ± 0.60
2012	23.08 ± 0.91	22.33 ± 0.75	22.76 ± 0.62
2013	21.33 ± 0.43	20.87 ± 0.69	21.15 ± 0.57
2014	22.52 ± 0.62	21.90 ± 0.62	22.21 ± 0.51
2015	23.04 ± 0.69	21.75 ± 0.74	22.91 ± 0.55
2016	22.50 ± 0.59	21.90 ± 0.50	22.08 ± 0.43
Average	22.52 ± 0.22	21.09 ± 0.19	21.81 ± 0.14

Table 62: Season-wise birth weight (Mean ± S.E.M.) of crossbred calves reared under semi-intensive system in A & N Islands

Season	Male	Female	Average
Wet season	22.96 ± 0.26	21.12 ± 0.22	22.02 ± 0.17
Dry season	21.44 ± 0.40	20.96 ± 0.42	22.23 ± 0.28
Overall	22.52 ± 0.22	21.09 ± 0.19	

Pilot Studies

A Study on Pelvimetry in Crossbred Cows Reared Under Semi-Intensive System in Andaman and Nicobar Islands

Perumal P, M.S. Kundu, Jai Sunder, T. Sujatha, K. Muniswamy, Arun Kumar De, D. Bhattacharya and A. Kundu

Dystocia (difficult in birth) is the most common cause of perinatal calf loss and it creates adverse effects on future breeding performance of the dam. Pelvic measurement is the best method to detect abnormally small or mis-shaped pelvices to reduce the incidence of dystocia, to select suitable breeding bulls and to improve the reproductive performance of the dam. Therefore, the study was conducted on 24 crossbred cows consisting of four different groups based on age and each group consisted of 6 animals, were maintained at Animal Science Research Farm Complex, ICAR-CIARI, Port Blair, A & N Islands, to study the external pelvimetry. The groups were Gr I: 24-36 months, Gr II: 37-48 months, Gr III: 49-53 months and Gr IV: 65 months and above. The study indicated clearly that the mean inlet and outlet pelvic area (cm^2) for Gr I was 199.81 ± 4.91 & 129.12 ± 3.65, Gr II was 224.23 ± 3.21 & 148.86 ± 2.32, Gr III was 256.85 ± 5.23 & 159.34 ± 4.85 and Gr IV was 274.89 ± 5.56 & 175.76 ± 4.37, respectively. The overall area of pelvic inlet and outlet was 242.92 ± 5.12 & 156.39 ± 4.18 cm^2, respectively. These pelvic parameters increased with the age of the animals and the parameters significantly ($p<0.05$) differed between the age groups (Gr I and Gr II vs Gr III or Gr IV). Based on the information, this is concluded that the pelvic parameters were significantly ($p<0.05$) more in animals of 49 months and above as compared to younger animals (Table 63). The result of this study indicates that female animals has to be selected for breeding purpose which should not be less than 49 months of age to intervene the problems dystocia and perinatal calf loss.

Table 63: Measurement of pelvic parameters in crossbred cows of different age group (mean ± SE)

Age Group	Transverse pelvic diameter (cm)		Vertical pelvic diameter (cm)		Pelvic Area (cm^2)	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Group : I 24-36 months (n=6)	12.74±0.86^{a}	10.63±0.76^{a}	15.12±1.12^{a}	11.20±0.95^{a}	199.81± 4.91^{a}	129.12±3.65^{a}
Group : II 37-48 months (n=6)	14.52±0.78^{b}	11.98±0.82^{b}	16.97±0.34^{ab}	12.54±0.76^{ab}	224.23±3.21^{b}	148.86±2.32^{b}
Group : III 49-53 months (n=6)	15.65±0.83^{c}	12.98±0.65^{c}	16.36±1.43^{bc}	12.86±1.12^{bc}	256.85±5.23^{c}	159.34±4.85^{c}
Group : IV 65 months & more (n=6)	16.01±0.65^{c}	12.54±0.75^{c}	17.21±1.32^{c}	13.24±0.75^{c}	274.89±5.56^{c}	175.76±4.37^{c}
Overall mean	15.12±1.43	12.21±1.07	16.27±1.43	12.55±0.98	242.92±5.12	156.39±4.18

Mean in the same column bearing different superscripts differ significantly ($p<0.05$).

A Retrospective Study on Kidding Pattern and Mortality Rate of Indigenous Local Goat Kids Reared Under Semi-Intensive System in Andaman and Nicobar Islands

Perumal P, Jai Sunder and A. Kundu

The kidding pattern and mortality rate of any goat flock are the prerequisite to determine profitability of the goat husbandry. These parameters help to replace the low performing or non-potential goat in order to maintain proper flock strength and in achieving sustainable production and reproductive performance of goat farm. Kidding in goat is under multifactorial influences such as housing system, climate, nutritional status, and incidence of diseases, many other managemental, prophylactic & therapeutic practices. Therefore, the present retrospective study was proposed to collect the data of 544 kids born during the year 2001 to 2017 maintained at research goat farm, ICAR-CIARI, Port Blair, A & N Islands to analyse the factors affecting the kidding pattern and mortality rate in Andaman local goat under semi-intensive system. Frequency and percentage of kidding and mortality rate of kids during different years (2001 to 2017), months (January to December) and seasons (wet and dry season) were calculated. Relative female ratio (RFR) as well as secondary sex ratio (SSR) was also calculated to assess the sex ratio of the kids in the organised goat farm. Result revealed birth rate (Fig.23), sex ratio, mortality rate, kidding pattern such as singles, twines and triplets varied between months, seasons and years. Birth rate, mortality rate, single and twine birth were the highest in monsoon compared to dry season whereas triplets, quadruplet and sex ratio were higher in dry than monsoon season. In conclusion, sex ratio, birth rate and mortality rate differed significantly between months, seasons and years. Wet season and months were found to be most conducive for breeding of goat under semi-intensive system in A & N Islands.

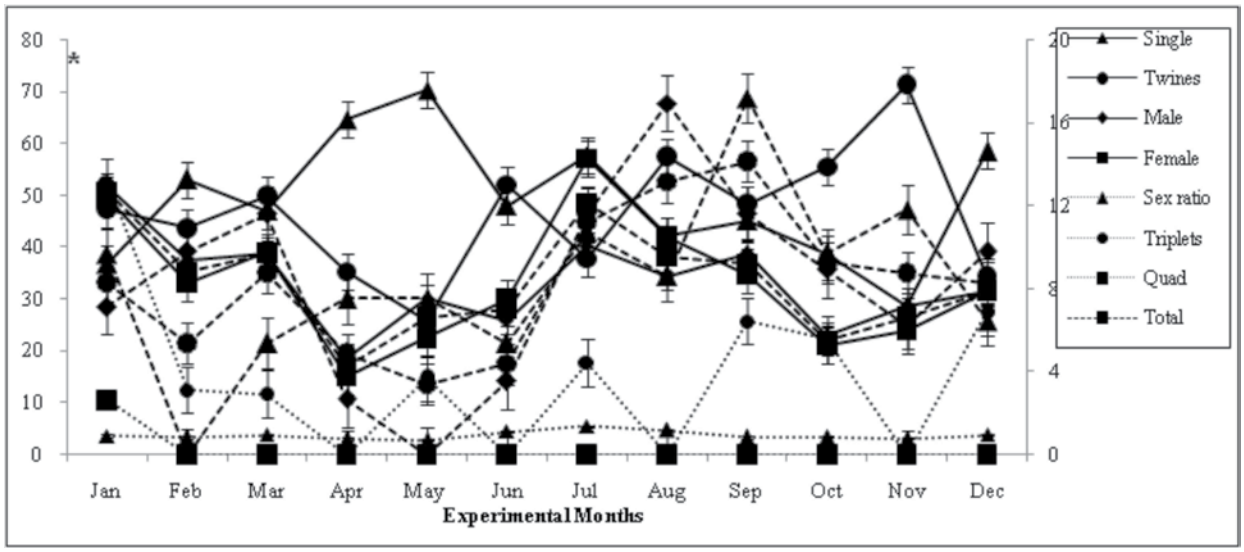


Fig. 23: Month-wise birth rate, sex ratio and mortality rate of goat reared under semi-intensive system in A & N Islands (*p<0.05). Quad: Quadruplets, M Male: Male mortality, M Female: Female mortality, M Average: Average mortality

Mineral Imbalance Induces Cellular Stress and Interferes With Immune Gene Regulation in Goat: A Case Study

Arun Kumar De, Perumal P, Jai Sunder, M.S. Kundu, T. Sujatha K. Munisyamy, D. Bhattacharya and A. Kundu

Table 64: Serum levels of minerals of the goats under study

Goats	Ca (mg/ dL)	P (mg/ dL)	Mg (mg/ dL)	Cu (ppb)	Zn (ppb)	Mn (ppb)	Fe (ppb)	Ca:P
Mineral Deficient Goats								
Normal Range	8.9-11.7	4.2-9.1	2.8-3.6	500-1600	(400-1600)	240-400	450-1900	1.5-2.0
Goat 1	4.1	9.7	3.1	630	204	310	800	0.42
Goat 2	4.0	7.6	3.2	650	201	230	900	0.53
Goat 3	3.2	8.3	2.7	700	178	250	870	0.39
Goat 4	4.6	8.1	3.3	560	167	310	1200	0.57
Goat 5	5.7	8.7	3.0	580	230	300	1400	0.66
Goat 6	4.3	7.8	2.8	600	310	290	780	0.55
Goat 7	5.2	9.6	2.9	610	230	290	980	0.54
Goat 8	5.6	9.3	2.8	630	195	280	860	0.60
Goat 9	4.3	8.9	3.2	670	340	310	1100	0.48
Goat 10	5.7	7.8	3.7	650	310	270	1070	0.73
Control Goats								
Goat 11	9.3	5.4	3.5	700	700	235	780	1.72

Goats	Ca (mg/ dL)	P (mg/ dL)	Mg (mg/ dL)	Cu (ppb)	Zn (ppb)	Mn (ppb)	Fe (ppb)	Ca:P
Goat 12	11.2	4.6	3.8	760	900	250	1400	2.43
Goat 13	9.7	5.2	3.2	780	890	270	1380	1.87
Goat 14	10.8	5.2	3.2	770	986	280	1200	2.08
Goat 15	8.8	5	2.8	700	670	293	1089	1.76
Goat 16	9.6	4.9	2.9	540	770	289	780	1.96
Goat 17	12.1	5.2	2.7	500	870	400	800	2.33
Goat 19	11.5	5.6	3.1	600	540	450	900	2.05

A farmer named Bhagirath Haldar of Sippighat village, South Andaman approached Animal Science Division, ICAR-CIARI, Port Blair as his goats were suffering from poor health, bone deformities, reduced libido and cathectic condition. An insight into the serum mineral profile revealed severe zinc deficiency and imbalance in the ratio of calcium and phosphorous (Table 34). The serum samples were further studied to understand the relationship between mineral imbalance and cellular stress and immunity. Serum samples from healthy population were taken as control. Significantly higher levels of serum heat shock proteins (Hsp 90, Hsp 70 and Hsp 27) were detected (Fig. 24) in mineral deficient goats as compared to control goats which indicates that mineral imbalance induces cellular stress. Anti-inflammatory cytokines (IL-2, IL-4 and IL-6) were up-regulated whereas anti-inflammatory cytokines (TNF-α and IFN-γ) were down-regulated in mineral deficient goats as compared to control goats. In conclusion, it may be stated that mineral imbalance triggers cellular stress and disturbs regulation of immune genes in goat.

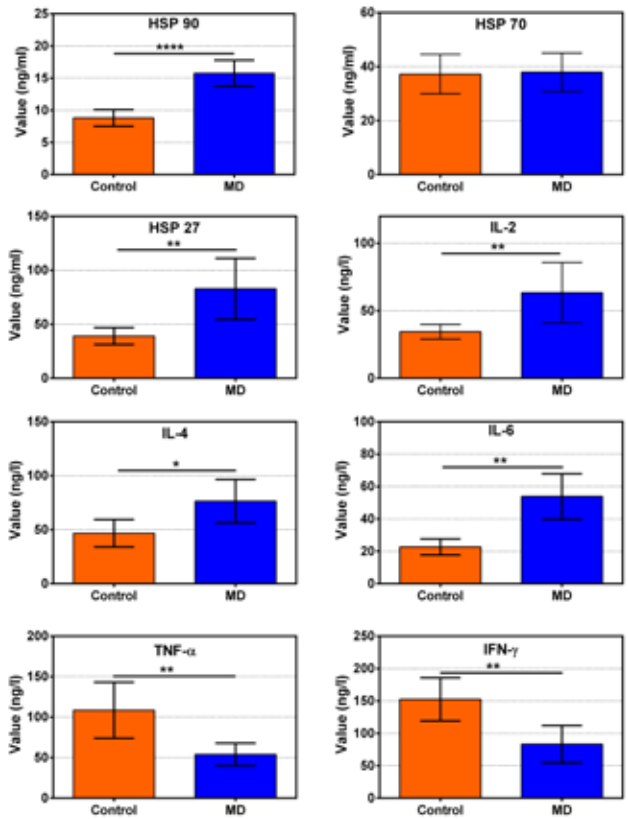


Fig. 24: Effect of mineral imbalance on expression of serum heat shock proteins and inflammatory cytokines in goats. Data are shown as mean ± SD. * denotes $p<0.05$, *** denotes $p\leq0.001$.

Zinc Toxicity in Goat is Associated with Cellular Stress and Immune Gene Disregulation

Arun Kumar De, Jai Sunder, Perumal P, M.S. Kundu, K. Muniswamy, T. Sujatha,
D. Bhattacharya and A. Kundu

An investigation was done to understand the reason behind hoof deformity in several goats maintained in our institute farm. Selenium toxicity, zing toxicity and copper toxicity are generally associated with hoof deformity. Estimation of the above said minerals in serum, hoof samples and hair samples revealed that the goats were suffering from severe zinc toxicity (Table 65) as the levels of other two minerals (Se and Cu) were within the normal range. Further study was undertaken to understand the role of zinc toxicity in cellular stress and immunity. It was found that zinc toxicity induces cellular stress and modulates the expression of several inflammatory cytokines (Fig. 25).

Table 65: Level of zinc in hair, blood and hooves in affected goats

ZINC (IN PPM)			
Animal No. (Goat)	**HAIR**	**BLOOD**	**HOOVES**
622	39.82	5.74	14.02
688	44.12	2.62	7.00
909	52.96	3.20	15.4
950	33.84	3.94	10.6
959	38.04	2.84	33.68
971	62.04	1.36	13.60
985	58.12	2.62	14.40
934	8.32	3.94	8.60
938	10.32	1.96	15.20
989	81.80	2.87	10.60
1189	41.40	2.30	7.40
Teressa Goat (young)	91.60	3.21	9.84
Teressa Goat (small)	41.20	1.49	6.40
Teressa Female Goat (adult, homeless)	92.00	4.71	8.20
AL (small)	22.04	1.82	5.90

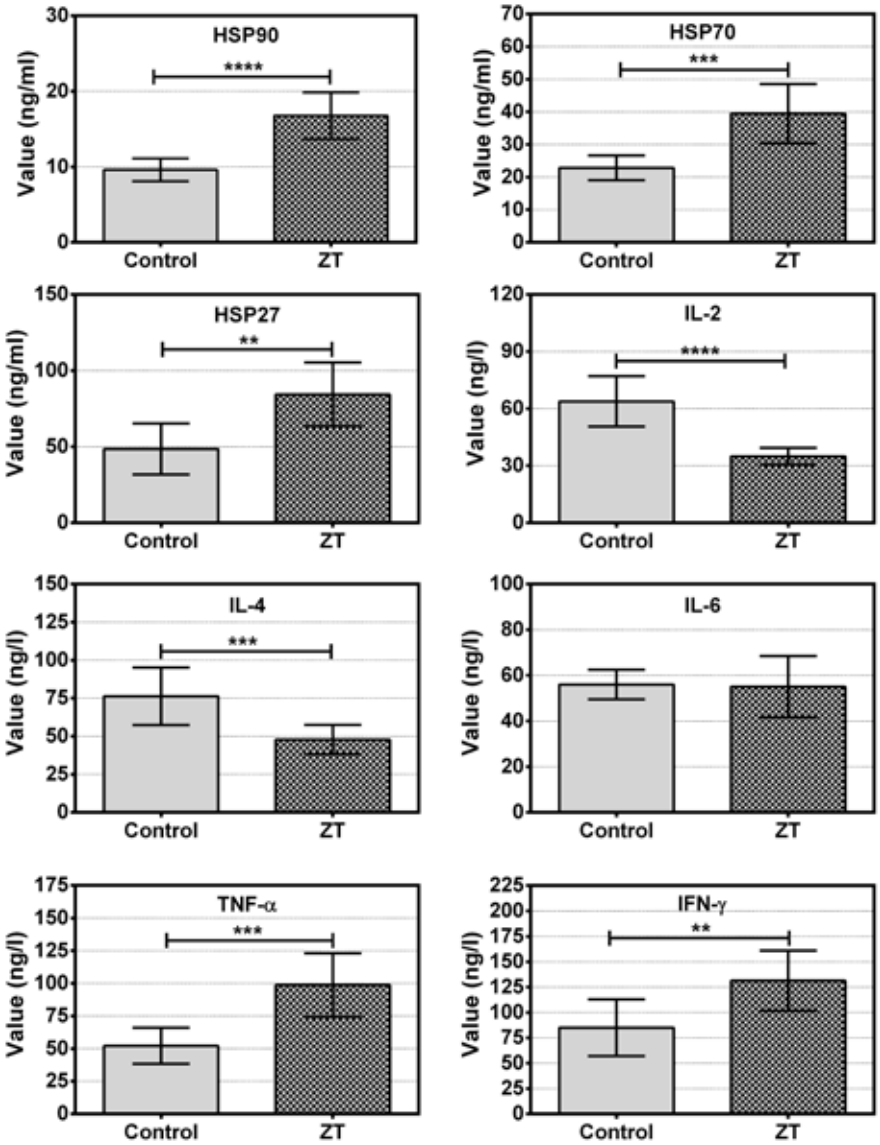
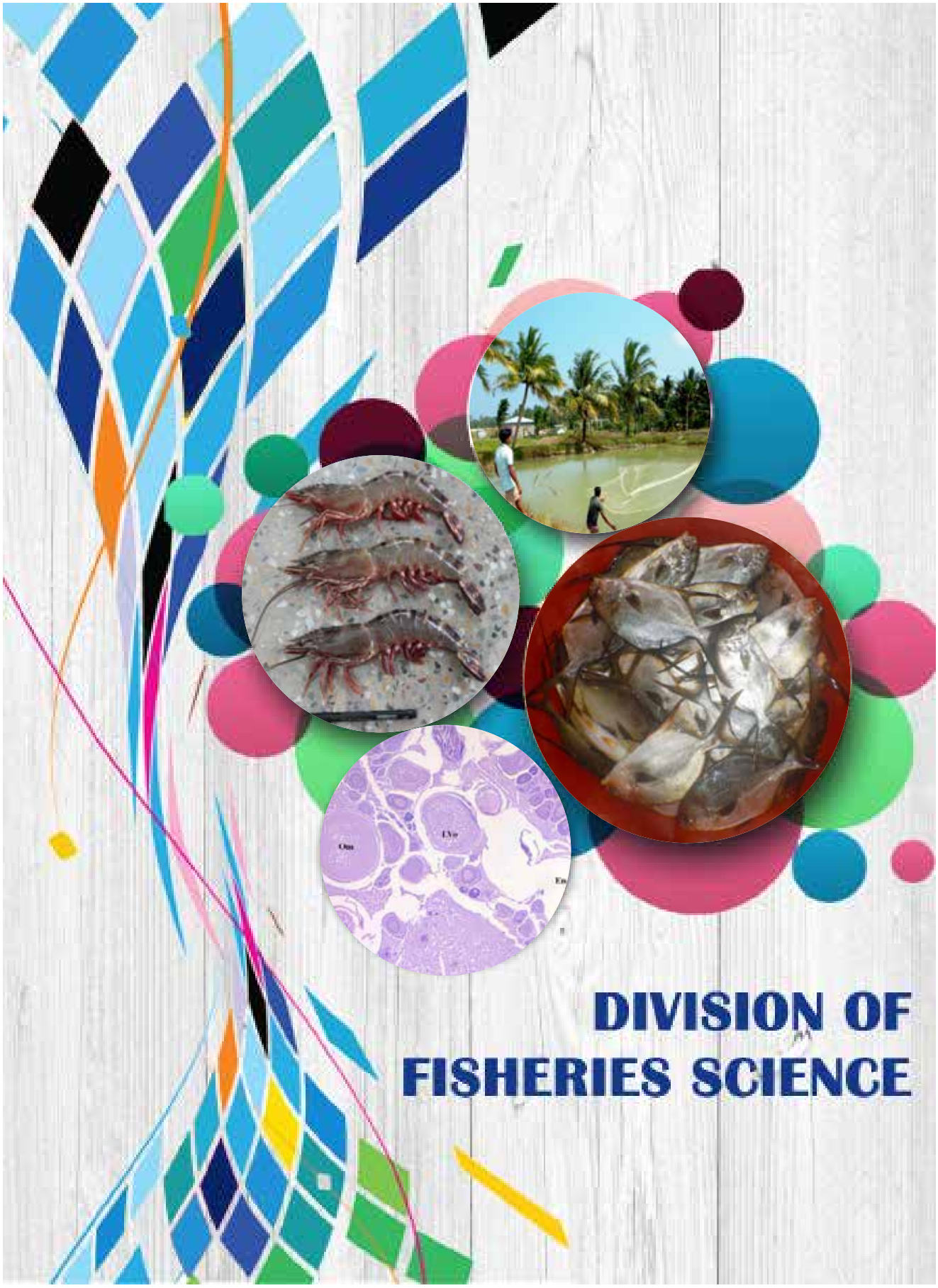


Fig. 25 : Effect of Zinc toxicity on expression of serum heat shock proteins and inflammatory cytokines in goats. Data are shown as mean ± SD. * denotes $p<0.05$, *** denotes $p\leq0.001$.



DIVISION OF FISHERIES SCIENCE

Assessment of Stock of Neretic Sharks from Andaman Waters

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

The study was taken with the objectives to assess the landing pattern of sharks, location the important shark fishing grounds and developing effective conservation measures against irrational exploitation of sharks and shark fins. Data were collected with respect to catch, effort, geo reference point, gear wise landings, and sizes of catches. The geo referenced catches are used to mark the vulnerable shark fishing grounds upon which conservation measures can be prepared. The data analysis over the period of three years is shown in Fig 26.

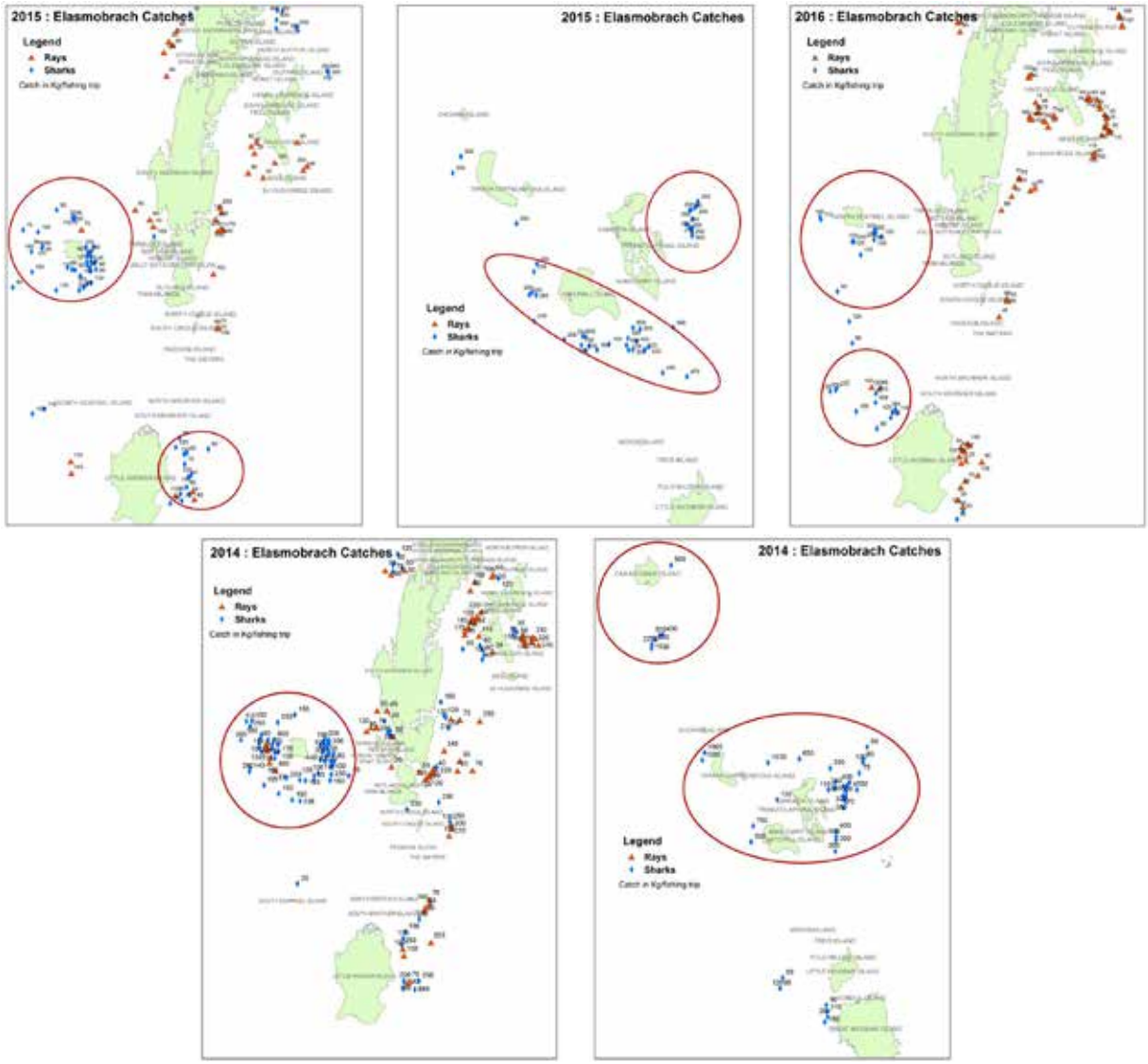


Fig 26: Year wise geo referenced catches analyzed and fishing areas of sharks and rays

Over 41 species of sharks reported from Islands 21 species were noted in landings. Of eleven sharks families recorded Carcharinidae constituted 62% followed by Sphyraenidae 30% and others. Among the gears used to land sharks, 81% of catches were from long lines, 12% by gill nets, 5% by hand lines and rest through trawlers and ring nets (Fig 27). Over three years of analysis and overlay of catches it was found that rich

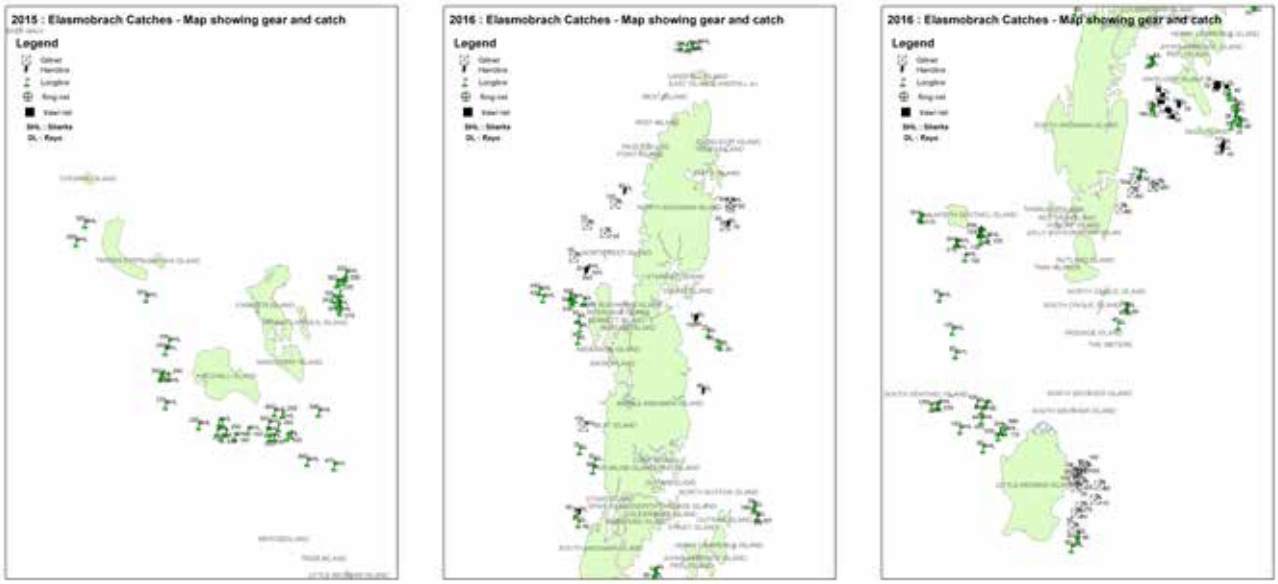


Fig 27: Gear wise landings analyzed for shark fishing and their catch per unit effort

shark fishing grounds were observed around North Sentinel Islands, Little Andaman and Nancowry group of Islands which were mostly caught using long line intentionally along with tunas and deep sea fishes. Gill nets were mostly used to catch smaller sharks and most of the composition comprised of hammer head sharks *Sphyrna sp*. In Andaman, shark fin trade is evolving in to a growing industry over the years as in 2016-17, 766 kg of shark fins were exported to mainland. The demand for fins makes them vulnerable to over exploitation as they are harvested mainly for fins despite the meat being used for local and export market. Assessing the fishing grounds where sharks are caught and gears that contribute maximum landings has given lot of insights in development of management practices towards conservation. Sharks are also being poached in large numbers owing to the demand in South Asia as evident from the data collected from local administration as part of project work. The study has mapped regions that were mostly targeted by fishermen and demarcating such zones as No Take Areas could effectively resolve the issues that future might face with regard to shark fisheries.

Seaweed Diversity and its Culture Prospects in *In situ* Conditions of Andaman

A. Anuraj, K Lohith Kumar, A.K.O Ratheesh, Harsha Haridas and R. Kiruba Sankar

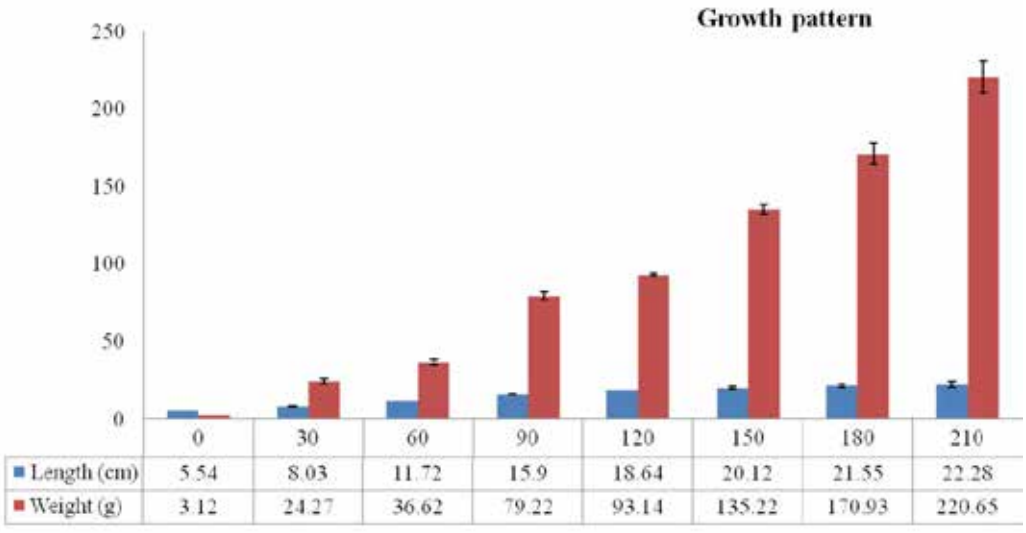
The effect of exogenous factors on the micropropagation of axenic explants of commercially important red seaweeds was studied. Effect of kind and concentration of culture media and plant growth regulators on *in vitro* propagation of *Gracilaria* were determined. Axenic sterile explants of seaweeds was cultured *in vitro* using filter sterilized autoclaved seawater (FSAS) or filter sterilized autoclaved artificial seawater (FSAAS) based media supplemented with cytokinins (2.5 mg $L^{-1}$to 7.5 mg L^{-1}), *viz.,* Kinetin, 6-Benzylaminopurine (6-BAP) and *meta*-topolin alone or in combination with an auxin, Indole-3-acetic acid (IAA) (0.2 mg L^{-1}). Segments of seaweed species were collected during low tide and cleaned off to eliminate the epiphtyes in laboratory. These explants were cut into 10 mm size using sterile blades and treated with antibiotic solution followed by detergent and surface sterilants to produce axenic viable explants. The effect of media, *viz.,* FSAS and FSAAS at 50%, 100% and 200% concentration on axenic explant growth, photosynthetic pigments and lateral bud formation were studied. The result showed that FSAS media at 100% (S_2) promoted maximum growth, photosynthetic pigments and induction of lateral buds in *G. foliifera* and *G. crassa*. FSAAS media at 100% (A_2) promoted axenic explant growth, photosynthetic pigments and lateral bud formation in *G. corticata* var. *cylindrica*.

The media which promoted maximum growth, photosynthetic pigments and lateral bud formation in respective axenic explants was used to study the effect of plant growth regulators on explant proliferation. Axenic explants of *G. foliifera* cultured in S_2 media supplemented with plant growth regulators, kinetin (7.5 mg L^{-1}) recorded more growth, photosynthetic pigments and lateral buds. A_2 media supplemented with plant growth regulators, kinetin at 2.5mg L^{-1} promoted growth in axenic explants of *G. corticata* var. *cylindrica* under *in vitro* conditions. The total chlorophyll pigment was found to be highest with the addition of kinetin at 5 mg L^{-1}, while total carotenoid was highest in media supplemented with kinetin at 7.5 mg L^{-1}. In relation to formation of lateral buds, A_2 media supplemented with kinetin at 2.5 mg L^{-1} promoted more lateral buds in *G. corticata* var. *cylindrica* axenic explants. In *G. crassa* axenic explants, kinetin at 5 mg/L in combination with IAA at 0.2 mg L^{-1} in S_2 media showed highest growth, photosynthetic pigments and lateral bud formation.

Capture Based Aquaculture of Marine Fin Fishes and Shell Fishes From Andaman Waters

A Anuraj, A K O Ratheesh, K Saravanan, S Murugesan, Benny Varghese, R. Kiruba Sankar and S. Dam Roy

Galvanized iron cages of 6m diameter with inner cage depth of 4.5 cm and outer cage depth of 5m was used in the study to culture Silver pompano stocked with initial mean length and weight of 5.54cm and 3.12 g of 1000 seeds. Initial feeding was done with 45% of pelleted feed and the seeds were reared for two and half months using hapa inside inner cage. After achieving considerable size they were released in to cage after reaching 30-40g size. The stocking density was maintained at 30/m^3 and trash fish was fed twice a day using local fishermen who were part of the project as community based culture practice. The culture of Silver pompano was carried out over a period of 210 days with the average final harvest of 22.28cm length and 220.65g of weight. (Fig 28). The cages were moored at Minnie Bay and the harvesting is shown in (Plate 76) .



	0	30	60	90	120	150	180	210
Length (cm)	5.54	8.03	11.72	15.9	18.64	20.12	21.55	22.28
Weight (g)	3.12	24.27	36.62	79.22	93.14	135.22	170.93	220.65

Fig 28: Growth of Silver Pompano *Trachyonotus blochii* in cages at Minnie Bay

Plate 76: Due to limitations and non availability of seeds the cages were not stocked after completing the culture and harvest of silver pompano. The dependency of seeds from mainland, adverse weather conditions and logistical issues were found to be major limiting factors.

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

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

It was documented that tunas mainly landed in Junglighat landing centre followed by Burmanallah and Dignabad whereas, incidental landings were recorded from Wandoor and Guptapara landing centers. Tuna catch comprised of *Thunnus albacares* (yellow fin tuna), *T. obsesus* (big eye tuna), *Katsuwonus pelamis* (skipjack tuna), *Gymnosarda unicolor* (dog tooth tuna), *Euthynnus affinis* (little tuna), *Thunnus tonggol* (longtail tuna), *Sarda orientalis* (oriental bonito), *Auxis thazard* (frigate tuna) and *Auxis rochie* (bullet tuna). The catch of tuna were dominated by yellow fin tuna followed by skipjack tuna, little tuna and frigate tuna respectively.

A total of 46 visits were made to the landing centers at Port Blair to collect. Using length and weight of *E. affinis* collected from the landing centers of Port Blair was used length based models. Fish samples were collected randomly and brought to laboratory for conducting biological studies. The length-weight relation was calculated using the method suggested by Le Cren (1951). Mature ova were considered in calculating the total fecundity. Stomachs were analyzed for fullness by visual method and prey were identified up to genus level. ELEFAN I module of FiSAT II software was used to calculate the growth parameters. Natural mortality and total mortality was calculated using Paulys empirical formula and length converted catch curve method in FiSAT II software. *Euthynnus affinis* was mainly exploited by the motorized boats using gill net followed by hand line. It was observed that the catch of tuna was high during the no moon days and low during the full moon days. The catch was recorded round the year with the peak in August-September months. The fork length of little tuna landed ranged from 18 cm to 70 cm. Fishes in the length range of 30 cm to 55 cm dominated the catch with the average length being 42 cm.

The Von Bertalanffy's growth parameters; L infinity and K value were calculated using ELEFAN module of FiSAT II software. L infinity; the maximum length an indefinitely old fish can attain was 74.03 cm and K value; the rate at which the fish approaches L infinity was 0.41 (Fig 29)

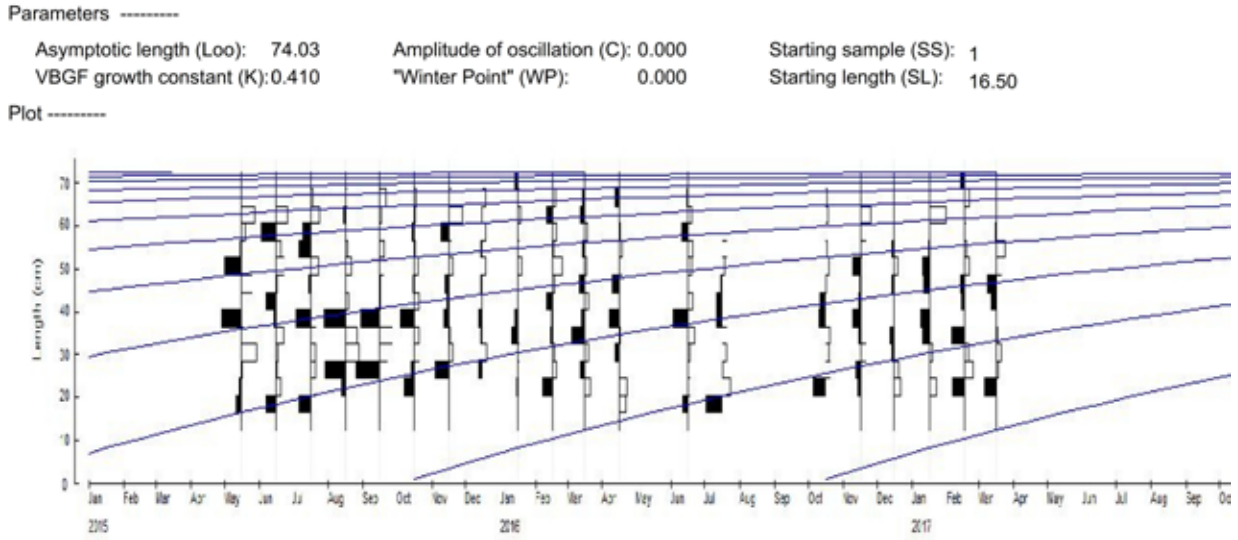


Fig. 29: Estimation of growth parameters using ELEFAN module in FiSAT II software

Mortality parameters were estimated using the FiSAT software. Total mortality (Z) was 1.09 which was calculated using Length Converted Catch Curve module (Fig. 30). Natural Mortality (M); the proportion of fish death caused due to natural factors such as ageing, disease, predation etc was calculated using Pauly's Emeperical formula. M was estimated as 0.77. Length weight relation was arrived at $W = 0.179\ L^{2.259}$.

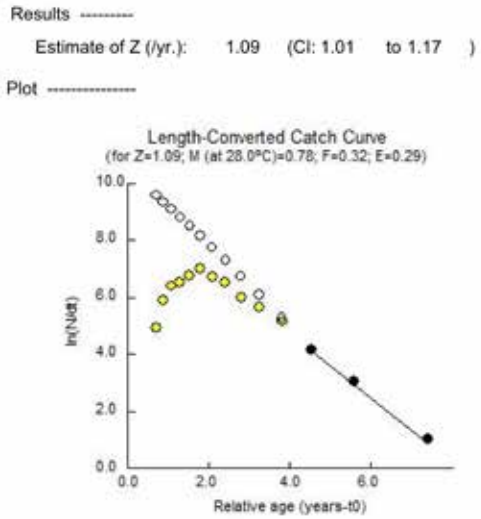


Fig. 30: Estimation of total mortality

Studies on reproductive biology revealed that Gonado-Somatic Index has two peaks in a year indicating that it spawns twice a year during the month of April-June and August-October. The relative fecundity was estimated at 280000 eggs per kg. Length at first maturity (L_M) was estimated at 39-40 cm.

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

K. Saravanan, J. Praveenraj and A. Anuraj

Baseline data has been collected from a total of 298 freshwater fish farms located at different villages of North and South Andaman and necessary advocacies were provided to the fish farmers. Fish and shellfish samples were collected from North and Middle Andaman (N&M) and South Andaman (SA) for screening against the target pathogens by following the OIE protocol. Freshwater carp and prawn samples (N&M-49; SA-72), wild marine shrimp samples (N&M-60; SA-22) and grouper samples (N&M :17; SA:59) were collected (Plate 77) . All the analysed freshwater carp samples gave negative result for the screened pathogens like Koi Herpes Virus (KHV) and Spring Viremia of Carp (SVC) and freshwater prawn samples gave negative result for Macrobrachium Noda Virus (MrNV) and Extra Small Virus (XSV). All the marine grouper samples gave negative result for Red Sea Bream Irido Viral Disease (RSIVD) and Viral Nervous Necrosis (VNN). Besides, wild marine shrimp samples gave negative result for Monodon Baculo Virus (MBV), Infectious Hypodermal and Haematopoietic Necrosis Virus (IHHNV), Yellow Head Virus (YHV), Taura Syndrome Virus (TSV), Infectious Myonecrosis Virus (IMNV), Acute Hepatopancreatic Necrosis Disease (AHPND) and *Enterocytozoan hepatopenaei* (EHP) infection respectively.

Plate 77: Collection of fish and shellfish samples. A: Cast netting in a pond ; B: Sample collection from rohu; C: Shrimp samples

Occurrence of bopyrid isopod parasites namely, *Probopyrus* sp. was reported from freshwater prawns like *Palaeomon* sp. and *Macrobrachium scabriculum*; *Epipenaeon ingens* was reported from *Peneaus indicus*. Likewise, marine fish parasites such as *Serrasentis* sp. and *Caligus* sp. were reported from *Rastrelliger kanagurta* and *Lernaenicus* sp. reported from *Dussumieria acuta* (Plate 78).

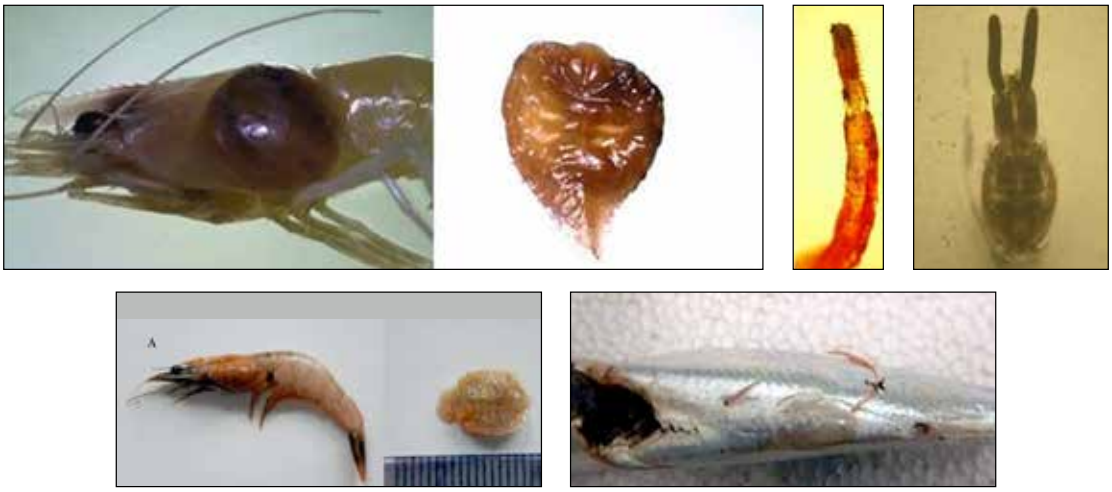


Plate 78: Occurrence of parasites. A: *Probopyrus* sp.;B; *Serrasentis* sp.; *Caligus* sp.; *Epipenaeon* sp.; E: *Lernaenicus* sp.

Under the capacity building activity, a total of 2 awareness and 1 training programme was conducted on fish diseases and fish health management measures at North and South Andaman (Table 66), in which a total of 68 farmers benefitted (Plate 79). During this period, a total of 4 research papers were published from this project.

Table 66: Details of awareness and training conducted under NSPAAD project

S. No.	Date	Place	Title	Number of Participants
Awareness				
1	09-08-17	Keralapuram, North Andaman	NSPAAD	20
2	20-08-17	Wimberlygunj, South Andaman	NSPAAD	26
Training				
1	16-01-18	Sippighat, South Andaman	Better Management Practices (BMPs) for Island Aquaculture	22

Plate 79: Awareness programme and training conducted at various places

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

K. Saravanan, T. Sivaramakrishnan, J. Praveenraj and R. Kiruba Sankar

An experimental trial was conducted to evaluate the effect of dietary administration of probiotic bacteria such as *Bacillus amyloliquefaciens, B. subtilis and B. megaterium* on rohu fingerlings. Fish feed was prepared with 25% protein and 6% lipid by using locally available ingredients such as fish meal (10%), groundnut oil cake (20%), coconut oil cake (15%), rice bran (20%), broken rice (14%), tapioca flour (3%), wheat flour (12%), cod liver oil (2%), coconut oil (2%) and vitamin and mineral premix (2%). Nine experimental feeds were formulated to contain *B. amyloliquefaciens* (10^6 cfu/ g feed as T1 and 10^9 cfu/ g feed as T2), *B. subtilis* (10^6 cfu/ g feed as T3 and 10^9 cfu/ g feed as T4), *B. megaterium* (10^6 cfu/ g feed as T5 and 10^9 cfu/ g feed as T6) and mixture of *B. amyloliquefaciens, B. subtilis* and *B. megaterium* (10^6 cfu/ g feed as T7 and 10^9 cfu/ g feed as T8) and control feed (C) without probiotic bacteria.

A total of 405 rohu fingerlings (average weight 5.02 ± 0.85 g) were distributed in nine treatment groups each comprising of three replicates and randomly assigned to receive the experimental diets. The fishes were fed at the rate of 3% body weight per day in two equal portions for a period of 45 days. Sampling was performed to record growth parameters, body indices, hematological, immunological and enzymatic parameters during the period of experiment. Water quality parameters were maintained at optimum level throughout the experiment. After 45 days, fishes were challenged with *Aeromonas hydrophila* at the rate of 0.1 ml of 10^7 cfu/ ml per fish and survival rate was recorded for the next 10 days.

Table 67 :Growth and production parameters of rohu fingerlings after 45 days feeding trial. SGR: Specific Growth Rate; FER: Feed Efficiency Ratio; FCR: Feed Conversion Ratio; PER: Protein Efficiency Ratio. Each value is expressed as the mean ± standard error and significant differences ($P < 0.05$) are indicated by different letters (a, b, c).

Treatments	Parameters				
	Weight gain (g)	SGR	FER	FCR	PER
T1	1.16 ± 0.16^{bc}	0.33 ± 0.09^{bc}	0.061 ± 0.033^{a}	2.56 ± 0.08^{b}	0.24 ± 0.033^{a}
T2	1.26 ± 0.29^{b}	0.30 ± 0.12^{c}	0.040 ± 0.038^{a}	2.89 ± 0.29^{b}	0.16 ± 0.015^{a}
T3	0.76 ± 0.09^{c}	0.25 ± 0.03^{c}	0.044 ± 0.014^{a}	3.27 ± 0.42^{bc}	0.17 ± 0.058^{a}
T4	0.73 ± 0.06^{c}	0.27 ± 0.06^{c}	0.054 ± 0.01^{a}	3.69 ± 0.97^{bc}	0.20 ± 0.047^{a}
T5	0.71 ± 0.01^{c}	0.31 ± 0.07^{c}	0.055 ± 0.01^{a}	4.81 ± 0.42^{c}	0.22 ± 0.040^{a}
T6	1.43 ± 0.11^{ab}	0.27 ± 0.08^{c}	0.034 ± 0.019^{a}	4.38 ± 0.71^{c}	0.13 ± 0.79^{a}
T7	1.89 ± 0.30^{a}	0.58 ± 0.06^{a}	0.087 ± 0.028^{a}	1.97 ± 0.27^{a}	0.34 ± 0.018^{a}
T8	1.72 ± 0.11^{ab}	0.52 ± 0.13^{ab}	0.095 ± 0.011^{a}	2.22 ± 0.56^{ab}	0.38 ± 0.045^{a}
C	0.82 ± 0.13^{c}	0.25 ± 0.05^{c}	0.035 ± 0.008^{a}	3.19 ± 0.33^{bc}	0.14 ± 0.032^{a}

Growth and production parameters such as weight gain, specific growth rate (SGR) and feed conversion ratio (FCR) indicated significant difference in the treatment group T7 followed by T8 than control group, whereas no significant difference was observed in feed efficiency ratio (FER) and protein efficiency ratio (PER) (Table 67). On the other hand, no significant difference exists in body indices such as hepatosomatic index (HSI) and viscerosomatic index (VSI) among the treatments but significant difference was observed between the control and treatments (Fig. 31). There was no major difference observed in whole body proximate composition of rohu fingerlings after 45 days feeding trial (Table 68).

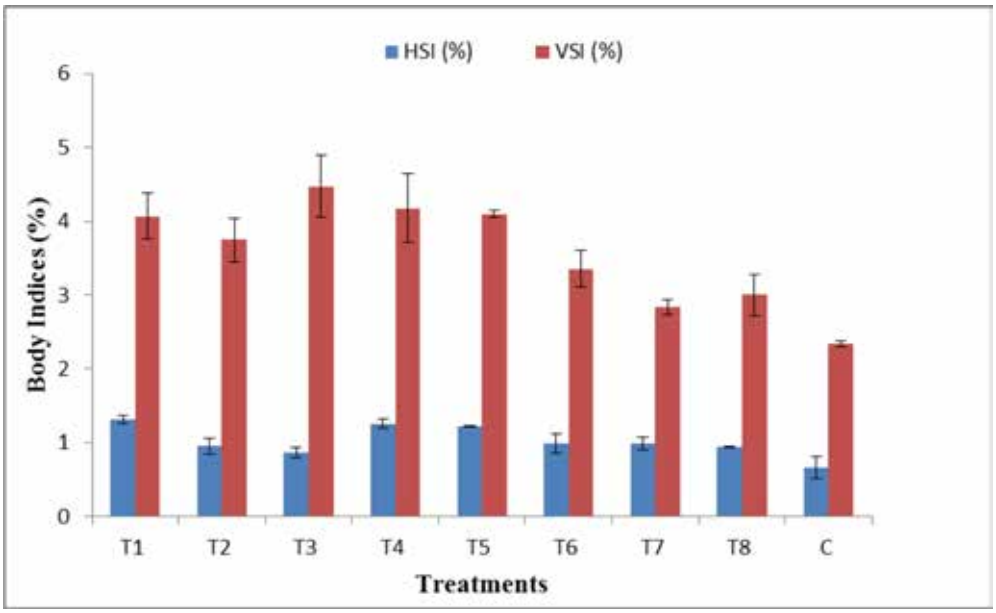


Fig. 31 : Body indices of rohu fingerlings after 45 days feeding trial

Table 68: Whole body proximate composition of rohu fingerlings after 45 days feeding trial

Treatments	Whole body proximate composition (%)				
	Moisture	Ether Extract	Crude Protein	Crude Fibre	Total Ash
T1	75.070	16.876	63.328	0.810	14.816
T2	74.573	16.300	60.562	6.635	15.510
T3	74.979	17.976	59.595	0.955	15.866
T4	75.054	16.895	61.964	0.756	15.376
T5	75.122	16.755	65.029	1.483	15.320
T6	75.134	20.993	67.463	1.145	16.887
T7	75.472	17.764	62.577	0.493	17.065
T8	77.398	14.904	65.421	4.262	16.794
C	76.345	18.606	63.223	0.639	15.648

Hematological indices were significantly higher in T7 followed by T8 than control group. Besides, the challenge test with *A. hydrophila* showed significantly lower survival rate for the fish fed with control diet than those of fish fed with other experimental diets. Hence, these results suggest that the dietary administration of mixture of *B. amyloliquefaciens, B. subtilis* and *B. megaterium* at 10^6 cfu/ g feed (T7) could be a more effective source of probiotic for rohu fingerlings.

Cataloguing of Inland Aquatic Biodiversity and Breeding of Indigenous Ornamental Fishes

Praveenraj Jayasimhan, A Anuraj, R Kiruba Sankar and S. Dam Roy

Ichthyological surveys conducted at Mannarghat and Manjery of South Andaman districts revealed the presence of *Stiphodon* species hitherto at Mannarghat water falls. Other species recorded includes *Rasbora* sp., *Aplocheilus andamanicus, Redigobius tambujon, Redigobius bikolanus, Eleotris fusca, Eleotris melanosoma* and *Giurus margaritacea.* Studies on molecular taxonomy of *Anabas cobitidius*, *Microphis insularis* and *Macrobrachium sp* were being done to confirm at species level. The cataloguing of freshwater fishes over period of three years revealed several new records and reports to Andaman and Nicobar Islands. Other objectives of the project were breeding of indigenous ornamental fishes and assessing its potential as commercially cultivable aquarium fishes. The indigenous Channa sp was identified and subjected to breeding and seed production. Broodstocks of *Channa royi* sp. nov was collected and acclimatized in 500 gallon FRP tanks and fed with prawns and fishes at 3% of the body weight for three times daily. Hormonal stimulation was subjected through ovaprim injection at 0.5 ml/kg of the broodstocks of the *Channa* and the breeding behaviour was observed for a period of one week. Breeding signs like chasing, tugging and coaxing was observed but there was no release of eggs. Other species, *Danio rerio* collected from Middle Andaman was reared and the species bred under confined conditions. Natural spawning was observed after a sudden shower of rain, which was followed by chasing of mature males towards gravid females, which led to the release of eggs and milts. Hatching was observed after a period of 24 hrs post fertilization. Egg sac larvae were released and the yolk sac was absorbed after 3 days. Free swimming larvae were obtained and it was fed on Artemia nauplii. Similarly broodstock development was done for *Sicyopterus* microcephalus but no breeding activity was observed as they require brackish water migration for egg laying. Most of the Island fish fauna are diadromous and requires brackishwater migration for their egg laying and development, it is important to study their biology further. Freshwater prawns like *Macrobrachium australae* and *Macrobrachium placidulum* was recorded from Mannarghat. Natural breeding was observed in the endemic pipefish, *Microphis insularis*. In this pipefishes unlike females, males give birth to the live young ones, and the juveniles accept zooplankton as the feed.

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

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

Pristipomoides landings have been recorded monthwise from landing centers to study were studied for food, feeding and reproductive biology (n=400). Feeding intensity of *Pristipomoides filamentosus* showed maximum with empty stomach followed by trace, 1/4th, 1/2th, 3/4th of filling stomach. Index of preponderance (IP) showed fishes as main food and other food items such as shrimps, amphipods, crab appendages and fully digested food materials (Fig.32 & 33).

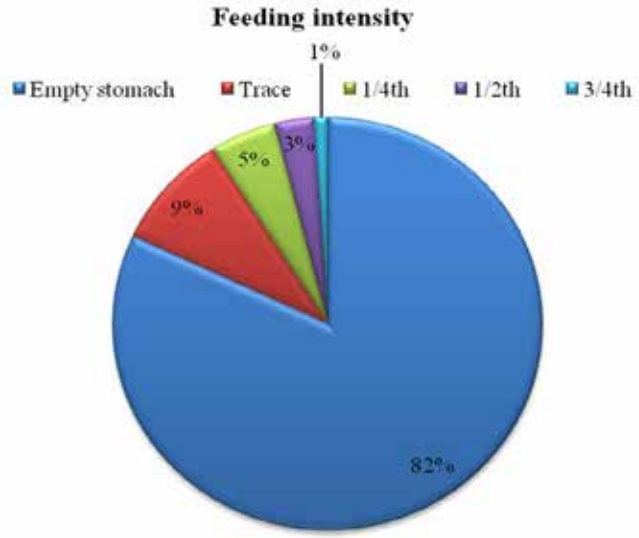


Fig. 32: Feeding intensity of *Pristipomoides filamentosus*

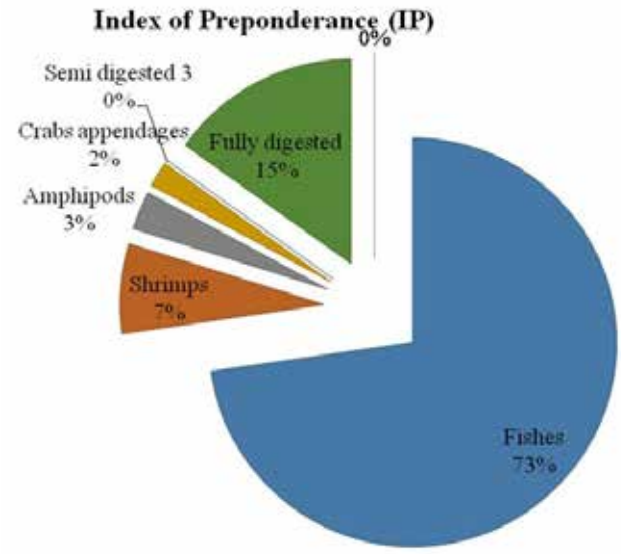


Fig.33: Index of preponderance of *Pristipomoides filamentosus* gut content analysis

The smaller size length group showed male character and as the fish grows the female oocyte stages were encountered. Different stages of oocytes observed are shown in Plate 80 (a-d).

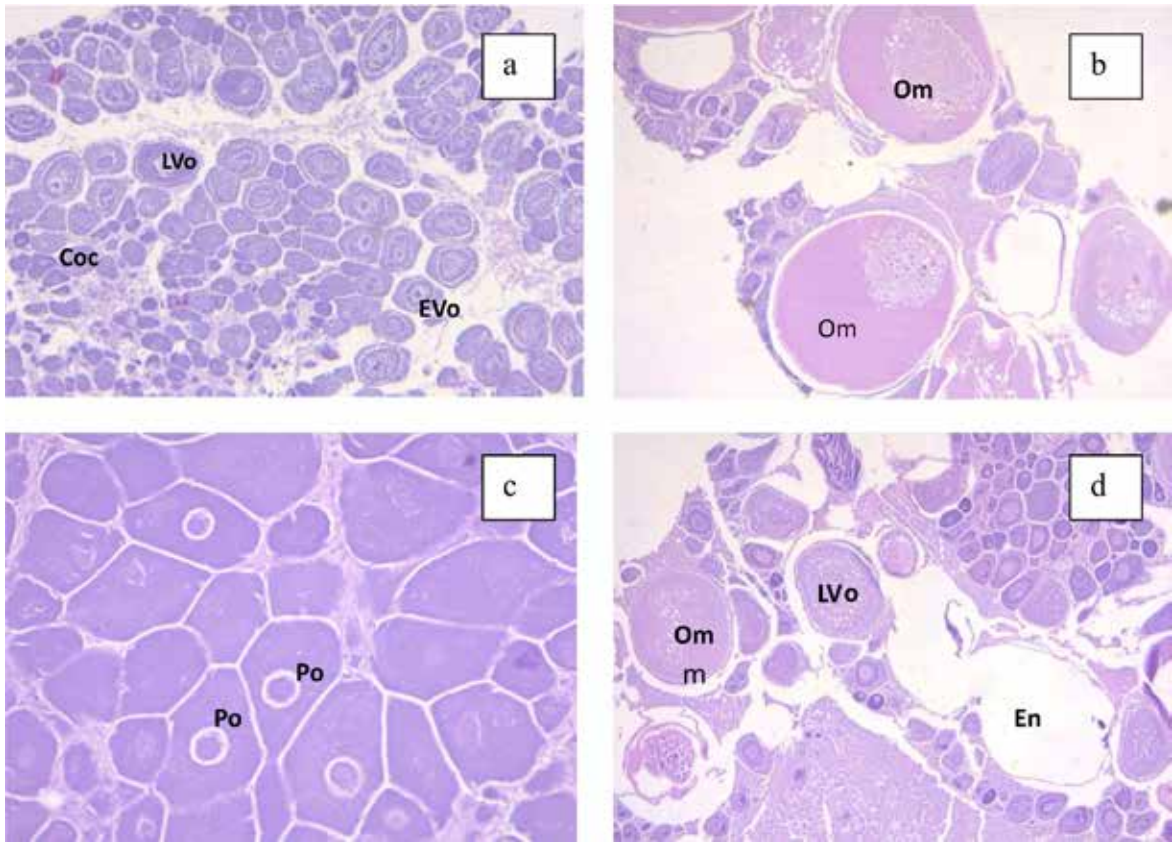


Plate 80 (a-d): Different stages of oocyte, Po-primary oocyte, Cortical alveoli stage (Coc), EVo- early vitellogenic oocyte, LVo- Late Vitellogenic oocyte, Mature oocyte (Om)

Biology of Blue Fin Trevally (*Caranx Melampygus*) from Andaman Waters

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

Length weight data was recorded from commercial gillnet and hook and line catch from Junglighat, Guptapara, Wandoor, Panighat, Burmanallah, Dignabad and Collinpur landing centers. A total of 87 individuals of *Caranx melampygus* were collected by experimental fishing through trolling from different feeding grounds in Chidiya Tapu, Collinpur, Jolly Buoy, Ross Island, North Bay and Madhuban in South Andaman. Blood samples were collected from the individuals for hormonal assay after anesthetizing the individuals in clove oil.(Plate 81 a) Serum was separated from the collected blood samples over night and stored at -20°C till further use. The specimens were recorded along with standard length, fork length, head length, weight, stomach weight, gut content, sex, gonadal weight and visceral examination (Plate 81 b-c). The gonads were collected weighed (Plate 81 d) and transferred to Neutral buffered formalin (NBF) for histology. The gut contents from gorged stomachs were weighed and stored in NBF for feeding analysis.

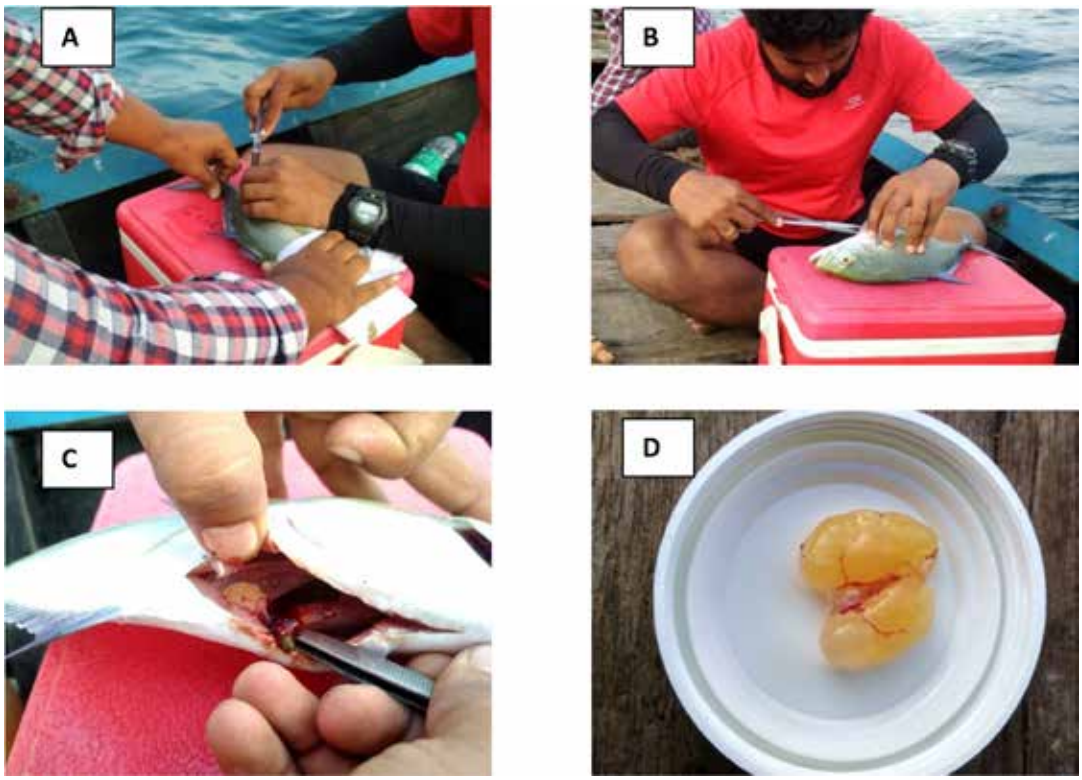


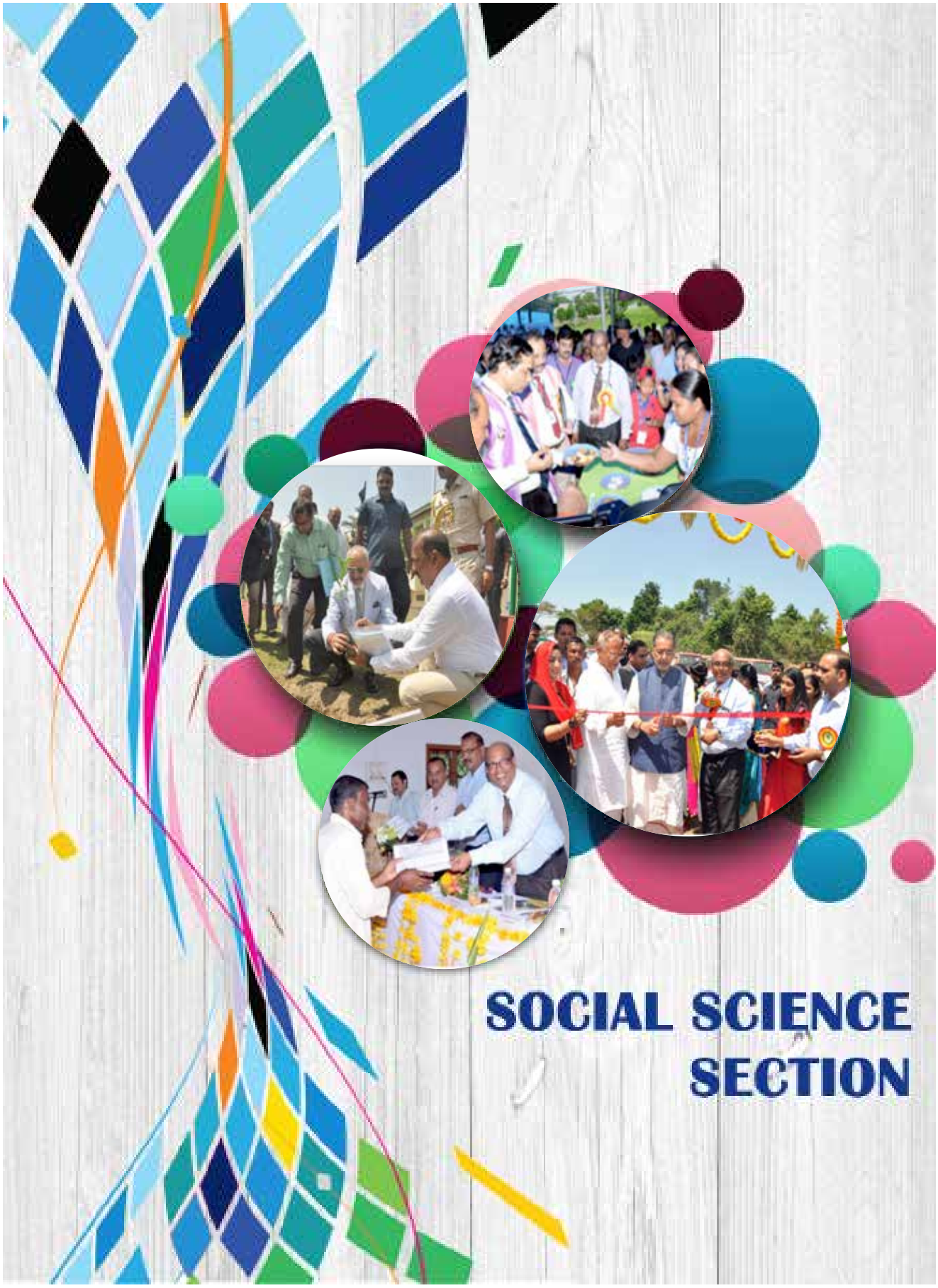
Plate 81 a-d : Blood sampling, visceral examination and gonad collection

Caranx melampygus was an incidental catch in both the fishing gears. Based on information received from the field officers in the Department of Fisheries, Andaman and Nicobar Administration, Diglipur and Mayabunder, the contribution of bluefin trevally to commercial catch was meager in the region and was limited to incidental occurrence of juveniles and sub adults in gill nets. The catches from gillnets were dominated by juveniles and sub-adults while adult sized individuals (>300mm) were recorded only from hook and line catch. Being an apex carnivore, the digestive juices of the animal were capable to digest the prey even after its death, hence the characterization of gut content from samples collected from landing centers were found to be difficult. Accordingly, the samples for feeding, reproductive and histological studies were collected by experimental fishing by troll lines. Trevallies are reported to be highly piscivorous and the bluefin trevally was no exception with the gut content dominated by prey fishes (76%) followed by crustaceans (9%), mollusks (7.4%) and the rest were unidentified matter. A majority of the collected specimens were sub-adults in the size range 167mm to 281mm fork length (FL), having their gonads in early maturing stage. Maturity was observed in individuals of 369mm FL and above. Mature individuals were observed in the months of October, December and March.

Documentation of Indigenous Fishing Practices of Nicobari Tribes

A.K.O. Ratheesh , S. Dam Roy, R. Kiruba Sankar, Nagesh Ram, S.K. Zamir Ahmed and *S.K. Pandey*

Questionnaire was framed to collect the information pertaining to indigenous fishing practices of Nicobari tribes incorporating their prior consent before the data collection. Meanwhile the secondary data from online and field visit sources were collected pertaining to the indigenous fishing practice of Nicobari tribes. Data with regard to navigation, sea safety practices and weather prediction practices for fishing is being collected and the possibility of locating the fish shoals through indigenous fishing knowledge will be documented. The current set of traditional practices documented includes making of hodi, traditional fish based products, indigenous fishing methods and disaster prediction knowledge etc.



SOCIAL SCIENCE SECTION

Enhancing of Farm Production and Promoting Forward and Backward Linkages through Technological Intervention

S.K. Zamir Ahmed, A. Velmurugan, Amit Srivastava, B.L Kashinath, R. Jaya Kumaravaradan and Siba Mahato

To enhance the on-farm production through technological interventions in Andaman Islands,broadbed furrow system, integrated farming system and seed production of improved rice varieties were the three interventions identified**,** so as toincrease the crop yield in degraded area. The off-farm technologies will improve the farmer's capabilities to manage the available limited resource and to earn their livelihood which will link to local markets. This enhanced production will not only fetch good price for the farmers but also conserve their resources.Two units of BBF and one unit of IFS have been identified for demonstration at South and Middle Andaman. The pre-intervention data could reveal that the farmers were getting an income of Rs.12, 000 to 15,000/ha by practicing a single crop of rice in their field.

A total of 25 FLDs in seven clusters of villages were conducted covering 5.28 ha with six HYVs of rice in the farmers' field at Diglipur, North Andaman. The result revealed that variety Gayatri gave the highest mean yield of 5.50 t/ha followed by CIARI Dhan 5 (5.10 t/ha), CSR 36 (5.00 t/ha) CIARI Dhan 7 (4.50 t/ha) and CIARI Dhan 6 (3.20 t/ha) against the local check Jaya (2.96 t/ha) &Jaganath (3.15 t/ha). The increase in yield of CIARI rice varieties over the local check ranged from 18.75 to 49.09 % in farmers' field.

Through seed village concept, truthfully labeled seeds of both rice and pulses were produced in association with the plant breeders of Division of Field Crop Improvement & Protection, during the period.A total of 59.42 quintal Truthfully Labelled (TFL) seed of 8 rice varieties (CARI Dhan 4, 5, 6 7, 8, 9, CSR36 and Gayatri) were produced during Kharif.Beside 2.68 quintal Truthfully Labelled (TFL) seed of 6 pulse varieties (CIARI Mung 1, CIARI Mung 3, ANU 11-15, CIARI Urd 1, CIARI Urd 2 and ANU 11-19) were produced under farmers participatory mode at Diglipur during Rabi, under farmers participatory mode at Diglipur North Andaman .

National Extension Programme - IARI and CIARI

Mission Leader: A. Kundu
S.K. Zamir Ahmed, P.K. Singh, A. Velmurugan, S. Yadav, R. Jaya Kumaravaradan,
Siba Mahato, L.B. Singh and D. Basantia

Under the National Extension Programme of IARI with CIARI as a partner for the first time evaluation of IARI technologies were carried out during Rabi 2017 with the involvement of KVK South & North Andaman in the farmers field . A total of 31 FLDs were conducted in two districts ,wherein cauliflower variety at Nimbudera, North Andaman could register an average yield of 69.5 Q/ha in Pusa Sharad and 70.1Q/ha in Pusa Meghana , whereas in Brinjal, var. Pusa Shyamla gave an yield of yield of 278.5Q/ha. In South Andaman, FLDs on cauliflower during rabi in South Andaman could register an average yield of 74.1 Q/ha in Pusa Sharad and 71.3 Q/ha in Pusa Meghana, whereas in Brinjal, var. Pusa Shyamla gave an yield of 245.3Q/ha respectively. (Table 69, Plate 82 a& b)

Table 69: Results of FLDs conducted at South , Middle & North Andaman (Rabi 2017-18)

(A)	South Andaman							
Sl. No.	Crop	Variety	Demo. (Nos)	Average Yield (Q/ha)	Local Check (Q/ha)	Increase in Yield (%)	Net Return (Rs./ha)	B:C Ratio
1.	Cauliflower	Pusa Sharad	02	74.1	69.7	6.31	42,300	1.2
		Pusa Meghna	02	71.3	69.7	2.29	33,900	1.1
2.	Brinjal	Pusa Shyamla	02	245.3	219.4	11.80	65,300	1.3

(A)	South Andaman							
Sl. No.	Crop	Variety	Demo. (Nos)	Average Yield (Q/ha)	Local Check (Q/ha)	Increase in Yield (%)	Net Return (Rs./ha)	B:C Ratio
3.	Brinjal	PusaUttam	02	Crop damaged due to heavy rains during the vegetative growth period in the last week of December, 2017..				
4.	Carrot	Pusa Vrishti	01					
(B)	Middle Andaman							
1.	Cauliflower	PusaSharad	2	69.5	66.3	4.82	28,500	1.15
2.	Cauliflower	PusaMeghna	2	70.1	66.3	5.73	30,300	1.16
3.	Brinjal	Pusa Shyamla	3	278.5	260.4	6.95	1,03,500	1.59
4.	Brinjal	Pusa Uttam	3	Crop damaged due to heavy rains during the vegetative growth period in the last week of December, 2017..				
5.	Carrot	Pusa Vrishti	2					
(C)	North Andaman							
1.	Cauliflower	Pusa Meghna	05	69.4	67.2	3.27	28,200	1.1
2.	Brinjal	Pusa Shyamla	05	246.3	219.4	12.26	71,300	1.40

Feed Back

Both Pusa Sharad and Pusa Meghna variety of cauliflower have performed well and farmers have requested for early availability of seeds to realize its full potential during Rabi 2018-19.Pusa Shyamla variety brinjal was preferred over Pusa Uttam.

Plate 82 a : Field performance of cauliflower varieties Pusa Sharad & Pusa Meghana (North, Middle & South Andaman)

Plate 82 b : Field performance of Brinjal variety Pusa Uttam at South Andaman (Left) &
Pusa Shyamla at Middle Andaman (Right)

Suggestions for up scaling the successful technologies

- The varieties suitable to coastal areas may be considered for demonstration in this Island ecosystem.
- The seeds of the varieties with complete package of practices should be made available, so as to sensitize the farmers periodically.
- Preference for cauliflower variety Pusa Meghna and brinjal variety Pusa Shyamla was high due to appealing nature of curd and the fruit respectively.

ICAR-Krishi Vigyan Kendra, South Andaman District

Trainings

For the period under report a total of 33 training programmes (vocational and in-service) were conducted of which 13 were "On" campus and 20 "Off" campus, by the concerned Subject Matter Specialist in closed collaboration with the host institute, line departments (Department of Agriculture, Fisheries, Animal husbandry, Industries, ATMA) of A & N Administration, NABARD, and NCUI, Port Blair to have a holistic approach (Table 70). The target groups trained were practising farmers (323), rural youth/farm women (214), SHGs (225) and the extension functionaries (73) which totalled to (835) in numbers (Fig.34). The training programmes both "Off" and "On" campus, were of three to ten days in durations (Plate 83). While imparting the training, the principles of 'Teaching by doing' and 'Learning by doing' were thoroughly followed with an objective to have a desirable change in knowledge, skill and attitude of the groups. The practical training programmes envisaged acquiring of high quality skill through appropriate training. Supportive literature were supplied after the completion of the training programmes which helped in the reinforcement of the technology taught.

During the whole programme, the KVK was conscious to ensure maximum participation of the farm women. So, strategies were formulated to involve them directly in the development process. These training programmes helped them to indirectly come out from the orthodox feeling and paved way for the confidence and capacity building. The trainees after the programme felt sound in the subject taught by self doing. This has led to the adoption of the scientifically tested agricultural technologies by majority of them in the shortest possible time, which in turn helped, to increase the level of productivity of various farm enterprises and income of the farmers.

Table 70: Details of training programme

Discipline	Trainings (Nos.)	Male (Nos.)	Female (Nos.)	Total (Nos.)
Agronomy	06	55	94	149
Horticulture	06	67	83	150
Animal Science	04	62	82	144
Home Science	03	22	44	66
Plant Protection	06	102	50	152
Fisheries	05	72	54	126
Agrl. Engg.	03	43	05	48
Grand Total	**33**	**423**	**412**	**835**

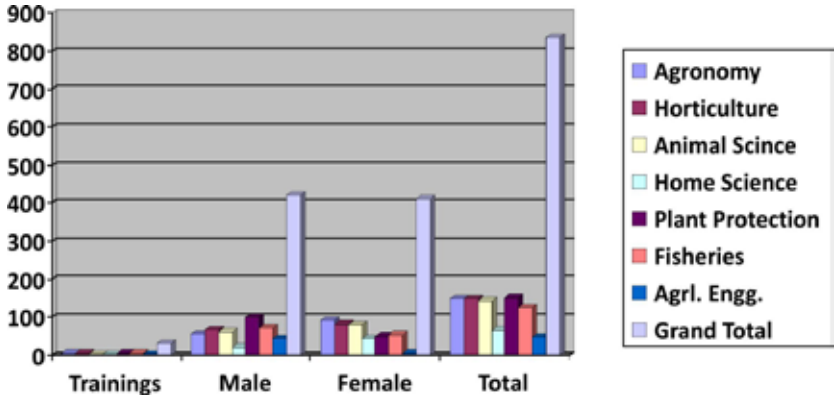


Fig.34: Distribution of male and female in training

Plate 83: Glimpses of Trainings

Plant propagation techniques

Plantation based cropping system

Value addition

Dairy farming training

Nursery pond management

Integrated fish farming system

Preparation of bio-pesticides

I C M on paddy

Glimpses of Trainings

Repair of power tiller

Use of farm tools

On Farm Trials (OFTs)

Evaluation of bacterial wilt resistant brinjal varieties

Three bacterial wilt resistant brinjal varieties were evaluated at South Andaman in seven different locations at farmer's field. The planting was done following inter-row and inter-plant spacing respectively of 65 and 45 cm respectively. The observation data revealed that all three developed varieties are found better for fruit yield than the check variety Pusa purple cluster. CIARI Brinjal 1 gave 201.6 g/plant, CIARI Brinjal 2 (86.25g/plant), CIARI – Brinjal 3 gave 90.93 g/plant. The data CIARI Brinjal-1 showed the lowest disease index of recorded (6.04 %) followed by CIARI Brinjal - 2 (7.8 %) and CIARI Brinjal - 3 (20.4 %) respectively

CIARI Brinjal 1

CIARI Brinjal 2

CIARI Brinjal 3

Plate 84: Evaluation of bacterial wilt resistant brinjal varieties

Performance and evaluation of milk production through mineral supplementation and probiotics in cross bred cattle

The result of the present OFT revealed that the average milk yield (lit.) recorded highest in the group fed with normal feeding + probiotics + mineral supplementation in the tune of 5.1 lit. / day /animal followed by group fed with normal feeding + mineral supplemenation. The lowest milk yield was recorded in the group fed with normal feeding + probiotics (Plate 85& 86). However, on an average the milk yield recorded was 4.3 litres/day /animal which is quite low to their potential yield which might be due to not supply of feed and any additives during the lactation period. Hence, it is suggested that, exogenous source of feed additives in the form of mineral / probiotics supplementation is very essential in lactating cows during the peak lactation phase for improving the milk yield as per the genetic potential of cattle.

Plate 85: Mineral supplement

Plate 86: Distribution of critical Inputs

Effect of early post emergence herbicide on growth and yield of paddy

The experiment was laid out in five farmer's field at Guptapara, Memyo, Mangluton, Collinpur villages and with four treatments *viz.,* T_1: Farmer practice (single hand weeding), T_2: Bispyribac sodium @ 60 g/ha, T_3: Metamifop @ 100 g/ha, T_4: Metamifop + Bispyribac-sodium @ 70 g/ha. The predominant weed flora of rice fields in the district consisted of *Echinochloa colonum* and *Leptochloa chinensis* among grasses, *Cyperus difformis, Cyperus iria* and *Fimbristylis miliacea* among sedges and *Marselia quadrifolia, Eclipta alba, Ammania baccifera, Bergia capensis* and *Ludwigia parviflora* among broad leaved weeds. Among the different weed control treatment, application of Metamifop + Bispyribac-sodium @ 70 g/ha (T_4) registered significantly higher grain yield of 56.0 q/ ha and straw yield of 74.50 q/ ha which was mainly due to lower weed density which facilitated the crop for better absorption of nutrients and light which in turn led to more yield attributing characters. Significant variations were observed on total weed density and dry weight at 20 and 40 DAP due to adoption of weed management practices. The lowest weed density and dry weight were recorded in T_4 which might be due to the suppression of initial weed growth at early stage. Weed control efficiency (WCE) indicated that comparative magnitude of reduction in weed dry weight by weed control treatment which was highly influenced by different treatment throughout the crop period. Application of Metamifop + Bispyribac - sodium @ 70 g/ha (T_4) was recorded higher weed control efficiency of 78.50 and 80.95 % at 20 and 40 DAT respectively (Plate 87 & 88).

Plate 87: Early post emergence herbicide in rice

Plate 88: Used of herbicide on paddy

Effect of Integrated nutrient management on growth and yield of maize

The experiment was laid out in five farmers field at Guptapara, Ferrar Gunj and Gopal Nagar of South Andaman with four treatments *viz.,* T 1 – farmers practice (DAP only), T2 – 100% recommended dose of fertilizer (135:62.5:50 kg NPK/ha) RDF, T3–Biofertilizer (Azosipirillum+Vasicular Arbusicular Mycorhiza (VAM)), T4 - Bio fertilizer (Azosipirillum+VAM) +75% RDF. Significantly taller plants and the highest total plant dry matter production were

recorded in application of biofertilizers (Azospirillum + VAM) + 75 per cent recommended dose of fertilizer which was on par with application of 100 per cent RDF. The highest cob length, cob girth, ,no. of grains/cob and 100 grain weight was observed under application of bio fertilizers (Azospirillum + VAM) + 75 per cent RDF which acted as the growth and yield enhancing factor for maize. The higher grain and Stover yield of 33.9 and 64.8 per cent were recorded under combination of inorganic fertilizers along with bio fertilizer (Azosipirillum+VAM) as compared to farmers practice (DAP only). The highest gross return (Rs.72683/ha), net return (Rs. 38039/ha) and B:C ratio (2.11) were found in application of biofertilizer along with 75 per cent RDF (101.3:49.66:37.5 kg NPK/ha) (Plate 89 & 90).

Plate 89: Vegetative growth stage of maize

Plate 90: INM on maize

IPM for leaf curl complex of Chilli - *Capsicum annum L.*

Four IPM modules were used for management of chilli leaf curl complex. All IPM modules significantly control the leaf curl complex as compared to farmer practices. The lowest incidences of leaf curl complex were recorded in 38% (Technical option 2) followed by 41% (Technical option 5), 44% (Technical option 3), 49% (Technical option 4) and 95% (Technical Option 1: Farmer practices). The lowest population of thrips (3 nos. / twig / plant) and mites (12 nos. / Leaf / plant) was recorded in Technical option 2, whereas highest population of thrips (26 nos. / twig / plant) and mites (50 Nos. / leaf / plant) was found in Technical Option 1: Farmer practices (Plate 91 & 92).

Plate 91:Technical Option – 2, (38 % incidence)

Plate 92:Technical Option – 3, (44% incidence)

Evaluation of different substrate for oyster mushroom (*Pleurotus* spp.) production

Four lignocellulosic substrates (Paddy straw, coconut husk, arecanut husk and banana leaves were used for oyster mushroom cultivation, and 3-6 flushes were obtained from these substrates. A bagasse substrate accelerated the mushroom growing processes. The complete mycelial colonization were found within 20, 22, 30 and 38 days respectively, whereas primordial initiation and fruiting body formation were recorded within 24,26, 40 and 44 days, respectively. The paddy straw substrate gave the maximum mushroom yield (700 g per 1 kg substrate) and this yield was significantly different to those found from banana leaves (500 g), arecanut husk (280 g) and coconut husk (270 g) as compared to farmer practices (200 g) at a confidence level of 90%. However, the highest percentages of biological efficiency were obtained in paddy straw. Low percentages of biological efficiency were found in arecanut

husk (46.66%) and coconut husk (54.00%). When the percentage of biological efficiency was taken into account the lignocellulosic substrate likes coconut has shown great potential for use as a raw material in absence of other substrate, since the abundant availability of coconut husk and arecanut husk in Island need to further evaluation with combination with saw dust and other agro waste which may act as alternative of paddy straw for oyster mushroom cultivation (Plate 93& 94).

Plate 93: Paddy straw substrates

Plate 94: Farm women at cropping chamber

Performance of different soil erosion resisting crops on checking soil erosion on 2-5% sloping terrain

On farm trial in 5 locations were conducted for checking the performance of soil erosion resisting crops in checking soil erosion. Results of the trial indicated that natural vegetation grown on land without any sort of tillage activities has the most ability to protect the top soil by reducing erosion with a less sediment outflow rate of 678 g/m^2/min. Cowpea crop of 1 month duration has the high erosion resisting ability among the selected crops by allowing sediment outflow rate of 1646 g/m^2/min. Hybrid napier and guinea grass are useful in developing the fodder bank as the crops are perennial in nature although the extent of resisting soil loss is high as compared to cowpea (Plate 95) .

Plate 95: Hybrid Napier and Cow pea cultivation on a sloping terrain

Performance and evaluation of rainwater conservation measures on coconut cultivation

The trial was conducted in 5 different locations and results showed that conservation trench along with application of mulch was the most suitable treatment followed by 'mulching only' and 'conservation trench only' treatments respectively. The water in the conservation trench were retained for an average 36 hours after the intermittent rain that makes the trench filled with excess runoff. The trenches were helpful in controlling the seepage in the sloping terrain and make the water available to the root zone of the crops on the down slope. During the year, rainfed crops exhibited the lowest BCR of 4.50 followed by 'conservation trench only' and 'mulching only'. Technical option 3 recorded the highest BCR of 5.67 (Plate 96).


Plate 96: Half moon shaped trench and coconut husk mulching for water conservation

Front Line Demonstrations (FLDs)

Elephant Foot Yam cv. Gajendra

It is a very popular and important tuber crop but due to improper adoption of ractices of cultivation its productivity is far below the average productivity of the district. Considering the scope of improvement in productivity through the recommended technologies, seven (FLDs) were conducted with an area of 0.7 ha in South Andaman in five MLT areas of farmer's fields. The yield of EFY was recorded 29.1 t/ha in the year with average net profit of Rs. 2, 09, 200 in recommended practice with a B C ratio of 2.49, wherein it was Rs.1, 41,600 in farmer's practice with the B C ratio of 2.01 (Plate 97 & 98)

Plate 97 : FLD on EFY cv. Gajendra

Plate 98: Visit of experts to Farmer's Field

Ginger cv. Jorhat

Considering the scope of improvement in productivity through the recommended technologies, eight front line demonstrations were conducted under in four different MLT areas of farmer's fields. Farmers' practices prevailing in the region were treated as control for comparison with recommended practice like no mother rhizome removal and application of leaf mulch for controlling soft rot in ginger. The yield of ginger was recorded 127.50 q/ha in the year. It has increased by 44.22 per cent (for recommended practice) over control. An average net profit of Rs. 2, 55,258 was recorded in recommended practice wherein it was Rs.1, 31,677 in farmer's practice. Benefit Cost Ratio varied from 5.75 - 5.90 under demonstrations while it was 3.54 - 3.75 for control (Plate 99 & 100).

Plate 99:FLD on Ginger cv. Jorhat

Plate 100: Director visit to farmer's field

Backyard poultry with Vanraja birds

Vanraja birds are of dual purpose and can also attain higher bodyweight, when they are provided with the concentrated feed, apart from the feed they intake by scavenging during daytime. Three FLDs were conducted at farmers' field with Vanaraja birds and the result revealed that the birds attain body weight of 2.0 kg at the age of six week (Plate 101& 102).

Plate 101:FLD on Vanaraja birds

Plate 102:Distribution of Vanaraja birds to farmers

Leaf colour chart based of Nitrogen management in rice

Leaf colour Chart based nitrogen management in rice were demonstrated in five farmer's field *viz*., Guptapara, Maymeo, Wandoor, Manglutan , Collinpur villages of South Andaman in an area of 0.4 ha per farmer. The results indicated that in an average yield of 47.20 q/ha which was 19.80 per cent higher grain yield as compared to local check (Plate 103&104).

Plate 103:LCC based N management in paddy

Plate 104:LCC management at field

Disease resistant black gram

Disease resistant black gram cv. VBN (Bg) 8 were demonstrated in five farmers' field *viz.,* Guptapara, Maymeo, Gopal Nagar and Nilambur villages in an average area of 0.4 ha / farmer. The results revealed that an average yield of 5.80 q/ha which is 27.2 per cent higher grain yield as compared to local check (T-9) of Blackgram with 4.22 q/ha (Plate 105 & 106).

Plate 105: DAP 2 % foliar nutrition in blackgram

Plate 106:YMV resistant blackgram cv. VBN(Bg) 8

Integrated disease and pest management on brinjal

Two trial of Front line demonstrations on Integrated disease & pest management in Brinjal were demonstrated in dry & rainy season. On compare to both seasons highest bacterial wilt incidence (48.96%) was found in rainy season in comparison to dry season 38.53%. However infestation of shoot and fruit borer were more (38.90 %) in dry season compared to rainy season (35.3).On comparing with both season IPM module significantly reduce the disease incidence (38.53% & 48.96%) and pest infestation (35.3% & 38.90 %) over farmer practices respectively (Plate 107 & 108).

Plate 107: 38.53% disease incidence in dry period

Plate 108: 48.96% disease incidence in wet period

Manual paddy thresher and manual maize sheller

Manual paddy thresher was demonstrated among the paddy growing farming community and was found that the drudgery involved in threshing operation of paddy was considerably reduced. Threshing by manual paddy thresher resulted more threshing efficiency (95%) and very less broken percentage as compared to manual paddy threshing by crushing with power tiller operation. The manual maize sheller was more efficient in reducing drudgery by shelling the cobs at a rate of 45 cobs/hour as compared to the hand shelling of 30 cobs/hour (Plate 109 & 110).

Plate 109:Threshing by manual paddy thresher

Plate 110: Use of manual maize sheller

Crab fattening in Tsunami affected land

In the brackish water pond 50 water crabs (av. 1.3 kg size) were released during July, 2017 and daily a total of 3.0 kg low priced fish (ray fish &)were fed twice daily. The cost of water crab was @ Rs. 450/ kg and feed cost was @ Rs. 30/kg. Due to virginity of the pond area without any pollution, availability of enough organic loads (detritus) the hardening of crab took 18 days. Total crab harvested on 18th day was 46 crabs (70 kgs) with survival of 92 %. After hardening of crab, it was exported to Kolkata @ 1500/kg and total gross amount realized was Rs. 1, 05,000/- . The cost of labour was 12,000/- + feed cost of Rs. 1530/-. The feed conversion ratio was 4.0% and B:C ratio was 7.76 (Plate 111).

Plate 111: Crab fattening in Tsunami land in Andaman

Success Stories

1. Coconut based cropping system – a success story of a farm woman

Smti Kamachi Chellamal who hails from the remote village in South Andaman, always reposed good faith in coconut based cropping system for sustainable livelihood. She is 60 years of age and studied up to class six. She has been maintaining coconut based cropping system of effectively utilizing interspaces in her garden for growing different inter/mixed crops and integrating fisheries and apiculture in a sustainable and profitable manner. She has got 3.5 ha of land in which she maintains 2 ha coconut plantation with 465 palms of Andaman Ordinary tall variety under rainfed condition. The coconut palm are 40-45 years of age and planted at a spacing of 6.5 m x 6.5 m. Interspaces are effectively utilized by a judicious selection of compatible intercrops like pineapple, banana, elephant foot yam, ginger, turmeric, chillies, brinjal, tapioca, broad dhania, spinach. *Glyricidia* is grown as live fence; the leaves and twigs are periodically cut and heaped in the field covered with banana leaves which helps for partial decomposition. Different forms of organic manures like compost and farm yard manure are used by the farmers and she does not apply chemical fertilizer. Frequent diagnostic visits made by the scientists of Krishi Vigyan Kendra - Port Blair has motivated her to adopt coconut based cropping system. She has harvested 27,550 coconuts in a year and spends around 2 lakhs towards

the cost of cultivation. She has earned Rs. 1.65 lakhs from coconut alone while from the round the year cultivation of broad dhania (*Eryngium foetida*) she got Rs 2.5 lakhs per annum. The other promising intercrops were ginger (Rs 1.12 lakhs), chillies (Rs 76,800), banana (Rs 52,000), papaya (Rs 54,000), tapioca and elephant foot yam (Rs 30,000 each). From fish pond, she earned Rs. 40,000 annually. Net income from the coconut based cropping system was about Rs 7.75 lakhs per annum (Plate 112 & 113).

Smti Kamachi Chellamal has become a role model not only for her village but also for the small/ marginal farmers and rural youth of these Islands and also she keeps in touch with researchers and extension personals to update the developments in farm technologies.

Plate 112:Visit of QRT Chairman & Members

Plate 113:Visit to Chellamal field

2. Sita Rani Das: A Successful woman in mushroom cultivation

To bring about a change in the supply and demand deficiency, a farm trial on mushroom cultivation has been started at farmers' field of Smti**.** Sita Rani Das w/o Shri Narayan Das, who lives at Humpregunj village, South Andaman district. Since past two years the meagre income of her husband from farming activities was hardly sufficient to meet the daily bread and butter as well as the income was not sufficient to meet the demands of her two daughters and one son. She was living a hard and miserable life. In the year 2016, while attending an awareness training programme on "Mushroom cultivation" by ICAR- KVK, Sippighat, she came in contact with the KVK experts, got motivated and developed interest on mushroom cultivation. After developing the skill in mushroom production technique in the year 2016, she constructed her own shed for mushroom cultivation. She constructed three rooms, including a dark room (10mt.x5mt), a cropping room (20mt. x5mt) and a stack room (10m x 5m). She collected many substrates such as paddy straw, banana leaf and saw dust for round-the-year cultivation and other materials such as poly bag, spawn, utensils, sprayer and chemicals were provided from NABARD funded mushroom project to establish the model unit. Mushroom spawns for cultivation of mushroom were provided from NABARD funded Mushroom Project at ICAR-KVK, and AICRP Mushroom Project of the Institute. She initially inoculated 20 bags each time and kept in dark room for colonization of bags under the supervision of KVK experts. KVK experts regularly visited the mushroom unit of Smt. Sita Rani Das to monitor the growth of the mushrooms and to encourage her for the venture. She completed four batches of mushroom cultivation in her shed and earned Rs. 8000/- per month to support her family. Water was main constraint for cultivation of mushroom as there was no potable water connection in her house. KVK experts contacted the local Gram Pradhan and Junior Engineer, Andaman Public Works Department and requested them for supply of water. They were convinced and necessary arrangement were made to supply the treated water in close vicinity to her house. The General Manager, NABARD with his team had also visited the model unit and appreciated her hard work. All family members helped her to get benefit from the mushroom production. In her opinion mushroom cultivation is an income generating business as the harvest is very high from a single bag. She further said that mushroom is in high demand in local markets as well as in restaurants and hotels. She is continuing the cultivation of mushroom and planning to expand her bags per batch up to 200 which may lead to an monthly income of Rs 80,000/- . Her model unit is being used as a training cum demonstration unit on mushroom cultivation for the farming community of Andaman

and Nicobar Islands as this is the first unit established with locally available materials at farmer's field in these Islands (Plate 114 & 115).

Plate 114: Oyster mushroom production

Plate 115: Monitoring by Scientist

Field days

Twelve "Field days" were conducted on different activities and a total of 261 numbers of beneficiaries (practising farmers/farm women, rural youth and extension functionaries) were participated (Table 71 & Plate 116).

Table 71: Details of field days

Discipline	Title	Venue	No of participants
Horticulture	EFY cv. Gajendra	Kerkabad	57
	Ginger cv. Jorhat	Kodiaghat	42
Animal Science	Backyard poultry	Badmaspahad	26
	Dairy cattle	Guptapara	15
Home Science	Mushroom cultivation	Humphrigunj	20
Agronomy	LCC based N management in rice	Guptapara	26
	Integrated nutrient management in maize	Gopal Nagar	20
	Foliar nutrition 2 % DAP	Guptapara	15
Plant Protection	Mushroom cultivation	Humphrigunj	10
Agri Engg	Manual paddy thresher	Port Mourt	18
	Manual maize Sheller	Port Mourt	12
Grand Total			**261**

EFY cv. Gajendra

Ginger cv. Jorhat

Back yard poultry

Oyster mushroom

SHG on mushroom production

Integrated pest management

Plate 116: Glimpses of Field visit

Extension activities

A total of 25 numbers of major group extension activities were performed wherein 9676 numbers of farmers including extension persons from line departments *viz.,* Agriculture, Animal husbandry , fisheries, industries , ATMA, NCUI , students from Govt. Schools and Colleges from South Andaman district participated. Honourable Member of Parliament, Shri Bishnu Pada Ray and Smti. Baby Fareeda , Adhyakshya , Zilla Parishad, South Andaman district were the Chief Guest and guest of honour on the PM's Live telecast programme on Krishi Unnati Mela screened at ICAR-CIARI, Port Blair (Table 72 & Plate 117).

Table 72: Details of extension activities

Title of the programme	Date	Venue	No. of participants
KVKs - Zonal Workshop - 2017	14th to 16th April, 2017	CIARI-Port Blair	110
Kisan Mela	22nd - 23rd June, 2017	CIARI,Port Blair	650
Sankalp Se Sidhi	26th August, 2017	CIARI,Port Blair	700
Andaman Bazar	1st - 4th Oct., 2017 & 9th -10th Feb., 2018	ITF ground, Port Blair	2050
Mahila Kisan Divas	15th October,2017	KVK,Sipighat	44
National Entrepreneurship Day	9th Nov., 2017	CIARI, Port Blair	35

Title of the programme	Date	Venue	No. of participants
Awareness on Soil Health Card.	17th Nov.,2017	Guptapara	74
World Fisheries Day	21st Nov.,2017	Junglighat	67
Agriculture Education Day	3rd Dec., 2017	KVK, Sippighat	56
VCRMC Meeting	12th Dec.,2017	Port Mourt	25
World Soil Day	5th Dec., 2017	Ferrargunj	105
Regional Agri. Fair	15th Feb., 2018	CIARI,Port Blair	4950
TSP - Exposure Visit	03rd -04th March, . 2018	KVK, Sippighat	10
PM's Live Telecast Program on Krishi Unnati Mela	17th March, 2018	CIARI, Port Blair	700

Plate 117: Glimpses of Extension Activities

KVKs-Annual Zonal Workshop-2017

Andaman Bazaar at ITF

PM's Live Telecast on Krishi Unnati Mela at CIARI, Port Blair

New India Manthan "Sankalp Se Sidhi"

Glimpses of Extension Activities

World Fisheries Day

Island Kisan Mela

Mahila Kisan Divas

World Soil Day

Agriculture Education Day-2017

National Entrepreneurship day

Diagnostic visits

One hundred thirty diagnostic visits were conducted on various field crops, horticultural crops, fisheries and animal science by the team. Serious problems i.e. Slug eating caterpillar on coconut at Neil Island, Little Andaman and Phytophthora Leaf blight on arecanut at Miletilak , Guptapara villages of South Andaman district were identified and addressed (Plate 118) .

Glimpses of Extension Activities

Team visits Neil Island for management of Slug eating caterpillar on Coconut

Awareness on the diseases management on crop

Installation of light trap in coconut field for management of slug eating caterpillar

Fruit flies attacks on Cucurbits

Phythophthora Leaf bight in arecanut

Scientist visit tomato field at Neil Island

Identification of Mealy bug on Papaya

Plate 118: Diagnostic visits

Pond based IFS at the Instructional farm of KVK

- Climate Resilient Integrated Farming System model funded by ICAR was developed at KVK farm with sanctioned amount of Rs 3 lakhs in an area of 0.15 ha (Plate 119).

Desilting and digging of pond

Lining of pond

Farm lay out & land scapping works

Poly mulch on the vegetable block

Director, NAARM visits IFS

SHG members visit to IFS

Plate 119: Glimpses of activities

VIP's Visits


NABARD Chief Vigillance Officer visit to Mushroom production unit


Coast Gaurd Officers Visit to Mushroom Laboratory & Production Unit.


Director NAARM-Visits to KVK and interacts with the Scientific staff

Plate 120: Glimpses of VIP's Visits

Table 73: Revenues from Farm Products

SL No.	Receipt No-CIARI	Date	Amount deposited(Rs)
01	13558	02.05.2017	3,229.00
02	13743	17.07.2017	9,415.00
03	13843	26.08.2017	4,221.00
04	13884	25.09.2017	4,431.00
05	13895	04.10.2017	4,010.00
06	14086	23.01.2018	15,472.00
07	-	-	7,995.00
Grand Total			**48,773.00**

Swachh Bharat Programme

During the period a total of eleven programmes were conducted at different villages with the host Institute, PRIs and villagers in South Andaman district.

National Initiative on Climate Resilient Agriculture (NICRA)

Nagesh Ram, L.B. Singh, B K Nanda, N. Bommayasamy, N.C. Choudhuri and V. K. Pandey

Objectives

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

Significant achievements

Natural Resource Management

The interventions related to the Natural Resource Management have been undertaken as per the decisions and recommendations of the Village Climate Risk Management Committee effective in the adopted villages under the project.

- **Enlargement of pond for more water harvesting**: The existing water harvesting structure at Badmaspahad of one progressive farmer was enlarged to harvest the excess rainfall of 580 cum. The harvested water was able to provide life saving irrigation for an area of 2 ha during the post monsoon period (Plate 121).

Plate 121: Fresh water pond area enlargement at Badmaspahad

- **Intervention of a new fresh water harvesting structure:** A new pond of 800 cum capacity has been constructed in the drought prone village Port Mourt to harvest fresh water. The pond has been constructed in a water logged area which was not suitable for cultivation even in the post monsoon months (Plate 122).

Plate 122: New fresh water pond at Port Mout

- **Development of a new brackish water pond for crab culture:** A new pond of capacity 1200 cum has been developed in the brackish water inundated area of village Port Mout for the intervention of crab culture among the fishing community. The pond has been developed near to the creek area beside the sluice gate to facilitate the exchange of brackish water (Plate 123).

Plate 123: New brackish water pond for crab culture near sluice gate at Port Mout

Crop Production

- **Water logging stress tolerance rice (CR 500) :** Long duration rice variety of CR 500 brought from KVK, Cooch Bihar in July, 2017 and is found to be more suitable for water logging condition and also moderately resistant to leaf and neck blast as well as brown spot disease. Farmers can grow CR 500 rice in water stagnated area as substitute for traditional rice of C-14-8. Which has more scope to replace the traditional photo sensitive variety. Rice cultivars showed significantly higher productive tillers per m^2 which was 41.4 per cent higher than local check of C 14-8 (2070kg/ha). Higher panicle length of 25.4 cm and number of grains per panicle (187) was recorded than local check. The grain yield of 3240 kg ha^{-1} was recorded in water logging stress rice variety of CR 500 which was 56.5 per cent higher than traditional variety. Higher gross return and net return of Rs.46500 ha^{-1} and Rs. 19000 ha^{-1} with B: C ratio of 1.69 was recorded in CR 500 mainly due to numerically higher grain and straw yield. Farmers have shown acceptance with the performance and quality of rice
- **Salt tolerant paddy varieties (CSR-36) :** Salt tolerant variety was demonstrated in sea water inundated tsunami affected land in three farmer's field in an area of 0.4 ha per farmer during the rainy season (July to December, 2017). The results revealed that paddy cultivars brought significant variation on growth and yield attributes of paddy. CSR 36 produced taller plant than local check (MTU 1010). Higher no of productive tillers of 342 /m^2 was registered with CSR-36, compared to local check besides it recorded significantly higher panicle length (24.6 cm) and more no. of filled grains/panicle (175 Nos). CSR-36 recorded more

grain yield of 4790 kg/ha, which was 10.1 % higher yield as compared to local check. The highest net return and B:C ratio (Rs. 27830/- and 1.94) with CSR 36 while MTU 1010 was least profitable (Rs.22550/- and 1.76).

- **Demonstration on paddy var. NC 492** was introduced in NICRA adopted village of Gopal Nagar in an area of 0.4 ha. NC 492 paddy cultivar was suitable for water logging and paddy cum prawn culture. NC-492 paddy variety registered significant improvement in plant growth characters like plant height (135.9cm), 232 productive of tillers/m^2, panicle length (21.6), total no. of filled grains (151) as compared to local check (Bhavani). The result revealed average yield of 31.3 q ha^{-1} which was 11.5 per cent higher yield than local check. NC 492 cultivar recorded higher gross return (Rs.40300), net return (Rs.14550) with the B:C ratio of 1.57.

- **Disease resistance hybrid maize (CoH (M)-6):** Disease resistant hybrid maize of CoH (M)-6 has been demonstration in four farmers field with an average area of 0.4 ha per farmer in NICRA adopted villages like Gopal Nagar and Port Mout of South Andaman. The result revealed higher plant height and dry matter production in CoH (M)-6 which was 15.5 per cent more than local check. Significant variation was observed on yield attributes as influenced by maize cultivars. CoH (M) recorded higher values of all yield attributing components *viz*., cob length (14.3 cm), cob girth (13.5 cm), weight of cob (178.3 g), number of grains per cob (467) and test weight (27.4 g).The maize grain and stover yield was 3638 and 6480 kg ha^{-1} , which was 22.8 and 17.4 per cent higher grain and straw yield than local check. Higher gross returns, net return of Rs. 55720 and 26220 ha^{-1} were obtained with B: C ratio of 1.88 under CoH (M)-6.
- **Elephant Foot Yam C.V. Gajendra:** Considering the scope of improvement in productivity through the recommended technologies, two demonstrations were conducted with an area of 0.08 ha at Port Mout and Bijay Kona. The yield of EFY was recorded 29.1 t/ha in the year. An average net profit of Rs. 2, 09, 200 was recorded in recommended practice with a B C ratio of 2.49, wherein it was Rs.1, 41,600 in farmer's practice with the B C ratio of 2.01.

Plate 124

Plate 125

- **Ginger c.v. Jorhat** : The yield of ginger recorded 127.50 q/ha in the year. Which is increased by 44.22 per cent (for recommended practice) over control. An average net profit of Rs. 2, 55,258 was recorded in recommended practice, wherein it was Rs.1, 31,677 in farmer's practice. Benefit cost ratio varied from 5.75 - 5.90 under demonstrations while it was 3.54 - 3.75 for control.

Plate 126

Plate 127

- **Improved shelter management practices with well ventilated system as a means to resist extreme climatic variables for poultry, goatry and dairy animal:** Improved poultry shed with well ventilated system resumed in low mortality rate.
- **Backyard poultry production with improved Nicobari and Vanraja birds:** The Nicobari birds regarded as one, which possess resistant to common diseases of the birds, were suitable under backyard condition. The production characteristics revealed that the bird can well thrives in this condition and performed better in terms of egg production, compared to other indigenous bird. The rearing of Vanraja was also initiated to provide more profitability to the farmers. The Vanraja birds are of dual purpose and could attain higher body weight, when they were provided with the supplemental feed, apart from the feed they intake by scavenging during daytime.
- **Integrated fish farming system :** Two ponds were taken for demonstration of integrated fish farming wherein fish+ seasonal vegetables + duck (Khaki Campbell) and poultry (Vanaraja) were reared in an area of 0.18 ha. In each pond 250 fish fingerlings (40-50g.), 20 Nos. of Khaki Campbell and on the bunds seasonal vegetables were raised. For the demonstration Rs. 18,700 was incurred towards the culture operation and net return obtained was Rs. 24,430 with B: C ratio of 3.05, as against the control with net return of Rs.9450 and B: C ratio 1.90.

Integrated Fish Farming System

VIP's Visits at the NICRA - Project Areas

Director, NAARM, Hyderabad, Director, CIARI , HOD-NRM, CIARI, Port Blair and team of KVK visited the NICRA ongoing project areas and interacted with the farmers of villages.

Director NAARM, Director CIARI, HOD NRM, CIARI, PI & Co-PIs
at NICRA village interacts with the farmers at NICRA villages

Director NAARM and Director CIARI interacts with IFF and poultry farmers

ICAR-KrishiVigyan Kendra, Nicobar, Car Nicobar

The ICAR-KVK - Nicobar, Car Nicobar was established on 20th May, 2010 under the administrative control of ICAR - Central Island Agricultural Research Institute (CIARI), Port Blair. Presently, the KVK Office is functioning from the Headquarter, Car Nicobar covering entire Nicobar district with 5 ha farm at Auckchung, Car Nicobar.

The KVK's approach is to work for organic, self-sufficient and sustainable agriculture for nutritional and livelihood security of the Islanders.

Trainings

A total of 14 trainings were conducted in thedisciplines of Agronomy and Animal Science (Plate 128). A total of 570 farmers including 234 female got benefited from the trainings (Fig.35). This involved 42 days and 1650 trainee days (Table 74).

Table 74: Discipline wise detail of training by KVK-Nicobar during 2017-18

Discipline	No. of training	Male	Female	Total
Agronomy	6	94	74	168
Animal Science	8	242	160	402
Total	14	336	234	570

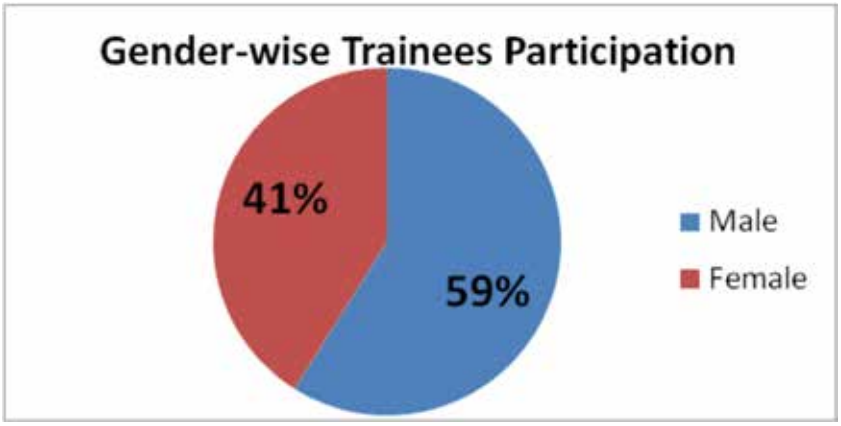


Fig.35: Gender wise trainees participation

Plate 128: Glimpses of Training Programme

Glimpses of Training Programme








Glimpses of Training Programme




On Farm Trial

Effect of different organic manure on growth and yield of okra

The Nicobarese generally practice shift cultivation to meet their nutritional security as the yields from the area drastically decrease after first year. In order to inculcate scientific farming practices among the tribal community is import and to maintain soil fertility year after year. Hence an OFT on 'Effect of different organic manure on growth and yield of okra' was formulated and undertaken at Car Nicobar (Plate 129).

The result revealed that, the application of organic manures increased the plant height as well as yield compared to farmers practice. Among the organics, goat manure (TO_2) at 5 ton per hectare significantly increased the Bhendi (Okra) yield to 11.42 kg/plot followed by application of farm yard manure (TO_3) (8.55 kg/plot), poultry manure (TO_1) (6.75 kg/ plot) as compared to farmers practice (5.73 kg/ plot). Hence to increase the okra yield, goat manure may be applied at 5 ton per hectare in Bhindi (Okra) crop (Table 75).

Table 75: Effect of different Organic manure on growth and yield of Okra

Treatment	Plant height (cm)			Yield kg per plot (3 x 4 m)	Yield (q/ha)
	30 days	60 days	At harvest		
TO_0 Traditional Farming	22.76	101.28	120.16	5.73	48.0
TO_1 Poultry Manure @ 6 t/ha.	25.24	93.6	110.88	6.75[c]	56.0
TO_2 Goat Manure @ 5 t/ha	43.4[a]	153.52[a]	174.72[a]	11.42[a]	95.0
TO_3 Farm Yard Manure @ 12 t/ha	40.72[b]	147.52[b]	165.48[b]	8.55[b]	71.0
CD (5%)	**13.86**	**51.77**	**52.33**	**2.05**	

Plate 129: Field at Big Lapathy and Tapoiming Village

Evaluation of different varieties of hybrid Napier in Nicobar

The Nicobarese are slowly adopting dairy farming. The milk production per cow is low in Car Nicobar due to minimal management practice and nutritional supplementation. This varietal evaluation will help in identifying and selecting the suitable variety of Hybrid Napier (fodder crop) in island ecosystem of Car Nicobar (Plate 130 & 131).

The initial study (7 months) revealed that, the yield of Hybrid Napier CO5 was maximum followed by CO4, CO3 and DHN6 which were found to be 992q/ha, 928q/ha, 747q/ha and 538q/ha with B:C ratio of 3.31, 3.09, 2.49 and 1.79 respectively (Table 76).

The planting materials were transported from Port Blair by ship to Car Nicobar, hence the viability and vigor of planting material might have been adversely affected within and between varieties. From next year, through this OFT, sufficient planting materials will be available at Car Nicobar. Hence, this OFT may be continued and repeated for 2 more years *i.e.* 2018-19 and 2019-20 for final varietal recommendation.

Table 76: Evaluation of yield and economic performance of different varieties of Hybrid Napier at Nicobar

Technical Options	Yield (q/ ha)	Gross Cost (Rs.)	Gross Income (Rs.)	Net Income (Rs.)	B:C Ratio
TO_0 Hybrid Napier CO3	746.67	60000	149334	89334	2.49
TO_1 Hybrid Napier CO4	928.00	60000	185600	125600	3.09
TO_2 Hybrid Napier CO5	991.58	60000	198316	138316	3.31
TO_3 Hybrid Napier DHN6	537.69	60000	107538	47538	1.79

Plate 130: Initial sprouting of Hybrid Napier in the Field

Plate 131: Visit of Director, ICAR-CIARI, Port Blair

Evaluation of efficacy of herbal eye drop in treating conjunctivitis in poultry

The Nicobarese rear poultry birds under backyard condition and conjunctivitis in poultry is a common problem. This leads to lower marketability of the birds. ICAR-CIARI, Port Blair has developed an herbal eye drop which has shown good results and healing property when treated in poultry with conjunctivitis (Plate 132) .

The table below provides an over view of average days of recovery in poultry, number of birds recovered and its economic parameters. The study clearly showed that the herbal eye drops worked at par with antibiotics and could be an effective ethno veterinary medicine and best alternative in organic farming setup for treatment of conjunctivitis. This OFT may be continued and repeated for 2 more years for final recommendation (Table 77).

Table 77: Efficacy and economics of different conjunctivitis treatments in poultry

Technical Options	Average days of recovery	No. of recovered birds	Gross Cost (Rs.)	Gross Income (Rs.)	Net Income (Rs.)	B:C Ratio
TO_0 Farmer's Practice	14	1 (5)	918	375	-543	0.41
TO_1 Herbal Eye Drop	9.2	5 (5)	968	1875	907	1.94
TO_2 Gentamycin	8.8	5 (5)	968	1875	907	1.94
TO_3 Chloramphenicol	8.6	5 (5)	968	1875	907	1.94

Plate 133: Treatment of conjunctivitis in poultry with herbal eye drop at Car Nicobar

B. Front Line Demonstrations

Title of the FLD	Results
Popularization of maize crop	FLD was conducted at 1 Farmer field of Big Lapathy Village, Car Nicobar. From an area of 100 m^2 170 kg green cob was produced with an net income ofRs. 6800/- and 4.40 B:C Ratio. The farmers were satified with the yield and demanded more seeds.
Vermi composting	FLD was conducted at two site, one at farmer's field at Big Lapathy, Car Nicobar and another at JNV School Campus, Car Nicobar. An average yield of 0.67q/m^3 was obtained from 1st harvest (3 months).
Coconut Composting	FLD on coconut composting wasinitiated at Arong, Car Nicobar in month of September, 2017 and the decomposition process is going on due to high lignin content of husk.
Supplementation of mineral mixture in dairy cattle for augmentation of productivity	The supplementation of mineral mixture in five dairy cows at the rate of 30g for 2 months and after 3 months of pasturation have augumented the average milk production by 0.48 litre per day per cow with an average B:C ratio of 3.64.
Intensive pig farming	Prior to feeding concentrate feed, the average weight of pigs were 24.33kg (8 to 12 months). After feeding the balanced feed for 3 months, the pigs attained an average body weight of 55.33kg . The average gross cost, net income and B:C ratio were in the tune of Rs.5333/-, Rs. 3967/- and 1.74 respectively.

Plate 133: FLD on maize at Big Lapathy, Car Nicobar

Plate 134: Vermicompost unit at Farmer field of Big Lapathy, Car Nicobar


Plate 135: Demonstration of coconut husk composting at Arong, Car Nicobar


Plate 136: Intensive pig farming at Tapoiming, Car Nicobar

Glimpses of Events Conducted

New India Manthan: Sankalp Se Sidhiprogramme on 29th August, 2017

Plate 137: Oath taking ceremony

Plate 138: Video show on Hon'ble Prime Minister's vision

Farmer-Scientist Interaction cum Community Breed Conservation Award Ceremony on 21st September, 2017


Plate 139: Farmer-Scientist Interaction cum Community Breed Conservation Award Ceremony

Celebration of Mahila Kisan Divas on 15th October, 2017


Plate 140: Mahila Kisan Divas at Malacca village, Car Nicoba

Celebration of World Soil Day (WSD) at Car Nicobar on 5th December, 2017



Plate 141: Celebration of World Soil Day with tribal farmers at Community Hall, Arong, Car Nicobar



Plate 142: Celebration of World Soil Day at Govt. Secondary School, Arong, Car Nicobar

Live telecast of Address by Hon'ble Prime Minister of India on 17th March 2018


Plate 143: Live Telecast of Address byHon'ble Prime Minister of India at Community Hall, Big Lapathy

Island KisanMela and Farm Innovators Meet on 22nd and 23rd June, 2017

Plate 144: Hon'ble DG, ICAR, New Delhi visiting the stall of Nicobarese during KisanMela - 2017 &
Plate 145: Inauguration of Threshing shed at Auckchung Farm

Soil Collection and Soil Health Card Distribution

Plate 146: Soil Collection and Soil Health Card Distribution

Demonstration on Organic Kitchen Garden at JNV School and Malacca Village on 7th March, 2018

Plate 147: Demonstration at JNV School

Plate 148: Field demonstration at Malacca Village

Table 78: Extension Activities

Nature of Extension Activities	No. of activities	Farmers (Nos.)			Total (Nos.)		
		M	F	T	M	F	T
Field Day	2	102	89	191	102	89	191
KisanGhosthi	02	148	82	230	148	82	230
KisanMela& RAF (CIARI)	02	14	16	30	14	16	30
Lectures delivered as resource persons	2	29	56	85	29	56	85
Scientific visit to farmers field	87	190	71	261	190	71	261
Diagnostic visits	11	6	5	11	6	5	11
Soil health camp	2	-	-	500	-	-	500
Exposure visits	3	17	19	36	17	19	36
Animal Health Camp	1	8	4	12	8	4	12
Sankalp se Siddhi	1	50	50	100	50	50	100
Awareness on FPO	7	209	115	324	209	115	324
Awareness on conservation of petroleum products in farming	7	114	110	224	114	110	224
PM speech live telecast on 17th March, 18	1	132	168	300	132	168	300
Radio & DD Talk	7	Island farmers					
Total	135	1019	785	2304	1019	785	2304

Saansad Adarsh Gram Yojana: Kinyuka

- During 2017-18, conducted activities for the development of agriculture and allied sector in the Kinyuka village, Car Nicobar adopted under SansadAdarsha Gram Yojana for improving livelihood and nutritional security of the tribal community.
- A total of 18 visits were made by the experts to monitor the progress of different interventions made through KVK as well as line departments.
- Training on "Scientific pigfarming" from 10th,11thand 13th October, 2017 were imparted at Kinyuka in which 40 tribal farmers got benefitted.

Award received by Farmers from the KVK district

1. Smti. Martha Lawrance, W/o Shri. LawranceMathew,Tapoiming, Car Nicobar: Best Farmer Award from ICAR-CIARI, Port Blair on 23rd June, 2017 at Kisan Mela-2017.
2. Shri. Crispin John, Tapoiming village : Best Farmer from ICAR-CIARI, Port Blair on 16th February, 2018 during RAF-2018.
3. Smti. Norah John, Tapoiming village : Best Farmer Award for conserving Wild Betel vine from ICAR-CIARI, Port Blair on 22nd March, 2018.
4. Community Breed Conservation Award on 21st September, 2017 from National Bureau of Animal Genetic Resource, Karnal for the efforts taken for conserving the precious Nicobari Pig.

ICAR - Krishi Vigyan Kendra –Nimbudera, N&M Andaman

Trainings

A total of 38 trainings were conducted by KVK, N&M Andaman in disciplines of Agriculture *viz.* Agronomy, Horticulture, Animal Science, Fisheries, Agriculture Engineering and Home science wherein a total of 1174 farmers including 545 women got benefitted (Table 79, Fig. 36 & 37) .

Table 79: Training conducted by KVK in different disciplines (In Nos.)

Discipline	Training	Male	Female	Total
Agronomy	06	102	70	172
Horticulture	07	123	89	212
Animal Science	07	125	78	203
Agricultural Engineering	06	132	70	202
Fisheries	06	142	56	198
Home Science	06	7	183	190
Total	**38**	**629**	**545**	**1174**

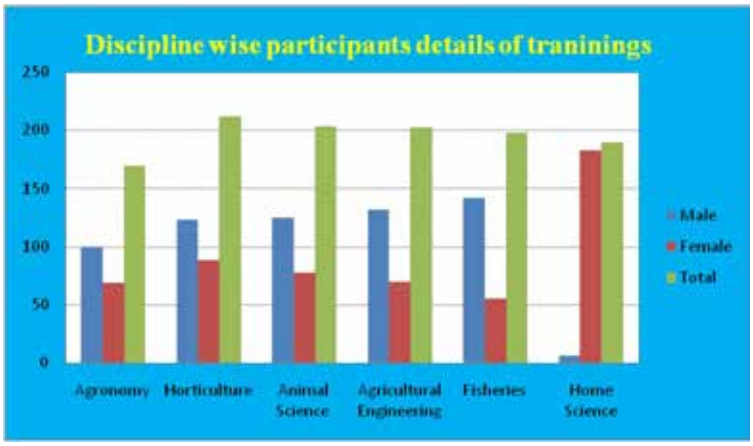


Fig.36: Discipline wise male, female and total number of trainees participation

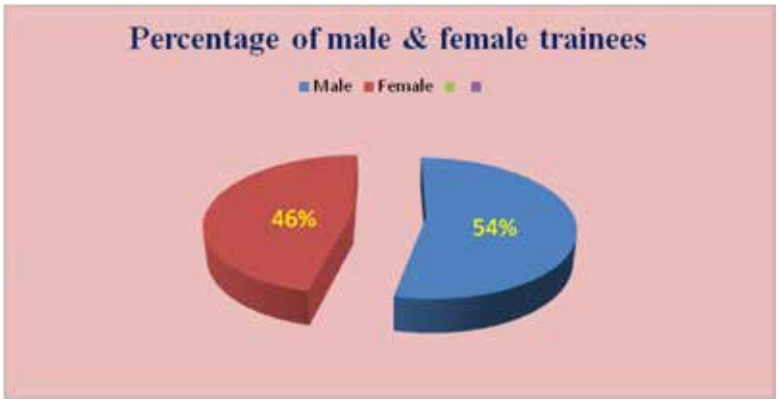


Fig.37: Percentage of male and female trainees participation

Plate 149: Glimpses of training conducted on thematic areas

Agronomy

Horticulture

Agricultural Engineering

Animal Science

Fisheries

Home Science

Front Line Demonstration [FLD]

During the year nine Front Line demonstrations were conducted in agriculture and allied aspects and the salient results are given below:

- Demonstration on paddy variety CARI Dhan 7, was conducted at two farmer's field at Hari Nagar and Duke Nagar villages in an area of 0.25 ha each. The results showed that on an average paddy yield of 4.72 t/ha was recorded from both the farmers fields which is 29.86 % higher grain yield than local check variety Swarnajaya (3.64 t/h).
- Bacterial wilt resistance varieties of brinjal (Arka Kesav), was conducted on two different locations of Middle Andaman.The growth performance of CV. Arka Kesav was superior than other farmers variety with respect to resistance to bacterial wilt (BLW) and mortality. Further Arka Kesav had given a higher yield of

40 t/ha. Acceptability for this variety was good among the farmers due to its high resistance to bacterial wilt disease and higher yield in comparison other local varieties.

- Intercropping in arecanut plantation, was carried out, in two location of Middle Andaman. The intercropping with planting of turmeric and ginger in the interspaces of arecanut plantation not only gave additional income but also increases the yield of main crop (arecanut).The additional income of Rs.60000/ to 100000/- was earned by local farmers by adopting the intercropping practices in arecanut plantations. Acceptability of the demonstration was high among the farmers and the technology is more renumurative to the farming community.
- Deworming in goat, The demonstration was conducted interesting three farmers from two different village *viz.* Profullya Nagar and Dharampur. During the demonstration period, the goat keepers were advised regarding the importance of deworming in goat, administered ALBOMAR powder (Micronised) @ 100 mg/ kg of body weight to 3 months old kids. The result revealed that the goat administered with ALBOMAR obtained the body wt. of 9.6 kg when compared to local check 7.9 kg at 6 months period.
- Vaccination in poultry, was performed at the fields of four farmers from three different village *viz.* Duke Nagar, Govindpur and Dharmapur. In this demonstration, the farmers were advised regarding the importance of vaccination, vaccination schedule in poultry; necessary inputs like day old vanraja chicks, and vaccines were supplied to the farmers with the help of Department of AH & VS, N & M Andaman, and the data on percent survival of Vanraja chickens were obtained from the farmers at 8 wks. The percent survival of vaccinated vanraja chickens was found 87 as compared to local check 33.
- Paddy cum fish culture was demonstrated in farmer's field at Govindapur village. A total area of 0.40 ha paddy field was selected for demonstration. Rearing of Rohu fry in rice field was found to increase in fingerling production and was economical to farmers. During the culture practice no rodent damage was noticed in fish cum rice field whereas rodent problem was observed in rice fields, without fish cultivation. As the demonstration gives additional income the technology was very well adopted by the farmers.
- Coconut climber, to minimize the labour input in coconut cultivation was carried out at 12 farmer's fields with an average plantation area of 0.3 ha. Coconut climber was found to be very useful and safe. Further while harvesting the nuts and tender coconuts, it reduced the drudgery and made easy for climbing the trees without risk. It was found that using climber and harvesting reduced 25% labour input cost was reduced in addition to this unskilled persons including women could climb the tree and harvest the nuts without any risk.
- Motorized peg type paddy thresher In the Island the paddy farmers adopted different methods for paddy threshing *i.e.* manual (10%), power tiller (80 %) and by tractor (10%). The demonstration of paddy threshing using motorized peg type paddy thresher was demonstrated to the farmers at four places. It was found that using peg type motorized thresher increased the threshing efficiency to 96% as compared to threshing by power tiller method (94%) and farmer practice (84%) respectively. Further it was found that significant reduction in threshing cost Rs. 93/q as compared to Rs. 188/p under farmer practice.
- Promoting vermi composting by involving SHG's were conducted.
- Three SHG'S from N & M Andaman were selected and trained in scientific way of vermi composting. Inputs were provided to all the three SHG's and the compost were later sold by SHG in the retail market at par with the market prices(i.e. Rs.10/kg).
- Tie and dye technique on fabric as a source of income generation.
- The process of tie-dye consists of folding, twisting, pleating, crumpling fabric or a garment and binding with string or rubber bands, followed by application of dye results in beautiful patterns and designs in fabrics like dupatta ,t-shirts, sarees etc. It is a kind of value addition in clothes thereby increasing the value of the fabric and enhancing the income of the family. Three SHG's from different villages of N & M Andaman were

selected and provided training on different techniques of tying the fabric to get various patters and ways of using dyes and fixers on the fabric. SHG's showed keen interest in learning the skill and further taking it as an enterprise.

CARI Dhan 7

Intercropping in arecanut plantation

Bacterial wilt resistance varieties of brinjal (Arka Kesav)

Vaccination in poultry

Deworming in goat

Paddy cum fish culture

Coconut climber

Motorized peg type paddy thresher

Tie and dye technique on Fabric

Distribution of worms to SHG's

High yielding varieties of Green gram CARI Mung 1 & CARI Mung 2

Plate 150: Glimpses of FLD's

ON FARM TRIALS [OFT]

Evaluation of high yielding varieties of green gram

Varietal trial with three technical options *viz* CARI Mung 1, CARI Mung 2, and Farmers variety were conducted t at 07 farmer's fields (07 replication).

Evaluation of high yielding varieties of sesame (Til)

In order to promote oil seed cultivation in the island evaluation of high yielding varieties of Sesame (Til) with three technical options *viz* Farmers variety, RT- 346 and RT-127 were conducted carried out at 07 farmer's fields (07 replication).

Plate 151: High yielding varieties of sesame (Til) RT-127 & RT-346

Assessment and evaluation of colocasia varieties was conducted at farmer's field of Middle Andaman. Planting of four different Colocasia varieties was taken up in Kharif season along with farmer's local variety. Evaluation of different varieties of colocasia showed that Shree Rasmi variety yielded 30.0 t/ha followed by Muktakesi 28.5 t/ha, Shree Kiran (23.6 t/ha) and Shree Pallavi (19.2 t/ha) on the other hand the local variety yielded 14.80 t/ha. Thus the result showed significant increase in yield by adopting improved varieties.

Plate 152: Evaluation of Colocasia varieties

Performance evaluation of indigenous lactating cattle fed with supplements of mineral mixture or chelated mineral mixture: The trial was carried for a period of three months in the fields of seven farmers from Profullya Nagar, T. V. Kulum, and Govindpur. During the trial, the ration of lactating indigenous cattle were supplemented with Farmers practice + mineral mixture (50 gm/ day) (T1), and Farmers practice $_{+}$ chelated mineral mixture (35gm/ day) (T2), and was compared with farmers practice (T0). It was noted that supplementation of both mineral mixture (T1), and chelated mineral mixture (T2) improved the milk yield and lactometer reading; and reduced the incidence of repeat breeding in cattle. However, the BC ratio of T2 (2.16) was found higher than T1 (2.10) and To (1.83) respectively.

Plate 153: Trial on supplementation of mineral mixture in cattle

Performance of growing pig fed with different levels of azolla, was performed at the fields of seven farmers selected from three villages *viz*. Profullya Nagar, Jaipur, and Paresh Nagar. In this trial, two different rations T1, and T2 were prepared and fed to growing pigs after incorporation of sun dried azolla as protein replacement @ 10 percent, and @ 20 percent in the conventional ration (T0). It was observed that addition of sundried azolla @ 10 percent and 20 percent level does not have any adverse effect on the growth of pigs. Furthermore, it was noted that inclusion of sun dried azolla @ 20 percent reduced the overall cost of feed resulting in the highest BC ratio (2.53), when compared T1 (2.33) and T0 (2.16) which reduced the overall cost of feed.

Plate 154: Trial on effect of feeding different levels of Azolla in pig

Impact of nutrition education in improving feeding practices, dietary adequacy and growth of young children

The concept of Nutrition Education (NE) aims at voluntary adaption of food choices and food and nutrition related behaviors conducive to health and well-being.The OFT was carried out in three anganwadi centers of N & M Andaman (Hari Nagar & Govindpur) A total of 3 groups (each group consisting of seven mothers along with their children) were selected. The age of the children were below 5 years. Three technical options were evaluated i.e. Technical Option 0: Controlled group (No awareness is imparted).Technical Option 1: Imparting NE and counseling to mothers. Technical Option 2: Imparting NE and counseling along with demonstration of low cost locally available supplementary food for a period of three months. Nutrition education and awareness were created through audio visual aids like lectures, pamphlets, slide shows and demonstration of low cost nutritious

recipes prepared from local produce. A pre & post evaluation was conducted before and after imparting nutrition education. Knowledge was imparted about giving rainbow diets, hygiene & sanitation, consuming local produce, consuming sugar & salt sparingly, etc. The highest increase in knowledge was recorded in subjects belonging to Technical option 2 (32% to 78%), followed by subjects from Technical option 1 (38% to 70%).However no increase in knowledge was recorded in Technical Option 0.Anthropometric assessment revealed there was an increase in weight of 100% of the children belonging to technical option 2 (minimum 200 gms to maximum 800 gms), whereas only 58% of the children from technical Option 1 showed an increase in weight from minimum 200 gms to maximum 400 gms. It was also observed that there was an improvement in the selection of foods to be given to children in mothers belonging to technical option 2 & 1. Thus it can be concluded that appropriate nutrition education program can improve feeding practices of rural mothers and lead to positive changes in child growth.

Plate 155: Nutrition education & counseling to mothers

Extension Activities

Table 80: Details of extension activities (In Nos.)

Nature of Extension Activities	Number	Farmers			Extension Official			Total		
		M	F	Total	M	F	Total	M	F	Total
Field Day	05	53	38	91	-	-	-	53	38	91
Kisan Ghosthi	04	71	43	114	-	-	-	71	43	114
New India Manthan Sankalp se Siddhi and pre-Rabi Sammelan	01	92	80	172	16	09	25	108	89	197
National Nutrition Week	01	162	108	270	-	-	-	162	108	270
Mahila Kisan Divas	01	0	65	65	-	-	-	0	65	65
World Fisheries Day	01	20	28	48	01	01	02	21	29	50
World Soil Day	01	61	75	136	30	09	39	91	84	175
Webcast for Krishi Unnati Mela-2018	01	211	182	393	05	04	09	216	186	402
Animal health camp	01	17	12	29	02	01	03	19	13	32

Nature of Extension Activities	Number	Farmers			Extension Official			Total		
		M	F	Total	M	F	Total	M	F	Total
Soil health card distribution Camp	01	38	12	50	-	-	-	38	12	50
Film show	35	559	514	1113	-	-	-	559	514	1113
Method of demonstration	16	170	67	237	7	5	12	177	72	249
Group meetings	14	151	87	238	-	-	-	151	87	238
Lecture delivered as resource persons	43	243	832	1075	-	-	-	243	832	1075
Advisory services	258	70	276	346	-	-	-	70	276	346
Scientific visit to farmers field	600	155	616	771	-	-	-	155	616	771
Farmers visits to KVK	188	15	173	188	-	-	-	15	173	188
Diagnostic visits	82	17	136	153	-	-	-	17	136	153
SHGs conveners meeting	02	0	25	25	-	-	-	0	25	25
Swachh Bharat Abhiyan	16	151	127	278	-	-	-	151	127	278
Total	1271	2256	3496	5792	61	29	90	2317	3525	5882

Field Day(s)

CIARI DHAN-7


Deworming in goat


Paddy cum fish culture


Motorized peg type paddy thresher


Coconut climber

New India Manthan-Sankalp se Siddhi on 19th August, 2017

National Nutrition Week on 1st September, 2017

Mahila Kisan Divas on 15th October, 2017

World Fisheries Day on 21st November, 2017

World Soil Day on 5th Dec 2017



Webcast of Krishi Unnati Mela-2018 on 17.03.2018



Animal Health Camp




Soil Health Card Distribution Camp on 31st Jan 2018



Kisan Ghosthi

Group Meetings

Field Demonstrations

Film show

Field visits

Diagnostic visits

Advisory services






Distribution of inputs





Kisan Mela at Harinagar Panchyat

Celebration of Independence Day & Republic Day

The 71st Independence Day and 69th Republic Day was celebrated at KVK, Nimbudera in a befitting manner with Staff, KVK, Pradhan, Basantipur, local farmers and others.

Celebration of Independence Day

Celebration of Republic Day

Swachh Bharat Abhiyan

Cleaning of KVK Office and creating awareness about Swachh Bharat Abhiyan

SUCCESS STORY

Augmentation of milk production in dairy animals - a success story

Farmers Name: Mr. K. Prabhakaran Nair

Village: T V kulum, Shivpuram

Impact factor	Before Adoption	After Adoption
Farmer practice	NA	Balanced ration
Yield of product	6.6 litre/day	11.3 litres/ day
Fixed cost	Rs. 85000/-	Rs. 85000/-
Recurring cost	Rs. 5600/-	Rs. 7400/-
Gross income	Rs. 14900/-	Rs. 22800/-
Net profit	Rs. 9300/-	Rs. 15400/-
B:C ratio	1.66	2.08

Before intervention

Mr. Prabhakaran, a resident of village T V Kulum of Gram Panchayat Shivpuram of N & M Andaman owns two jersey cows and three calfs. Like other parts of N & M Andaman district, lack of infrastructure facilities, slow and interrupted internet, lack of market, lack of raw material, lack of skilled manpower etc contribute to the miseries of people in this region. Thus, the farmers in this region were not aware of the new technologies and scientific practices in animal husbandry. Moreover, the sale of milk was also not seen as a source of income as there was no constant market. So, the farmer never felt the need to improve milk production and to provide the balanced ration to their dairy cattle. However, with the intervention of KVK, now the things are changing.

Technical interventions

KVK recognised that the farmers can realise the importance of dairying for income generation when they will get market for the sale of milk. In this connection, the KVK conducted the Kisan Gosthi in association with Assistant Commissioner, Rangat, A & N Administration to highlight the need for establishment of ANIIDCO milk collection centre in the area. The effort of KVK and action of Administration bore fruits, when the ANIIDCO started collection of milk in the area. Now, the farmers are more concerned about the health of their dairy cattle and their nutritional requirement for higher production as the sale of milk is no longer a problem. Keeping in view, the conducted on farm trial for balancing of dairy ration at the farmers field using locally available feed resource such as coconut cake, azolla etc. a trial for supplementation of chelated mineral mixture in ration of dairy cattle at the field of Mr. Prabhakaran was conducted.

Technological benefits after intervention

As a result of KVK intervention, the sale of milk is no longer a problem in the area. The farmers are now showing interest in dairy farming. Trials on balancing of dairy ration helped the farmer to recognise the need to balance the ration of dairy cattle for sustainable production. All these have brought changes in the attitude of people and now they don't look dairy cattle as a liability but as an important source of income.

KVK -Farm

Development of KVK hilly land

The allotted 2.0 ha hilly land which was not suitable for cultivation was cleared and being developed for year round cultivation of horticulture and field crops by making terraces. Approach road has also been constructedi. The land is covered with pulse crop and horticultural demonstration units are established.

Establishment of mango mother block

Development of low land

Construction of peripheral roads and fish nursery ponds in KVK farm was taken up under MGNREGA scheme with the help of Basantipur Panchayat with total out lay of Rs 12.00 lakhs.

Excavation of irrigation pond in paddy land

Pond Dyke

Farm activities at KVK Farm, Nimbudera

Development of KVK farm at N&M Andaman is benefitting local farmers. Different innovative technologies is being demonstrated on farm to farmers and KVK land is also being used for production of seeds of paddy, pulses, vegetables and fish seeds.





Farm Production and Revenue Generation

Crop & variety	Area (Ha)	Production		Sold	Revenue Generation (Rs.)
		Commercial	Seed		
Paddy (Mixed)	1.0	847 kg		847 kg	9317
Paddy CARI-7	0.1		97 kg	97 kg	2522
Paddy CARI-6	0.05		30 kg	30 kg	780
Paddy CARI-9	0.25		200 kg	200 kg	5200
Paddy NR-40	0.08		57 kg	57 kg	1482
Pulse (Green gram)	0.25	16 kg		9 kg	270
Pulse (Black gram)	0.20	12 kg	-	-	-
Bhendi (A. Anamika)	0.25		11.6 kg	600 gm	240
Lobia (A. Mangala)	0.08		2.580kg	580 gm	174
Amaranthus (A. Anurima)*			200 gm	200 gm	40
Bhendi (A. Anamika)*			300 gm	300 gm	120
Lobia (A. Mangala)*			50 gm	50 gm	15
Brinjal Seedling		850 Nos.		850 Nos.	
Chilli Seedling		390 Nos.		390 Nos.	
Tomato Seedling		20 Nos.		20 Nos.	
Marigold Seedling		23 Nos		23 Nos.	
Arecanut Seedling (Mixed)		6315 Nos.		5815 Nos.	58,150
Coconut Seedling (Local)		85 Nos.		85 Nos.	12,75
Poultry (Duck) Live weight		40 kg		40 kg	4,800
Poultry (Chicken) Live weight		4.4 kg		4.4 kg	528
Egg grade “A”		159 Nos.		159 Nos	618
Poultry Egg hatching facility		75 Nos.		75 Nos.	300
Spinach		3 kg		3 kg	60
Tender Coconut		10 Nos.		10 Nos.	80
Arecanut with husk		700 Nos.		700 Nos.	490
Total				**Total**	**85,186**

*Seed Procured from other ICAR institutes/ universities/Agri. Universities to meet the local demand

TRIBAL SUB PLAN (TSP)

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

Capacity building programmes

S.No.	Title	Venue	Date	Participants		
				Male	Female	Total
1	Weed control in paddy crop	Harminder Bay, Little Andaman	13th -14th July, 2017	65	38	103
2	Black pepper as intercrop for coconut gardens	Harminder Bay, Little Andaman	26th Sept.,2017	14	16	30
3	Underutilized fruits for backyard farming	Harminder Bay, Little Andaman	27th Sept.,2017	13	12	25
4	Cultivation of bacterial wilt resistant brinjal	Vikash Nagar, Kamorta, Nicobar	16th Jan., 2018	17	13	30
5	Quality seed and its importance in agriculture	Harminder Bay, Little Andaman	26th to 27th March, 2018	63	39	102
6	Application of CIARI-bioconsortia for plant health management	Harminder Bay , Little Andaman	27th March, 2018	29	25	54
7	Oyster mushroom cultivation	Harminder Bay, Little Andaman	27th March, 2018	20	24	44
			Total	221	167	388

Details of input provided to the tribal farmers

Sl. No.	Inputs	Quantity	Place
1	Elephant foot yam	250(kg)	Car Nicobar
		500(kg)	Little Andaman
		250(kg)	Vikas Nagar, Kamorta
2	Colocasia	100(kg)	Car Nicobar
		150(kg)	Harminder Bay, Hut Bay
		100(kg)	Vikas Nagar, Kamorta
3	Ginger	50 (kg)	Car Nicobar
		100 (Kg)	Harminder Bay, Hut Bay
		50 (kg)	Kamorta
4	PVC coated chain link fencing materials (6 farmers)	600 m^2	Kamorta
5	Rice TFL seed (CARI Dhan 4, 5, 6 and CSR 36)	10 Q	Little Andaman
6	Brinjal seed (CARI Brinjal 1)	0.5 kg	Car Nicobar

7	Butachlor herbicide	42 litre	Little Andaman
8	CIARI bioconsortia	50 kg	Little Andaman
9	Drip kits	5 Nos.	Car Nicobar
10	Farm tools (Pickaxe, khurpi, grass cutter and rose can)	75 Nos.	Little Andaman
11	Vegetable seeds (okra, brinjal, tomato, pumpkin, chilli, gourds, cucumber etc)	250 Nos.	Little Andaman
12	Rooted cuttings of black pepper	50 Nos	Little Andaman
13	Coconut climbing devices	15 Nos.	
14	Coconut dehuskers	30 Nos	
15	Outboard engines	20 Nos.	Car Nicobar & Little Andaman


Distribution of coconut climbing devices and coconut dehuskers to the Nicobarese tribes at Harminder Bay


Awareness programme


Training and distribution of farm tools and vegetable seeds at Harminder Bay

Distribution of seed and field inputs at Little Andaman'



Monitoring of the activities at Car Nicobar and Harminder Bay, Little Andaman




Way Forward

- Horticulture based nutritional kitchen garden for Onges and Backyard poultry with Nicobari fowl and Nutritious Kitchen garden for Great Andamanese in collaboration with A & N Administration, AAJVS and ANTRI has been planned.


WOMEN PARTICIPATION (SC/ST)

Empowering women specially the SC/ST beneficiaries through various capacity building and a need based technological demonstration in agriculture and allied fields were undertaken by the Institute. The women folks participated with lots of enthusiasm to harness the benefit of latest knowledge and skill in the field of scientific goat farming, maintenance of fishing inputs, nursery and weeds management of rice, IFS, conservation of Nicobari fowl, pig, production and post harvest processing of coconut, application of bio-consortia for control of plant disease, nutritious kitchen garden, tuber crops, poultry, pig farming, parthenium weed management, horticulture based cropping system, importance of quality seeds etc.

The participation of women were 1224 in the category of ST comprising from Nicobar District and Little Andaman, beside 4411 from South Andaman & 4071 from North & Middle Andaman District belong to other than SC& ST category.

TECHNOLOGIES TESTED, DEMONSTRATED & TRANSFERRED

- Pure Nicobari fowls under backyard
- Package of practices for Vanaraja chicks
- Preparation of low cost feeds using locally available resources
- Demonstrated herbal acaricide to control tick infestation in livestock
- Demonstrated herbal eye drop to control ophthalmic infection in poultry
- Technology for spiced based ready-to-serve (RTS) products of noni and dragon fruit at Food Process Engineering Laboratory (FPEL) were tested.
- Salinity tolerant Bioconsortia for enhancing vegetable production were demonstrated.
- Enriched vermicompost production, faster decomposition and organic waste recycling was demonstrated at Neil Island
- Pekin duck for small farmers under backyard and high yielding varieties of rice namely Gayatri, CIARI Dhan 6, CSR 36,CIARI Dhan 7 at Diglipur, North Andaman
- Seed village concept for production of truthfully labeled rice seed at North Andaman in participatory mode
- Carp grower feed, a formulated feed developed and demonstrated.
- Developed liquid based bio-formulation named **"**CIARI-*GroPro***"** for plant growth promotion and seed treatment in organic agriculture.

Varieties notified

- Two rice varieties *viz.,* CARI Dhan 1 and CARI Dhan 5 developed by ICAR-CIARI, Port Blair for Andaman and Nicobar Islands were notified during 2017-18.

Products Developed/ Marketed (under the guidance of Mr. A.K.O. Ratheesh, Scientist, Fisheries)

- Dried lizard fish- Launched by Department of Industries, A & N Administration
- Tuna pickle : Launched in Andaman Bazaar
- Organic plant growth stimulant from fish waste

SEED & PLANTING MATERIAL PRODUCED (2017- 2018)

Particulars	Variety	Quantity (Nos/kg)
Coconut seedlings	AOD, AGD, AYD, AOT	1829 Nos.
Arecanut seedlings	Samrudhi & Mangala	9395 Nos.
Elephant foot yam	Gajendra	2.0 tons.
Ginger	Jorhat	450 kg.
Turmeric	Prabha & Pratibha	250 kg.
Colocasia	Sree Rashmi & Sree Pallavi	100 kg.
Black pepper	P-2 & P-5	2225 Nos.
Clove	Local	325 Nos.
Cinnamon	Local	350 Nos.
Nutmeg	Local	200 Nos.
Sweet potato (vine cuttings)	CARI Swarna & CARI Aparna	6000 Nos.
Greater yam	CARI Yamini	200 kg.
Dragon fruit (rooted cuttings)	-	3000 Nos.
Marigold (rooted cuttings)	-	5000 Nos.
Jasmine (rooted cuttings)	-	1600 Nos.
Noni (seedlings)	CIARI-Sampada, CIARI-Sanjivini, CIARI-Samridhi & CIARI-Rakshak	15000 Nos.
Rice (Nucleus Seed)	CARI Dhan 1, CARI Dhan 2, CARI Dhan 3, CARI Dhan 4, CARI Dhan 5, CARI Dhan 6, CARI Dhan 7, CARI Dhan 8 & CARI Dhan 9	77 kg.
Rice (Breeder Seed)		176 kg
Rice (TFL)	CARI Dhan 4, 5, 6 7, 8, 9, CSR36 & Gayatri	59.42 Q.
Pulse (TFL)	Mungbean (CIARI Mung 1, CIARI Mung 3, ANM 11-15) and Urdbean (CIARI Urd 1, CIARI Urd 2 & ANU 11-19)	2.68 Q.
Brinjal (TFL)	CARI Brinjal 1	2.5 kg.
Plant disease control and growth promotion	CIARI- Bio consortia	50kg.
Mushroom spawn	Sold to island farmers directly or through Agricultural Department	445 Nos.

INFORMATION ON OTHER SECTION

Priority setting, Monitoring and Evaluation (PME) Cell

The X Institute Research Council (IRC-2017) Meeting both for External and Institute funded projects was held on 3rd, 19th, 20th and 21st July, 2017 at Dr. N.T. Singh Conference Hall, wherein a total of 91 projects were presented and reviewed with appropriate suggestions by the house.

Institute Annual Report 2016-17, ICAR-CIARI at a glance (2nd Revision),Island Agriculture Newsletter both in English and Hindi (April 2017 to September, 2017),DARE/ICAR Annual Report 2017-18, Cabinet Report (Every month), Half Yearly Performance Review (April to September, 2017 & October 17 – March, 2018), Output-outcome framework for the schemes from 2017-18 to 2019-20, Annual Plan 2018-2019, follow up of Action points on R & D activities of the Institute, Updating data base of Research project of the Institute from 1978 to 2018, response to the PM's view on agriculture (Point wise) – 30 points, Document on PM's vision on Agricultural Research and ICAR – 12 points, Outcome review of CIARI for XII plan for NITI Ayog, Action plan on R & D activities of the Institute, monitoring of soil health card submission on portal etc. Beside, 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, Island Kisan mela, and Regional Agriculture Fair.

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

Library

The central library is the store house of knowledge especially on Horticulture, Field Crops, Natural Resource Management, Animal Sciences, Biotechnology, Fisheries Science, Social Science and many other related areas and plays a pivotal role in catering the needs of the scientist, technical, research workers, students and administrative staff of the institute. It also extends these facilities to the local research and educational institutes of these Island and mainland. During the span of four decades, the Library has grown in size to earn the reputation of having exhaustive collection of books and journals. The library has been enriched with 7032 books, 2551 miscellaneous publications in addition to journals by subscription, gratis, on exchange basis and technical books. Gratis publications such as Annual Report, Newsletter and Research Bulletin received from India and Foreign Institutes as exchange relationship is also maintained. Island special section with 490 books has been created to give information related to Andaman and Nicobar islands. Special collection on Hindi literature along with reprographic facility is also available. These sections have been well appreciated by the dignitaries visiting the library. Besides, efforts have been made to acquire non-conventional literatures such as technical reports, reports on socio-economic study and annual reports from various sources to be kept as a ready reckoner for the users. Besides school student and farmers also visited this library regularly. A total 36 meeting was organised in the conference hall of the Library during the period.

News papers clippings services: A news paper clipping service "The glimpse" covering news items related to agriculture and allied sciences were collected on daily basis for ready references.

Official Language Cell

For the implementation of the official language policy and the targets fixed in annual programme, efforts were made for doing maximum work in official language. Various steps were taken to popularize Official Language among the officers and staff and to promote the use of Hindi in the official work of the institute.

Activities undertaken

- Hindi Fortnight from 14th September to 26th September, 2017
- Rajbhasha Seminar on **"Digital India"** on 14th September, 2017.
- **Dweep Krishi Sandesh** a technical book in Hindi was prepared
- For extension and maximum use of Hindi in official works, bilingual scientific bulletins/ folder were prepared in Hindi and the technical information was broadcasted / telecasted through Doordarshan and All India Radio, Port Blair for the local farmers of these islands.
- 31 nos of literature books in Hindi were added in section for Hindi books at Institute Library.
- 17 nos of bulletin/pamphlet/brochure/ certificates, invitation cards were prepared bilingually during Regional Agricultural Fair.

Town Official Language Implementation Committee (TOLIC), Port Blair

As per the Office Memorandum No. 12024/09/2010/OL, dated 15.10.2010 issued by the Rajbhasha Vibhag, Home Ministry, Govt. Of India, the charge of Town Official Language Implementation Committee (TOLIC), Port Blair was given to Central Island Agricultural Research Institute, Port Blair. Half yearly meeting of Town Official Language Implementation Committee, Port Blair was conducted on 28th July, 2017 and 22nd December, 2017. Chal Vaijayanti Shield and Cup were given to offices on annual basis.

Seventeen staff of TOLIC were awarded with memento and certificates for their contribution and co-operation in implementation of the official language programme during the year 2016-2017.

Workshop

- Joint Hindi Workshop by TOLIC was organized on 03rd April, 2017 to bring awareness about the importance of increasing use of Hindi in official dealing. **LOGO for TOLIC**, Port Blair was released. Thirty eight participants attended the workshop.
- Joint Hindi Workshop was organized on 23rd December, 2017 under the chairmanship of Dr. A. Kundu, Chairman, TOLIC and Director (Acting), ICAR-CIARI., Shri Rajesh Chaturvedi, Manager (OL), State Bank of India, Kolkata was the resource person for the workshop. 37 participants attended.

Glimpses of Activities

Hindi Fortnight

TOLIC Half Yearly meeting

Post Graduate Cell

Post Graduate Cell facilitated the students who have registered for undergoing training/ dissertation/ implant training and other activities for the benefits of the graduate & post graduate students at ICAR-CIARI in collaboration with the other research institutes/universities. During the period three students in the discipline of M.Sc.(Biotechnology), B.Tech (Agriculture) and M.Tech (Bioinformatics) from Periyar University, Aditya Engineering College and Karunya University respectively have undergone training for a period of one to three months. The PG cell also facilitates the Ph.D. work related to the students who have registered with the PRIST University, Thanjavur.

Estate Section

The Estate Section consists of Estate, Workshop and Instrumentation centre. It takes up works related to infrastructure development, repair & maintenance of the institute to support its research activities. Three diesel generator sets are kept as stand by for restoration of power supply during power cuts and exigencies. The electricity and water supply system to residential & non-residential buildings are also operated and maintained by the Estate section to support research activities and staff welfare.

Repair and Infrastructure Development

Trainees Hostel cum Scientists Home and Modern Hatchery were constructed. Similarly, two units of Poultry Sheds (Parent Shed and Brooder cum Grower Shed) and a Hatchery shed under Poultry Shed Project were constructed. The construction of pig shed and micro plots with covered rain shelter construction in completion stage. Roads around the residential buildings, non-residential building and the main entrance of the Institute of about 2 Km length were repaired/re-surfaced for smooth movement of vehicles. The repair and maintenance of residential and non-residential buildings were carried out for an amount of Rs.26.18 lakhs. Which includes goat shed, estate store and poly house/ shade net house. The repair works also includes replacement of roof of the damaged roof of calf shed and the Car shed at Marine Hill. The roof extension of Farm Office of Bloomsdale Farm was also done. The damaged Institute and

buildings name board in Phase-I, Phase-II and Central Laboratory were replaced. The damaged portion of boundary wall up to a length of about 20 m were repaired and painted. The structural member and the damaged wooden wall were replaced in type 'H'/116 quarter. A septic tank and a soak pit was constructed for smooth flow of sewage water for type-II "G' block. Painting of type-IV/21, part of V/2 quarter, kitchen and store room of Guest House were done. Similarly painting of Main gate, Main gate walls and other structures around Institute building such as toe wall, Side wall, Retaining wall etc. were done during VIP visit and while organising Seminar, Symposium etc. for face lift. The Room No.210 of Central Laboratory building was renovated and modified to establish a Laboratory for Pesticide Residue Analysis. Two Hoardings have been made for display of Soil Health Scheme of Govt. Of India and fixed at the entrance of ICAR-CIARI and ICAR- KVK Sippighat complexes. A pandal for accommodating about 1000 farmers was constructed during Isand Kisan Mela, Institute foundation day and Regional Agricultural Fair. About 20 stalls were constructed inside the pandal for display of research materials of the Institute and other line departments of A&N Administration.

Workshop

The Workshop plays an important role for arranging transportation for scientists, staff, farmers to carry out research and welfare activity of the Institute. It also plies regular school trips, arrange and manage vehicles during major events of the Institute. The routine and major repairs of staff car, jeep and staff/school bus were also carried out in stipulated time to faciliate research activity of the Institute.

Instrumentation Cell

The repairs and maintenance of scientific equipments, refrigerators and air conditioners installed in the Central Laboratory and other building were carried out to keep to facilitate research activities of the Institute. Un-interrupted power supply was also provided through our Stand by Generators during important meetings and functions of the Institute to cater to the need of the Scientists and the Institute as a whole.

ITMU Cell

ITMU Cell organized two ITMC meetings, the first on 20th November, 2017 and the second was held on 12th April, 2018. The new ITMC was constituted, wherein, Dr. S.B Roy, Principal Scientist, NIRJAFT was nominated as external member. The cell has facilitated the commercialization of the developed technologies and a base value has been fixed. ITMU Cell also organized a seminar on 12th April, 2018 in which Dr. S. B. Roy, Pr. Scientist, NIRJAFT delivered a lecture on the topic "Intellectual Property Rights- an Indian Perspective", considering IPR/Patenting/ Commercialization and interacted with all the staff members of CIARI.

Moreover, the follow up of the previously registered patent for processing of the patent application was done by the ITMU cell. Compilation of technologies/methodologies developed by the institute has also been updated and submitted to the Council. The technologies suitable for farm women were also submitted to the ICAR-CIWA, Bhubaneswar for publication. Furthermore, collection and compilation for updating the Information of Technology Licensing and patent filing at ICAR Institutes was also done. Monthly report/annual report were submitted to ADG, IP & TM Unit, ICAR, New Delhi. Display posters for showcasing CIARI technologies were prepared and displayed in the ITMU display unit for farmers and stakeholders.

Agriculture Knowledge Management Unit (AKMU)

Agriculture Knowledge Management Unit (AKMU) envisages providing online inter-connectivity between the different research institutes, national centres and state agricultural universities. This cell is responsible for the creation and updating of the Institute website and for the conduct of ARS-NET online examination through ASRB, New Delhi. It is equipped with 2 servers, switches, router, modem, 20 desktop/terminals and one 10 KVA UPS.

Activities during the period

- Maintenance of Hardware/ Software, Servers LAN and internet connectivity. ***VSAT*** equipment and its peripherals.
- Handling institute email accounts with ids at gmail.com and icar.gov.in
- Handling Personnel Management Information System Network (PERMISnet-II) and Project Information & Management System (PIMS) of ICAR PIMS
- Maintaining records with respect to inventory management of Computer Cell, antivirus licenses, cartridges etc.
- Online submission of tender in Central Public Procurement Portal (CPPP). e-Procurement and e-Publishing of tenders. Purchase and handling of DSC of all the designated users.
- Online submission of institute service tax on monthly basis and e-filing of return of service tax on half yearly basis.
- Online submission of institute income tax on monthly basis and e-filing of return of income tax for individuals.
- Maintenance and management of Aadhar based and Non Aadhar based biometric attendance system.
- Preparation of presentations and slide operating for various meetings/ seminars for Director.
- Handling Government E-market Place (GeM), DGSnD, social media account *viz;* Facebook and Twitter and Guest house communication
- Preparation of banners, posters, brochure, certificates, nameplates for various meetings/ seminars etc.
- R-governance, office automation, software for the preparation of salary of TSM staff.
- Downloading the circulars and other information from ICAR website.

Women Cell

International Women's Day 2018 was celebrated on 08.03.2018 at the Institute. A total number of 95 participants including women employees of the Institute, farm women and farmers attended the programme. An in-house lecture on current laws prevailing in the country for prevention of sexual harassment of women at work place was also arranged for the benefit of participants.

Sports Activities

Annual sports meet of the Institute was conducted during 29th to 31st January, 2018. The athletic meet was inaugurated by Director, ICAR-CIARI followed by oath by the players. A total of 62 events including outdoor, indoor and athletic events were conducted for the staff and their family members. The staff members representing various houses *viz*. Havelock, Neil and Ross & Smith participated enthusiastically in various track and field events and made the sports meet a grand success. Havelock House was awarded with 'Overall Championship Trophy' for their splendid performance in all the events whereas, Neil and Ross & Smith secured 2nd and 3rd place respectively. Besides 'Best Athlete Trophies' were awarded to Shri. K. Pradhan and Smt. Saida Bibi respectively.

Institute team also participated in the ICAR-Eastern Zonal Sports Meet held at ICAR-RCER, Patna, Bihar during 13th to 16th November, 2017. The team bagged 3 gold, 2 silver and 1 bronze medal by Shri. Pradhan, Dr. S. Monalisha Devi, Smt. Saida Bibi and Dr. Soobedar Yadav. The winners also participated in the ICAR Inter-Zonal Sports Meet

held at ICAR-NAARM, Hyderabad during 21st to 25th February, 2018. The facilities for outdoor sports and indoor sports like table tennis, carom, multi gym, etc. have been well maintained for the welfare of staff members.



Celebration of Independence Day and Republic day

Independence Day and Republic Day were celebrated in the institute with high spirits and enthusiasm. On the occasion of Independence Day, Director CIARI appreciated the efforts of staff members for their excellent contribution for overall progress of the institute in terms of research, development and extension activities. After the flag hoisting ceremony, various events like quiz, drawing competition for children's and fun games for ladies were arranged in the institute premises. On the occasion of Republic day celebration. The Director, CIARI lauded the staff members for their valuable contribution and congratulated for the dedicated and devoted work and support for the institute in the last one year.

Swachh Bharat Abhiyan (SBA) Activities

Date	Activities	Participation in Nos.
12th to 31stMay 2017 (Swachhta Pakhwada)		
12th May 2017	Swachhta Pledge	140
26th May 2017	Awareness on tree planting ,drawing competition for school students at Port Mort village, South Andaman	70
31st May 2017	Lecture on "**Official procedure with special reference to Record management and Digitization**"	125
27thJuly 2017	Swachhta awareness rally cum mass tree plantation at residential campus of ICAR-CIARI, Port Blair in collaboration with Forest Range Office, Garacharma Range, A & N Forest Department	120
29th August 2017	Shramdan in and around the premises of Composting unit of Animal Science Farm Complex and live demonstration of the compost preparation	87
Swachhtha hi Seva" fortnight from 17th September 2017 to 2nd October 2017		
17th Sept. 2017 Sewa Divas	• Pledge, Shram dan and Cleanliness drive • Pledge, Shram dan and Cleanliness drive at KVK, Nimbudera • Pledge, Shram dan and Cleanliness drive at KVK, Nicobar	83 15 06
24th Sept 2017 Samagra Swachhtha Diwas	• Shram dan at World Coconut Germplam Centre, Sippighat. • Facilitation of proper toilet facility by staff of KVK, Nimbudera at Govindpur I, Basantpur Panchayat, N & M Andaman • Cleaning of KVK office premises of KVK, Nimbudera by all staff members	75 62 15

Date	Activities	Participation in Nos.
25th September 2017 (Sarwatra Swachhta)	• Shram dan and Cleanliness drive at Market place, Bathu Basti Junction, Port Blair in collaboration with Forest Range Office, Garacharma Range, A & N Forest Department and Port Blair Municipal Council, A & N Administration. • Cleaning in Temple and Panchayat premises of Nimbudera village, N & M Andaman	82 46
1st Oct. 2017 Swachhtha nearby tourist spot	• Cleaning of beach at Carboyn's cove in collaboration with Department of Environment and Forest, A & N Administration. • Cleaning at Amkunj Beach with support of local village residents, Shivapuram panchayat, N & M Andaman.	52 38
9th to 18th October 2017 (Swachh Bharat Abhiyan)		
9th to 18th October 2017	Cleaning and beautification of surrounding areas / disposed off old files and records, whitewash and dusting in divisions and sanitation programme	200
20th Oct. 2017 Post Diwali Cleaning	Cleanliness drive in residential complex of Institute main campus	47
25th November 2017 Swachh Bharat Abhiyan	Shram dan and cleanliness drive at Bathu Basti with collaboration of Forest Dept. and Port Blair Municipal Council	82
16th Dec. 217	Cleanliness drive, Run for Swachhta and Shramdan at Sports Ground and Type I Children Park	61

Glimpses of SBA Activities





AWARD AND RECOGNITION

Scientist	Award/ Recognition	Awarding Agency/ Organizing society
S. Dam Roy	Fellow	Awarded in 2017 on the Section of Fisheries Science; specialization on Fishery Resource Management and Aquaculture by NAAS
	Fellow	Zoological Society of India
	Fakhruddin Ali Ahmed Award-2016	For Outstanding Research in Tribal Areas by ICAR
Kundu A, Sujatha T, Sunder J, De AK and Dam Roy S.	Breed Conservation Award 2017 for efforts in conservation of Nicobari breed of fowl	ICAR-NBAGR
B. Gangaiah	Editor Expert Member, Wet land Ecology	Indian Journal of Agronomy Andaman & Nicobar Administration
B. Augustine Jerard	Peer Reviewer	• Journal of Plantation Crops from Indian Society for Plantation Crops, CPCRI, Kasaragod • Crop Protection - Elsevier • African Journal of Biotechnology- Academic Journals • Indian Journal of Horticulture
	Coconut Expert/ Specialist	• Government of Fiji for consultation through Ministry of External Affairs, GoI to serve under Ministry of Agriculture, Government of Fiji under the Indian Technical and Economic Cooperation Programme of Government of India • Secretariat of Pacific Community and invited to participate in International workshop and deliver lecture at Coconut Industry Development Programme • International coconut experts by Coconut Genetic Resources Network (COGENT) of Bioversity International
	Chairman	State level Technical Committee for High Value, Department of Agriculture, A&N Administration
	Member	Nominated to attend the State Level Project Screening Committee (SLPSC) meeting of Andaman and Nicobar Islands held on 16th November 2017 for screening of the agricultural projects to be placed for the State Level Sanctioning Committee in connection with RKVY project proposals
	Member	State level Monitoring Committee of the Coconut Development Board's schemes in A & N Islands .
Pankaj Kumar Singh	Fellow	Indian Society of Genetics and Plant Breeding, IARI, Pusa, New Delhi.

Scientist	Award/ Recognition	Awarding Agency/ Organizing society
S.K.Zamir Ahmed	Member	Task Force Committee on "Biotechnology based programme for SC/ST Population and Rural Development " (DBT), Govt. of India, Ministry of Science & Technology Dept. of Bio Technology, New Delhi
	Best Institutional Building Award	ICAR –CIARI Port Blair
	Appreciation letter	Rotary Club, Port Blair
	Reviewer	Journal of Society of Extension Education (2017-18), TNAU, Coimbatore.
V. Baskaran	Appreciation certificate	ICAR-CIARI, Port Blair
	Member	Formation of Block Technology Team, Prothrapur, UTATMA, South Andaman District
I. Jaisankar	Fakrudhin Ali Ahamed Award-2016	ICAR, New Delhi
	Best Institute Building Award	ICAR-CIARI, Port Blair
	Appreciation Letter	Director, ICAR-NBPGR for Plant genetic resource exploration and collection mission in Great Nicobar Biosphere Reserve from 11.01.2018 to 31.01.2018.
De AK, Muthiyan R, Kundu A, Sunder J, Kundu MS and Mondal S	Best Oral Presentation Award	Sher-e-kashmir University of Agricultural Sciences and Technology of Jammu
Sujatha T.	Appreciation certificate	Acharya Nagarjuna University, Guntur, A.P.
	Certificate of Excellency	Member of Scientific Advisory Board in recognition of outstanding contribution to quality of the journal in the year 2017-18 by International Journal of Livestock Research
K. Abirami	Judge	Flower show at Regional Agricultural Fair (RAF), 15th to 17th February, 2018 at Port Blair
Pooja Bohra	Member of the Editorial Board	Journal of Horticulture and Forestry, Academic Journals.
	Peer Reviewer	• Scientia Horticulturae, Elsevier • Journal of Food Science and Technology, Springer Nature • International Journal of Fruit Science, Taylor and Francis • African Journal of Biotechnology, Academic Journals • International Journal of Horticultural Science and Ornamental Plants • The Philippine Agricultural Scientist
Ajit A. Waman	Member of Editorial Board	• African Journal of Agricultural Research, Academic Journals • Amity Journal of Agribusiness
	Peer Reviewer	• The Philippine Agricultural Scientist • International Journal of Agricultural Sciences

Scientist	Award/ Recognition	Awarding Agency/ Organizing society
Perumal P.	Best Faculty Research Award-18	Careers 360, New Delhi
	Innovative Scientist Award-2017	SIAM, Jaipur, Rajasthan
	Best Oral Presentation Award-2017	ICAR RC for NEH Region, Umiam, Meghalaya
De A.K.	Editorial Board Member	Journal of Disease Markers (ISSN: 2380-0682)
	Editorial Assistant	Journal of Advanced veterinary and Animal Research (ISSN: 2311-7710)
K. Sakthivel	Best research paper award	ICAR CIARI, Port Blair
	Best oral paper award	TNAU, Coimbatore
	Reviewer	• Journal of Environmental Biology • Journal of Mycology and plant Pathology • African Journal of Biotechnology
A.Velmurugan	Fakhruddin Ali Ahmed Award for outstanding research in Tribal Farming Systems	ICAR, New Delhi
S. Swain	Peer reviewer	• Current Journal of Applied Science and Technology • Journal of Agricultural Economics and Rural Development
	Member, Editorial Board	Amity Journal of Agribusiness
K. Saravanan	Young Scientist Award	Education Expo TV during 3rd South Asian Education Awards-2018
	Best Extension Scientist Award	ICAR-CIARI, Port Blair
	Associate Editor	• Journal of Entomology and Zoology Studies • Journal of Fisheries and Life Sciences • International Journal of Fisheries and Aquatic Studies
	Peer Reviewer	Journal of Fisheries and Life Sciences
R Kiruba Sankar	Expert(Fisheries)	Union Territory Wetland Authority, Andaman and Nicobar Administration
A Anuraj R Kiruba Sankar & S Dam Roy	Best Research Paper Award	CIARI, Port Blair
V.Damodaran	Facilitator	• Plant Genome Saviour Community Award for Tribal Council, Car Nicobar for conservation and utilization of Nicobari Aloo from PPV&FRA, GOI, New Delhi, on 19th April, 2017 at Bihar
Sanjay Kumar Pandey and team of KVK-Nicobar	Certificate of Appreciation	ICAR-CIARI, Port Blair
KVK Stall	Best Stall Award	ICAR-CIARI, Port Blair
FCI&P Division	Best Division Award 2017	ICAR-CIARI, Port Blair

ONGOING RESEARCH PROJECT

External Funded Project

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
DASD, Kozhikode						
1.	CSS-MIDH (NHM) Project	K. Abirami	V. Damodaran	8.10	2002	Contd..
DBT, Govt. of India, New Delhi						
2.	*In vitro* Mass Multiplication, Characterization and Habitat Enrichment of Two Horticulturally Important Underutilized Species from Andaman and Nicobar Islands	Pooja Bohra	Ajit A. Waman	16.47	2017	2020
3.	Marker Assisted Introgression of Bacterial Blight Resistance in Popular Rice Cultivars of Andaman and Nicobar Island	R. K. Gautam	P.K. Singh and K. Sakthivel	69.00	2013	2018
PPV&FRA, New Delhi						
4.	Development and standardization of DUS characteristics procedures for Noni (*Morinda citrifolia* L.)	I. Jaisankar	Awnindra K. Singh	*2.,38*	2013	Contd...
ICAR, New Delhi						
5.	ICAR-AICRP on Fruits	K. Abirami	-	1.20	2015	Contd..
6.	ICAR-AICRP- Vegetable Crop	Soobedar Yadav	-	1.5	2005	Contd.
7.	ICAR-AICRP on Floriculture	V. Baskaran	-	1.00	2016	Contd..
8.	ICAR- AICRP on Tuber Crops	V. Damodaran	B. A. Jerard and L.B. Singh	4.00	2010	Contd..
9.	ICAR-AICRP on Palms	Ajit A. Waman	-	7.00	2015	Contd..
10.	Sero-Surveillance of FMD in Andaman and Nicobar Islands	Jai Sunder	-	3.0	2011	Contd..
11.	AICRP on FMD	Jai Sunder	-	Rs. 3.0 (2015-16)	2014	Contd..
12.	AICRP on Goat Improvement	Jai Sunder	-	57.0	2014-	Contd...

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
13.	AICRP on ADMAS	Jai Sunder	-	Non funding	2014	Contd..
14.	Poultry Seed Project	A. Kundu	-	190.68	2014	Contd..
15.	AICRP on Pig	M.S. Kundu	-	142.06	2015	Contd..
16.	ICAR Seed Project: Seed Production in Agricultural Crops	P. K. Singh	R. K. Gautam	75.50	2006	2020
17.	AICRP Mushroom	K. Sakthivel	N.C. Choudhari, V.K. Pandey, Pooja Kapoor, R.K Gautam and S. Dam Roy	3.5 (one year)	2017	--
18.	AINP- Vertebrate Pest Management	K. Sakthivel	-	2.5 (one ear)	2009	2018
19.	AICRP on Management of Salt Affected Soils and Use of Saline Water in Agriculture	A.Velmurugan	-	11.5	2014	2018
20.	AICRP on Integrated Farming Systems	T.P. Swarnam	-	85.0	2010	2020
21.	All India Network Project on Mariculture	R. Kiruba Sankar	K Saravanan, Harsha Haridas, S Murugesan, Benny Varghese and S. Dam Roy	-	2018	2021
NABARD						
22.	Establishment of Duckling Resource Unit for N&M Andaman	T. Sujatha	Jai Sunder and A.Kundu	10.99		2017-2020
23.	Floriculture Based Sustainable Livelihood Model for Island farmers	V. Baskaran	K. Abirami A. Velmurugan and N. Bommayasamy	17.06	2015	2018
24.	Evaluation and Popularisation of Value Added Compost and Other Organic inputs in Neil Island	A. Velmurugan	T.P. Swarnam I. Jaisankar and S.K. Zamir Ahmed	10.0	2017	2019

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
25.	Enhancing of Farm Production and Promoting Forward and Backward Linkages through Technological Intervention	S.K. Zamir Ahmed	A. Velmurugan, Amit Srivastava, B.L Kashinath and R. Jaya Kumaravaradan	9.99	2017	2019
Bill & Melinda Gates Foundation funded through IRRI Philippines						
25.	Stress Tolerant Rice for Poor Farmers of Africa and South Asia	R. K. Gautam	P.K. Singh, S.K. Zamir Ahmed and A. Velmurugan	7.00	2011	2020
NICRA						
26.	Restoration of agriculture in Tsunami Affected Lands of Andaman and Nicobar Islands	B. Gangaiah	A. Anuraj, M.S Kundu, T. Subramani, S.Swain, L. B. Singh, S K Pandey and B. L. Meena	76.5	2016	2019
IMD (MoES)						
27.	Integrated Agromet Advisory Services for A&N Islands	A.Velmurugan	T. Subramani, T.P.Swarnam, P.K. Singh, A. Kundu, R.Kiruba Sankar, Nagesh Ram, S.K. Zamir Ahmed and S. Dam Roy	60.0	2008	2019
Andaman & Nicobar Administration						
29.	Consultancy for District Irrigation Plan for Andaman and Nicobar Islands	A.Velmurugan		10.0	2016	2017
MOFPI						
30.	Food Processing Training Centre (FPTC),	S. Swain	-	20.0	2014	2023
NFDB, Hyderabad						
31.	National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) of Andaman and Nicobar Islands	K. Saravanan,	T. Sivaramakrishnan, Praveenraj and Jayasimhan	51.35	2015	2019

Sl. No.	Title	Principal Investigator	CO-PIs	Budget (lakhs)	Year of Start	Year of Completion
IARI-NEP						
32.	National Extension Programme	S. K. Zamir Ahmed	P.K.Singh A. Velmurugan, SobedarYadav and R. Jaya Kumaravaradan	-	2017	Continued

Institute funded

Sl. No.	Project Title	PI	Co-PIs	Year of start	Year of completion
Horticulture & Forestry					
1.	Collection, Characterisation and Evaluation of Selected Economically Important Aromatic Crops in Andaman & Nicobar Island	Soobedar Yadav	K. Abirami and R. K. Gautam	2017-18	2020-21
2.	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. Sakhtivel and S. Swain	2017-18	2020-21
3.	Development of Production Technology of Ornamental Crops in Bay Islands	V. Baskaran	K. Abirami and A. Velmurugan	2011	2018
4.	Collection, Characterization and Standardization of Agro Techniques of Fruit Crops in Andaman and Nicobar Islands	K. Abirami	V. Baskaran, T. Subramani and V. Damodaran	2010	2018
5.	Collection, Characterization, Evaluation and Mass Multiplication of Unconventional Native and Exotic Fruit Crops for Bay Islands	Pooja Bohra	Ajit A. Waman, T. Bharathimeena and S.K. Zamir Ahmed	2015	2021
6.	Development of Protocols for Micropropagation of Selected Fruit Crops for Bay Islands	Pooja Bohra	Ajit A. Waman and L.B. Singh	2015	2019
7.	Collection, Characterization and Utilization of Natural Diversity of Important Spice Crops From Bay Islands and Evaluation of their Improved Varieties	Ajit A. Waman	Pooja Bohra, T. Sujatha, L.B. Singh and V. Damodaran	2015	2021

8.	Exploration, Characterization, Micropropagation and Agro-technique Standardization of an Important Rhizomatous Species-Mango Ginger from Bay Islands	Ajit A. Waman	Pooja Bohra, I. Jaisankar, D. Basantia, and V. Damodaran	2015	2019
9.	Development of Dwarf and High Yielding Varieties in Coconut for Andaman & Nicobar Islands	B. A. Jerard	V. Damodaran and K. Abirami	2011	2019
10.	Development and Evaluation of Horti - Silvipastoral System in Tropical Island Condition	I. Jaisankar	T.P. Swarnam and V. Damodaran	2015	2019
Field Crop Improvement & Protection					
11.	Augmenting Rice Productivity through Varietal Purification of Popular Land Races	R.K. Gautam	P. K. Singh, S. K. Zamir Ahmed, A.K. Singh, K. Sakthivel and S. Swain	2015	2018
12.	Development of Biotic Stress Resistant Lines in Brinjal (*S. Melongena* L.)	P. K. Singh	K. Sakthivel	2010	2018
13.	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 and B.L. Meena	2017	2021
Natural Resource Management					
14.	Vulnerability Assessment and Adaptation Led Mitigation Strategies of Andaman and Nicobar Islands Farming to Climate Change	B. Gangaiah	T. Subramani, S. Swain, A. Velmurugan, B.K. Nanda, V. Damodaran, K. Lohit Kumar and M.S. Kundu	2015	2019
15.	Assessment of Post Harvest Losses in Fruits and Vegetables and Strategies for their Reduction in the Islands	S. Swain	S.K .Zamir Ahmed, L. B Singh, Chandrika Ram and Manoj Kumar	2015	2017
16.	Development of Nutraceutical Beverages from Potential Underutilized Fruits and Medicinal Herbs of Andaman And Nicobar Islands	S. Swain	K Abirami, Pooja Bohra and Pooja Kapoor	2015	2018
17.	Development of Production Technologies for High Value Vegetables in Soil Less Culture	T.Subramani	B. Gangaiah and V. Baskaran	2017	2020

Animal Science					
18.	Prevalence And Economic Impact of Gastro-Intestinal Parasites of Livestock in Andaman and Nicobar Islands	D. Bhattacharya	M.S.Kundu, Jai Sunder, T. Sujatha, and A.K.De	2017	2020
19.	Pharmaco-Assessment of Ethno-Veterinary Medicinal Plants of A&N Islands for Poultry Diseases	T. Sujatha	Jai Sunder, A. Kundu, D. Bhattacharya and A. K. De	2017	2020
20.	Molecular Signature of Eco-Sustainability of Indigenous Livestock Breeds of Andaman and Nicobar Islands and Lakswadeep	Arun Kumar De	Jai Sunder, M.S.Kundu, D. Bhattacharya and A. Kundu	2017	2019
21.	Gender Identification in Day Old Poultry by PCR Based Methodology	Arun Kumar De	T. Sujatha, A. Kundu and Jai Sunder	2017	2019
22.	Studies on Endocrinological ae Species for Enhancing Fertility in Bay Islands	P. Perumal	M.S Kundu, D. Bhattacharya, Jai Sunder, A. K. De and A. Kundu	2017	2020
23.	Augmentation Of Fodder Resources to Improve Livestock Productivity in Andaman & Nicobar Islands	M.S. Kundu	B. Gangaiah, T. Sujatha and A. Kundu	2015	2018
24.	Molecular Characterization of Immune System Genes of Nicobari Fowl	K. Muniswamy	T. Sujatha, A.K.De, Jai Sunder, and A. Kundu	2017	2020
Fisheries Science					
25.	Capture Based Aquaculture of Economically Important Marine Finfishes of Andaman	A. Anuraj	A K O Ratheesh, K Saravanan, S Murugesan, Benny Varghese, R Kiruba Sankar and S. Dam Roy	2015	2019
26.	Cataloguing Inland Aquatic Diversity and Breeding of Indigenous Freshwater Fishes of Andaman And Nicobar Islands	J. Praveenraj	A Anuraj, R Kiruba Sankar and S. Dam Roy	2015	2018
27.	Characterization of *Bacillus Spp.* From Andaman Mangroves and Evaluation of its Antagonistic Effect on Fish Pathogens	K. Saravanan	T. Sivaramakrishnan, J. Praveenraj and Kiruba Sankar, R	2015	2018
28.	Seaweed Diversity and its Culture Prospects in *In-Situ* Conditions of Andaman	A. Anuraj	K Lohith Kumar, A K O Ratheesh, Harsha Haridas	2015	2019

29.	Assessment of Stock of Neritic Sharks from Andaman Waters	R. Kiruba Sankar	K Lohith Kumar, S Monalisha Devi, A K O Ratheesh and S. Dam Roy	2015	2018
30.	Study on Biology and Stock Assessment of Selected Tuna Species from Andaman Waters	K. Lohith Kumar	R. Kiruba Sankar, S. Monalisha Devi, A.K.O. Ratheesh and S. Dam Roy	2015	2018
31.	Study on Stock Assessment and Biology of *Pristipomoides Filamentosus* (Valenciennes, 1830) From Andaman Waters	S. Monalisha Devi	S. Dam Roy, K. Lohith Kumar, R. Kiruba Sankar, and A.K.O.Ratheesh	2014	2018
32.	Biology of Blue Fin Trevally (Caranx Melampygus) from Andaman Waters	A K O Ratheesh	S. Dam Roy, R. Kiruba Sankar, S. Monalisha Devi and K. Lohith Kumar	2017	2020
33.	Documentation of Indigenous Fishing Practices of Nicobari Tribes	A K O Ratheesh	S. Dam Roy, R. Kiruba Sankar, Nagesh Ram, S.K. Zamir Ahmed and S.K. Pandey	2017	2019

Flagship Programme : Integrated Agriculture System for Eco Regions

Period: 2014-17

Project Leader **:** S. Dam Roy
Co-ordinator : A.Velmurugan

SI.No.	Technical Programme	Team Leader	Associates
1.	Crop improvement	R.K. Gautam	V. Bhaskaran, K. Abirami, I. Jaisankar, Sachidananda Swain, K. Sakthivel, T. Bharathimeena, Pooja Bohra, Divya Parisa, T.Damodaran and Chandrika Ram
2.	Livestock component	A.Kundu	M.S. Kundu, Jai Sunder, T. Sujatha, Sophia Inbaraj, Zachariah George and N.C. Choudhuri
3.	Fisheries component	R. Kiruba Sankar	A. Anuraj, K. Saravanan, T. Sivaramakrishnan and Shailesh Kumar
4.	Natural resource management	B. Gangaiah	A. Velmurgan, T.P. Swarnam, T. Subramani, B.K. Nanda, V.N.Singh, S.K. Pandey, Manoj Kumar and B. L. Meena
5.	Socio-economic and impact assessment	S.K. Zamir Ahmed	Nagesh Ram, Amit Srivastava, Pooja Kapoor, Haripriya Nayak, Ani Dath and Dibakar Khan

PUBLICATION

SI.No.	Research Publication
1.	Abirami K., Virendra S. Rana., V. Baskaran and Manish Das (2018). Influence of harvesting stage on herb, essential oil and artemisinin yields in the antimalarial herb. *Artemisia annua* L.*Medicinal Plants.* 10 (1): 36-42.
2.	Anuraj A., Ajit Arun Waman., Chandra Prakash., S. Dam Roy., M. Viji, Manoj Baidya and N.K. Chadha (2017). Investigating the effects of exogenous factors on growth, photosynthetic pigments and bud induction in *Gracilaria corticata* var. *cylindrica* under *in vitro* conditions. *International Journal of Current Microbiology and Applied Sciences*, 6: 3235-3246 (NAAS 5.38)
3.	Balamurugan, A., Kumar, A., Muthamilan, M., Sakthivel, K., Vibhuti, M., Ashajyothi, M., Sheoran, N., Kamalakannan, A., Shanthi, A. and Arumugam, T. (2018). Outbreak of tomato wilt caused by *Ralstonia solanacearum* in Tamil Nadu, India and elucidation of its genetic relationship using multilocus sequence typing (MLST). *European Journal of Plant Pathology*. doi.org/10.1007/s10658-017-1414-3.
4.	Baskaran V and K. Abirami (2017). Effect of pinching on yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda under Andaman conditions. *Agriculture Science digest*. 37(2): 148-150.
5.	Baskaran V., K. Abirami and P. Simachalam (2017). Effect of growth regulating chemicals on flowering, corm production and post harvest life of gladiolus *Gladiolus grandiflorus*) cv Punjab Dawn in Bay Islands. *Indian journal of Agricultural Sciences*. 87(4): 551-554.
6.	Bhu Bharti, R., Sankaran, M and Subramani, T (2017). Effect of Integrated nutrient management on nutrient uptake and yield of Okra. *Advance Research Journal of Crop Improvement,* 8 (1): 24-30. *Advance Research Journal of Crop Improvement,* 8 (1): 24-30.
7.	Chatterjee N., Dhar B., Bhattarcharya D., Deori S., Doley J., Bam J., Das P.J., Bera A.K., Deb S.M., Devi N.N., Paul R., Malvika S. and Ghosh S.K. (2018). Genetic assessment of leech species from yak (*Bos grunniens*) in the tract of Northeast India. *Mitochondrial DNA Part A, DNA Mapping Sequencing Analysis*, 29(1):73-81.
8.	Devi Sukham Monalisha, Jaiswar Ashok Kumar, Chakraborty Sushant Kumar Kumar Ranjan, Shirke Swapnil (2018). Biometric studies on spotted sardinella Amblygaster sirm (Walbaum, 1792) (Pisces: Clupeidae) occurring along Andaman coast, India. *Indian Journal of Geo-Marine Sciences*, 47(01): 135-140.
9.	Devi Sukham Monalisha, Jaiswar Ashok Kumar, Kumar Ranjan, Ali Mohammad Irfan, Velakkandy Sajin, Shirke Swapnil, Jahageerdar Shrinivas, Chakraborty Sushant Kumar (2018). Species discrimination of clupeoid fishes (Pisces: Clupeiformes) from Andaman Waters based on morpho-meristic characters. *Indian Journal of Geo-Marine Sciences*, 47(01): 141-147.
10.	Gangaiah, B., Abbubaker and Dam Roy, S. (2017). Herbicides for weed management vis-à-vis for human drudgery reduction and productivity enhancement of transplanted rice in Andaman & Nicobar Islands. *Journal of the Andaman Science Association,* 22(1): 11-15.
11.	Pradeep, H.D. Swapnil S. Shirke, M. Nashad and Monalisha Devi Sukham. A first record of the Small fin Gulper Shark *Centrophorus* 1860 (Chondrichthyes: Squaliformes: Centrophoridae) from the Andaman & Nicobar waters. Indian EEZ. *Journal of Threatened Taxa*, 9(11): 10899–10903.
12.	Hosahalli Divakar Pradeep, Shivdas Shirke Swapnil, Musaliyarakam Nashad, Sasidharan Venu, Kumar Ravi Ranjan, Gopalakrishnan Sumitha, Sukham Monalisha Devi, and Mahesh Kumar Farejiya. 2017. First record and DNA Barcoding of Oman cow nose ray, *Rhinoptera jayakari* Boulenger, 1895 from Andaman Sea. *India,*40(1): 67- 74(6.6)

13.	Inbaraj S, Kundu A, De AK, Sunder J and Sejian V (2017). Seasonal changes in blood biochemical and endocrine responses of different indigenous goat breeds of tropical island agro-ecological environment. *Biological Rhythm Research*, DOI:10.1080/09291016.2017.1366723.
14.	Jaisankar I., Awnindra K Singh, A. Velmurugan and Abhinay Samadder, (2017). Effect of shade on Noni *(Morinda citrifolia L.)* under Bay Island conditions. *Journal of Andaman Science Association*, 22(1):25-29.
15.	Jaisankar, I., R.K. Gautam, A. Velmurugan, K. Sakthivel, Sajan Soans and P. Simachalam, (2017). Genetic diversity of bamboo species in Andaman and Nicobar Islands revealed through DNA markers and morphological traits. *Indian Forester*, 143 (5): 405-410.
16.	Jaisankar, I., Subramani, T., Velmurugan, A., Singh, A.K., (2017). Genetic diversity revealed among rattan genotypes from Andaman and Nicobar Islands based on RAPD and ISSR markers. *Forest Res. Eng. Int. J.* 1(2): 00007. DOI: 10.15406/freij.2017.01.00007.
17.	Jerard B. A., Rajesh M. K., Regi Jacob Thomas, Niral V., Samsudeen K. (2017). Island ecosystems host rich diversity in Coconut (*Cocos nucifera*): evidences from minicoy Island, India. *Agricultural Research,* 6(3):214–226.
18.	Kiruba Sankar R, P Krishnan, S Dam Roy, Raymond Jani Angel, Goutham Bharathi, K Lohith Kumar, P Ragavan, M Kaliamoorthy, R Muruganandam, S Rajakumari, Purvaja R, R Ramesh (2018). Structural complexity and tree species composition of mangrove forests of Andaman Islands, India. *Journal of Coastal Conservation,* 22(2): 217-234.
19.	Kiruba Sankar R, P Krishnan, S Dam Roy, Raymond Jani Angel, Goutham Bharathi, K Lohith Kumar, P Ragavan, M Kaliamoorthy, R Muruganandam, S Rajakumari, Purvaja R, R Ramesh (2018). Structural complexity and tree species composition of mangrove forests of Andaman Islands, India. *Journal of Coastal Conservation,* 22(2): 217-234.
20.	Krishnamurthy S L, Sharma P C, Sharma D K, Ravikiran K T, Singh Y P, Mishra V K, Burman D, Maji B, Mandal S, Sarangi S K, Gautam R K, Singh P K, Manohara K K, Marandi B C, Padmavathi G, Vanve P B, Patil K D, Thirumeni S, Verma O P, Khan A H, Tiwari S, Geetha S, M Shakila, Gill R, Yadav V K, Roy S K B, Prakash M, Bonifacio J, Ismail Abdelbagi, Gregorio G B and Singh Rakesh Kumar (2017). Identification of megaenvironments and rice genotypes for general and specific adaptation to saline and alkaline stresses in India. *Scientific Reports*, 7: 7968.
21.	Kumar S., Singh M.C., Yadav Soobedar and Sharma D K (2017) Effect of photosynthetic Radiation (PAR) from LEDs on growth and development of chrysanthemum morifolium Ramat C V Zembla. *Int. J. Curr. Microbiol. App Sci* : 6 (9) 458-465
22.	Kumar, N., Velmurugan, A., Nicholas Hamm, A.S. and Dadhwal, V.K. (2017). Geospatial mapping of soil organic carbon using regression kriging and remote sensing. *Journal of the Indian Society of Remote Sensing*, https://doi.org/10.1007/s12524-017-0738-y.
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24.	Mangaraj, S., Swain, S. and Despande, S S. (2018). Development of nutritious healthy noodles incorporating soy based functional food ingredients. *Journal of Food Science and Technology*, 4: 28.
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28.	Nilavan, E.S., Raman, R.P., Srivastava, P.R., Basha, K.A., Kumar, K., Kumar, A., Shukla, S.P., Saravanan, K. and Kumar, S (2017). Dietary Piperin improves hemato-immunological parameters, growth profiles and resistance against *Aeromonas hydrophila* in *Labeo rohita*. *Journal of Aquaculture in Tropics*, 32: 189-203.
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30.	Pooja Bohra and Ajit Arun Waman (2017). Observations on occurrence of polyembryony in four species from Bay Islands, India. *Indian Forester*, 144(3): 198-199. (NAAS 4.38)
31.	Pooja Bohra and Waman A.A., 2017, *Spondias dulcis* L.: An important species in Bay Islands. *International Journal of Forest Usufructs Management*, 18(1): 25-29. (NAAS 3.23)
32.	Praveenraj, J, Sainath, P, R Kiruba Sankar, Daniel, P, S Dam Roy (2017). New record of Mugilogobius tigrinus from a freshwater stream of South Andaman. *India. Journal of Fisheries and Life sciences* 2(2):1-3.
33.	Praveenraj, J., Kiruba-Sankar, R., Kumar, L., Angel, R, J., and Roy, S, D (2017). A first report of Redigobius oyensi (De Beaufort, 1913) (Teleostei: Gobinellinae) from Car Nicobar Island. *Journal of Threatened Taxa*, 9(10): 10853-10855. (NAAS 5.4)
34.	Praveenraj, J., R Kiruba Sankar., Roy, S D., Kumar, L., Kumar, S., Angel, R J., and Thakur, V R (2017). Danio rerio (Teleostei: Cyprinidae): A new record of freshwater fish from Andaman Islands. *India Acta Icthyologica et Piscatoria*, 47(4):383-388. (NAAS 6.7)
35.	Praveenraj, J., Rajan, P. T., R Kiruba-Sankar and S. Dam Roy (2017). Record of Oceallated shrimpgoby Tomiamichthys russus(Cantor, 1849) from Andaman Islands, India. *Acta Icthyologica et Piscatoria* 47(4):399-402. (NAAS 6.7)
36.	Rekha, S.C., Sankaran, M and Subramani, T (2017). Performance of Bell Pepper with different irrigation regimes and nutrient scheduling under protected structure in island ecosystem. *Advance Research Journal of Crop Improvement*, 8 (1): 89-94.
37.	Rout M, Bhattacharya D, Prusty BR, Chatterjee N, Bera AK, Doley J, Deori S, Medhi D, Bam J, Hanah SS, Deb S.M. and Pattnaik B. (2017). Foot-and-mouth disease virus infection-specific non-structural protein antibodies detected in populations of mithun (*Bos frontalis*), yak (*Bos grunniens*) and their hybrids maintained in farms and villages of Arunachal Pradesh, India. *Indian Journal of Animal Sciences*, 87(9):1090-1091.
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40.	Sakthivel, K., Gautam, R.K., Manigundan, K., Reena Singh, Ramalingam, J., Laha, G.S., Kumar, A. and Velazhahan, R. (2017). The host background of rice influences the resistance expression of a three gene pyramid (*xa5+xa13+Xa21*) to bacterial blight (*Xanthomonas oryzae* pv. *oryzae*) pathotypes of Indian mainland and Bay islands. *Plant Breeding*, 136(3): 357-364.
41.	Sakthivel, K., Manigundan, K., Gautam, R.K., Reena Singh, Yogeshwari, Subramani, T., Sushil K. Sharma and Rajesh Khande (2018). Bioefficacy of antimicrobial peptide biosynthesis-gene-linked antagonistic *Lysinibacillus sphaericus* strains for management of bacterial plant diseases under Islands conditions of Andaman and Nicobar. *India. Journal of Environmental Biology*, 39.
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News Letter

S.K. Zamir Ahmed, Amit Srivastava and Rina Saha, Island Agriculture, ICAR- CIARI Newsletter, Vol.X, No.1, April-September 2017, p.8.

PEER RECOGNITION TO DIRECTOR

Dr. Anandamoy Kundu has taken over as Director (Acting), of ICAR- CIARI, Port Blair w.e.f. 18th August, 2017.

He has got vast experience of two decades in R&D and extension programme of the multidisciplinary institute (CIARI) pertaining to island ecosystem. He is the pioneer in identification, characterization, registration and conservation of precious livestock and poultry breeds of Andaman and Nicobar Islands namely Nicobari fowl, Nicobari pig and Teressa goat. Besides, he was the main driving force behind the development of livestock and poultry cross breeds for sustainable rural farming under island ecosystem. He has also standardized the package of practices for rural poultry farming, pig farming, and semi-intensive goat farming.

He has more than 100 research papers in national and international peer-reviewed journals and is also the recipient of prestigious national awards and recognition, namely "ICAR -Outstanding Team Research, Dr P.K. Pani Research and Breed Registration Award.

He has got vision to make the agricultural production of Andaman and Nicobar Islands sustainable in association with Andaman and Nicobar Administration through technological backstopping in agri-horti-fish-livestock sectors of the Institute for enhancing the income of the island farmers and other stakeholders with doable technologies in agriculture and allied fields.

Peer recognition to Director in committees and panels

- Chairman, Town Official Language Implementation Committee, Port Blair
- Member, Andaman and Nicobar Price Stabilization Fund and Andaman and Nicobar Price Stabilization Fund Management Committee, Andaman and Nicobar Administration, Directorate of Civil Supplies & Consumer Affairs, Port Blair
- Expert Member, State Level Executive Committee for implementation of PKVY, A&N Islands, Port Blair.
- Member, State Level Steering Committee for promotion of City Compost, A&N Islands
- Chairman, Independent Third Party Monitoring and Evaluation Committee for evaluation of works carried out under State CAMPA, A & N Islands, Port Blair
- Member, UT Coordination Committee between A&N Administration & CIARI, Port Blair
- Member, Society for Science Centre, A&N Islands, Port Blair
- Member, State Level Environment Council, A&N Islands, Port Blair
- Member, State Level Water Quality Review Committee, A&N Islands, Port Blair
- Member, Andaman & Nicobar Science and Technology Council, A&N Islands.
- Member, State Level Sanction Committee for Rashtriya Krishi Vikas Yojana, A&N Islands.
- Member, State Seed Sub-Committee for Agricultural & Horticultural Crops, A&N Islands.
- Member, Inter Departmental Working Group to monitor and oversee the functioning of Kisan Call Centre of A&N Islands.
- Member, High Value Agriculture Development Agency for the UT of A&N Islands.
- Member, Governing Council of Andaman & Nicobar Coconut Mission
- Member, Agriculture Technology Management Agency Governing Body of A&N Islands

- Member of Scientific Advisory Committee at UT Level
- Member, Steering Committee at the UT Level for documentation of traditional knowledge of Ethno Medicine used by the tribal people of A&N Islands.
- Member, Inter departmental Committee on encouraging investments in supply Chains including provisions for cold storage for more efficient distribution of Farm Produce.
- Member, State Level Steering Committee for promotion of City Compost constituted by Chief Secretary (Agri.), A&N Administration, Port Blair
- Member, in the committee to coordinate the activities of skill development training programme in the area of Food Processing Sector, constituted by the Hon'ble Lt. Governor, A&N Islands
- Member, Project Appraisal Committee of A&N Administration, Directorate of Industries, Port Blair
- Member, Panel for Fish and Fisheries Products, Food Safety & Standards Authority of India, Ministry of Health & Family Welfare, New Delhi
- Member, State Level Monitoring Committee (SLMC) for UT of A&N Islands to monitor periodically the Operationalization of National Policy for Farmers
- Member, State Board for Wildlife for the Union Territory of A&N Islands
- Member, Steering Committee to monitor the progress of development of Coconut based Food Processing Industries in A&N Islands
- Member, Andaman Adim Janjati Vikas Samiti, A & N Islands, Port Blair
- Member, Committee to formulate Fisheries Policy for Development of Fisheries with particular reference to tuna fisheries in Andaman & Nicobar Islands
- Chairperson, Institute Animal Ethics Committee
- Member, Working Committee of the Andaman and Nicobar Medicinal Plant Board (Society), Port Blair.

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

Scientist	Program	Venue	Date / Duration
K. Saravanan	Joint Hindi Workshop	ICAR-CIARI, Port Blair	3rd , April 2017
P.K. Singh	52st Annual Rice Research Group Meeting	Assam Agricultural University, Jorhat, Assam	8th -11th April, 2017
B. Gangaiah	KVK Annual Zonal Workshop, Zone-V	ICAR-CIARI, Port Blair	14th -16th April, 2017
K. Saravanan	International Symposium on Aquatic Animal Health and Epidemiology for Sustainable Asian Aquaculture	ICAR-NBFGR, Lucknow	20th -21st April, 2017
K. Saravanan	School on Aquatic Animal Epidemiology	ICAR-NBFGR, Lucknow	24th -28th April, 2017
V. Damodaran	17th Annual Group Meeting of AICRP on tuber crops	UHS, Bagalkot	28th – 30th April, 2017
K. Abirami	Annual Review meeting of CSS-NHM project on spices	CCSHAU, Karnal	12th -13th May,2017

Scientist	Program	Venue	Date / Duration
B. Augustine Jerard	Meeting of Coconut Task Force of Fiji, Ministry of Agriculture,	Suva, Fiji	12th May, 2017
S.K. Zamir Ahmed	Biotech Based Programme for SC/ST Population and Rural Development Meeting	New Delhi	22nd-23rd May 2017
B. Augustine Jerard	International Conference on 'India-Pacific Islands Sustainable Development- 'Furthering the FIPIC agenda through sustainability initiatives' organized by Governments of India and Fiji	Grand Pacific Hotel, Suva, Fiji	25th -26th May,2017
S. Dam Roy	24th General Body Meeting of NAAS	NASC, New Delhi	5th June ,2017
S. Dam Roy	National Symposium on "Empowering the farmer for tribal areas for sustainable agricultural extension"	NASC Complex, New Delhi	7th June, 2017
Jai Sunder	Annual Review Meet of AICRP on goat improvement	Leh	12th -14th June ,2017
I. Jaisankar	XXXV – AICRP on Vegetable crop group meeting	ICAR- IIHR, Bengaluru	23rd - 27th June, 2017
M.S. Kundu	Annual Review meet on AICRP Pig	Sri Venkateswara Veterinary University, Tirupati	1st - 2nd July, 2017
R. Jaya Kumaravaradan	Foundation Course for Agricultural Research Service (FOCARS)	NAARM, Hyderabad	05th July to 04th Oct., 2017
K Lohith Kumar	Stakeholders meet on Development of Tuna Fisheries in Andaman Nicobar Islands	ICAR-CIFT, Kochi	8th July ,2017
B. Augustine Jerard	International Workshop on Pacific Coconut Sector Value Chain held at Nadi, Fiji as part of the Coconut Industry development for the Pacific Project (CIDP) being carried out by Secretariat of Pacific Community (SPC)	Nadi, Fiji	11th – 13th July, 2017
B. Gangaiah	National Youth Volunteers Induction Training	Nehru Yuva Kendra Sangathan, Port Blair	17th July, 2017
Ajit A. Waman	Annual General Meeting of AICRP on Palms	UHS, Bagalkot, Karnataka	26th -29th July, 2017

Scientist	Program	Venue	Date / Duration
T. Sujatha, K. Abirami, K. Sakthivel, Venkatesan K. K. Saravanan and K. Lohith Kumar	National Seminar on Empowerment of women through skill development and training: A critical analysis of Government policies and programmes with special reference to Andaman & Nicobar Islands	Jawaharlal Nehru Rajkeeya Mahavidyalaya, Port Blair	28th – 29th July, 2017
P. K. Singh	XI Annual Review Meeting of ICAR Seed Project- Seed Production in Agricultural Crops	MPKV, Rahuri, Maharashtra	29th -30th July, 2017
V. Baskaran	Annual group meeting on Floriculture	ICAR-IIHR, Bengaluru	03rd -05th August, 2017
B. Gangaiah	National Water Mission Brain Storming Session- State Specific Action Plan-Water	New Delhi	10th August, 2017
S. Swain	Livelihood Business Incubation (LBI) proposal under ASPIRE scheme	MSME-DI Extn. Centre, New Delhi	18th August, 2017
T. Subramani	Two days National Workshop on Weed Risk Assessment	NIPHM, Hyderabad	30th -31st August, 2017
R.K. Gautam	ICAR-IRRI collaborative project meeting on Salinity and Global Rice Array	NASC, New Delhi	8th September, 2017
Arun Kumar De	International conference on "Recent Trends in Bioinformatics and Biotechnology for Sustainable Development" organized by Society for Bioinformatics and Biological Sciences at	Sher-e-kashmir University of Agricultural Sciences and Technology of Jammu	12th -13th October, 2017
B. Gangaiah	NICRA Review Meeting	NAAS, New Delhi	22nd – 25th October, 2017
S.K. Zamir Ahmed	Scientific Advisory Committee meeting of KVKs of Zone V	Port Blair	24th October2017
Jai Sunder	Annual Review meet of AICRP on ADMAS	Pune	26th – 27th October, 2017
S.K. Zamir Ahmed and R. Jaya Kumaravaradan	Workshop on DISHA (An outreach initiative to offer insight into local industries) Rotary Club of Port Blair	ICAR-CIARI, Port Blair	31st October, 2017.
P. Perumal	3rd International Conference on Bio- Resource and Stress Management	Jaipur, Rajasthan, India	08th - 11th November, 2017

Scientist	Program	Venue	Date / Duration
Jai Sunder	Regional Committee Meeting Zone –II	ICAR-CIFRI, Kolkata	13th November, 2017
S. Dam Roy, S. Monalisha Devi, A. K. O. Ratheesh and Harsha Haridas	11th IFAF an International Conference on Fostering Innovations in Fisheries and Aquaculture-Focus on Sustainability and Safety	ICAR-CIFT, Kochi	21st -24th Nov., 2017
T. Sujatha	Conference of IPSACON 2017	ICAR-NIANP, Bengaluru	28th – 30th November, 2017
K. Lohith Kumar	Winter School Structure and Function of Marine Ecosystem: Fisheries	ICAR-CMFRI, Kochi	1st - 21st December 2017
R.K. Gautam and K. Sakthivel	National conference on New Vistas in Vegetable Reesearch towards Nutritional Security under Changing Climate Scenario	TNAU, Coimbatore	6th -9th December, 2017
R. Jaya Kumaravaradan	Professional Attachment Training	ICRISAT, Hyderabad	15th Dec, to 14th March, 2018
K. Sakthivel	21 days training on Whole Genome Sequencing of Plant Pathogens	IARI, New Delhi	29th December, 2017 to 19th January, 2018
S. Swain	Symposium on Doubling of farmers' income through technological interventions	Anand Agricultural University, Anand, Gujarat.	8th -10th January, 2018
	AICRP on Post Harvest Technology (PHT)	Junagadh Agricultural University, Junagadh, Gujarat	23rd - 25th January, 2018
T. Sujatha	International Symposium on Biodiversity of medicinal plants & Orchids: Emerging Trends and Challenges – BMPO 2018	ANU, Guntur, AP	9th -11th February, 2018
Soobedar Yadav, K. Sakthivel and Venkatesan, K	National workshop on Revisiting Foundation Course for Agricultural Research Services (FOCARS): Reflections and feed back of trained scientist	ICAR-NAARM Hyderabad	15th – 16th March, 2018
M.S. Kundu, P. Perumal and S. Swain	Food Processing Conclave 2018	Hotel Megapode Nest Port Blair, Andaman and Nicobar Islands.	22nd March, 2018
S. Swain	Brainstorming session on setting up Lemon grass processing unit at Kamorta Islands	Port Blair, A & N Administration	22nd March, 2018

Scientist	Program	Venue	Date / Duration
I. Jaisankar	Working committee of the Andaman and Nicobar Medicinal Plant Board	APCCF, Vansadan, Port Blair	23rd March, 2018
B. Augustine Jerard	State Level seminar cum exhibition on 'Promotion of Floriculture in A&N Islands' organized by Directorate of Agriculture, A&N administration	Port Blair, A&N Islands	23rd - 24th March, 2018
Sulochana, AD (OL)	Technical Seminar of TOLIC	Regional implementation Office, Kolkata, Ministry of Home Affairs, (OL) Deptt., New Delhi at Guwahati.	10thNovember, 2017
	Regional Official Language Seminar and prize distribution function	Regional Implementation Office, Kolkata, Ministry of Home Affairs, OL Deptt., New Delhi at Patna.	10th March, 2018

HUMAN RESOURCES DEVELOPMENT OF STAKEHOLDERS

a) Training to stakeholders

Sl. No.	Training	Period	Participants (No.)	Type of participants	Venue	Conducted by
1.	Scientific goat farming	21st April,2017	17	Farmers	Muccapahar, South Andaman	Animal Sci. Division
2.	Weed control in paddy crop	13th & 14th July, 2017	103	Farmers	Little Andaman, South Andaman	FCI&P Division
3.	Scientific goat farming	22nd July, 2017	50	Farmers	Guptapara, South Andaman	Animal Sci. Division
4.	Use of GPS for safe and profitable fishing	1st Aug., 2017	24	Farmers	Big Lapathy, Car Nicobar	Fisheries Sci. Division
5.	Reduction of post harvest losses in mango, pine apple and bael through value addition techniques	1st to 3rd Aug., 2017	34	Farmers/ SHG's/rural youths	CIARI, Port Blair	NRM Division

Sl. No.	Training	Period	Participants (No.)	Type of participants	Venue	Conducted by
6.	Use of GPS for safe and profitable fishing	2nd Aug., 2017	30	Farmers	Kinyuka, Car Nicobar	Fisheries Sci. Division
7.	Safety measure and hygeinic fish handling practices	14th Aug., 2017	15	Farmers	Hut Bay	Fisheries Sci. Division
8.	Establishment of duckling resource unit	6th to 8th Sept., 2017	60	Farmers	Nimbudera, Middle Andaman	NABARD
9.	Black pepper as intercrop for coconut gardens	26th Sept., 2017	30	Farmers	Harminder Bay	H & F Division
10.	Underutilized fruits for backyard farming	27th Sept., 2017	25	Farmers	Harminder Bay	H & F Division
11.	Management of rice crop	10th Oct., 2017	64	Farmers	Keralapuram Gram Panchayat, North and Middle Andaman	FCI&P Division
12.	Hands on training programme on empowerment of rural youth for sustainable livelihood through goat and rural poultry farming	06th to 17th Nov.,2017	12	Rural Youth	ICAR-CIARI, Port Blair	Animal Sci. Division
13.	Scientific goat farming	30th Dec.,2017	14	Farmers	Nayagarh, Baratang	Animal Sci. Division
14.	Conservation of underutilized fruit wealth of Andaman	26th Dec.,2017	52	School students	Swadeshnagar, North and Middle Andaman	DBT-BioCARe Project
15.	High density multispecies cropping system	27th Dec., 2017	26	Karen community farmers	Webi, North and Middle Andaman	AICRP on Palms
16.	Agriculture & allied fields as attractive livelihood enterprises for youths	29th Dec., 2017 to 08th Jan., 2018	04	Farmers	CIARI -	Social Sci. Section
17.	Production of spices in plantation-based cropping system	8th to 9th Jan., 2018	60	Farmers	Sivapuram	CSS- NHM
18.	Cultivation of spices in plantation based cropping system	8th to 9th Jan., 2018	55	Farmers	Shivpuram, Middle and North Andaman	H & F Division

Sl. No.	Training	Period	Participants (No.)	Type of participants	Venue	Conducted by
19.	Prospects of organic cultivation of tuber crops in Middle & North Andaman district	9th Jan., 2018	67	Farmers	Swadesh Nagar	AICRP on tuber crops
20.	Better management practices (BMPs) for Island Aquaculture	16th Jan., 2018	22	Farmers	Sippighat, South Andaman	Fisheries Sci. Division
21.	Cultivation of pulses in rice fallow in Andaman and Nicobar Islands	16th Jan., 2018	85	Farmers	Collinpur, South Andaman	FCI&P Division
22.	Cultivation of bacterial wilt resistant Brinjal in Nicobar Islands	16th Jan., 2018.	30	Farmers	Vikash Nagar, Kamorta, Nicobar	FCI&P Division
23.	Cultivation of pulses in rice fallow in A & N Islands	16th Jan., 2018	85	Farmers	Collinpur	FCI&P Division
24.	Role of sero surveillance of livestock and poultry diseases in sustainable Animal production	16th to 18th Jan., 2018	100	Tribal farmers	Car Nicobar	Animal Sci. Division
25.	Improved rural poultry Farming practices	16th to 18th Jan., 2018	110	Tribal farmers	Car Nicobar	Animal Sci. Division
26.	Post harvest processing and value addition of coconut and areca nut	2nd to 4th Feb., 2018	42	Tribal farmers	Harminder Bay	NRM Division
27.	Pig rearing to the tribal farmers at Car Nicobar	8th and 9th Feb.,2018	25	Farmers	ICAR-CIARI	Animal Sci. Division
28.	Sustainable livelihood through livestock and poultry farming	26th to 27th Feb., 2017	45	Farmers	Hutbay, Little Andaman	Animal Sci. Division
29.	Quality seed production of rice	27th Feb., 2018.	41	Farmers	Keralapuram Gram Panchayat, North and Middle Andaman	FCI & P Division
30.	Rodent pest management	27th Feb., 2018	50	Island farmers	Dasarathpur, Middle andaman	FCI & P Division
31.	Capacity building cum distribution of inputs: Role of balanced feeding of livestock and poultry	16th March, 2018	50	Farmers	Hutbay, Little Andaman	Animal Sci. Division

Sl. No.	Training	Period	Participants (No.)	Type of participants	Venue	Conducted by
32.	Quality seed and its importance in agriculture	26th to 27th March, 2018	102	Farmers	Little Andaman	FCI & P Division
33.	Application of CIARI-Bioconsortia for Plant Health Management	28th, March 2018	53	Nicobari community	Harminder Bay, Hut Bay	FCI & P Division
34.	Oyster Mushroom Cultivation	28th, March,2018	51	Nicobari community and Hut Bay farmers	Hut Bay	FCI & P Division

b) Winter School

Sl. No.	Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
Winter School						
1.	Organic farming in tropical Islands of India	7th to 27th Nov., 2017	25	ICAR Scientists/ SAU Asst. Prof/ KVK SMS	ICAR-CIARI, Port Blair	NRM Division

c) Seminar

Sl. No.	Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
Seminar						
1.	Spices of Islands: Potentials and Way forward for profitability	22nd to 23rd March, 2018	120	Officials from State departments, farmers, SHG members and students	ICAR-CIARI, Port Blair	H & F Division

d) Field Day

Sl. No	Title	Period	Participants (Nos.)	Venue	Conducted by
Field Day					
1.	Organic of ginger and cultivation turmeric	25th April, 2017	16	ICAR-CIARI (Siphighat Farm)	H & F Division
2.	Organic cultivation of ginger, turmeric and elephant foot yam	25th April, 2017			AICRP on tuber crops
3.	Fodder crops to improve livestock productivity	2nd Aug., 2017	30	Farmers	Animal Sci. , Division

Sl. No	Title	Period	Participants (Nos.)	Venue	Conducted by
4.	Farmers participatory seed production	11th Oct., 2017	15	Keralapuram Gram Panchayat, North and Middle Andaman	FCI&P Division
5.	Organic cultivation of ginger	18th Dec., 2017	29	Chidiyatapu	H & F Division
6.	China aster: a potential loose flower for Andaman & Nicobar Islands	16th March, 2018	40	ICAR-CIARI	H & F Division

e) World Coconut day

Sl. No.	Title	Period	Participants (No.)	Type of participants	Venue	Conducted by
World Cocontut day						
1.	World Coconut Day-2017	16th Sept., 2017	34	College students	ICAR-CIARI, Port Blair	AICRP on Palms

f) Awareness campaigns

Sl. No	Title	Period	Participants (Nos.)	Venue	Conducted by
Awareness campaigns					
1.	Goat farming	2nd July, 2017	17	Sippighat, South Andaman	Animal Science Division
2.	Goat improvement	22nd July, 2017	15	Guptapara, South Andaman	Animal Science Division
3.	National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) in Andaman and Nicobar Islands	9th Aug., 2017	20	Keralapuram, Diglipur	Fisheries Sci. Division
		20th Aug., 2017	26	Wimberlygunj, South Andaman	Fisheries Science Division
4.	Goat improvement	16th Sept., 2017	20	Indra Nagar, South Andaman	Animal Science Division
5.	Establishment of model village for livestock and poultry farming	07th Oct., 2017	43	Tushnabad	Animal Science Division
6.	Goat improvement	16th Oct., 2017	21	Burmanalla, South Andaman	Animal Science Division

g) Exposure Visit(s)

Sl.No.	Types of participants	Participants (No.)	Period	Venue
Exposure Visit				
1.	Students of B.Sc. Geography JNRM College, Port Blair	90	17th March, 2018	ICAR-CIARI, Port Blair
2.	Students of Mahatma Gandhi International School, Brookshabad, Port Blair	99	16thNov., 2017	
3.	Students of College of Horticulture & Forestry, Central Agricultural University, Arunachal Pradesh	35	30th Dec., 2017	
4.	Students of class IX of Govt. Secondary School, Junglighat, Port Blair	72	15th Jan., 2018	
5.	Students of class IX of Govt. Senior Secondary School, Wimberlygunj, South Andaman, Port Blair	80	18th Jan., 2018	
6.	Farmers of Prothrapur block under ATMA	25	19th Jan., 2018	
7.	D.EI.Ed Trainees of DIET, Garacharma	105	14th March, 2018.	
8.	Tribal farmers	10	3rd to 7th March, 2018	

h) Exhibition

Sl.No.	Types of participants	Participants (No.)	Period	Venue
Exhibition				
1.	Island Kisan Mela and Farm Innovator Meet under the theme "Value addition and Marketing of Agri. and Agro Products"	1230	22nd to 23rd June, 2017	ICAR-CIARI, Port Blair
2.	11th Indian Fisheries and Aquaculture Forum	>1500	November, 2017	ICAR-CIFT, Kochi
3.	Regional Agricultural Fair (RAF) of Southern Region on the theme "Sustainable Agriculture through Integrated Framing System" in association with A & N Administration.	4353	15 to 17 Feb., 2018	ICAR-CIARI, Port Blair

i) Radio Talks

Title	Date of broadcast	Expert
Role of KVK in agriculture development at Car Nicobar	30th June, 2017	Sanjay Kumar Pandey
Scientific farming of livestock	23 June, 2017,	Zachariah George
Scientific cultivation of vegtables and nursery maintainance	04, July, 2017	Sanjeev Kumar Singh
Improve varieties of rice for the Islands	14th July,2017	R.K. Gautam
Integrated nutrient management in rice	17th July,2017	B. Gangaiah
GM crop and their problems	18th July, 2017	P. K. Singh
ORC – a success Story	19th July, 2017	S.K. Zamir Ahmed
Maintenance of small agriculture implements	10th Oct.,2017	Manoj Kumar
Scope for vegetable cultivation in N & M Andaman	13th Nov.,2017	B.L. Kasinath
Scope of commercial floriculture in N & M Andaman	14th Nov., 2017	D. Basantia
Dhan ki surkshit bhandaran	23rd Dec., 2017	S.K. Zamir Ahmed
Kisan Diwas	17th Feb., 2018	S.K. Zamir Ahmed
Organic cultivation of elephant foot yam in plantation crops of A & N Islands	27th February, 2018	V. Damodaran
Nutrition kitchen garden why and how	02nd March, 2018	Sanjay Kumar Pandey
Vermi compositing	05, March, 2018	Sanjeev Kumar Singh.
Up gradation of breeds in animals	06 March, 2018,	Zachariah George.

j) Doordarshan Interview

Title	Date of broadcast	Expert
Sweet Carambola: Andaman Dweepo ke liye ek upyukt fasal	20th May,2017	Pooja Bohra
Best agriculture technologies for Island farmers	26th July, 2017	S.K. Zamir Ahmed
Role of KVK in technology dissemination	22nd Nov., 2017	B.L. Kasinath
Prospects of vegetable cultivation in N & M Andaman	23rd Nov., 2017	B.L. Kasinath
Commercial fruit cultivation in N & M Andaman	23rd Nov., 2017	D. Basantia
Dweepo meh jaivik kheti	01st Dec.,2017	B. Gangaiah
Jaivik kheti meh visisht prabhandan	04th Dec., 2017	B. Gangaiah
Career opportunities in agriculture	10th Jan., 2018	S.K. Zamir Ahmed
Fodder production for the dairy development	19th Feb., 2018	M.S. Kundu
Potential of Maize cultivation in the island	7th March, 2018	Sanjay Kumar Pandey

k) Students Guided by Scientist for Dissertation

Name of the student	Qualification	College/University	Duration in months	Supervisor
Students Guided by Scientist for Dissertation				
N. Bhanu Priya	M. Sc, Biotechnology	Muthayammal College of Arts & Science, Periyar University	3	Arun Kumar De
Bahashree Bhat	M. Tech, Bioinformatics	Karunya Institute of Technology and Science	3	Arun Kumar De
Prem Prakash	M.Sc. (Marine Biology)	Pondicherry University, Port Blair	3	K. Saravanan

TRAINING AND CAPACITY BUILDING

Physical targets and achievement

S. No	Category	Total No. of employees	No. of training planned for 2017-18 as per ATP	No. of employees undergone training		
				April - Sept. 2017	Oct., 2017-18	April t2017-18
1.	Scientist including KVK Head	37	8	-	8	8
2.	Technical + KVK SMS	51	4	-	4	4
3.	Administrative & Finance	21	12	3	8	11
	Total	109	24	3	20	23

Category – wise training attended by employees

Category : Scientific Staff						
S. No	Name of employee	Designation	Discipline/ Section	Name of training programme attended	Duration (Days)	Organizing Institution
1.	S. Dam Roy	Pr. Scientist	Fisheries Science	Application of remote sensing in harvest fisheries	3	ICAR-CMFRI Kochi
2.	R.K. Gautam	Principal Scientist	FCI &P	Vigilance officers' workshop	1	ICAR-CIFRI, Kolkata
3.	Jai Sunder	Pr. Scientist	I/c FAO	PFMS	2	NRRI Cuttack
4.	Jai Sunder	Pr. Scientist	Animal Science	MDP on leadership development (a pre-Rmp programme)	12	ICAR- NAARM Hyderabad

Category : Scientific Staff						
S. No	**Name of employee**	**Designation**	**Discipline/ Section**	**Name of training programme attended**	**Duration (Days)**	**Organizing Institution**
5.	K. Sakthivel	Scientist	FCI&P	Sequencing of plant pathogens	1	IARI, New Delhi
6.	A.K Dey	Scientist	Animal Science	Engineering mammalian cells with CRISPR tools	12	CSIR –CCMB Hyderabad
7.	B.L. Kasinath	Senior Scientist & Head	KVK Nimbudera	Web based education content management (Under TELAAGE)	10	NAARM Hyderabad
8.	K. Lohith Kumar	Scientist	Fisheries Science	Structure and function of marine ecosystem fisheries	22	ICAR-CMFRI Kochi

Category : Technical Staff						
S. No	**Name of employee**	**Designation**	**Discipline/ Section**	**Name of training programme attended**	**Duration (Days)**	**Organizing Institution**
1.	Pooja Kapoor	SMS	KVK, Nimbudera	Impact assessment of agricultural research and technology	4	NAARM Hyderabad
2.	Zachariah George	SMS	KVK, Car Nicobar	Developing business proposal for producer companies and start up in Agri-business	5	NAARM Hyderabad
3.	V.K. Pandey	SMS	KVK, Port Blair	Bio security management	1	NIPHM Hyderabad
4.	Ani Dath	Sr. Tech. Officer	Computer Cell	Communication and scientific writing for technical officer of ICAR	7	NAARM Hyderabad

Category : Administrative Staff						
S. No	**Name of employee**	**Designation**	**Discipline/ Section**	**Name of training programme attended**	**Duration (Days)**	**Organizing Institution**
1.	Sushil Kumar Singh	SAO	Administration	Orientation training on GFR-2017,GST and PFMS	2	NRRI Cuttack
2.	Sushil Kumar Singh	SAO	Administration	Vigilance officers' workshop	1	ICAR-CIFRI, Kolkata
3.	Sushil Kumar Singh	SAO	Administration	Right to Information Act 2005	1	ISMT, New Delhi
4.	R.N. Mazumdar	AAO/DDO	Administration	Orientation training on GFR-2017,GST and PFMS	2	NRRI Cuttack
5.	S.K. Biswas	Assistant	Store section	PFMS	2	NRRI Cuttack
6.	P.K.Roy	Assistant	Bill & Cash	PFMS	2	NRRI Cuttack
7.	Prakash Mondal	Sr. Clerk	FAO	PFMS	2	NRRI Cuttack
8.	Nehru Ram	Senior Clerk	Bill & Cash	Orientation training on GFR-2017,GST and PFMS	2	NRRI Cuttack

ROUND UP OF INSTITUTE MAIN ACTIVITIES

Sl. No.	Activities	Date
1.	Base with research farm was established at Minicoy by taking over the CPCRI regional station	1st April, 2017
2.	Joint workshop by TOLIC	3rd April, 2017
3.	Organic inputs preparation demonstrated at Neil Island	5th April, 2017
4.	Plant Genome Saviour Community Award to Nicobari Tribes for Nicobari Aloo	19th April, 2017
5.	8th RAC meeting	15th to 17th May, 2017
6.	Celebration of Swachh Bharat Abhiyan Pakhwara	12th May, 2017
7.	Island Kisan Mela and Farm Innovators Meet on the theme Value Addition & Marketing of Agri. and Agro Products	22nd to 23rd June, 2017
8.	Stakeholders Meet for Development of Tuna Fisheries in Andaman and Nicobar Islands at ICAR-CIFT, Kochi	8th July, 2017
9.	78th Meeting of Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops	9th July, 2017
10.	TOLIC meeting	28th July, 2017
11.	Tree Planting under SBA	27th July, 2017
13.	Dr. Anandamoy Kundu takes over as Director, CIARI	18th August, 2017
14.	Celebrated Sankalp Se Siddhi: Doubling farmers' income by 2022; need for adopting Integrated Farming System	26th August, 2017
15.	World Coconut Day (WCD) celebration	16th September, 2017
16.	Breed Conservation Award to Tribal Council, Car Nicobar and ICAR-CIARI, Port Blair for Nicobari pig and Teressa goat	21st September 2017

Sl. No.	Activities	Date
17.	Beach Cleaning Drive under Swachhtha Hi Seva	1st Oct., 2017
18.	Swachhtha Hi Seva	2nd Oct., 2017
19.	Community Breed Conservation Award Ceremony cum Farmer-Scientist Interaction at Car Nicobar	12th October, 2017
20.	Winter School on 'Developments in Organic farming in Tropical Islands of India'	7th to 27th November, 2017
21.	Interaction Meet on Organic Farming	22nd November, 2017
22.	Participation of ICAR-CIARI in Zonal Sports Meet	13th to 16th November, 2017
23.	Annual Sports Meet - 2018	29th to 31st January, 2018
24.	Hon'ble Union Minister of Agriculture & Farmer's Welfare Shri Radha Mohan Singh Ji inaugurated Regional Agricultural Fair (RAF), Southern Region	15th February, 2018
25.	Regional Agricultural Fair for Southern Region conducted at ICAR-CIARI, Port Blair	15-17th February, 2018
26.	Visit of Smti. Krishna Raj, Hon'ble Minister of State, Ministry of Agriculture and Farmers Welfare, GoI	21st February, 2018
27.	International Women's Day Celebration	08th March, 2018
28.	State level seminar on "Spices of Islands- Potentials and way forward for profitability"	22-23rd March, 2018
29.	Webcasting on Krishi Unnati Function by KVKs at South Andaman, North and Middle Andaman and Nicobar District	17th March,2018

IMPRESSION OF DELEGATES

Delegates	Impression
Dr. S.K. Sharma, Ex-VC, HPKV, Palampur & Chairman, RAC, ICAR-CIARI on 19th May, 2017	I was impressed with the technologies developed by the CIARI suitable for the tropical Island ecosystem. I hope the farmers will be benefitted with these technologies in increasing their livelihood security. I wish CIARI a great success in years to come.
Prof. Jagdish Mukhu, Lt. Governor, A & N Islands on 29th May, 2017	I am deeply impressed by the work done by the scientists of the organisation in the field of agriculture, horticulture and animals to uplift the standard of Islands. The Institute is nicely maintained.
Dr. J.S. Sandhu, DDG(CS), ICAR, New Delhi on 19th July, 2017	It is my pleasure to visit this Institute and it has its unique in many things. My first impression while looking at the museum depiction, Institute has developed a number of technologies for farmers. I wish all the best.
Rtr. G. Dhinakaran, Rotary Club of Port Blair on 31st October, 2017	Excellent information available for students who are participated in DISHA sponsored by our club. I am sure they all would be highly benefitted by the programme. Thanks to all the resource persons for their time and support.
Shri Abhay Singh, PS to Hon'ble Union Agriculture Minister on 4th January, 2018	Today I had an occasion to visit CIARI, which turned otu to be jewel of ICAR, Institute. Our scientists are doing tremendous work in this geographically difficult zone. My appreciation and best wishes to this beautiful Institute.
Fr. Joe Rodrigues Fr. Agnel Bhawan, Borda, Goa – 403601 on 9th January, 2018	Very informative and educative. Much labour has taken place. It is the work of positive mind. I appreciate the efforts, work and the sacrifices in order to give knowledge to the upcoming person to make our India a progressive India.
Smt. Krishna Raj, Minister of State, GoI on 21st February, 2018	I visited Dweep Krishi Darpan in CIARI and found quite informative and personally a learning experience for me. Please keep up the good work.

MOMENTS TO CHERISH


Visit of Hon'ble Union Minister of Agriculture & Farmers Welfare Shri Radha Mohan Singh Ji for RAF, 2018


Visit of Hon'ble Union Minister of State for Agriculture and Farmers Welfare Smti. Krishna Raj

Hon'ble Member of Parliament (A & N I) Shri Bishnu Pada Ray interacting during Web Casting

Visit of Dr. Trilochan Mohapatra, Secretary & Director General, Govt. of India, Department of Agricultural Research & Education and Indian Council of Agricultural Research, Ministry of Agriculture & Farmers Welfare, Krishi Bhavan, New Delhi during the Institute's Foundation Day and IKM

LINKAGE AND COLLABORATION WITH OTHER DEPARTMENTS

- 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
- Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Palode, Trivandrum, Kerala
- ICAR-AICRP on Palms, Floriculture, Fruits, Vegetables, Tuber crops
- DASD, Kozhikode, Kerala
- Department of Agriculture, A & N Administration
- RMRC, ICMR, Port Blair
- ICAR Institutes; IVRI, PD_ADMAS, CIRG, CSWRI, PDP.
- DAHVS, A&N Administration.
- TANUVAS
- NABARD
- Department of Agriculture & Cooperation, Ministry of Agriculture & Farmers Welfare, Govt. of India, New Delhi
- Indian Institute of Pulses Research, Kanpur
- TNAU (NPRC, Vamban), Coimbatore
- ICAR-DMR, Solan
- ICAR-IARI, New Delhi
- ICAR-NBAIM, Mau, UP.
- ICAR-IISR, Mau, UP.
- National Bureau of Agricultural Insect Resources, Bengaluru, India
- IRRI, Philippines
- ICAR-IIRR, Hyderabad
- ICAR-CIBA, Chennai
- ICAR-NFDB, Hyderabad
- ICAR-NBFGR, Lucknow
- TNFU, Nagapattinam, Tamil Nadu
- ICAR-NAARM, Hyderabad
- Regional Remote Sensing Center, Nagpur
- India Meteorological Department, Pune
- Dept of Agriculture, A&N Administration, RKVY
- ICAR-CSSRI, Karnal
- ICAR-DWSR, Jabalpur
- ICAR-CIPHET
- Directorate of Industries, A&N Administration and MOFPI, GOI

Deputation abroad

Dr. B. Augustine Jerard, Principal Scientist and Head, Division of Horticulture and Forestry was on deputation to serve the Ministry of Agriculture, Government of Fiji under Indian Technical and Economic Cooperation (ITEC) programme of Ministry of External Affairs, Government of India from 11th October 2016 to 9th October 2017. During the deputation the following accomplishments were made at Fiji.

- Identification of location-based coconut production problems in different parts of republic of Fiji and recommended effective solutions
- Designed strategies to produce quality planting material to strengthen planting/replanting programme at Fiji. An action plan was prepared and submitted for implementation which was lauded by Ministry of Agriculture, Government of Fiji.
- Action plan and initiation of identification, collection, establishment and evaluation of superior coconut germplasm with desirable traits for product improvement and diversification. Many unique coconut types were characterized, and training imparted to Fiji researchers on management of coconut genetic resources.
- Formulated and guided the coconut researchers at Fiji to establish coconut research programmes to enhance sustainable coconut production in Fiji.
- Documentation and dissemination of coconut production, harvesting and processing technologies at Fiji.
- Imparted training to research and extension staff, farmers and coconut stakeholders at various parts of Fiji on coconut production technologies, intercropping, multi-species cropping, coconut tree climbing, identification and management of coconut pests, embryo culture, pollen processing and hybridization techniques.
- Helped coconut researchers of Fiji in preparation of publication on description local coconut varieties at Fiji for documentation
- Prepared and submitted a Coconut Industry Plan for Fiji, way forward and action plan for next 20 years for coconut sector improvement in Fiji

The final report on coconut sector of Fiji received by Permanent Secretary, Ministry of Agriculture, Government of Fiji.

Dr. B. Augustine Jerard with the trainees of Coconut Value addition at Taveuni Island of Fiji during the deputation.

PERSONNEL

Director (Acting) Dr. A. Kundu

Head / Incharge Divisions / Section/ KVK

Head, Division of Animal Science	Dr. A. Kundu
Head, Division of Natural Resource Management	Dr. B. Gangaiah
Head, Division of Horticulture & Forestry	Dr. B. A. Jerard
Head I/c, Division of Field Crop Improvement & Protection	Dr. R.K. Gautam, upto 18th Sept., 2017 Dr. P.K. Singh w.e.f. 19th Sept., 2017
Head i/c, Division of Fisheries	Dr. R. Kiruba Sankar
Incharge, Social Science Section	Dr. S.K. Zamir Ahmed
Senior Scientist & Head, KVK (South Andaman & Nicobar)	Dr. Nagesh Ram
Senior Scientist & Head, KVK, N & M Andaman	Dr. B.L. Kashinath
Head of Office	Mr. Sushil Kumar Singh
Senior Administrative Officer	Mr. Sushil Kumar Singh
Sr. Finance & Accounts Officer (i/c)	Dr. Jai Sunder
Incharge, Priority setting, Monitoring & Evaluation Cell	Dr. S.K. Zamir Ahmed
Incharge, Computer Cell	Dr. P. Perumal upto 4th Jan., 2018 Dr. Jai Sunder w.e.f. 5th Jan., 2018
Incharge, Library	Dr. M.S. Kundu
Incharge, Central Instrumentation Facility	Dr. Jai Sunder
Incharge, Estate Section	Er. S.L. Paik
Incharge, Workshop &Instrumentation Cell	Er. M. Arul Selvam
Incharge, Guest House	Dr. V.B. Pandey upto 25th August, 2017 Mr. Amit Srivastava, w.e.f. 26th Aug., 2017
Incharge, Security Officer	Mr. A.K. Betal upto 27th Aug., 2017 Mr. A.K. Tripathi w.e.f. 28th Aug., 2017
Incharge, Sippigaht Farm	Dr. V. Bhaskaran
Incharge, Bloomsdale Farm	Dr. P.K. Singh
Coordinator, Bio-Informatics Centre	Dr. A.K. De
Incharge, ITMU	Dr. P. Perumal upto 4th Jan., 2018 Dr. Jai Sunder w.e.f. 5th Jan., 2018
Coordinator, Out Reach Centre	Dr. S.K. Zamir Ahmed
Incharge PG Cell	Dr. Jai Sunder
Assistant Director (OL)	Mrs. Sulochna
Nodal Officer, KVK, Kavarati & Regional Station, Minicoy	Dr. B. Gangaiah
Asstt. Nodal Officer, KVK, Kavarati & Regional Station, Minicoy	Dr. S.K. Zamir Ahmed
Incharge Head, Regional Station, Minicoy	Mr. Arun Kumar Oppoottil Ratheesh, Scientist w.e.f. 11th Dec., 2017

PC Incharge, KVK, Kavaratti	Dr. V.M. Abdul Gafoor
Farm Managers	
Garacharma	Dr. V.B. Pandey
Sippighat	Dr. V. Damodaran
Bloomsdale Farm	Mr. A.K. Tripathi, 27th Aug., 2017 Shri A.K. Betal w.e.f. 28th Aug., 2017

Vigilance Officer	Dr. R.K. Gautam upto 25th Feb., 2018 Dr. Debasish Bhatacharya w.e.f. 26th Feb., 2018
Transparency Officer	Dr. R.K. Gautam
Nodal Officer, HRD	Dr. R.K. Gautam
Central Public Information Officer	Dr. R. Kirubasankar
Nodal Officer online HYPM & RFD	Dr.S.K.Zamir Ahmed
Nodal Officer, PIMS, PERMISnet & ASRB Online	Dr. P. Perumal upto 4th Jan., 2018 Dr. Jai Sunder w.e.f. 5th Jan., 2018
Nodal Officer, Biometric Attendance System	Mr. R.N. Mozumdar
Nodal Officer, CPGRAMS	Mr. Sushil Kumar Singh
Nodal Officer, Court Case Monitoring System	Mr. Amit Srivastava
Nodal Officer, Swachh Bharat Abhiyan	Dr. Jai Sunder
Nodal Officer, MGMG	Dr. S.K. Zamir Ahmed
Nodal Officer, TSP	Dr. A. Kundu
ISO 9001:2008 Management Representative	Dr. S.K. Zamir Ahmed
ISO 9001:2008 Asstt. Management Representative	Mr. Amit Srivastava
RFD Co-Nodal Officer	Mr. Amit Srivastava

Division of Natural Resource Management

Dr. B. Gangaiah, Head

Dr. A. Velmurugan, Principal Scientist (Soil Science)

Dr. T.P. Swarnam, Principal Scientist (Agronomy)

Dr. T. Subramani, Scientist (Agronomy)

Dr. Sachidananda Swain, Scientist (Ag. Structure & Process Engineering)

Division of Field Crops Improvement & Protection

Dr. Pankaj Kumar Singh, Principal Scientist & Head (I/c) from 19th Sept., 2017

Dr. R.K. Gautam, Principal Scientist (Plant Breeding) & Head (I/c) up to 18th Sept., 2017

Dr. K. Sakthivel, Scientist (Plant Pathology)

Dr. T. Bharathimeena, Scientist (Entomology)

Dr. Venkatesan, K., Scientist (Economic Botany)

Division of Horticulture & Forestry

Dr. B. Augustine Jerard, Head

Dr. V. Bhaskaran, Pr. Scientist (Horticulture)

Dr. I. Jaisankar, Scientist (Forestry)

Dr. K. Abirami, Scientist (Fruit Science)

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

Dr. Ajit A. Waman, Scientist (Spice, Plantation, Medicinal & Aromatic Plants)
Mr. Soobedar Yadav, Scientist (Spices, Plantation & Medicinal & Aromatic Plants)

Division of Animal Science

Dr. A. Kundu, Head
Dr. Debasis Bhattacharya, Pr. Scientist (Vet. Parasitology)
Dr. Jai Sunder, Principal Scientist (Veterinary Microbiology)
Dr. Madhu Sudan Kundu, Principal Scientist (Animal Nutrition)
Dr. T. Sujatha, Sr. Scientist (Poultry Science)
Dr. Arun Kumar De, Scientist (Animal Biotechnology)
Dr. K. Muniswamy, Scientist (Animal Biotechnology)
Dr. P. Perumal, Scientist (Animal Reproduction)

Division of Fisheries Science

Dr. S. Dam Roy, Principal Scientist (Fish & Fisheries Sci.)
Dr. R. Kiruba Sankar, Scientist (Fish & Fishery Science) & Head I/c
Dr. (Mrs.) S. Monalisha Devi, Scientist (Fisheries Resource Management)
Mr. K. Lohit Kumar, Scientist (Fisheries Resource Management)
Dr. K. Saravanan, Scientist (Fish Health)
Mr. J. Praveen Raj, Scientist (Fish Health)
Mr. Arun Kumar Oppoottil Ratheesh, Scientist (Fisheries Resource Management)
Ms. Harsha Haridas Scientist (Aquaculture)

Social Science Section

Dr. S.K. Zamir Ahmed, Principal Scientist, (Agricultural Extension) & Section I/c
Dr. R. Jaya Kumaravaradan, Scientist (Agricultural Economics) – since 21.10.2017

Krishi Vigyan Kendra, Port Blair

Dr. Nagesh Ram, Sr. Scientist & Head
Dr. L.B. Singh, Subject Matter Specialist (Horticulture)
Er. Bijaya Kumar Nanda, Subject Matter Specialist (Agri. Engineering)
Mrs. Haripriya Nayak, Subject Matter Specialist (Home Science) on study leave
Mr. N. Bommayswamy, Subject Matter Specialist (Horticulture)
Dr. Vivek Kr. Pandey, Subject Matter Specialist (Plant Protection)
Dr. N.C. Choudhuri, Asstt. Chief Technical Officer (Animal Science)

Krishi Vigyan Kendra, Nicobar

Dr. Nagesh Ram, Sr. Scientist & Head I/c
Mr. Sanjay Kumar Pandey, Subject Matter Specialist (Agronomy)
Dr. Zachariah George, Subject Matter Specialist (Animal Science)

Krishi Vigyan Kendra, North & Middle Andaman

Dr. B.L. Kashinath, 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. Batti Lal Meena, Subject Matter Specialist (Agronomy)
Dr. Shardul Vikram Lal, Subject Matter Specialist (Animal Science)
Dr. Shailesh Kumar, Subject Matter Specialist (Fisheries)

COMMITTEE OF THE INSTITUTE

I.	**Rajbhasha Karyanvayan Samiti**	
1.	Director, CIARI	Chairperson
2.	HoD (NRM)	Co-Chairperson
3.	HoD (FCI&P) or representative	Member
4.	HoD (Horticulture & Forestry) or representative	Member
5.	HoD (Fisheries) or representative	Member
6.	I/c Social Science Section	Member
7.	Dr. Debashish Bhattacharya, Principal Scientist, Animal Sci. Division	Member
8.	Sr. Administrative Officer or representative	Member
9.	Dr. S. Monalisha, Scientist	Member
10.	Shri A. K. Tripathi, Sr. Technical Officer	Member
11.	Assistant Director (Official Language)	Member Secretary
II.	**Sports Committee**	
1.	Dr. Jai Sunder, Principal Scientist	Chairperson
2.	Shri Sushil K. Singh, Sr. Administrative Officer	Co-Chairperson
3.	Mrs. Saidi Bibi, Private Secretary	Member
4.	Shri Babuswamy, Technical Assistant	Member
5.	Shri K. S. Pradhan, Technician	Member
6.	Secretary, IJSC (SS)	Member *(Ex-Officio)*
7.	Officer-in-Charge (Sports) – Dr. K. Saravanan	Member Secretary *(Ex-Officio)*
III.	**Security Committee**	
1.	Dr. M. S. Kundu, Principal Scientist	Chairperson
2.	Dr. A. Velmurugan, Principal Scientist	Co-Chairperson
3.	Finance & Accounts Officer or representative	Member
4.	Shri Nehru Ram, UDC	Member
5.	Officer-in-Charge (Security)	Member Secretary *(Ex-Officio)*
IV.	**Un-serviceable Stores & Farm Produce Disposal (Auction) Committee**	
1.	Dr. P. K. Singh, Principal Scientist	Chairperson
2.	Dr. Kiruba Sankar R., Scientist	Co-Chairperson
3.	Finance & Accounts Officer or representative	Member
4.	Shri Abhay Srivastava, Senior Technical Assistant	Member *(Ex-Officio)*
5.	OIC (Stores)/ AAO	Member Secretary*(Ex-Officio)*

V.	**Technical Scrutiny / Evaluation Committee**	
1.	Dr. B. Gangaiah, HoD, NRM	Chairperson
2.	Dr. Jaisunder, Principal Scientist	Member
3.	Indenter	Member *(Ex-Officio)*
4.	OIC (Stores)	Member Secretary *(Ex-officio)*
VI.	**Proprietary Article Declaration Committee**	
1.	Dr. Debashish Bhattacharya, Principal Scientist	Chairperson
2.	Dr. A. K. De, Scientist	Member
3.	Indenter	Member *(Ex-Officio)*
4.	Assistant Administrative Officer	Member Secretary *(Ex-Officio)*
VII.	**Institute Website Management Committee**	
1.	Dr. B. Augustine Jerard, HoD, H&F	Chairperson
2.	Dr. A. Velmurugan, Principal Scientist	Co-Chairperson
3.	Dr. A. K. De, Scientist	Member
4.	Shri Amit Srivastava, Senior Technical Officer	Member
5.	Mrs. Ani Dath, Senior Technical Officer	Member
6.	I/c Computer Cell	Member Secretary *(Ex-Officio)*
VIII.	**Estate Management & House Allotment Committee**	
1.	Dr. S. K. Zamir Ahmed, Principal Scientist	Chairperson
2.	Dr. K. Abirami, Scientist	Co-Chairperson
3.	Sr. Administrative Officer or representative	Member
4.	Finance & Accounts Officer or representative	Member *(Ex-Officio)*
5.	Secretary, IJSC (SS)	Member *(Ex-Officio)*
6.	OIC (Estate)	Member Secretary *(Ex-Officio)*
IX.	**Purchase Advisory Committee**	
1.	Dr. B. Augustine Jerard, HoD, H&F	Chairperson
2.	Dr. P.K. Singh	Co-Chairperson
3.	Dr. Venkatesan K., Scientist	Member
4.	Dr. R. Kirubasankar, Scientist	Member
5.	Dr. S. Swain, Scientist	Member
6.	Sr. Administrative Officer or representative	Member *(Ex-Officio)*
7.	Finance &Accounts Officer or representative	Member *(Ex-Officio)*
8.	Officer-in-charge (Stores)	Member Secretary *(Ex-Officio)*
X.	**Local Purchase Committee**	
1.	Dr. V. Baskaran, Sr. Scientist	Chairperson
2.	SAO / AAO / Representative	Co-Chairperson
3.	Finance & Accounts Officer / Representative	Member *(Ex-Officio)*
4.	Indenter/ Concerned Sectional In-charge	Member *(Ex-Officio)*

XI.	**Works & Maintenance Committee**	
1.	Dr. R. K. Gautam, Principal Scientist	Chairperson
2.	Dr. Velmurugan, Principal Scientist	Co-Chairperson
3.	Dr. T. Sujatha, Sr. Scientist	Member
4.	Dr. Arun Ratheesh, Scientist	Member
5.	Sr. Administrative Officer or representative	Member *(Ex-Officio)*
6.	Finance & Accounts Officer or representative	Member *(Ex-Officio)*
7.	Officers-in-Charge (Estate)	Member Secretary *(Ex-Officio)*
XII.	**Institute Grievance Committee**	
1.	Director	Chairperson
2.	Dr. B. Gangaiah, HoD, NRM	Co-Chairperson
3.	Dr. Nagesh Ram, Sr. Scientist & Head, KVK	Member
4.	Dr. T. Sujatha, Sr. Scientist	Member
5.	Finance & Accounts Officer or representative	Member
6.	Secretary, IJSC (SS)	Member *(Ex-Officio)*
7.	Sr. Administrative Officer	Member Secretary *(Ex-Officio)*
XIII.	**Staff Welfare Committee**	
1.	Director	Chairperson
2.	Dr. Jai Sunder, Principal Scientist	Co-Chairperson
3.	Smt. Archana Sharma, Technical Officer	Member
4.	Finance & Accounts Officer	Member
5.	Secretary, IJSC (SS)	Member *(Ex-Officio)*
6.	Sr. Administrative Officer	Member Secretary *(Ex-Officio)*
XIV.	**Library Advisory cum Management Committee**	
1.	Dr. R. K. Gautam, Principal Scientist	Chairperson
2.	Dr. S. K. Zamir Ahmed, Principal Scientist	Co-Chairperson
3.	Dr. K. Muniswamy, Scientist	Member
4.	Sr. Administrative Officer or representative	Member (Ex-Officio)
5.	Finance & Accounts Officer or representative	Member (Ex-Officio)
6.	In-charge (Library)	Member Secretary (Ex-Officio)
XV.	**Price Fixation Committee**	
1.	Dr. M. S. Kundu, Principal Scientist	Chairperson
2.	Dr. V. Baskaran, Senior Scientist	Co-Chairperson
3.	Concerned Farm Manager / Laboratory Official	Member
4.	Sr. Administrative Officer or representative	Member (Ex-Officio)
5.	Finance & Accounts Officer or representative	Member (Ex-Officio)
6.	Secretary, IJSC (SS)	Member (Ex-Officio)
7.	AAO / OIC (Stores)	Member Secretary

XVI.	**VIP Visit Arrangements Committee**	
1.	Dr. Jai Sunder, Principal Scientist	Chairperson
2.	Shri Sushil Kumar Singh, Senior Administrative Officer	Co-Chairperson
3.	Shri A. K. O. Ratheesh, Scientist	Member
4.	Shri K. Shyam Sunder Rao, Sr. Technician	Member
5.	Protocol Officer –Shri Amit Srivastava, Sr. Tech. Offr.	Convenor/ Member Secretary
XVII.	**Results Framework Document Committee**	
1.	Director	Chairperson *(Ex-Officio)*
2.	Nodal Officer (RFD) / I/c PME	Member *(Ex-Officio)*
3.	Co-Nodal Officer (RFD)	Member *(Ex-Officio)*
4.	Dr. A. K. De, Scientist	Member Resource Centre
5.	Shri Sushil K. Singh, Sr. Administrative Officer	Member Resource Centre
XVIII.	**Internal (Women) Complaints Committee**	
1.	Dr (Mrs.) T. Sujatha	Chairperson
2.	Shall be nominated separately after seeking consent	Member (External)
3.	Mrs. Lucy Thomas	Member
4.	Dr. P. Perumal, Scientist	Member
5.	Sr. Administrative Officer	Member
6.	I/c Women's Cell – Dr. Pooja Bohra	Member Secretary
XIX.	**ISO Management Committee**	
1.	Director	Chairperson
2.	Dr. R. K. Gautam, Principal Scientist	Co-Chairperson
3.	Dr. T. Subramani, Scientist	Member
4.	Finance & Accounts Officer	Member
5.	Sr. Administrative Officer	Member
6.	Management Representative	Member Secretary
XX.	**Institute Joint Staff Council (Office Side)**	
1.	Director	Chairperson
2.	Dr. B. Augustine Jerard, HoD, H&F	Member
3.	Dr. S. K. Zamir Ahmed, Principal Scientist	Member
4.	Dr. K. Abirami, Scientist	Member
5.	Dr. V. Damodaran, Asstt. Chief Tech. Officer	Member
6.	Finance & Accounts Officer	Member *(Ex-Officio)*
7.	Senior Administrative Officer	Secretary (Office Side)
	Institute Joint Staff Council (Staff Side) – Elected	
1.	Shri S. P. Narayan	Secretary (Staff Side)
2.	Shri Dibakar Khan	Member, CJSC
3.	Shri A. Babuswamy	Member
4.	Shri P. Kakesh Rao	Member

5.	Shri K. Ali Akbar	Member
6.	Smti S. Sheela Pal	Member
XXI.	**Institute Variety Release Committee**	
1.	Director	Chairperson
2.	Dr. B. Augustine Jerard, HoD, H&F	Co-Chairperson
3.	Shall be nominated separately after seeking consent	Member (External Expert)
4.	Dr. M. S. Kundu, Principal Scientist	Member
5.	HoD (FCI&P)	Member Secretary
XXII.	**Institute Foreign Deputation Committee**	
1.	Director	Chairperson
2.	Dr. B. Augustine Jerard, HoD, H&F	Co-Chairperson
3.	Dr. A. K. De, Scientist	Member
4.	I/c PME Cell	Member Secretary
XXIII.	**Tenders Opening Committee**	
1.	Dr. T. Sujatha, Sr. Scientist	Member
2.	Dr. I. Jaisankar, Scientist	Member
3.	Mrs. Ani Dath, Sr. Tech. Officer	Member
4.	Mrs. Shibani Sengupta, Assistant	Member
5.	AAO / I/c Estates / OIC (Stores)	Member Convenor
XXIV.	**Institute Publication Committee**	
1.	Dr. B. Augustine Jerard, HoD, H&F	Chairperson
2.	Dr. Debasis Bhattacharya, Principal Scientist	Co-Chairperson
3.	Dr. A. K. De, Scientist	Member
4.	Dr. Soobedar Yadav, Scientist	Member
5.	Assistant Director (OL)	Member
6.	I/c PME Cell	Member Secretary
XXV.	**Campus Cleanliness & Beautification Committee**	
1.	Dr. V. Baskaran, Sr. Scientist	Chairperson
2.	Dr. V. B. Pandey, Chief Technical Officer	Member
3.	Shri S. L. Paik, Asstt. Chief Technical Officer	Member
4.	I/c(Security)	Member Secretary
XXVI.	**Farm Management Committee (for all farms)**	
1.	Dr. S. K. Zamir Ahmed, Principal Scientist	Chairperson
2.	Shri N. C. Chaudhary, Asstt. Chief Tech. Officer	Member
3.	Shri Benny Varghese, Sr. Technical Officer	Member
4.	Concerned Farm Manager	Member Secretary
XXVII.	**Guest House Management Committee**	
1.	Dr. Jai Sunder, Principal Scientist	Chairperson
2.	Dr. A. Velmurugan, Principal Scientist	Member

3.	Shri Sushil Kumar Singh, Sr. administrative Officer	Member
4.	Shri Benny Varghese, Sr. Technical Officer	Member
5.	OIC (Guest House)	Member Secretary
XXVIII.	**Biosafety Standards Committee**	
1.	Dr. Debasis Bhattacharya, Principal Scientist	Chairperson
2.	Shall be nominated separately after seeking consent	Member (External)
3.	Dr. Kiruba Sankar R., Scientist	Member
4.	Dr. Pooja Bohra, Scientist	Member
5.	Scientist In-Charge (CIF)	Member Secretary
XXIX.	**Institute – Regional Station – KVK Coordination Committee**	
1.	Director	Chairperson
2.	Dr. B. Augustine Jerard, HoD, H&F	Co-Chairperson
3.	Head, KVK, South Andaman	Member
4.	Head, KVK, North & Middle Andaman	Member
5.	Head, KVK, Nicobar	Member
6.	Shri Lohith Kumar (rep. KVK& RS Lakshadweep)	Member
7.	Senior Administrative Officer	Member
8.	Finance & Accounts Officer	Member
9.	I/c Social Science Section	Convenor / Member Secretary
XXX.	**Cultural Programmes Committee**	
1.	Dr. S. Monalisa Devi, Scientist	Chairperson
2.	Dr. K. Abirami. Scientist	Co-Chairperson
3.	Shri Amit Srivastava, Sr. Technical Officer	Member
4.	Shri Shyam Sunder Rao, Sr. Technician	Member
5.	Shri Abhay K. Srivastava, Sr. Technical Assistant	Member Secretary
XXXI.	**Institute Technology Management Committee**	
1.	Director	Chairperson
2.	I/c PME Cell	Member
3.	Dr. I. Jaisankar, Scientist	Member
4.	Dr. Ajit Arun Waman, Scientist	Member
5.	Scientist – In – charge, ITMU	Member Secretary

NEW ENTRANTS/ TRANSFER / PROMOTION/ RETIREMENT/ DEATH

New Entrants to CIARI

- Dr. D. Bhattacharya, Pr. Scientist, on 17.04.2017
- Dr. Perumal P., Scientist on 30.06.2017
- Dr. Venkatesan K., Scientist on 10.07.2017
- Ms. Harsha Haridas, Scientist on 12.10.2017
- Dr. R. Jaya Kumaravaradan, Scientist on 21.10.2017

Transferred from CIARI

- Mrs. Divya Parisa, Scientist, to ATRI ZONE- III, Umiam on 31.07.2017
- Dr. Anuraj A., Scientist to CMFRI, Kochi on 05.08.2017
- Dr. A.K. Singh, Pr. Scientist to ICAR-IIPR, Kanpur on 13.09.2017
- Shri Arun Kumar O.R., Scientist to RS Minicoy on 24.11.2017

Promotion

Scientist

- Dr. V. Baskaran, Pr. Scientist, PB-4 of Rs. 37400-67000+9000 to 37400-67000+10000/- w.e.f. 14.02.2017
- Dr. A.K. Singh, Pr. Scientist, PB-4 of Rs. 37400-67000+9000 to 37400-67000+10000/- w.e.f. 01.01.2017
- Dr. (Mrs.) T.P. Swarnam, Pr. Scientist, PB-4 of Rs. 37400-67000+9000 to 37400-67000+10000/- w.e.f. 28.02.2017

(b) Skilled Supporting Staff

- Shri M. Jaganath, TSM to SSS on 05.08.2017
- Shri S. Thirupathi Rao, TSM to SSS on 05.08.2017
- Shri Jeetu Lohar, TSM to SSS on 05.08.2017
- Shri Somra Uraon, TSM to SSS on 05.08.2017
- Shri Nicolas Belong, TSM to SSS on 05.08.2017
- Shri Pabianus Minj, TSM to SSS on 05.08.2017
- Shri Shyam Narayan, TSM to SSS on 05.08.2017
- Shri Gabrious Soreng, TSM to SSS on 05.08.2017
- Shri Telesfer Minj, TSM to SSS on 05.08.2017
- Smti S. Pancha, TSM to SSS on 05.08.2017
- Shri Silvanus Kerketta, TSM to SSS on 05.08.2017
- Smti Pandiyammal, TSM to SSS on 05.08.2017
- Shri Theophil Kindo, TSM to SSS on 05.08.2017
- Shri Manuel Minj, TSM to SSS on 05.08.2017
- Shri Tapan Kumar Mondal, TSM to SSS on 05.08.2017
- Smti V.K. Pathumma, TSM to SSS on 05.08.2017
- Shri P. Haldar, TSM to SSS on 07.08.2017
- Shri Zakir Hussain, TSM to SSS on 07.08.2017

Retirement/ VRS

Technical

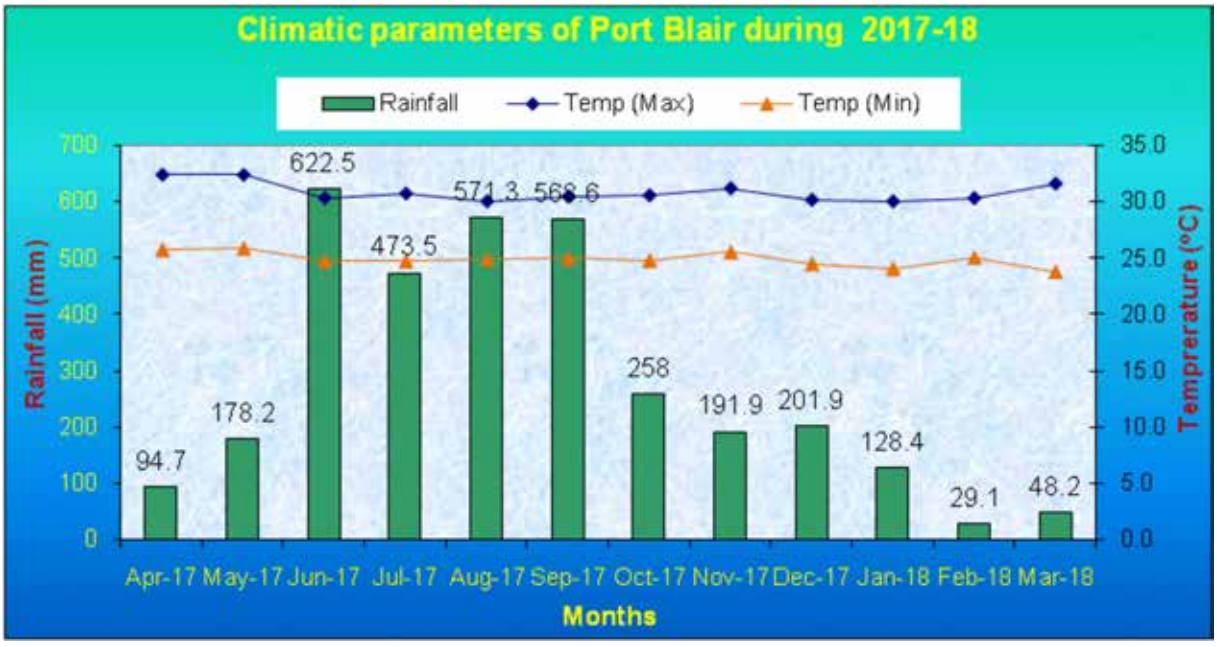
- Shri K. Babu Rao,T-3 on 31st August, 2017
- Shri Ambika Singh, T-5 on 30th September, 2017
- Smt. Maria G. Tete TSM on 30th September, 2017
- Shri R. C. Das, T-5 on 31st March, 2018

Left to heavenly abode

- Late A. Panchanathan, SSS on 10th December, 2017

Climate and Climatic Parameters of Andaman and Nicobar Islands an Overview

Port Blair, Andaman & Nicobar Islands received a rainfall of 3366.3 mm during the year (April, 2017 –March, 2018) in 147 rainy days. Of this rainfall, 2235.9, 651.8 and 478.6 mm were received from South-West (June-September), North-East (October-December) and post monsoon period (January-May). Rainfall received was highest (622.5 mm) in June and was least in February (29.1 mm). The overall performance during the year was rated as normal (105.86% of the mean rainfall of 3180 mm). The year has recorded a mean annual temperature of 27.9^{0}C with mean maximum and minimum temperatures of 30.9 and 24.9^{0}C. Mean monthly temperature was highest during April and May 2017 (32.4 ^{0}C) and lowest during March, 2017 (23.8^{0}C). The climatic parameters of Port Blair during the year are depicted below.



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