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2002-2003

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PREFACE

Andaman & Nicobar group of Islands possessing unique biodiversity and comparatively unexplored flora and fauna have gained importance not only at National level but also in International scenario. The Islands experience a typical, hot humid climate with Island ecosystem. It offers, on the one hand, many advantages in spite of having lot of inherent disadvantages. The flora and fauna of these coral islands and rich tribal knowledge are yet to be documented and characterized fully. Further, the increasing stress on tourism and value addition has opened a new vista in the islands development.

The CARI, which is going to complete 25 years of its existence on June 23, 2003 and is carrying out many pioneer research works with multi disciplinary approach in various agricultural and allied sectors, is now focusing itself to face the new challenges in the coming years. The scientists of the institute who bagged many prestigious awards are fully geared up to exploit the benefits of WTO and other International agreements.

The institute is not only engaged in conducting research and developing technologies pertaining to the island ecosystem, but also giving full stress in transfering the technologies and getting them implemented in the field with the collaborative approach. This has been providing a broader research base to the scientists with multiple problems to tackle, which led to the prosperity of the farming community and weaker sections of the society. The relevance of the technologies developed by the Institute in solving the growing unemployment problem in the islands, particularly in the agriculture and allied sectors is another prime concern to the scientists. In this scenario, many campaigns with integrated approach involving farmers and development departments have been designed for implementation.

It is imperative to have a reliable database for the islands containing various genetic resources, biotic and abiotic stresses, production limitations and other related aspects for the benefit of not only islanders but also planners and policy makers. Generation of quality planting and seed materials and technological inputs, documentation of resources for their sustainable exploitation and value addition are now the prime concerns to the scientific community in the islands. It is the right time to face the challenges to make the islands self sufficient and explore the possibilities for boosting the export of value added agricultural products. Closer link between farmers and scientists is a welcome step in this direction and we hope in the near future tremendous benefits will occur with this close linkages. The brief annual scientific progress and achievements for the year 2002-2003 is highlighted in this report.

Dr. R.B. Rai
Acting Director

DIVISION OF HORTICULTURE & FORESTRY

- Varietal evaluation of different vegetables revealed that among them ridge gourd variety Pusa Nasdar, cowpea variety Laffa, amaranthus variety Co-2 recorded the maximum yield. Cultivation of high value vegetables like capsicum, beans, tomato was feasible and economically viable under protected cultivation. Nutritional requirement was standardized for okra and amaranthus. A fertilizer dose of 75:120 kg NP/ha was found suitable for okra and amaranthus respectively.

- Bacterial wilt resistant lines were identified in tomato (BT-1, BT-105, BT-116-8-1, BT-118-4-1-1, CHDT-1), brinjal (BB-93C, BB-64, BB-40) and chilli (LCA-334, Pant –C-3, BC-14-2, Surakta, AC-92-4).

- Out of 10 varieties of banana evaluated, variety Dwarf Cavendish registered the highest yield followed by Red Banana. Out of 7 mango varieties/hybrids studied, the variety, Neelam and the hybrid, Arka Punit recorded the maximum canopy spread, hight and girth.

- Among 4 selections of custard apple evaluated, Sel. 1 gave the highest yield (6.175 kg/tree). 3 varieties of passion fruit were studied for its growth in the first year after planting. Variety Kaveri produced maximum height (3.10 m) followed by Andaman local (2.88 m). Seed and leaf of Alligator's apple were analyzed for their various nutrient composition. It showed that cotyledon is rich in fat (43%).

- Underutilized fruits like West Indian cherry, bilimbi, carambola and chalta were analyzed for their physico-chemical characteristics. Bilimbi recorded the maximum acidity with 4.57%. All these fruits exhibited higher calcium and phosphorus contents.

- Varietal evaluation of gerbera revealed that cultivar Red gold recorded the maximum number of flowers/plant/year (155) whereas Nilima recorded the maximum flower diameter (12.5 cm) followed by Red gold (11.5 cm).

- 31 species of exotic orchids and 22 hybrids of cattleya were collected from mainland for evaluation under Andaman conditions. Studies on vase life of native orchids showed that *Eulophia andamanensis* had the highest shelf life of 49.50 days. Among the shade loving plants, *Euphorbia epiphylloids* was found highly suitable indoor plant.

- Studies on ecological sustainability of plantation based land use revealed that *Pueraria* added the maximum biomass (11.00 t/ha) and nutrients (72.90, 3.90 and 86.40 kg NPK/ha).

- Among the indigenous germplasm collection of coconut, Rangath Sweet has recorded the highest yield (125 nut/palm/year). Among the exotic germplasm

collection, Niulekha, a dwarf cultivar was found to be promising with the highest copra content of 245 g/nut.

- Elite palm arecanut G-215 was identified as the highest yielder of nuts (1468 nuts/palm/year). In arecanut based farming, gross and net return varied from Rs. 25,500 to 1,10,000 and Rs. 12,500 to 94,000/ha respectively.
- *Gliricidia* based hedge row intercropping study revealed that maize yield declined 23% in the alley-cropping system. But, *Gliricidia* hedge produced 8.7 t/ha/yr with pruning biomass containing 3.01% of nitrogen and also reduced the soil erosion by 54% which collectively compensated the yeild loss of maize therby making the system viable. *Gliricidia* was found suitable standard for black pepper cultivation in the island as 4 years old pepper vines produced 2 kg berries on a *Gliricidia* shrub.

DIVISION OF FIELD CROPS

- Rice yield trials over multi-locations across years enabled to recommend Quing Livan No.1, Nanjing 57161, Taichung Sen Yu, MTL 113 and Milyang 55 as the most promising varieties producing about 5 t/ha for large-scale cultivation under the humid tropics of Bay Islands.
- 17 'new plant type' (NPT) rice varieties were tested in Kharif 2002 and IR 67964-46-1-3-2 was found to produce the largest panicle and the highest yield.
- Pokkali somaclones were evaluated at SC_{12} and BTS 24, BTS 18, BTS 14-2-1 and BTS 10-5 were found to be promising with yield potential of 3 t/ha under saline soil.
- Microprojectile based gene delivery was optimized involving vectors pCAMBIA 1301 and pCAMBIA 1305.2. Basmati 370 and Pusa Basmati were found to be efficient recipient varieties displaying optimum transgene expression. The protocol developed across varieties seems to be compatible for other *indica* varieties in developing transgenic plants with economically important genes.
- 12 varieties of tomato were evaluated for growth and yield parameters with the application of plant growth regulators. Fruit weight per plant was maximum with IAA in PP II, followed by Pant 5 and LE 3704.
- Tomato varieties were evaluated for agro-morphological characters with hormonal treatments and salinity stress. Higher yield per plant was observed in KS 118 with Kinetin. However, with increasing salinity, better yield was obtained with GA_3 treatment in PP II.
- Somaclones developed from brinjal varieties, viz. BB 66C, SM 141 and BB 60C were evaluated at SC_3 generations for agro-morphological characters including disease and pest tolerance. Among them 149 promising somaclones were selected.

- Micropropagation of an endemic medicinal plant, *Alpinia sp.* has been developed. The best medium for micropropagation was found to be 2mg/l BAP+0.5mg/l NAA. Rooting media for WPM containing 5 mg/l, was found to be the best rooting medium. *Ex-vitro* survival of the micropropagates was found to be 100%.

DIVISION OF NATURAL RESOURCE MANAGEMENT

- Study focusing on runoff loss and soil loss under different crop canopies (oil palm, coconut, arecanut, agro-forestry, fodder and forest) and slopes and measures to arrest these losses revealed that the soil and runoff loss increased significantly in all crop canopies with increasing slope during the period under study except agroforestry and forest. Further, the moisture content was the lowest at 0-15 cm depth regardless of the crop canopies.
- The BBF land manipulation divides the one hectare of land to 0.6:0.4 ratio for rice and vegetables respectively. The beds of 4.5m wide and furrows of 6-7 m wide were found suitable for BBF system.
- Amaranthus-Bhendi-Ratoon bhendi was found the most profitable cropping sequence for beds with higher net returns (Rs. 81600) and B:C ratio (2.74). Chilli-Cauliflower-Brinjal and Chilli-Cowpea-Raddish sequences can also be recommended for beds on the basis of net returns and B:C ratio.
- In the furrow, Quing Livan No.1-Ratoon was the most promising cropping sequence compared to Taichung Sen Yu-Ratoon and S1P1 681032-Ratoon. Quing Livan No. 1-Ratoon with 40 kg N/ha recorded grain yield of 3232 and kg/ha.
- Among 11 paddy varieties tested for anaerobic water seeding, 145, Nanging-57161, C14-8, Zen-Gui-At, NARDI-110, BTS 24 and Quing Livan No. 1 responded positively to water seeding at a depth of 5 cm. Among these varieties C 14-8 registered the maximum germination percentage (94.5), seeding height (31.5 cm), seeding DMP (842 kg/ha) and seeding vigor index (2448).
- Eventhough first 3 weeks of sowing recorded 159.5mm of rainfall, wet seeding of C 14-8 using anaerobic seeder registered 2063 kg/ha of grain yield.
- Upon survey of 5 villages of South Andaman, it was found that bullocks and male buffaloes are the main source of draught animal power in these Islands. Indigenous (wooden) plough and planker are the main animal drawn implements. The use of improved farm implements is very low in Islands as compared to mainland.
- Study on the effects of deforestation and cultivation on specific and general biochemical characteristics, soil microbial indices, community structure and their relationships in native soils under wet tropical forests of South Andaman revealed

that on a long-term basis, deforestation and cultivation markedly reduced microbial activity and substrate use efficiency due to significant decline in available organic matter/substrate levels.

DIVISION OF ANIMAL SCIENCE

- Rearing of Japanese quails revealed that cage reared birds excelled over deep litter reared birds in terms of age at first egg production, age at 50% egg production, total egg production and hatchability. Oral feeding of S.cerevisiae- 49 had a beneficial effect on growth and feed conversion efficiency of Japanese quails. It could be reared successfully with optimum fertility with the male and female ratio of 1:1 or 1:2 in deep litter.
- F2 generation with 50% exotic inheritance of Holstein Friesian and 62.5% exotic inheritance of Jersey (with local cattle) had been produced after selection and culling in F1 generation on the basis of their phenotypic performance, disease tolerance and adaptation in this climate. Comparative performance of indigenous and genetically upgraded cattle for their growth, production and reproductive traits was evaluated.
- Progeny of the crosses of ILI-80 with White Nicobari, Black Nicobari and Brown Nicobari had been produced. The body weight was better in case of Black Nicobari crosses than other crosses. But, the feed conversion efficiency, age at sexual maturity and egg production were found better in White Nicobari crosses than Black Nicobari crosses.
- In developing the economic ration by using locally available energy and protein sources, it was found that colocasia root powder could be used as an energy sources in the quail ration without adversely affecting growth of the quail chickens.
- On screening of sera samples for sero surveillance and antigenic characterization of etiological agents of major livestock and poultry diseases in the Islands, 77.4% cases were found positive for *Salmonella pullorum,* 9.02% for *Mycoplasma gallisepticum*, 91.3% for *Chicken Anemia Virus*, 95.6% *Reo* virus and 46.15% for *Avian encephalomyelitis* in case of poultry, 13.3% for *Brucella melitensis* in goats, 43.75% for Swine fever in pigs, 20.47% for Brucella, 23.56% for IBR, 42.3% for TB and 46.15% for JD in cattle.
- Study to investigate seasonal changes in the aflatoxin level depending upon storage period and conditions in various food/ feed stuffs indicated that sources rich in protein had a higher incidence of fungi infestation and thus recorded higher level of aflatoxin in the feed ingredients.

DIVISION OF FISHERIES SCIENCE

- The clown fish , *Amphiprion percula* was successfully bred in captivity. Each female laid 300 to 800 capsule shaped eggs in each spawning, which hatched in 7 days to release the larvae. The larvae could be raised to juveniles with 90% survival. Another species, *A. sandarocinos* was successfully bred for the first time by giving formulated feed.
- Walnes medium gave the highest population growth of cultured microalgae in 6-9 days. The shelf life of various microalgae varied from 5 days to 2 months.
- Two species of edible oysters, namely *Crassostrea rivularis* and *Saccostrea cucullata* were found to be dominant and had culture potential in Andaman waters.
- The observation on grouper catches indicated the dominance of *P. pesuliferus* and *Veriola louti* which were targeted due to export value.
- The culture of tilapia, *Oriochromis urolepis* in brackishwater gave a production of 1 t/ha in 6 months.
- The culture trials on the giant freshwater prawn, *Macrobrachium rossenbergii*, alongwith Indian major carps with a stocking density of 8000 prawn seeds/ha gave a production of 500 kg of prawn/ha in 7 months. The juveniles reached above 100g size and matured in a period of 7-8 months.
- The isozyme characterization of the mullet, *Liza tade* from South and Middle Andamans showed consistent polymorphism.
- The characterization of backcrossed carps with isozyme profile indicated different polymorphic loci with regard to esterase phosphoglucomutase, superoxidodimutase, etc.

SOCIAL SCIENCE SECTION

- Under TAR-IVLP, 16 technologies in agriculture and allied fields were intervened in more than 330 farmers' field in 8 villages in South and Middle Andaman Islands. Some of the achievements like successful rice cultivation in saline sulphate soils of Dasrathpur village through intervention of suitable variety, participatory water stress management in vegetables through construction of check dam on the nallah, commercial cultivation of cut flowers by the farmers and backyard framing of improved Nicobari birds for higher income were remarkable for this year.

KRISHI VIGYAN KENDRA

- 23 training courses were conducted for the target groups namely, farmers, farm women, youth and extension personnel, wherein 231 men and 291 women got trained in various agriculture and allied fields.
- Under Frontline demonstration (FLD) on pulses, Black Gram, var. PDU1 gave an average yield of 7.95 q/ha, whereas in the Green Gram, var. PDM54 gave an average yield of 8.76 q/ha. In Oilseeds, var. Swetha of Sesame gave an average yield of 6.27 q/ha. In HYV of rice, var. Krishna Hamsa performed the best (5.48 t/ha). Vegetables namely Ridge gourd, var. Arka Sujat (204 q/ha), Cowpea, var. Arka Garima (104 q/ha) and Brinjal, var. BB45C (412 q/ha) were the best.
- The Nicobari fowl gave an average yield of 140 eggs whereas the Khaki Campbell duck yielded 230 eggs per bird. Quail gave 17.5 kg (42 days) and broiler (Samrat 2000) gave 180 kg (45 days)/100 bird unit in each.
- Under OFT, NARDI 110, a HYV of rice for normal soil gave an average yield of 4.56 t/ha, whereas in problem soil BTS 24 gave an average yield of 2.75 t/ha.
- For popularization and dissemination of the proven technologies in agriculture and allied fields for the target groups, numerous extension activities were conducted comprising of field days, field visits, exhibition, campaigns, farmers meet, kisan goshti, farmers scientists interaction, diagnostic services, world food day, kisan divas, women in agriculture day, media personnel visits, radio and TV talks and promotion of farmers club in the adopted villages.

HISTORICAL PERSPECTIVE

Agriculture in the Bay islands is about 135 years old and obviously started at the expense of forest land with the help of contract labourers and later on the activity was carried on by the settlers from different parts of mainland, India. In 1927, the Department of agriculture was established; till 1901, 10198 ha were cleared of which 4198 ha were put under cultivation. In 1981, the area under cultivation went up to 40594 ha and in the year 2000, the total area reached 50410 ha. Soon after independence, these islands faced the influx of refugees from Bangladesh (erstwhile East Pakistan) and with abrupt influx of these new settlers, the socio-economic status of the existing population underwent a tremendous metamorphosis. To ensure food and economic security, the government allotted 2 ha of cultivable paddy land and 2 ha hilly land to the settlers.

In Nicobar, coconut and arecanut cultivation has a historical past. But unsystematic cultivation and over-crowding population have affected the yields of these plantations very badly. Inspite of government grant and input assistance, agricultural production has fallen short of demand necessitating shipment of food grains, vegetables and fruits from mainland. With the opening of better communication infrastructure, the Islands attract tourist population from mainland and abroad. The increasing influx of population is taxing the assimilative capacity of the Andaman and Nicobar Islands. The Government of India has therefore decided to develop these islands in a more comprehensive and integrated manner with minimum disturbance to the environmental quality.

As the available land for cultivation is minimal, harnessing of the resources in a sustainable manner has assumed paramount importance. A step towards this goal was the establishment of Central Agricultural Research Institute by amalgamation of the Regional Research Stations of ICAR, namely, the Indian Agricultural Research Institute, New Delhi, the Central Marine Fisheries Research Institute, Cochin, the Central Plantation Crops Research Institute, Kasaragod and the Indian Veterinary Research Institute, Izatnagar with the ICAR Regional Centre for NEH region. The Institute has been entrusted with the onerous task of catering to the needs of the population of these islands and conservation of ecosystem, as well, by forging a research base to enhance crop, livestock and aquatic productivity through the judicious use of the rich and diversified, though, fragile natural resource base of these islands.

Central Agricultural Research Institute (CARI) is playing a significant role in agricultural research in these islands. The Institute is catering to the need of the Islands' farming community. CARI is evaluating and developing appropriate technologies in agriculture and allied fields and is transferring them to farmers through its Krishi Vigyan Kendra (KVK) and Agricultural Technology Information Centre (ATIC).

MANDATE

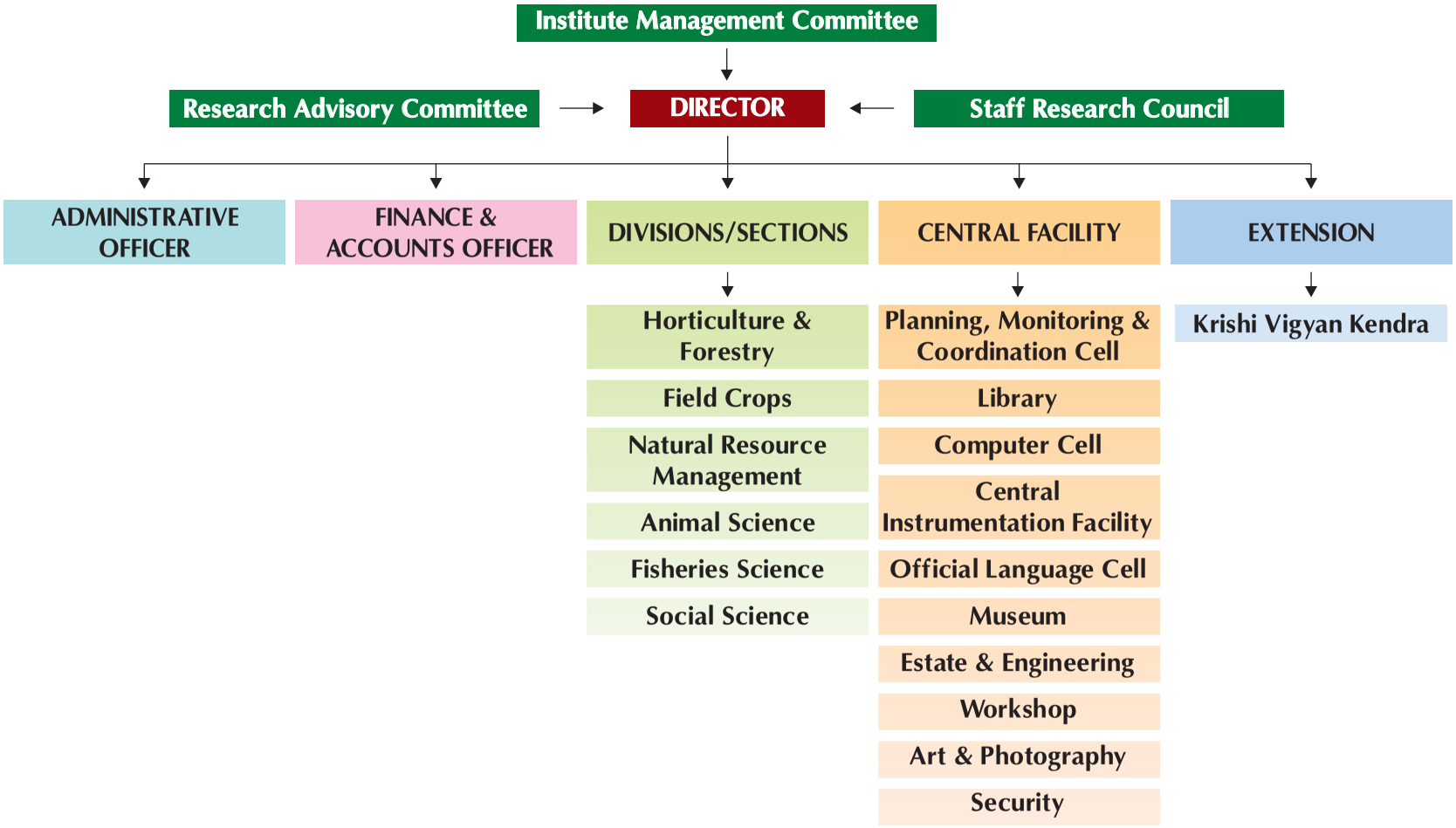
- To provide a research base to improve the productivity of important agri-horticulture, livestock and fisheries of A & N islands through adaptive and basic research for attaining economic self-sufficiency.
- To develop appropriate plans for conservation of natural resources and their sustainable use.
- To standardize technologies for animal health coverage and livestock production.
- To standardize techniques for capture and culture fisheries including coastal aquaculture.
- First line transfer of technology and training to the relevant state departments.

ORGANISATIONAL SET UP

The Central Agricultural Research Institute is located in the remote, backward and tribal territory of Andaman and Nicobar Islands. The main research and residential complex is located at Garacharma, 9 km away from Port Blair, the capital of the Union Territory. The Garacharma Complex houses the Director's Office within administrative block.

Division of Field Crops, Division of Horticulture and Forestry, Entomology and Plant Pathology Section, Division of Animal Science, Division of Fisheries Science and Division of Natural Resource Management have their laboratories in Central Laboratory Block. Recently, a Central Instrumentation facility has been set up in the Central Laboratory block for common access to all the Scientists for utilization of state of art equipments. The field research unit of horticulture, plantation crops, fisheries and the main Krishi Vigyan Kendra building are situated at the Sipighat farm which is 8 km away from the main campus. The Bloomsdale farm is situated 13 km away from the main campus, which is meant for the field experiment work of Natural Resource Management and Field Crops Division. The Institute has also established a fisheries laboratory at Marine Hill. World Germplasm Centre under CPCRI, Kasaragod has been merged with Central Agricultural Research Institute, Port Blair.

ORGANOGRAM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Central Instrumentation Facility
Official Language Cell
Museum
Estate & Engineering
Workshop
Art & Photography
Security
Krishi Vigyan Kendra

STAFF POSITION

Sl.No.	Category	Sanctioned	Filled
1.	Scientific	59	34
2.	Technical	55	46
3.	Administrative	34	29
4.	Supporting	86	86
5.	Temporary Status Holder	57	57
	Total	291	252

FINANCIAL STATEMENT

The Annual Budget of the Institute for the year 2002-2003 was Rs. 749.00 lakhs, out of which Rs. 292.00 lakhs was under plan and Rs. 457.00 lakhs was under non-plan heads. The details of the Annual Fund allocation and budget utilization under various heads are given below :

Budget Utilization During 2002-2003

Head of Account	Plan		Non-Plan	
	Sanctioned	Expenditure	Sanctioned	Expenditure
Estt. Charges	0.75	0.75	315.05	291.02
T.A.	11.50	11.45	7.00	6.99
Other charges				
incl. Equipments	193.25	193.28	108.00	112.17
Works	85.00	85.63	26.95	26.89
Total	292.00	291.11	457.00	437.07

RESEARCH PROGRAMMES AND ACHIEVEMENTS

DIVISION OF HORTICULTURE AND FORESTRY

IMPROVEMENT AND AGROTECHNIQUES OF VEGETABLE CROPS

R.P. Medhi and M.A. Suryanarayana

Ridge gourd

Thirteen varieties of ridge gourd including one local variety were evaluated during rainy season. Results indicated that variety

Pusa Nasdar - High yielding var. of Ridge gourd

RAU LA-2 performed better (252.65 q/ha) followed by BRG-3-1 (189.67 q/ha) (Table 1). However, average of three years data with nine varieties indicated that the variety, Pusa Nasdar gave maximum yield of (222.54 q/ha) followed by IAHS-1 (209.31 q/ha).

Cowpea

Twelve varieties of cowpea were evaluated for growth and yield performance during the period. Results indicated that maximum yield was recorded in variety, Laffa (79.10 q/ha) followed by BCP-3 (53.04 q/ha) during the current year (Table 1). Two years average also indicated similar results, i.e.

Laffa - High yielding var. of cowpea

Laffa recorded maximum yield of 94.06 q/ha.

Amaranthus

Six varieties were evaluated in replicated trial for their growth and yield performance during Oct- Nov. 2002. The results revealed significant variations among the varieties in yield and other growth characters. The variety CO-2 recorded maximum yield of 193 q/ha followed by Arka Saguna (174.0 q/ha) and Pusa Kirti (173.0 q/ha) (Table 1). Similarly, maximum plant height (56.3 cm), number of leaves (15.4) and average plant weight (320 g/10 plants) were also observed in CO-2.

Okra

In a nutritional trial on okra variety Prabani Kranti involving 8 treatments with different N and P combination conducted during rainy season, Phosphorus improved significantly all the growth and yield parameters. The maximum yield of 116.26 q/ha was obtained in treatment N_2P_3 (75 Kg N and 120 Kg P_2O_5/ha) followed by N_2P_1 (75 kg N and 40 kg P_2O_5 kg/ha) (Table 2).

Amaranthus

Six nitrogen levels were tried with variety, Arka Suguna during rabi season. The plants

were harvested 24 days after planting. The mean weight of plant was maximum (210.76 g) with treatment 200 kg N/ha. Similarly maximum yield was obtained in treatment N_5 (200 kg N/ha) followed by N_4 (160 kg N/ha) (Table 2).

Table 1. Performance of vegetable crops.

Ridge gourd		Cowpea		Amaranthus	
Variety	Yield (q/ha)	Variety	Yield (q/ha)	Variety	Yield (q/ha)
IAHS-1	119.03	Arka Garima	24.00	Red Danta	138
IAHS-2	88.11	NDCP-13	22.50	CO-5	143
CHRG-1	87.87	NDCP-8	25.60	Arka Suguna	174
CHRG-2	107.03	CHCP-1	31.00	Pusa Lal Chaulai	149
KRG-5	53.00	CHCP-2	30.30	Pusa Kirti	173
Arka Sujat	87.19	Laffa	79.10	CO-2	193
Arka Sumeet	130.33	Black seeded	18.40		
Pusa Nasdar	181.33	Sel-1	23.10		
Agri Local	85.88	Sel-2	25.30		
RHRRG-1	134.67	IR-8	27.00		
RHRRG-2	124.00	Red Pod	25.53		
BRG 3-1	189.67	BCP-3	53.04		
RAU LA-2	252.65				

Table 2. Fertilizer trials on vegetable crops.

Okra		Amaranthus		
Treatment	Yield (q/ha)	Treatment	Wt. of 10 plants (g)	Yield (q/ha)
N_1P_0	69.09	N_0	164.3	37
N_1P_1	80.00	N_1	168.34	46
N_1P_2	86.79	N_2	189.8	56
N_1P_3	71.40	N_3	192.68	56
N_2P_0	96.38	N_4	206.66	66
N_2P_1	107.35	N_5	210.76	69
N_2P_2	104.12			
N_2P_3	116.26			

N_1 - 50 kg N/ha
P_0 - Nil
P_1 - 40 kg P_2O_5/ha
N_2 - 75 kg N/ha
P_2 - 80 kg P_2O_5/ha
P_3 - 120 kg P_2O_5/ha
N_0 - Control
N_2 - 80 kg N/ha
N_4 - 160 kg N/ha
N_1 - 40 kg N/ha
N_3 - 120 kg N/ha
N_5 - 200 kg N/ha

Sub project

EVALUATION OF SOLANACEOUS VEGETABLES FOR YIELD AND BACTERIAL RESISTANCE IN ANDAMAN & NICOBAR ISLANDS

Kishan Swaroop and M.A. Suryanarayana

Brinjal

Thirty three varieties were evaluated during rabi season. Results revealed that the variety, BB-93 C gave the highest yield (531.66 q/ha) followed by BB-55(509.33 q/ha), BB-45 C (480.00 q/ha), BB-66 C (446.93 q/ha), BB-64 (393.36 q/ha) and BB-40 (377.17 q/ha). More than 90 percent survival of plants against bacterial wilt disease was recorded in the varieties, BB-40, BB-93 C and BB-64 after 150 days of planting.

Tomato

Thirty two varieties were evaluated for their performance with regard to yield and bacterial wilt resistance. Maximum yield was recorded in the varieties, BT-1 (250.33 q/ha), LE-3704 (248.00 q/ha), BT-116-8-1-1 (247.33 q/ha), BT-105 (191.66 q/ha), BL-333-1 (189.00 q/ha) and CHDT-1 (176.33 q/ha). The varieties which recorded 90-100% survival against bacterial wilt disease after 90 days of planting are: BT-116-8-1-1, BT-1, BT-105, CHDT-1, BL-333-1 and BT-118-4-1-1.

Chilli

Twenty two varieties were evaluated and maximum yield of 220 q/ha green chillies was recorded in variety LCA-334 followed by Surakta (180.33 q/ha), RHRC-Clustering erract (180.08 q/ha), LCA-235 (172.16 q/ha) and BC-30 (171.00 q/ha). 100 percent survival was

Different chilli varieties

recorded against bacterial wilt disease at 150 days of planting in varieties such as LCA-334, Pant-C-3, BC-14-2, Surakta, ACS-2000-03 and ACS-92-4.

VARIETAL EVALUATION AND STANDARDIZATION OF AGROTECHNIQUES FOR TROPICAL FRUITS

R.P. Medhi and D.R. Singh

Mango

Seven varieties of mango including four hybrids were evaluated for their performance. Maximum plant girth (78.00 cm) plant height (377.77 cm) and plant spread (375.55 x 406.66 cm) were observed in case of variety, Neelam. Similarly, in case of hybrid mango maximum plant height (388 cm), plant girth (52 cm) and plant spreads (395 x 370 cm) were observed in Arka Punit. (Table 3).

Banana

Ten varieties of banana including one

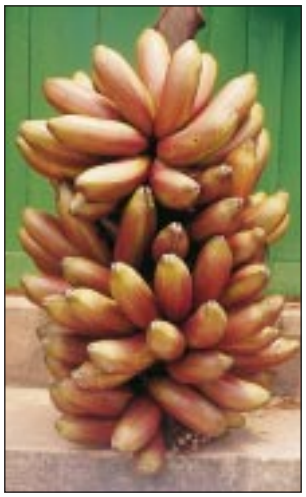
Table 3. Performance of tropical fruit crops.

Mango				Banana					Cashewnut			
Variety	Height (cm)	Girth (cm)	Canopy spread (cm x cm)	Variety	Height (cm)	Girth (cm)	No. of Hands	Bunch weight (kg)	Variety	Height (cm)	Girth (cm)	Canopy spread (cm x cm)
Raspuri	319.66	75.0	371.10 x 406.66	Red Banana	322.21	63.33	4.22	8.35	Selection -2	260.00	22.66	225.0 x 190
Neelam	317.77	78.0	375.55 x 406.66	Ratalu	329.33	66.77	3.44	7.32	Priyanka	213.33	17.34	130.0 x 105
Malgoa	340.00	46.0	358.33 x 358.33	Dwarf Cavendish	170.99	69.10	7.66	9.56	V-6	300.00	20.00	275.0 x 315
Arka Arun	315	38.0	300 x 235	Cheena	331.66	69.00	7.88	6.63	V-4	326.67	20.67	350.0 x 315
Arka Punit	388	52.0	395 x 370	Khatta Champa	326.00	53.33	7.83	6.47	Jhargram-1	183.34	13.34	105.0 x 90
Arka Anmol	265	34.5	249 x 260	Metha Champa	255.66	60.21	5.10	5.44	V-1	130.00	21.67	132.5 x 136
Kesar Afus	180	25.0	200 x 180	Ney Poovan	353.32	56.11	6.61	4.10	UN	163.34	10.00	165.0 x 140
				Raja Bale	398.77	61.22	6.55	7.28	Local	276.67	20.34	250.0 x 250
				Korengi	381.66	67.33	6.00	6.45	VRI-3	140.00	14.34	165.0 x 140

Table 4. Performance of indigenous fruit crops

Custard apple			Passion fruit		
Variety	Height (cm)	Yield (Kg/tree)	Variety	Height (cm)	Yield on main stem
Sel – 1	3.25	6.175	Kaveri	3.10	103
Sel – 2	2.90	4.250	Mizoram selection	2.70	106
Sel – 3	2.50	4.500	Andaman local	2.88	120
Sel – 4	2.45	3.750			

plantain were studied for growth characters and yield performance for ratoon crops (Table 3). Maximum bunch weight was observed in case of variety Dwarf Cavendish (9.56 kg) followed by Red Banana (8.35 kg) and Ratalu (7.32 kg).


Red Banana

Cashewnut

Eight varieties and a local collection were planted to evaluate their performance in South Andaman. After two and a half years of planting, maximum height was recorded in variety, V-4 (326.7 cm) followed by V-6 (300 cm) whereas highest girth was recorded in Selection -2 followed by V-1. Maximum canopy spread was recorded in V-4 (across 350 and along 315 cm) followed by V-6 (across 275 and along 315 cm). The graft of V-1 showed first flowering during the month of Oct 2002 and maximum flowering was observed in local variety followed by V-4 (Table 3).

INTRODUCTION AND EVALUATION OF EXOTIC AND LESS KNOWN INDIGENOUS FRUIT CROPS

D.R. Singh and R.P. Medhi


Custard apple

Custard apple

Four selections namely Sel-1, Sel-2, Sel-3 and Sel-4 were planted in Garacharma farm during the year 1996-97 to evaluate their performance. Vegetative parameters indicated that the maximum plant height (3.25 m), plant spread (3.0 m) and yield 6.17 kg/tree were recorded in Sel-1 (Table-4). In custard apple, hulled seeds with 36 hrs. water soaking recorded the maximum germination (90%) and took least number days (14) for germination as compared to other treatments.

Passion fruit

Three varieties namely Kaveri, Mizoram selection and Andaman local were collected and planted in June 2002 to evaluate for their performance. Maximum growth was observed in variety, Andaman local (Table 4).

Soursop

Soursop selection planted in Garacharma farm during 1996-97 recorded yield of 55 fruits/tree. Fertilizer trial in soursop seedlings planted during 2001 showed that a dosage of 300 g urea and 150 g phosphorus produced maximum height (190 cm) and number of branches (80) compared to other dosage of

fertilizers.

Alligator's apple

The leaves and seeds of alligator's apple were analysed for their nutrient

Alligator's apple

composition. The seedlings were found to be saline resistant.

West Indian Cherry

Fruits were analysed for their physico-

West Indian Cherry fruits and its seeds

chemical and nutrient compositions and shown in Table 5.

Carambola (Star fruit)

Bilimbi fruit

Fruits of carambola were analysed for their mineral compositions and observed that it had high percentage of crude fibre (23.53 %) and crude protein (5.25%).

Bilimbi

Bilimbi seedlings planted during 1993-94 recorded an yield of 250 kg/tree and mature fruits were analysed for their mineral composition (Table 5).

Chalta

Plant growth regulators, viz. IBA and NAA@ 1000, 1500 and 2000 ppm were used for rooting in semi-hardwood cuttings. Among the treatments, 2000 ppm IBA produced significantly higher percentage of survival (93.22), number of roots (21.61), length of roots (30 cm) and number of leaves (22). Physico-chemical and mineral compositions of the fruit

Table 5. Nutrient composition of indigenous fruit crops.

Component	Alligator's apple		West Indian Cherry	Bilimbi
	Leaf	Seed coat		
Moisture (%)	35.95	9.04	92.17	90.71
Dry matter (%)	64.04	90.96	7.82	9.28
Crude Protein (%)	13.56	2.19	8.75	7.00
Crude Fibre (%)	20.75	73.80	15.45	17.65
Ether extract (%)	2.40	2.40	0.15	1.60
Insoluble ash (%)	0.45	-	0.10	5.10
Calcium (%)	2.50	-	0.50	0.50
Phosphorus (%)	0.12	-	0.17	0.05

showed higher percentage of crude protein and curde fibre.

COLLECTION AND EVALUATION OF TUBEROSE, GLADIOLUS, CHRYSANTHEMUM, GERBERA, MARIGOLD, BALSAM AND AMARYLLIS

Sujatha A. Nair and D.R. Singh

Performance of Chrysanthemum varieties

Nine varieties of Chrysanthemum were evaluated for their performance in open conditions. Red Gold recorded the maximum number of flowers per plant per year (155) with 15 sprays / plant and the spray stalk length was 32 cm. Nilima recorded the maximum flower diameter (12.5 cm) among different varieties followed by Red Gold (11.5 cm). *CO-1 chrysanthemum recorded the longest flowering duration with flowering being initiated in October and continuing until March. This variety also produced the maximum number of suckers per plant. CO-1 followed by Chandrika was suitable for loose flower purpose. Kirti was found to be suitable for pot culture, being dwarf in stature and floriferous with light weight flowers.

Nineteen varieties such as Kasturi, Aparajitha, Lord Robbert, Appu, Mr.s.CTally, Autumn King, Nanako, Basanti, Pancho, Bhavana, Phillies, Birbal Sahini, Punjab Anuradha, Coy, Ravi Kiran, Flirt, Schizuca and Shyama were collected from Dr. Y.S. Parmar University of Hort. & Forestry, Nauni, Solan, for evaluation.

Spacing trial in Amaryllis

Among the different plant populations planted per unit area, the optimum spacing for amaryllis was found to be 20 x 25 cm yielding 20 spikes / m^2 of 21.5 cm length.

Pre-planting treatment with plant growth regulators in tuberose cv. Single

The bulbs of tuberose cv. Single were pre-treated with varying concentrations of plant growth regulators. Pre-treatment of tuberose bulbs with 200 ppm GA_3 resulted in the production of maximum number of marketable spikes per plot (38.5) with the maximum spike length (109.50 cm).

POST-HARVEST STUDIES

Vase life of Chrysanthemum varieties

Red Gold recorded the maximum vase life of 7.5 days when held in distilled water and was on par with Nilima which remained fresh for 7.2 days in the same holding solution. Kirti recorded the minimum vase life of 2.8 days.

Packaging and Storage

Nilima kept fresh for 15 days in polybags with 1% vent at 4^0 C and Red Gold for 13.5 days whereas at ambient temperature, the shelf life was 3.5 and 2.1

days respectively.

COLLECTION, CATALOGUING, EVALUATION AND STANDARDIZATION OF AGRO-TECHNIQUES OF NATIVE AND EXOTIC ORCHIDS AND SHADE LOVING PLANTS

D.R. Singh and Sujatha A. Nair

Exotic Orchids

Thirty one species of exotic orchids were collected, viz. *Eria rufinhla, Dendrobium mischatlim, Bulbophyllum leptanthum, Dendrobium cathcatrii, Aerides multiflorum, Dendrobium maceri, Aerids odoratum, Dendrobium moschatum cupreum, D. cripidatum, Bulbophyllum triste, B. ebullum, Aerides odoratum, Oberonia croftiana, Vanda cristata, D. arachrits, B. thomsonii, D. nobil, Epidendrum xanthum, C. pendulum, B. scabratane, Epidendrum radiacuas, Vanda cristata, Coelogyne pubscens, Oncidium growsransey, Grreptalum macelosum, Ascocenbuna anpullaceaum, Agcostphyllum sp., Eria pubesens, B. affine, Coeliogyne flanida* and all these species are being evaluated.

Hybrids

Twenty two hybrids of cattleya were collected for evaluation under Andaman conditions. They are George King X Anceps, Destiny X Michal Collins, Hawin Wedding Sany X J. Delight, Elizabeth Futton X Lucky Strike, Helanbrown X Pastrol Innocence, Queen Sinikhet X Jilla Wildeness, Queen Sirikhet X HWS, HWS X Queen Sirikhet, C. pradhan udais yellow X Intermedia, Udais Yellow X HWS, HWS X purpuates, Tokyo Boy X September Song, Forbesi X HWS, Udias Cat Yellow X V. gold, HWS X Little Fliver, Elizabeth Futton X Yaiwayong (White), Blue Spring D. X Irene York, Tokyo X Angel Bell suzie, George King X Lucky Strike, Profyashpal X Irene York, Naomikern X Jigmi Delight, Desse X September Song.

Indigenous Orchids

Five species of *Bulbophyllum* and six species of *Dendrobium* were collected and cataloguing is in progress.

Evaluation of orchids and shade loving plants

Native orchids were evaluated based on their vegetative and floral characters. *Eulophia andamanensis* was found more suitable for cut flowers. (Table 6). Two native orchids namely *Dendrobium crumenatum* and *Dendrobium formosum* were found suitable for growing in coconut shell. With regard to shade loving plants, the indigenous shade loving plant, *Euphorbia epiphylloids* was found the most suitable as indoor plant.

Anthurioum var. Wrinkled Orange

Fourteen varieties of Anthurium were evaluated and it was observed that among all the varieties, the Honey produced the maximum number of flowers (26) followed by Mauritius and Wrinkled Orange with 23 and 20 flowers/plant respectively for two years continuously. Vase life studies revealed that Agnihotri and Colorado both had maximum vase life (110.50 days) followed by Deep pink (105.50) and Salasaga (90.00) days.

Standardization of agrotechniques

Orchids

For three indigenous orchids, viz. *Eulophia andamanensis, Dendrobium aphyllum* and *Luisia teretifolia,* potting media were standardized. The study revealed that the potting media for *Eulophia andamanensis* consisting of a combination of charcoal + coir dust + coconut husk + leaf mould without brick pieces influenced better plant growth and flowering when compared with other combinations. However, charcoal + brick piece + coir dust + coconut husk produced the maximum number of flowers/spike (29.0). The potting media comprising of charcoal + brick pieces + coconut husk + leaf mould in equal ratio recorded the maximum number of flower/spike (5) and shelf/life (4 days) in *Dendrobium aphyllum*. In *Luisia teretifolia*, the potting media consisting charcoal + brick piece + coir dust + coir dust + leaf mould in equal parts gave the maximum number of flowers/spike (9.75) and shelf life (13.50) days.

Eulophia andamanesis

Table 6. Salient features of *Eulophia andamanensis*.

Length of spike (cm)	61.2 – 130
Life of spike (days)	49.67
Flower size (cm)	6.65
No. of spike/Plant	2-4
No. of florets/Spike	29-45
No. of suckers/Plant	2-4
Colour of florets	Green
No. of days taken from first floret opening to last floret opening	25
No. of florets fresh at a time	15-20

Shade loving plants

For endemic shade loving plant *Euphorbia epiphylloids,* rooting media were standardized. The study revealed that media consisting of red soil, sand and compost in 1:1:2 ratio produced the maximum percentage of rooting (90.00) and survival (100%).

Euphorbia epiphylloids

Post harvest studies

Vase life study on native orchids revealed that *Coleogyne trinervia* had the

maximum vase life (10 days) followed by *Cymbidium aloifolium* (9 days) and *Dendrobium crumenatum* (3 days).

IMPROVEMENT OF COCONUT AND ARECANUT

M.A. Suryanarayana

Coconut hybrids had been under evaluation along with Andaman Tall and Dwarf varieties since 1994. The mean morphological characters recorded on 8th year of planting (Table 7) revealed that maximum number of leaves (16.3) was produced in D x T hybrids, whereas the length of the leaf was the highest in Natural cross dwarf palm (416.3). The D x T hybrids palms recorded the maximum girth at base (128.6 cm) and maximum number of leaflets (178.1).

Among the 24 Pacific Ocean Islands collection (exotic) maintained, a total of 905 seed nuts from 11 accessions were sent to CPCRI, Karsaragod for screening against the root wilt affected areas of Kerala.

Arecanut

Four varieties, viz. Cal-31, Cal-35, Mangala and Samrudhi were being evaluated since 1992. Mean morphological characters recorded on the 10th year of planting (Table 8) revealed that the least plant height (7.92 m) was recorded in Mangala.

Highest number of leaves and maximum girth (10.3 and 66.6 cm) was recorded in Samrudhi, where as the number of nodes was maximum (51.1) in Mangala. Though the highest number of bunches (2.1) was

Table 7. Morphological characters of coconut hybrids.

Cultivar	Height of palm (m)	Girth (cm)	No. of leaves	Length of the petiole (cm)	Total length of leaf (cm)	Length of the longest leaflet (cm)	Breadth of the longest leaflet (cm)	No. of leaf let
Dwarf	4.80	106.4	14.4	113.6	385.8	101.4	5.04	178.8
T x D	5.15	125.3	13.6	131.1	409.0	96.2	4.56	168.0
NCD	5.07	120.8	15.0	111.6	416.3	92.2	4.44	173.1
Andaman Tall	5.08	126.0	13.8	138.3	399.0	98.0	4.55	148.0
D x T	4.89	128.6	16.3	121.6	405.5	97.9	4.57	178.1

Among the 24 Pacific Ocean Islands collection (exotic) maintained, a total of 905 seed nuts from 11 accessions were sent to CPCRI, Karsaragod for screening against the root wilt affected areas of Kerala.

Table 8. Morphological characters of arecanut.

Cultivar	Plant height (m)	Girth (cm)	No. of leaves	No. of nodes	Internodal length (cm)	No. of bunches/ palm	No. of nuts/bunch
Mangala	7.92	62.6	10.0	51.1	14.5	2.1	111.0
Samrudhi	8.80	66.6	10.3	46.4	17.8	1.9	182.0
Cal-31	8.32	60.8	10.0	41.8	22.9	1.3	74.2
Cal-35	8.12	54.3	8.8	42.4	19.7	0.3	4.7

recorded in Mangala, the maximum number of nuts/bunch (182/bunch) was recorded in Samrudhi.

STUDIES ON PLANTATION BASED SPICE CROPS FOR TROPICAL REGION

M.A. Suryanarayana

Two different models of arecanut based spices cropping system comprising of clove, nutmeg, cinnamon, black pepper and bay leaf were being maintained in an area of 0.7 ha and 0.15 ha respectively. The three year mean yield data revealed that in Model-I an yield of 2,10767 No. of arecanut, 17.3 kg black pepper, 30.13 kg cinnamon and 0.04 kg clove was obtained, where as in Model-II, a mean yield of 42,500 No. of arecanut, 7.1 kg cinnamon, 2.1 kg clove, 4 kg bay leaf and 66 No. of nutmeg was obtained.

TREE-SOIL-CROP INTERACTION IN A & N ISLANDS

C.B. Pandey and A. Venkatesh

Giricidia based alley-cropping

To know the relative effect of aboveground and belowground competition on maize crop in a *Gliricidia* based alley-cropping system in humid climate, three competition situations were created: *Gliricidia* hedge + maize, *Gliricidia* shrub + maize and sole maize crop. Maize grain yield declined in the alley-cropping system to the maximum of about 34% due to above ground competition and minimum 23% due to belowground competition. Other yield attributes of the crop also suffered reduction similar to that of grain yield (Table 9).

Gliricidia hedgerows produced pruning biomass of 8.7 t / ha / yr, which contained 2.01% nitrogen. It can be used either as a green mulch. Alternatively, it can also be used as a green fodder. *Gliricidia* leaves are moderate in palatability.

Table 9. Gliricidia/maize competition in alley-cropping system.

Treatment	Cob length (cm)	Cob diameter (cm)	Grain yield (t / ha)	Straw yield (t / ha)
Gliricidia hedge + Maize	16.4	3.7	2.95	1.98
Gliricidia shrub + Maize	14.2	3.2	1.64	1.63
Sole maize crop	15.4	3.5	3.84	1.83

Table 10. Soil erosion under different treatments in an alley-cropping system.

Treatment	Total soil loss (t / ha / yr)	Nitrogen loss (kg / ha)	Phosphorus loss (kg / ha)
Gliricidia + Maize + Tillage	122.35	194.53	36.70
Gliricidia + No maize + No Tillage	45.20	67.80	13.56
No Gliricidia + Maize + No Tillage	7.19	10.78	0.21

Gliricidia - a standard for black pepper

In addition, *Gliricidia* hedgerow, raised across the slope, arrested soil erosion (Table 10). Maximum soil erosion at 45° slope in the alley-cropping (*Gliricidia* + maize) occurred under tillage condition. Following tilth preparation, a maximum of 86% soil loss of the total soil erosion occurred within 2 months and declined thereafter due to stabilization of soil. Chemical analysis of the soil indicated that eroded soil contained 194 kg N and 37 kg P.

Though *Gliricidia* hedgerow affected the maize yield adversely, pruning biomass production from *Gliricidia* hedgerows and its role in soil erosion control together made the system economically viable. Besides these, *Gliricidia* was found as a suitable shrub (standard) for black pepper cultivation. Five years old black pepper produced 3 kg berries per *Gliricidia* shrub

DIVISION OF FIELD CROPS

GENETIC MANIPULATION FOR IMPROVED PRODUCTIVITY IN RICE WITH SPECIAL REFERENCE TO BIOTIC AND ABIOTIC STRESS TOLERANCES IN BAY ISLANDS

Asit B. Mandal and R. Elanchezhian

Identification of promising rice varieties for Andamans

To mitigate almost 50% production requirement gap in rice, medium duration HYVs were introduced and evaluated recurrently in Bay Islands. Plant height, number of panicles per plant and panicle length of those varieties was found in the range of 96.4 to 103.00 cm, 5.5 to 7.73 and 21.73 to 23.80 cm, respectively (Table 11). Yield trials over multi-locations across years recommend Quing Livan 1, Nanjing 57161, Taichung Sen Yu, MTL 113 and Milyang 55 producing about 5 tons/ha for large scale cultivation under the humid tropics of Bay Islands.

Assessment of the performance of the breeding lines

Previously developed breeding lines of the institute were evaluated during Kharif 2002 for identification of the most promising lines. All the lines were found to be semi-tall with moderate panicle length. Plant height was observed to range from 92.46 to 98.06 cm. Lowest EBT/plant (5.46) coupled with high yield potential (9.61 g/plant) was observed in BM 4. Grain yield was found to be ranging from 7.44 to 9.61 g/plant. They would be nominated for evaluation under AICRIP trials in the next season, so that assessment could be done countrywide and most promising entries could be identified and released.

Identification of promising lines of super rice varieties

Seventeen new plant type rice varieties, which are popularly referred as Super rice, were tested during Kharif 2002. The lines were found to be semi-dwarf in stature (90.93 to 107.73 cm) with 110 to 120 days duration (Table 11). Number of panicles per plant ranged from 3.53 to 4.86. This year too, IR 67964-46-1-3-2 was found to produce the largest panicles (28.46 cm) and the highest yield (7 t/ha) among the varieties evaluated under research field condition. However, the yield in general was low this year due to inclement weather during harvesting and threshing constraints.

High yielding new plant type accession (IR 67964-46-1-3-2)

Evolving somaclones in HYV Annada

To further improve upon the existing Annada variety, development of somaclones *en route* tissue culture from

mature seed derived calli was attempted. Among 9 promising somaclones selected previously, 3 somaclones, viz. Soma 7, 2 and 11 were found to be promising producing 8.44, 7.67 and 7.58 g/plant, respectively. However, with a view to recover desirable stable lines, progenies of all the nine entries have been forwarded for assessment in the next rice-cropping season.

Assessment of Pokkali somaclones at advance generation

A set of Pokkali somaclones was evaluated to assess their performance at SC_{12} (Table 11) with a view to identify dual-purpose variety, which could be

Salt tolerant variety - BTS 24 in saline plot

grown both under normal and saline soils. The duration of the somaclones ranged from 100-120 days with semi-tall to tall stature. Somaclones produced moderate number of panicles (4.2 to 7.4) with medium sized panicles (21.2 to 27.2 cm). BTS 24, BTS 18, BTS 14-2-1 and BTS 10-5 were found to be promising, which produced about 3.5 t/ha under saline soil condition in farmers fields.

PERFORMANCE OF AICRP TRIALS

Saline Alkaline (Sodicity) Tolerance Varietal Trial (SATVT)

A set of 24 cultivars was evaluated under saline soil condition. The duration of cultivars ranged from 105 (CSR 27) to 130 days (C200BS 6-23). Height of plants varied from 61.53 cm (91-H 1-24-1) to 114.2 cm (C200BS 6-23). Panicle/m^2 was found to be the minimum in CST 7-1 (165.1) and the maximum panicle/m^2 was observed in C200BS 6-23 (380.35). The cultivars, viz. CSR 27, CSR 92-IR-4 and 92 H 51-4 were found to yield 3.82, 3.61 and 3.51 t/ha, respectively.

National Saline Alkaline Screening Nursery (NSASN)

A set of 21 cultivars was assessed under saline soil condition. The duration of cultivars ranged from 110 to 130 days. Height of plants varied from 62.21 cm (Jaya) to 116.81 cm (Kalanamak 3131). Panicle/m^2 was found to be the lowest in TOX 3723-103-2-3-1 (165.33) and highest in NDRK 5078 (266.0). The cultivars, viz. Kalanamak 3119, NDRK 5077 andd NRK 5078 were found to yield 2.59, 2.22 and 2.19 t/ha, respectively.

Microtillering in IR 72

Rapid microtillering was induced in androgenic plantlets of IR 72. MS with 4-8 mg/l of Kinetin showed very fast microshooting with the maximum of 94.7 shootlets per cultured shoot at 4 mg/l in 30 d.


Microtillering in IR 72

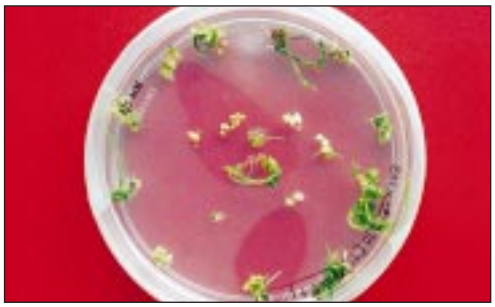
Table 11. Performance of rice varieties in Bay Islands

Sl. No.	Designation	Days to 50% flowering	Plant height (cm)	No. of panicles/ plant	Panicle length (cm)	Grain yield/ plant
Varieties compatible for large scale cultivation						
1.	Zen-Gu-AT-1	76.66	103.00	6.60	22.53	5.18
2.	MTL 113	74.66	97.33	5.86	21.86	5.19
3.	Taichung Sen Yu	75.66	100.00	5.86	23.80	5.64
4.	Nanjing 571614	76.00	96.40	6.53	23.13	5.40
5.	BG 1639	75.00	98.80	6.33	22.06	4.49
6.	Milyang 55	74.66	100.40	7.73	23.13	4.12
7.	IR 18350-229-3	75.66	97.93	5.80	22.00	4.76
8.	Quing Livan-1	78.66	102.86	5.80	21.73	5.17
9.	$S_1P_1$681032	75.66	97.93	7.66	22.66	4.82
10.	IR 31851-6-6-3-3-2	74.00	102.66	7.06	22.33	4.65
Super rice varieties						
1.	IR 68552-100-1-2-2	101.66	103.13	3.93	23.73	4.32
2.	IR 71703-65-7-3-2	88.66	105.93	4.00	25.06	3.72
3.	IR 65600-129-1-1-2	88.33	96.46	3.80	24.43	4.05
4.	IR 66159-189-5-5-3	88.66	98.40	4.86	22.46	5.57
5.	IR 66738-118-1-2	93.33	90.93	4.40	24.36	4.75
6.	IR 67964-46-1-3-2	93.33	107.53	3.80	28.46	6.78
7.	IR 67962-40-6-3-3	94.00	99.26	3.86	21.36	4.59
8.	IR 67963-63-1-3	83.33	99.60	4.60	21.93	5.30
9.	IR 67964-46-1-3-2	92.00	107.73	4.33	24.60	6.33
10.	IR 67966-188-2-2-1	89.66	101.46	3.93	23.53	4.91
11.	IR 68011-15-1-1-2-3	97.66	96.60	4.50	24.06	4.28
12.	IR 68552-57-3-2-1	92.00	98.86	4.73	22.46	5.26
13.	IR 69125-25-3-1-1	94.00	98.73	4.40	24.20	5.02
14.	IR 69138-13-2-2-3	90.00	102.13	4.53	23.86	4.81
15.	IR 70485-15-3-2	88.66	97.43	4.66	23.40	5.38
16.	IR 70255-30-3-3	97.66	99.80	3.53	24.13	4.55
17.	IR 71684-36-3-3-2	97.66	98.13	4.33	23.66	5.24
18.	Annada	84.03	95.13	6.26	25.46	3.76
BTS somaclones						
1.	BTS 14-2-1	76.00	121.26	24.66	5.36	11.94
2.	BTS 24	78.66	124.53	25.53	4.73	11.05
3.	BTS 18	81.33	118.73	24.20	5.66	13.46
4.	BTS 10-5	78.00	132.40	24.66	4.73	11.29

Microtillering and subsequent whole plant development offer ample scope to develop large number of clones from a stock of choice for *in vitro* conservation, characterization and screening for diverse characters of agronomic importance.

Optimisation of microprojectile based gene delivery in *indica* rice

Prior to launch a full fledged transgenic development programme with economically important 3 genes, viz. Cry IA(b); Cry IA(c) and AmSOD,



Microprojectile based gene delivery in *indica* rice

optimization of the system was felt essential. Both pCAMBIA 1301 and pCAMBIA 1305 version 2 were used with a few elite scented *indica* rice and two new plant type rice varieties. In respect of pCAMBIA 1301 among the three genotypes, Basmati 370 was found to be the most compatible for optimum transgene expression. 1 m dia microcarrier, 1100 psi and 10 ml particle volume were appropriate conditions for maximum gene expression. While working with pCAMBIA 1305 version 2 among three genotypes tested, Pusa Basmati emerged as the most suitable for maximum transgene expression. 1 m microcarrier, 100 psi He pressure and 10 ml particle volume were also found to be compatible.

IN VITRO PROPAGATION AND MOLECULAR CHARACTERIZATION OF MEDICINAL PLANTS USED BY THE TRIBALS OF BAY ISLANDS

Sheeja T.E. and Asit B. Mandal

Survey, collection and cataloguing of medicinal plants

Extensive surveys were conducted in South, North and Little Andamans for collection of medicinal plants this year too. A total of 35 plants were collected bringing the total number of plants established to 150 in the Tropical Gene Garden of the Institute. Some of the most important medicinal plants collected this year are given below along with their status and place of collection.

- *Semicarpus kurzii*- Endemic- North Andaman
- *Mallotus peltatus*- Extra Indian- Chidiyatapu, Little Andaman
- *Phyllanthus andamanicus*- Endemic - Saddle peak
- *Andrographis paniculata*- Indigenous- Little Andaman, Chidiyatapu
- *Hernandia peltata*- Endemic - Wandoor
- *Planchonia andamanica*- Endemic - Chidiyatapu, Little Andaman


Semicarpus kurzii


Hernandia peltata

- *Kaempferia syphonantha*- Endemic - Little Andaman
- *Donnax cannaeformis*- Extra Indian - Chidiyatapu, Nyasaher
- *Ammomum fenzlii*- Endemic - Car Nicobar
- *Guetterda andamanica*- Endemic - Chidiyatapu
- *Piper sarmantossum*- Extra Indian - Little Andaman
- *Byttenaria andamanica*- Endemic - Bloomsdale

Medicinal plants from mangroves areas

An extensive survey was conducted in the mangrove areas of Chidiyatapu, Wandoor and Little Andaman and 49 plants growing as mangroves or associates were identified. The folk knowledge associated with these plants were also documented. The plants were collected and 25 of them were established and conserved in the gene garden.

Collection and molecular characterization of selected endemic species

Different accessions of 4 medicinal species of tribal importance, viz. *Mallotus phillippensis*, *Hernandia peltata*, *Phyllanthus andamanicus* and *Semicarpus kurzii* were collected from North, Middle and South Andaman. The distribution and population density of the 3 species was recorded. Samples were collected from 14 sites, viz. Mayabandar and Diglipur areas in North Andaman; Baratang and Rangat in Middle Andaman and 10 other sites in South Andaman. The complete phytomorphological characterization, status, distribution, specific use and other salient features were recorded with the assistance of Botanical Survey of India, Regional Office, Port Blair to authenticate the species.

Ex situ conservation

Ex situ conservation of all the 4 species had been done at the gene garden established for conservation of medicinal plants at the Garacharma Research Complex of CARI, Port Blair.

In vitro propagation of *Alpinia rotunda*

In vitro micro propagation was attempted in an indigenous species of *Alpinia* collected from Little Andamans. Young rhizomes were chosen. The explants were sterilized and cultured on to WPM medium. Maximum bud multiplication was observed with 5 mg/l BAP. Healthy plantlets were generated *in vitro* @ 8 plantlets per explant. The *in vitro* generated


Tissue cultured plants of *Alpinia*

plantlets were directly field transferred without any hardening process and survival rate was found to be 100%. The protocol is expected to be compatible and would be very cheap under the island conditions, which may be scaled up for commercialization.

In vitro propagation of *Piper sarmantossum*

In vitro propagation was also tried involving *Piper sarmantossum*, an extra Indian species, which is a potent antipyretic, stomachic, antipyretic and antiasthmatic herb. The nodal explants were chosen for culture. Bud initiation was observed within 21 days and single plantlet was developed on MS supplemented with 2 mg/l BAP. No callusing was observed.

PHYSIOLOGICAL APPROACHES FOR IMPROVED ABIOTIC STRESS TOLERANCE IN SOLANACEOUS VEGETABLE CROPS

R. Elanchezhian, Asit B. Mandal and Sheeja T.E.

Effects of hormones on crop growth in tomato

Twelve varieties of tomato were evaluated for growth and yield parameters towards application of plant growth regulators, viz. IAA (100 ppm) and GA_3 (10 ppm). Maximum plant height and primary branches were observed in BT 17 and Pant 5, respectively. Number of fruits per plant was maximum in LE 3704 with IAA treatment. Fruit weight per plant was maximum with IAA treatment in PP II, followed by Pant 5 and LE 3704.

Effect of hormones and salinity stress in tomato

Agro-morphology

Three varieties, viz. PPII, KS 118 and Pant 11 were evaluated for agro-morphological parameters under three hormonal treatments, viz. IAA @ 100 ppm, GA_3 @ 10 ppm and Kinetin @ 5 ppm and two salinity stress levels, viz. 4 and 8 dSm^{-1}. Plant height decreased across salinity stress among three varieties. Maximum plant height was observed in Pant 11 with GA_3 application. The same variety recorded maximum height even under 4 and 8 dSm^{-1} with Kinetin treatment. Maximum fruits per plant were observed in PP II and were found to be high only with GA_3 treatment across salinity levels. At high salinity marked reduction in fruit numbers was observed. Among the varieties, higher yield per plant was observed in KS 118 (476.33 g) followed by PP II (421.33 g) across hormonal treatments, viz. Kinetin and GA_3, respectively. However with increasing salinity stress, better yield was obtained with GA_3 treatment (337 g) followed by Kinetin treatment (297.5 g) in PP II.

Nitrate reductase activity

Nitrate reductase activity in response to hormones and salinity stress was

estimated in tomato varieties, viz. PP II, KS 118 and Pant 11. The activity was found to be high with increase in salinity stress among three varieties. Maximum enzyme activity was observed with GA_3 treatment at 8 dSm^{-1} salinity in PP II (8.117 μM NO_2/g fresh weight). Minimum enzyme activity was met with IAA treatment at 4 dSm^{-1} salinity in the same variety (4.626 μM NO_2/g fresh weight).

Estimation of the Nitrate reductase activity

Tomato

Nitrate reductase activity was estimated in 14 tomato varieties under glass house condition. Highest enzyme activity was observed in Pant 5 (7.966 μM NO_2/g fresh weight) followed by Sel. 10 (6.607 μM NO_2/g fresh weight). The same experiment was also conducted involving plants grown under open range condition, in which highest enzyme activity was recorded in KS 118 (6.014 μM NO_2/g fresh weight).

Brinjal

Nitrate reductase activity was estimated in 11 brinjal varieties at pre-flowering and flowering stages. At pre-flowering stage, the enzyme activity ranged from 5.06 μM NO_2/g fresh weight in PPC to 11.59 μM NO_2/g fresh weight in BB 60C. However, at flowering stage the enzyme activity remained almost constant across varieties (11.21 to 11.62 μM NO_2/g fresh weight).

Promising brinjal somoclones at SC_3 generation

Growth evaluation of brinjal somaclones

Somaclones developed from brinjal varieties, viz. BB 66C, SM 141 and BB 60C were evaluated at SC_3 generations for agro-morphological characters including disease and insect pest tolerances. At SC_2, 1371 plants belonging to 18 somalconal families of 4 varieties, viz. BB 66C, SM 141, BB60C and PPC were evaluated. Among these families 111 plants belonging to 9 somalconal families were selected based on improved agro-morphological characters and appreciable disease and insect pest tolerances. These nine families of somaclones were further evaluated at SC_3 and 149 promising somaclones were selected and are being evaluated at SC_4 generations.

Optimisation of transformation for improved abiotic and biotic stress tolerances

Agrobacterium mediated genetic transformation was optimized involving vector pCAMBIA 1301 in brinjal varieties, viz. BB 45C, BB 66C and Punjab Barsati as well as tomato variety Pant 5. Both transient and stable GUS expression were observed.

DIVISION OF NATURAL RESOURCE MANAGEMENT

ASSESSMENT OF SOIL LOSS WITH BIOLOGICAL CONTROL MEASURES UNDER DIFFERENT CANOPIES IN HILL SLOPES OF ANDAMAN ISLANDS

S.Ghoshal Chaudhuri, S.C.Pramanik and R.Dinesh

Estimation of runoff loss and soil loss under different crop canopies and slopes and appropriate measures

Experiments were conducted during the last 3 years to estimate runoff loss and soil loss as influenced by different crop canopies and slopes. The temporal and spatial variability in soil moisture was studied by taking soil samples from 0-15 cm, 15-30 cm, 30-60 cm and 60-90 cm from different crop canopies, viz. oil palm, coconut, arecanut, agro-forestry, fodder and forest (control) during December 2001 to January 2003. From the morphological study, it was found that the slope in agroforestry was steep but it had not showed excess soil and runoff loss due to barrier caused by litter fall, close spacing of fast growing species, and cultivation of grass. The soil and runoff loss increased significantly in all crop canopies with increasing slope during the period under study except agroforestry and forest (Table 12). Data on various soil parameters (Table 13) revealed that organic C levels were consistently higher under the agroforestry and forest canopies possibly due to greater and regular litter fall, which contributed significantly to the organic matter pools in the soil. Similarly, the levels of available N and K were also at markedly greater levels under these canopies. Available P levels,

Vegetative Barrier for steep sloppy land

Table 12. Surface run off and soil loss as influenced by slope under different crop canopies

Canopy	Slope (%)	Surface runoff (%)	Soil loss (Mg/ ha)
Oil palm	27.2	56.8	10.56
Coconut	32.1	60.2	10.92
Arecanut	25.7	67.6	12.25
Agro-forestry	39.6	48.3	**6.42**
Fodder	42.1	51.5	**9.30**
Forest	19.4	50.7	**8.04**

Table 13. Relevant soil properties under different crop canopies

	Arecanut	Coconut	Oil palm	Fodder	Agroforestry	Forest
Organic C (%)	0.56	0.61	0.63	0.57	0.83	0.79
Available N (mg/ kg)	106	107	107	116	156	142
Available P (mg/ kg)	4.2	4.3	4.5	4.2	4.3	5.7
Available K (mg/ kg)	61.5	63.0	59.0	61.5	91.5	89.5

Land use practice in agroforestry

however, exhibited minimum variation between the sites.

Studies were also conducted to assess the moisture retention capacity of soils under the said canopies during the post monsoon period (November 2002-February 2003). The trends were identical to those observed during the previous two years. Results revealed that the moisture content was the lowest at 0-15 cm depth regardless of the crop canopies. Soils under arecanut followed by oil palm and fodder always registered low moisture content apparently due to the high demand of moisture by these crops. At 15-30 cm depth, moisture content was lowest under oil palm followed by arecanut and coconut. At 30-60 cm depth, moisture content was lowest under fodder canopy probably due to downward influx of moisture. Maximum moisture content was recorded at 60-90 cm under agroforestry canopy followed by fodder and arecanut canopies due to relatively lower rate of consumption of moisture by these crops.

RUN OFF HARVESTING AND RECYCLING FOR PRODUCTION OF VEGETABLES DURING DRY SEASON IN ANDAMAN ISLANDS

S.C.Pramanik and S.Ghoshal Chaudhuri

Conjunctive use of mulching and irrigation on growth and yield of okra in low-lying rice fallow

An experiment was carried out for three seasons from 1999-2002 to find out the influence of conjunctive use of irrigation and mulching on growth, yield and water use efficiency (WUE) of okra in Bay Islands. The results revealed that paddy straw mulching @6.0 t/ha and irrigation significantly increased the growth, yield and WUE in okra in all the three seasons (Table 14). The maximum yield of okra

Table 14. Growth, yield and water use efficiency in okra influenced by mulching and irrigation

Treatment	Plant height	Yield (t/ha)	Water use efficiency (kg/ha mm)
T_1 (control)	85.2	3.4	12.3
T_2 (mulch)	94.5	4.3	13.55
T_3 (I_1)	97.3	5.1	16.0
T_4 (I_1+M)	114.8	5.8	17.8
T_5 (I_2)	110.3	6.3	19.7
T_6 (I_2+M)	120.8	7.0	21.1
T_7 (I_3)	112.1	6.9	18.7
T_8 (I_3+M)	118.7	6.9	18.7
LSD (P=0.05)	6.5	0.6	18.6

I_1, I_2, I_3 M indicates one, two and three irrigations and mulching, respectively.

was recorded with two irrigation + mulching. However, the marginal yield due to mulching was maximum (0.7 t/ha) with one irrigation, which decreased with increase in frequency of irrigation. The WUE of the crop was maximum with irrigation + mulching registering 65.7 percent increase over control. The crop received 107.5 mm and 90.8 mm effective rainfall during these years. Considering the yield and WUE, two irrigation + mulching was found beneficial. In the farmers field also, the technique of mulching along with irrigation was assessed and found significantly increasing the yield of okra, brinjal, tomato and other vegetables.

ASSESSMENT OF THE QUALITY OF SOILS IN PLOTS OF KNOWN AGRICULTURAL HISTORY IN A & N ISLANDS FOR THE DEVELOPMENT OF A SOIL QUALITY INDEX

R.Dinesh and S.Ghoshal Chaudhuri

Biochemical characteristics of native soils under wet tropical forests of South Andaman

In this study, the general and specific biochemical properties of native soils under three forests types (Evergreen, Semi-Evergreen and Moist Deciduous) of South Andaman Island were evaluvated. Portions of these forests were clear-felled at varying periods of time to establish coconut, arecanut and rubber plantations. In order to determine the effects of deforestation and cultivation, the biochemical parameters of soils concerning these plantations were also studied. The general parameters included variables related to microbial activity and specific biochemical parameters included the activities of extracellular hydrolytic enzymes involved in the carbon, nitrogen, sulphur and phosphorus cycles.

Significant differences between the sites occurred for the biochemical properties reflecting soil microbial activity. The microbial biomass C, biomass N, soil respiration, metabolic quotient (qCO_2), N mineralization capacity and dehydrogenase/ catalase activity were, in general, greater under the forests compared to the plantations. The results, therefore, indicated a decline in microbial activity due to deforestation and cultivation (Table 15). On an average, the decline in biomass C was 63%, biomass N 58%, CO_2 evolution 57%, qCO_2 51%, N flush 39%, dehydrogenase 38% and catalase 64% in soils under the plantations. The higher levels of biomass C-organic C under the forests (2.8%) reflected greater availability of substrate to the soil microflora compared to the plantations (2.2%). The results on specific biochemical parameters also indicated markedly higher activities of extracellular enzymes under the forests. The decline in activity under the plantations was phosphomonesterase 59%, phosphodiesterase 55%, â-glucosidase 52%, casein-protease 43%, BAA-protease 60%, invertase 57%, CM-cellulase 31%, arylsulphatase 35% and urease 37%.

Table 15. Biochemical parameters in soils under forests and plantations

	Forests			Plantations		
	Evergreen	Semi-evergreen	Moist deciduous	Coconut	Arecanut	Rubber
General parameters						
Total C (g kg^{-1})	15.7cd	18.2bc	23.2a	7.4f	8.1f	11.9de
Total N (g kg^{-1})	1.41cd	1.54bc	2.13a	0.83f	0.86f	1.05de
Organic C (g kg^{-1})	14.4c	16.4c	22.4a	6.9e	7.6e	10.8d
Microbial biomass C (mg N kg^{-1})	422c	494b	617a	145e	148e	270d
N flush (mg N kg^{-1})	9.5d	12.8ab	13.8a	6.3e	6.7e	8.5d
Microbial biomass (N mg N kg^{-1})	34.8b	45.9a	49.4a	15.2d	16.3d	21.2c
Dehydrogenase (nmol TPF $g^{-1}h^{-1}$)	252b	262b	389a	170d	169d	221c
Catalase (mmol H_2O_2 consumed $g^{-1}h^{-1}$)	1.67c	2.31b	2.62a	0.56e	0.60e	1.31d
Specific parameters						
Phoshomonoesterase (µmol *p*- nitrophenol g^{-1} h^{-1})	13.1 cd	14.0 bc	15.6 a	4.8 f	4.4 f	8.4 e
Phosphodiesterase (µmol *p*- nitrophenol g^{-1} h^{-1})	3.4 bc	3.7 ab	4.3 a	1.4 e	1.4 e	2.4 cd
Aryl sulphatase (µmol *p*- nitrophenol g^{-1} h^{-1})	0.54 cd	0.56 bc	0.74 a	0.36 f	0.35 f	0.49 de
â-Glucosidase (µmol *p*- nitrophenol g^{-1} h^{-1})	4.4 b	4.3 b	5.5 a	1.7 d	2.1 d	3.2 c
Casein-protease (µmol tyrosine g^{-1} h^{-1})	2.5 cd	2. 8 bc	3.6 a	1.4 f	1.6 f	2.1 de
BAA-protease (µmol NH_3-N g^{-1} h^{-1})	7.2 cd	7.4 bc	8.4 a	4.2 f	4.1 f	5.3 e
CM cellulose (µmol glucose g^{-1} h^{-1})	0.61 cd	0.63 bc	0.83 a	0.44 f	0.42 f	0.55 e
Invertase (µmol glucose g^{-1} h^{-1})	9.5 cd	10.5 bc	12.4 a	3.7 f	4.1 f	6.3 e

Means followed by the same letter within a row are not significantly different at P <0.05 level (DMRT)

Table 16. Microbial activity and biomass indices at the forest and plantation sites

	Biomass C (µg g^{-1})	Biomass N (µg g^{-1})	Basal Respiration (µg CO_2-C g^{-1} per day)	Ergosterol (µg g^{-1})	AMP (nmol g^{-1})	ADP (nmol g^{-1})	ATP (nmol g^{-1})
MD1	623	50	16.9	3.91	0.27	0.57	2.94
MD2	672	54	26.6	4.14	0.21	0.48	2.72
SE1	503	41	14.5	3.28	0.25	0.61	2.78
SE2	580	46	16.6	3.71	0.28	0.41	2.71
T1	154	11	2.3	0.54	0.12	0.21	0.64
T2	143	10	2.4	0.46	0.12	0.21	0.61
P1	155	11	2.4	0.47	0.15	0.23	0.62
P2	193	14	2.7	0.58	0.15	0.25	0.67
LSD	60	4	1.1	1.1	0.04	0.09	0.49

MD= Moist Deciduous; SE= Semi-Evergreen; T= Teak; P= Padauk

Changes in soil microbial indices, community structure and their relationships following deforestation and cultivation in wet tropical forests

Soils from the A horizon of 2 major wet tropical forests (moist deciduous and semi-evergreen) and 2 adjacent plantations of padauk (*Pterocarpus dalbergioides*) and teak (*Tectona grandis*) established by clearing portions of these forests were studied for the activity, biomass and community structure of soil microorganisms. The long-term influence of such changes in land use on soil microbial indices and their interrelationships were also assessed.

The two sites revealed marked differences in soil organic matter and microbial properties. The levels of microbial biomass C, biomass N, basal respiration, metabolic quotient (qCO_2), ergosterol and adenylates (ATP, AMP, ADP) at the forest sites markedly exceeded the corresponding values at the plantation sites (Table 16). The ratios of the different microbial properties also differed markedly between the sites. The biomass C-N ratios at the plantation sites consistently exceeded the corresponding organic C-total N ratios (range 8.3-10.0%) indicating low N availability to soil microbes at these sites. The biomass C-N ratios further indicated that the microbial biomass at all the sites is largely fungal and the ergosterol-biomass C ratio indicated that the fungi, especially at our plantation site had very low ergosterol content. While AEC (Adenylate Energy Charge) levels of more than 8.0 reflected rapid microbial proliferation at the forest sites, the mean metabolic quotient (qCO_2) reached values of 31.2 mg CO_2-C g^{-1} biomass C per day at the forest sites and declined to 15.5 mg CO_2-C g^{-1} biomass C per day at the plantation sites. Therefore, higher qCO_2, AEC and larger ATP-biomass C ratio at the forest sites indicated that the soil microbes here were highly active compared to those at the plantation sites. Principal component analysis indicated that the ratios of ATP-biomass C and ergosterol-biomass C formed the first factor indicating a decomposition pathway dominated by fungi. The second factor was loaded by the ratios of soil organic C-total N, biomass N-total N, biomass C-N and biomass C-soil organic C reflecting soil organic matter availability in relation to nutrient availability. The ratio qCO_2 and AEC formed the third factor, reflecting the specific metabolic activity of soil microbes. Overall, our study indicated that on long-term basis, deforestation and cultivation markedly reduced microbial activity and substrate use efficiency due to significant decline in available organic matter/ substrate levels.

STATUS AND SCOPE OF FARM MECHANIZATION IN A& N ISLANDS

M.Din and N.Ravisankar

Under this project, a survey was conducted in 5 different villages of South Andaman, namely Sipighat, Namuna Ghar, Guptapara, Chouldhari and Mitha Khari to collect

information regarding the use of agricultural implements, tools and machinery used by the farmers through detailed personal interviews of farmers with respect to scope of mechanization, constraints in custom hiring, real use of animal power sources in agriculture, labour availability and bottlenecks in mechanization. Besides, the data on various crops, cattle population, agricultural implements and tools were collected from Directorate of Agriculture and Animal Husbandry and Veterinary Services, Andaman and Nicobar Administration.

Traditional cultivation practices

Male bullocks and buffaloes are the main source of draught animal power (DAP) in these islands. The traditional cultivation practices adopted by small and marginal farmers, owning bullocks/buffaloes and tractors, consists of various operations carried out for crop production is shown in Table 17. Transplanting, interculture harvesting, threshing and winnowing are done by manually both in animal and tractor farm.

Hand tools and implements

Indigenous (wooden) plough and planker are the main animal drawn implements in the preparation of seedbed and sowing. Primitive types of hand tools are being used for agriculture, horticulture and forestry. Wooden puddlers are used for puddling. Most of the farmers are using plankers for clod breaking in paddy fields for sowing of vegetables/pulses. Plant protection is done by spray pump. Farmers use plain sickles for harvesting of crops and grasses. Threshing of paddy is done manually or by animal. Pedal threshers are available only in the Government department. Farmers are following the traditional method for drying to coconut and arecanut. Fabrication of hand tools like khurphi, spade, garden hoe, dab and dehushker coconut and arecanut cutter, crowbar, pick axe, rake, digging hoe, grass cutter blade, plane sickle, wooden plough,

Table 17. Cultivation practice adopted for raising rice crop in surveyed villages

Type of operation	Farm equipment	
	Animal farm	Tractor farm
1. Nursery raising		
i) Ploughing	Indigenous/desi plough	Cultivator
ii) Levelling	Wooden planker	Wooden planker
iii) Bund making	Spade	Spade
iv) Sowing	Hand broadcaster (Manual labour)	Hand broadcaster (Manual labour)
2. Seed –bed preparation		
i) Ploughing	Indigenous/desi plough	Cultivator
ii) Levelling	Wooden planker	Wooden planker
iii) Puddling	Wooden puddler	Cage wheel
3. Transplanting	Manual labour	Manual labour
4. Plant protection operation	Sprayers/duster	Sprayers/duster
5. Weed control	Khurpi	Khurpi
6. Harvesting	Plain sickle	Plain sickle
7. Threshing	Animal treading/Hand beating	Animal treading/Hand beating
8. Winnowing	Manual using wind	Manual using wind

wooden harness, wooden planker and wooden puddler is done by local artisans only. There is no genuine workshop for repair of animal, power tillers and tractors drawn implements

Status of farm mechanization

Agricultural workers, draught animals, tractors, diesel engines and electrical motors are the sources of farm power in Islands. At present, the availability of farm power is 0.29 kW/ha in islands whereas its national average is about 1.29 kW/ha as reported by Singh, 2001. Study revealed that share of animate power was more (62.86%), followed by inanimate (37.14%). It showed that the availability of farm power in the islands was very low and had much scope for further mechanization.

EVALUATION OF BROAD BED AND FURROW SYSTEM OF LAND MANIPULATION FOR GROWING FODDER AND VEGETABLES IN RICE FIELDS

Anil Kumar Nair, N. Ravisankar,
R. Dinesh, and S. Ghoshal Chaudhuri.

Experiment 1 : Evaluation of vegetable/ fodder sequence on the beds

Ten cropping sequences, viz. Fodder-Bhendi, Amaranthus-Bhendi-Ratoon bhendi, Tomato-Baby corn-Cucumber, Chilli-Cauliflower-Brinjal, Brinjal-French bean-Cowpea, Brinjal-Poi-Tomato, Chilli-Cowpea-Raddish, Cowpea-Cauliflower-

Cowpea in bed and Paddy in furrow

Fallow, Cucumber-Amaranthus-Tapioca, Amaranthus-Cowpea-Fallow and Pine apple were evaluated on the beds based on the yield, cost of cultivation, gross and net returns and Benefit Cost ratio.

The results indicated that okra, chilli, tomato, brinjal, cowpea, amaranthus, raddish, baby corn and hybrid napier could be grown successfully on the beds. Among the sequences evaluated Amaranthus-Bhendi-Ratoon Bhendi was the most profitable sequence (Table 18) with higher net returns and B:C ratio followed by Chilli-Cauliflower-Brinjal and Chilli- Cowpea-Raddish.

Experiment 2 : Effect of recommended dose of fertilizer on growth and yield of rice varieties grown in furrows

Performance of 3 rice varieties, viz. Taichung-sen-Yu, S1P1-681032 and

Bhendi in bed

Table 18. Performance of various cropping sequences on beds of BBF

Cropping sequence	Yield (kg/0.4 ha)	Cost of cultivation (Rs.)	Net returns (Rs.)	B : C ratio
Fodder-Bhendi	150943 – 4487	40000	24000	1.68
Amaranthus-Bhendi-Ratoon bhendi	1140-5705-4385	25000	81600	2.74
Tomato-Baby corn-Cucumber	4125-605	19000	34350	1.59
Chilli-Cauliflower-Brinjal	680-3703-2846	19000	31360	1.93
Brinjal-French bean-Cowpea	3650-1100-2200	19000	28500	1.30
Brinjal-Poi-Tomato	3245-2000-3825	17000	25450	1.38
Chilli-Cowpea-Raddish	600-2800-3200	15000	25000	1.77
Cowpea-Cauliflower-Fallow	2650-3400	14000	35500	1.41
Cucumber-Amaranthus-Tapioca	2400-1100	11250	13200	1.17
Amaranthus-Cowpea-Fallow	1300-3000	13500	23000	1.66

Quing Livan No. 1 were evaluated in the furrows with recommended dose of fertilizers. The recommended dose of fertilizer adopted was 60:30:40 kg NPK/ha for Taichung-Sen-Yu and Quing Livan No.1 and 90:60:40 kg NPK/ha for S1P1-681032. The results are presented in Table 19.

The results indicated that all the 3 varieties were better than the traditional C14-8. Short duration varieties could be grown successfully which gives opportunity to grow second crop of rice or ratooning in the furrows. Among the 3 varieties tested, Quing Livan No. 1 recorded better growth and yield parameters that was reflected through grain yield (3232 kg/ha).

Experiment 3 : Effect of rice varieties and nitrogen on the growth, yield attributes and yield of rice ratoon in the furrows

The varieties grown in the first crop was evaluated for its performance as ratoon with four N levels (T_1: 0 kg, T_2: 20 kg, T_3: 40 kg, T_4: 60 kg/ha). The first crop was harvested with the stubble height of 45 cm and N was applied in two splits at 10 and 35 days after harvesting for ratoon crop. The results indicated that quing Livan No. 1 registered better growth and yield parameters and yield compared to other two varieties. All the varieties responded to N application. Better growth and yield parameters were recorded with 40 kg N/ha for all the varieties. Quing Livan No. 1 with 40 kg N application to ratoon rice recorded a yield of 838 kg/ha.

From the results of above experiments, it could be concluded that Amaranthus-

Table 19. Growth, yield attributes and yield of paddy varieties (First crop)

Character	Taichung-Sen-Yu	S1P1-681032	Quing Livan No. 1
Plant height (cm)	114.0	111.4	116.0
Panicle length (cm)	25.24	26.42	24.52
1000 grain weight (g)	27.0	24.53	30.33
Grain yield (kg/ha)	2987	2656	3232

Bhendi-Ratoon Bhendi, Chilli-Cauliflower-Brinjal, Chilli-Cowpea-Raddish and Tomato-Baby corn-Cucumber crop sequences in the beds and Quing Livan No. 1 followed by ratoon with 40 kg N/ha in furrows could be advocated as profitable and self sustainable cropping system for broad-bed and furrow system in Bay Islands.

AGRO TECHNIQUES FOR DIRECT SEEDED RICE IN BAY ISLANDS

N.Ravisankar, Anil Kumar Nair, M. Din, S.C.Pramanik and R. Elanchezhian

Experiment 1 : Screening of varieties suitable for anaerobic sowing

Eleven varieties, viz. 145, Milyang 55, BG-1639, Nanging-57161, MTL 113, C14-8, Zen-Gui-At-1, Taichung-Sen-Yu, Quing Livan No.1, NARDI 110 and BTS 24 were evaluated for its suitability to anaerobic germination under laboratory condition. 200 seeds were sown in the beakers having 5, 7.5 and 10.0 cm depth of water. The seeds were observed for characters like germination percentage, seedling height, and seedling DMP and seedling vigor index. Seedling vigor index was calculated using the formulae (Root length + Shoot length) x Field emergence percentage. The results indicated that among the 11 varieties tested 145, Nanging-57161, C14-8, Zen-Gui-At-1, NARDI 110, BTS 24 and Quing Livan No.1 responded positively to water seeding at a depth of 5 cm. Among these varieties, the traditional variety of Bay Islands C14-8 registered the maximum germination percentage (94.5), seedling height (31.5 cm), seedling DMP (842 kg/ha) and seedling vigor index (2448).

Anaerobic seeder

Experiment 2 : Performance of C14-8 under anaerobic wet seeding

The maximum area of rice cultivation was occupied by C14-8 variety; hence in the initial stage of project, it had been decided to test the C14-8 rice variety for its performance under anaerobic wet seeding. The crop was sown on 7th September 2002 by using anaerobic seeder received from the IRRI, Philippines in unreplicated trial. Recommended package of practices were followed and harvested on 23rd January 2003. During the cropping period of 139 days 843 mm of rainfall was received. In this, 35% of the total rainfall was received during the first 3 weeks (37, 38 & 39th Standard weeks) after sowing. The observations on growth and yield attributes were recorded and presented in the Table 20.

The perusal of the results indicated that the anaerobic wet seeding of C14-8 registered a grain yield of 2063 kg/ha, which was comparable with that of conventional method of transplanting which requires 25-30 man days for transplanting which was 10 times higher than that of anaerobic wet seeding using anaerobic seeder. Even though first 3 weeks of sowing received

C14-8 under anaerobic wet seeding

high rainfall (159.5mm), it did not affect the seedling establishment due to the anaerobic sowing which protected the seeds from rain splashing could be the contributing factor for normal yield in direct seeding. Besides these, a reduction of 10-15 days in the total field duration was also observed under anaerobic wet seeding which helped the crop to avoid the terminal drought during the grain filling stage.

Table 20. Performance of C14-8 under anaerobic wet seeding

Parameters studied	Results
Number of man days required for sowing	3/ha
Plant height at harvest	135.9 cm
Number of panicles	158/m^2
Panicle length	18.4 cm
Number of filled grains	72.9/panicle
Grain yield	2063 kg/ha
Straw yield	3175 kg/ha
Harvest Index	0.39

DEVELOPMENT OF RAINWATER MANAGEMENT TECHNOLOGY FOR HIGH INTENSITY, HIGH RAINFALL AREAS ON WATERSHED BASIS IN ANDAMANS

S.Ghoshal Chaudhuri, S.C.Pramanik and R.Dinesh

The Garacharma research farm of CARI was selected as the watershed site due to its varied and undulating topography, presence of several micro-watersheds and a perennial stream flowing across the farm. A total of about 39 ha of watershed was surveyed and a detailed contour map (with an interval of 1 m) was prepared. The maps depict permanent features, position of buildings and streams. Before contour survey, vegetation survey was also carried out for the area. On the basis of this contour survey, 2 masonry check dams and 7 temporary check dams had been constructed to arrest siltation in the main pond. The main pond was developed by incorporating upstream blanketing and reinforced concrete cement on the upstream phase of the bund as a blanket and bund-strengthening measures were adopted by boulder pitching and site cleaning. The water impounding capacity of the pond was enhanced to 21.6 cum by development of the pond horizontally and vertically. The second pond was also developed by incorporating upstream blanket, stone pitching, grout curtain, chute spillway and creation of apron. The water impounding capacity of the second pond was enhanced to 14.7 cum. As a result of this project, about 16000 litres of water per day was supplied during the post monsoon period for vegetable cultivation and 9000 litres of water was supplied for domestic use on a daily basis. Construction of 7 permanent and 8 temporary check dams (at proper intervals) under the project had increased the ground water levels up to 14 cm in the post monsoon period. This enabled us to educate the farmers of Ograbraj village in constructing low cost indigenous check dams in their fields for retaining ground water moisture in the lean months for the first time.

DIVISION OF ANIMAL SCIENCE

ADAPTABILITY AND PRODUCTIVITY OF JAPANESE QUAIL IN A & N ISLANDS

A.Kundu S.P.S. Ahlawat, S. Senani,
R.B.Rai, M.K. Padhi S. K. Saha
R. N. Chatterjee S. P. Yadav and
S. Jeyakumar

Quicken - An inter-species of Chicken x Quail

Female of Japanese quail and male of Nicobari fowl were taken. 60 quail hens were separated from the quail male at 5 weeks of age and kept separately in individual cages for a week. The quails were inseminated with the Nicobari semen through artificial insemination. Semen of White Nicobari male was collected and 0.02 ml of semen was inseminated twice in a week into each quail hen. Each week eggs were put into an incubator and transfered to hatcher at 14th day. The chicks hatched were kept for brooding in deep litter. Standard feeding and managemental practices were followed during the experiment. Weekly body weight was recorded. Mortality, if any, was recorded daily.

Out of 37 eggs set, 9 chicks hatched. The average hatching time was 19 days, which was intermediate to that of the quail (17 days) and chicken (21 days). Fertility was low. The interspecies quail had been named as 'Quicken'. Mortality was 4% in 1st week. The appearance of the quicken was like quail with more flight ability. The body weight of the quicken was higher than that of the normal quail and the body weight was much closer to that of the quail than that of the chicken (Table 21). Plumage Colour was mostly like that of quail. The performance egg production of the quicken is still under study.

Table 21. Body weight of Quicken and Japanese Quail.

Age (Week)	Quicken (g)	Japanese quail (g)
1	6	6
2	10	9
3	25	23
4	37	34
5	65	49
6	85	63
7	110	83
8	135	98
9	143	112
10	152	130
11	150	128.6
12	152	140.0
13	160	157.09
14	190	158.09

Innate Immune Response Study

This experiment was conducted to compare the immune response in selected and non selected group (body weight criteria) of Japanese quails. Selection programmes of different batch of birds were carried out keeping body weight as the criteria. Body weight was recorded from 0 day onwards in every 4 weeks interval. Birds were separated at 4th week into 2 groups. Birds of higher body weight was kept under selected group and lower body weight under non-selected group. Both the groups were reared under normal managemental conditions. 10 birds from each group were selected for the experiment. 0.1 ml of 2% sheep RBC was injected i/v at 6th

week of age. Titre value was estimated by HA test on day 0, 5, 7, 10 and 14 and thereafter at weekly intervals. The HA titre was expressed as reciprocal of last dilution of the test sera showing button formation. Peak titre value was reached on the 5th day post injection. Peak titre value was found to be greater in non selected group (3.4±0.8) than in selected group (2.9±0.9).Thus, the result concluded that birds with higher body weight showed decreased humoral immunity than those with lower body weight. The result of the test is depicted in Figure 1.

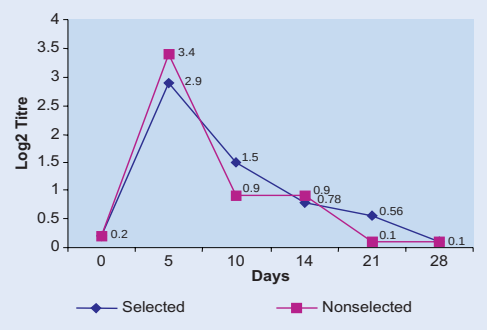


Figure 1. Immune response by HA test

Birds of same hatch were selected and divided into three groups of 20 each. On 28th day, Receptal 0.5 ml (0.008 ml Receptal + 0.492 ml Distilled water) and 0.5 ml Distilled water were administered i/v to the 1st and 2nd group respectively. 3rd group was kept as control. Traits measured were body wt. gain, feed consumption and egg production from 4th week onwards. The experiment revealed that administration of receptal resulted in early sexual maturity in Japanese quail. Significantly higher body weight was found in receptal group (P<0.17) at 6th week of age. Higher egg production was recorded in receptal treated group of birds. The study suggested that the administration of receptal increased the overall productive performance in Japanese quail.

Adaptability study

Hatchability study of quails was also conducted during the period. An average of 27.44% hatchability had been achieved. The poor hatchability might be due to the fluctuation in the temperature. During dry and wet season, the hatchability of quail eggs were 25.16±2.86 and 29.73±2.86% respectively. Overall mortality percent were 15.98 and 18.11 in wet and dry seasons respectively. Hen Housed egg production (HHEP) was found to be higher in wet season compared to the dry season.

GENETIC UPGRADATION AND EVALUATION OF INDIGENOUS CATTLE OF ANDAMAN

R.N.Chatterjee, R.B.Rai, A.Kundu,
S.P.Yadav, S.Senani and Jai Sunder

Production of F_2 generation

F_2 generation with 50% exotic

F_2 Generation calves

inheritance of Holstein Friesian and 62.5% exotic inheritance of Jersey (with local cattle) had been produced after selection and culling in F_1 generation on the basis of their phenotypic performance, disease tolerance and adaptation in this climate. Comparative performance of indigenous and genetically upgraded cattle for their growth, production and reproductive traits were evaluated.

Performance of growth traits

The growth traits measured were birth weight and body weights at 1st, 2nd 3rd, 4th, 5th, 6th and 7th months of age. The body weights of local male calves were significantly ($P<0.05$) higher than local female calves at 1st, 2nd and 5th months of age, while the body weights of genetically upgraded male calves were significantly ($P<0.05$) higher than female calves at 2nd months and onwards upto 7th months of age. It was also observed that some of the genetically upgraded female calves had higher body weight at birth even upto 34 kg at birth. The birth weights were found to be depended on dam weight, plane of nutrition and exotic inheritance of the concerned calf and its dam.

Performance of production and reproductive traits

The production and reproductive traits studied were average daily milk yield (DMY), location yield (LY) , peak yield (PY), peak period (PP), lactation length (LL), dry period (DP), age at first heat (AFH), service period (SP), service per conception (SPC) and calving interval(CI). DMY, PY, LY and LL were significantly ($P = 0.05$) higher in genetically upgraded cattle than local cattle. However, there was no significant difference in DP and PP in both the genetic groups. SP and SPC were higher among local cows, while, CI was higher among genetically upgraded cows. Phenotypic response to selection for DMY, PY and LY were positive in F_2 than F_1 generation.

Molecular characterization

Molecular characterization of indigenous and different genetic groups of upgraded cattle by RAPD-PCR is in progress. DNA isolation from blood samples had been completed and kept for further analysis. RAPD-PCR of these DNA samples was carried out using a few random primers.

DEVELOPMENT A SYNTHETIC LAYER SUITABLE FOR BACKYARD FARMING IN BAY ISLANDS

R.N.Chatterjee, R.B. Rai, A.Kundu, S.P.Yadav and Jai Sunder

Production of progeny of different crosses

White Nicobari with ILI-80

A total number of 437 progeny was

Progeny of crosses of ILI-80 male X White Nocobari female

produced by crossing White Nicobari male with ILI-80 female (direct cross) and 521 progeny were produced from the cross of ILI-80 male X White Nicobari female (reciprocal cross) in 4 hatches at weekly interval. All these progeny were maintained under deep litter system. Out of these, 136 progeny of direct cross and 142 progeny of reciprocal cross were supplied to 12 selected (at random) farmers of 5 villages of South Andaman at 5 weeks of age.

Black Nicobari with ILI-80

A total of 273 progeny was produced by crossing Black Nicobari male with ILI-80 female (direct cross) and a total of 142 progeny were produced by crossing ILI-80 male with Black Nicobari female (reciprocal cross) in 3 hatches at weekly interval and were maintained under deep litter system.

Brown Nicobari with ILI-80

A total of 167 progeny of the cross of Brown Nicobari male with ILI-80 females (direct cross) was produced in 3 hatches at weekly interval. All these progeny were maintained in deep litter system. A total of about 21 progeny of the direct cross of Brown Nicobari with ILI-80 was given to a farmer in adult stage for their evaluation under back yard farming system.

Housing and management under backyard

Under backyard system, the birds were housed only at night. Birds were provided with some amount of supplementary feed in the form of Kitchen waste, wheat or rice in the morning and allowed to walk to a long distance in search of feed and these birds used to come back at dusk. All these birds were not vaccinated against any disease under back yard system.

Growth performance under backyard

For evaluation of growth traits under back yard management system, the progeny of White Nicobari with ILI-80 were supplied to the farmers at 5 week of age. The pooled body weight of the progeny of direct and that of reciprocal crosses at 8th

Crosses of ILI-80 male X White Nocobari female under backyard

and 12th week of age differed significantly ($P<0.05$). The male and female body weight of the progeny of direct cross differed significantly at 6th, 8th and 14th week of age, while the same differed significantly at 8th, 10th, 12th and 14th week of age for the progeny of reciprocal cross (Table 22).

Mortality under IBD outbreak in backyard

The mortality rate of the progeny of direct and reciprocal crosses of White Nicobari with ILI-80 under field

Table 22. Body weights of crosses of White Nicobari with ILI-80 under backyard management system

Traits	Direct cross: White Nicobari Male X ILI-80 Female			Reciprocal cross: ILI-80 Male X White Nicobari Female		
	Male	Female	Pooled	Male	Female	Pooled
BW-6	265.97^{b} ± 8.67	242.51^{a} ± 8.34	256.12^{a} ± 6.67	280.00^{a} ± 7.65	256.79^{a} ± 7.36	269.35^{a} ± 5.76
BW-8	345.00^{b} ± 8.96	312.34^{a} ± 8.07	326.11^{a} ± 7.04	385.56^{c} ± 8.17	354.91^{b} ± 7.98	375.53^{b} ± 6.09
BW-10	418.48^{a} ± 9.37	406.67^{a} ± 8.74	414.00^{a} ± 7.36	439.00^{b} ± 8.68	394.64^{a} ± 8.45	405.56^{a} ± 6.57
BW-12	543.74^{a} ± 10.08	528.89^{a} ± 9.87	537.69^{a} ± 7.89	650.00^{b} ± 9.03	623.56^{c} ± 9.61	637.03^{c} ± 7.11
BW-14	679.67^{a} ± 11.78	654.67^{b} ± 10.65	668.78^{a} ± 8.56	762.69^{b} ± 10.03	643.34^{c} ± 10.56	663.13^{a} ± 7.56
BW-16	724.56^{a} ± 12.09	709.69^{a} ± 11.57	718.46^{a} ± 9.05	740.00^{a} ± 11.29	717.86^{a} ± 11.52	727.05^{a} ± 8.27

Values (in the same row) with different superscripts differ significantly (P< 0.05)
Values (in the same row) with same superscripts did not differ significantly (P< 0.05)

condition were 61.16% and 26.16%, respectively.

EVALUATION OF DIFFERENT ENERGY AND PROTEIN SOURCES FOR EVOLVING ECONOMIC RATIONS

S. Senani and S.K.Saha

In this study, colocasia tubers were dried and pulverized in to a powder and used in place of maize in quail diets. 30 quail chicks were divided into 3 groups of 10 chicks each. In treatment 1 and 2, 50 and 100 percent maize were replaced by colocasia tuber powder and while control had no colocasia tuber powder. All the diets had mineral mixture, bioboost and common salt as common ingredients. The composition of the 3 diets is presented in the Table 23. On nutrient analysis, the control T_1 and T_2 diets showed 20.1, 19.6 and 20.2 % CP, 12.2, 13.8 and 11.5% CF, 1.3, 1.5 and 1.3% EE, 10.6, 6.6 and 9.7% Ash and 3.2, 2.96 and 3.15% acid insoluble ash respectively. Over 6 weeks, T_2 recorded comparable growth to control and after 8th week it recorded higher growth than control and T_1 both. The mortality was higher in T_1 as compared to control and T_2. On the basis of this study, it is concluded that colocasia root powder could be used as an energy source in the quail ration without adversely affecting the growth of the quail chickens.

Table 23. Composition of experimental and control rations

Ingredients	Control	T_1	T_2
Maize	42	21	-
GNC	44	44	44
FM	13	13	13
Colocasia	-	21	42
MM	0.3	0.3	0.3
Bio-Boost	0.3	0.3	0.3
Salt	0.4	0.4	0.4
CP Cal.%	23.9	23.48	21.38
Nutrient composition			
DM	96.4	95.2	96.0
CP	20.1	19.6	20.2
CF	12.2	13.8	11.5
EE	1.3	1.5	1.3
Ash	10.6	8.6	9.7
Insoluble Ash	3.2	2.96	3.15

STUDIES ON MYCOTOXIN IN FEED STUFFS, SEASONAL VARIABILITY AND ITS DETOXIFICATION

S.Senani, Deepa Bhagat, R.B.Rai, A.Kundu, R.N.Chatterjee and Jai Sunder

Studies were conducted to investigate seasonal changes in the aflatoxin level depending upon storage period and conditions in various food/ feed stuffs. Feed ingredients were stored and after every 2 months aflatoxin levels were determined. From the analysis, it was known that sources rich in protein had a higher incidence of fungi infestation and thus recorded higher level of aflatoxin in the feed ingredients (Table 24). Further studies on seasonal variability and detoxification are in progress.

Table 24. Monitoring of level of Aflatoxin in different feed stuffs

Ingredient	Aflatoxin (May 2002)	Aflatoxin (July 2002)
Maize	10	14.8
GNC	21.6	56
CNC	30	28
Rice Bran	13	38
FM	20	98
Sorghum	10.5	17.0
Peanut	11.6	44.0
Onion	5.8	-
Rice	4.4	8.8

SERO SURVEILLANCE & ANTIGENIC CHARACTERIZATION OF ETIOLOGICAL AGENTS OF MAJOR LIVESTOCK & POULTRY DISEASES OF A & N ISLANDS

Jai Sunder, R.B.Rai, A.Kundu, R.N.Chatterjee, S.P.Yadav and B.Ganesh Kumar.

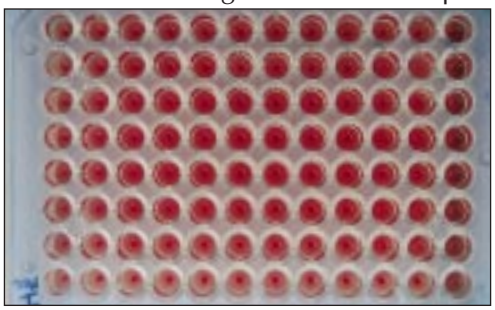
ELISA, SAT, AGPT, TAT etc. as diagnostic techniques

The sera samples were collected from the different islands of Diglipur, Rangat, Mayabunder, Car Nicobar and South Andaman and the following results were observed:

Poultry : A total no. of 343 sera samples of poultry birds screened showed the presence of *Salmonella pullorum* (77.4%), *Mycoplasma gallisepticum* (9.0%), C.A.V. (91.3%), Reo virus (95.6%) and *Avian encephalomyelitis* (46.1%).

Goat : Screening of 122 sera samples revealed the presence of *Brucella melitensis* in 13.33% cases.

Swine : Screening of 32 sera samples



ELISA plate

showed a sero prevalence of swine fever in 43.75% cases.

Cattle : On examination of 122 sera samples, it was found that the sero prevalence of IBR was 23.56% and of Brucellosis 20.79%.

Diagnosis of Diseases

Bovine Tuberculosis & Para Tuberculosis

The animals were subjected to intra dermal tests using Tuberculin& Johnin

Tubercle nodules on the parietal surface of the lungs

Pinpoint hemorrhages on thigh in IBD

PPD antigens by giving 0.1 ml in the neck region. The bovines exhibited clinical signs of temperature, swelling, redness and thickness above 10 cm. Postmortem examination revealed the presence of TB nodules on the parietal surface of lungs. Out of 26 bovines screened for TB and JD, intradermal test showed the prevalence of TB (42.3%) and JD (46.15%).

Mastitis

Out of 64 milk samples collected and examined, 29 samples were found to be positive for Streptococcal mastitis. The prevalence of Streptococcal mastitis was found to be 45.3% and of Brucella mastitis 13.6%. California Mastitis test

Clinical Examination Done During The Health Camp.

and Chloride test were found to be highly specific in diagnosing Sub clinical Mastitis.

Development of vaccine against IBD

An effective vaccine against IBD was developed by processing 20g of bursa of fabricus from affected birds and 40 ml of normal saline. The sample was centrifuged at 8000 rpm at 4^{0}C. The supernatant was collected (30ml) and formalin was added @ of 0.3% and inactivated formalized vaccine was prepared. This vaccine was tested for its efficacy in 300 chicks (2 weeks of age) at rate of 2 drops i/v /oral. The vaccine was found to be effective, as no subsequent outbreak of IBD was noticed in the vaccinated birds. The sera of the vaccinated birds (60.23%) revealed the presence of precipitin antibodies by AGPT Upto 16 weeks post immunization.

Immuno Competence Study in Indigenous Poultry Germplasm of A&N Islands

Five birds of White Nicobari, Brown Nicobari, Frizzle fowl, Naked Neck, Barred and ILI-80 were injected with 0.1 ml of 2% sheep RBC i/v during the experiment and approximately 2 ml of blood was collected prior to the injection. On 0^{th} day, haemagglutination test showed that the birds were free of any prior infection. The titre value of the same

birds were recorded on 5th, 6th, 7th, 10th and weekly intervals and thereafter up to 28th day. The finding revealed that all the birds except ILI-80 showed the big titre value around the 10th day whereas ILI-80 reached its peak titre on 14th day post injection of 2% sheep RBC.

It was found that the indigenous birds maintained a peak value for more than 7-8 weeks whereas ILI-80 maintained its peak value for only 2-3 weeks. Of all the indigenous breeds, Brown Nicobari showed the maximum titre value of log 8 which indicated that Brown Nicobari might be most resistant among the selected indigenous birds. In tests of all,

DIVISION OF FISHERIES SCIENCE

STUDIES ON RECRUITMENT, CULTURE AND NUTRITIVE VALUE OF EDIBLE OYSTERS OF ANDAMAN WATERS

R. Soundararajan, S. Dam Roy and S. Senani

The preliminary surveys conducted before the initiation of the project on edible oysters indicated that the extent of beds of *C. rivularis* in different rocky shores ranged from 180 (Mithakhari) to 4800 m^2 (Oyster island). The density of *C. rivularis* ranged from 13 (Redskin Island) to 102 oysters/m^2 (Wandoor). The densities in Wandoor, Havelock Island, Mayabunder, Ariel Bay and Smith Island were higher (>70/m^2). The estimated total biomass of *C. rivularis* ranged from 672 kg at Marine Hill to 83360 kg at Arial Bay having potential for direct exploitation and culture. The areas of distribution of *S. cucullata* in different sites ranged from 700 (Havelock Island) to 10000 m^2 (Oyster Island). The average density was between 30 (Corbyn's cove) and 660 oysters/m^2 (Ariel Bay). The densities were comparatively higher in Chidiatapu, Wandoor, Manglutan (> 100/m^2). The estimated total biomass of *S. cucullata* varied between 1096 kg at Corbyn's cove and 88999 kg at Ariel Bay.

The size and weight of *C. rivularis* occuring at Chidiatapu and the edibility (percentage of meat weight in total weight) are given in Table 25. The length of oysters ranged from 43 to 105 mm and the total weights from 74.3 to 128.5 g. The edibility ranged from 3.4 to 6.8. Similarly, the length of *S. cucullata* observed in Marine Hill ranged from 26 to 70 mm and the total weights from 8.8 to 17.5 g, with edibility ranging between 5.3 and 7.0.

In *C. rivularis*, the sex ratio of male and female ranged from 1:1.0 – 3.2. While maximum number of males were with ripe gonad in February, maximum number of females were with ripe gonad in November and January (Table 26). In *S. cucullata*, the males with ripe gonad were more in December and the number of females with ripe gonad was more in January to February.

Crassostrea gryphoides

Crassostrea rivularis

Table 25. Size and weight of edible oysters

Month	Size Range (mm) Length	Av. Weight (g) Width	Total	Edibility Meat	
Crossostrea rivularis					
November, 02	50-98	37-80	128.52	4.32	3.36
December, 02	55-105	34-70	83.70	5.70	6.81
January, 03	45-105	32-75	74.26	3.44	4.63
February, 03	43-100	30-80	108.42	4.42	4.1
March, 03	55-95	35-74	87.04	4.96	5.70
Saccostrea cucullata					
November, 02	33-68	17-35	8.95	0.62	6.93
December, 02	34-70	17-36	8.82	0.56	6.34
January, 03	26-60	17-35	10.81	0.63	5.83
February, 03	30-66	15-37	11.40	0.80	7.01
March, 03	35-70	16-40	17.53	0.92	5.25

Table 26. Gonadal Stages (%) of edible oysters

Month	Sex	Sex ratio	Spent/Developing	Maturing	Ripe
Crossostrea rivularis					
November, 02	M	1.0	22.22	61.11	16.66
	F	1.6	6.66	26.66	66.66
December, 02	M	1.0	16.66	66.66	16.66
	F	3.2	-	63.15	36.84
January, 03	M	1.0	25.0	65.62	9.36
	F	0.6	11.11	33.33	55.55
February, 03	M	1.0	8.0	68.0	24.0
	F	1.0	16.0	44.0	40.0
March, 03	M	1.0	54.2	37.5	8.3
	F	1.6	7.6	53.8	38.5
Saccostrea cucullata					
November, 02	M		48.48	42.42	9.09
	F		21.43	50.00	28.57
December, 02	M		52.0	4.0	44.0
	F		8.33	45.83	45.83
January, 03	M		18.18	50.00	31.81
	F		7.14	25.00	67.85
February, 03	M		4.35	56.32	39.13
	F		3.70	22.22	74.07
March, 03	M		43.46	39.65	16.90
	F		2.85	36.65	60.50

BREEDING AND CULTURE OF FRESHWATER GIANT PRAWN, M. ROSENBERGII IN ANDAMANS

N.Sarangi, R.Soundararajan and Nagesh Ram

The experiments so far undertaken resulted in achieving the production of 425.0 kg to 700.0 kg/ha without any commercial grade feed. Owing to the aquaculture need of the islands, some pilot scale studies were also undertaken on breeding and larval rearing of *M. rosenbergii* during 2002-03.

Nursery rearing of *M. rosenbergii*

Juveniles raising experiment on prawns was conducted in 4 ponds with water areas of 0.02 ha and 0.04 ha each for a period of 105 days. The juveniles were stocked at the initial length of 11.6 mm and attained the average length of 90.0 mm and 78.0 mm in the stocking densities of 50 No./ m^2 and 150 No./ m^2 respectively, whereas in the stocking densities of 75 No./ m^2, 2 different types of final average length and weight were obtained (81.5 mm and 13.29 g; 108.0 mm and 19.6 g). The rate of survival was highest (71.2%) with low stocking density. However, a moderate survival of 57.5% was obtained with the stocking density of 150 No./m^2. The post stocking management of the nursery pond was carried out partly with commercial grade feed for 45 days after stocking and partly with feed prepared at the Institute.

Culture of freshwater prawn, *M. rosenbergii* with carp fingerling raising

Trials on prawn culture was carried out along with carp fingerling rearing programme to standardize the technology as the available limited water area needs to be utilized in judicious manner for generating multiple productions. Ponds having water area of 0.04 ha each prepared and stocked with prawn seed procured from Chennai hatchery and produced at the Institute make shift hatchery at the stocking density of 80,000/ha and the initial length varied from 13.6 mm – 15.2 mm. Improved scientific management measures was adopted with application of feed made out of locally available ingredients. In a rearing period of 225 days, the prawns attained the average length of 125.0 mm and average weight of 57.0 g and the total production arrived at 517.5 kg/ha. The ponds were simultaneously used for carp fingerling rearing for a period of three months. The survival rates achieved from spawn to fingerling stage were 10-15% for catla, rohu and mrigal.

M.rosenbergii after 220 days rearing

Breeding, larval rearing and Broodstock development of *M. rosenbergii*

The adult prawns were monitored to become mature and berried in Institute farm ponds under improved managements.The berried females weighing from 25-45 g were transferred to a makeshift hatchery at Garacharma farm of the Instute. In all, 8 batches were allowed to release zoea during February to April and larval rearing was undertaken following protocols adopted in previous years. The maximum zoea obtained was 30,000 during March 2002. The zoea produced from one set could be raised to post larvae stage in 46 days with 0.2% recovery, suggesting some modification in operating system of the makeshift prawn hatchery. Under brood stock development programme, the prawn larvae raised in the Institute hatchery were raised to juveniles and stocked @ 5000/ha were allowed to grow and mature with locally available feed. The prawns with average weight of 107 g and average length of 152 mm observed to become berried during January 2003 after a period of 7-8 months rearing.

BROOD STOCK RAISING AND MATURITY STUDIES ON GROUPERS IN ANDAMANS

N.Sarangi

Grouper landing was studied in Guptapara and Woundoor fish landing centres of South Andaman. The grouper species of commercial importance were identified and recorded and their maturity conditions were observed. A total of 33,176.5 kg groupers was recorded during August 2002 to January 2003. The contribution of *P. pesuliferous* and *V. louti* was 20,100 kg and about 13,073 kg by other groupers. Catch was in higher order during September to December. The length and weight of some representative specimens were studied (Table 27). The gonad development as observed in *Cephalopholis sonnerati, Epinephelus longispinis, E. areolatus* and *Variola louti* was found at very early stages of their development.

Table 27. Length and weight of some groupers surveyed

Species	Av. length (cm)	Av. weight (kg)
Plectropomus pessuliferus	49.75 (36.0- 62.0)	1.6 (1.0- 2.8)
Variola louti	32.67 (29- 39.5)	0.62 (0.3-0.8)
Cephalopholis sonnerati	33.0 (28.0-35.0)	0.85 (0.2-0.9)
C. cynostigma	35.0 (32.0- 36.0)	0.500 (0. 25-0.7)
E. longispinis	36.0 (30.0-38.0)	0. 725 (0.5-1.0)
E. aerolatus	30.8 (26.0- 41.3)	0. 47 (0.3-0.75)
E. undulosus	62.5 (58-65)	1.5 (1.0–2.5)
E. malabaricus	102.0 (84.5-110.5)	10.0 (4.5–12.0)
E. tauvina	103.0 (75.5-115.0)	20.0 (5.5-25.0)
E. flavocaeruleus	39.0 (25.8- 45.5)	2.0 (1.5–3.5)

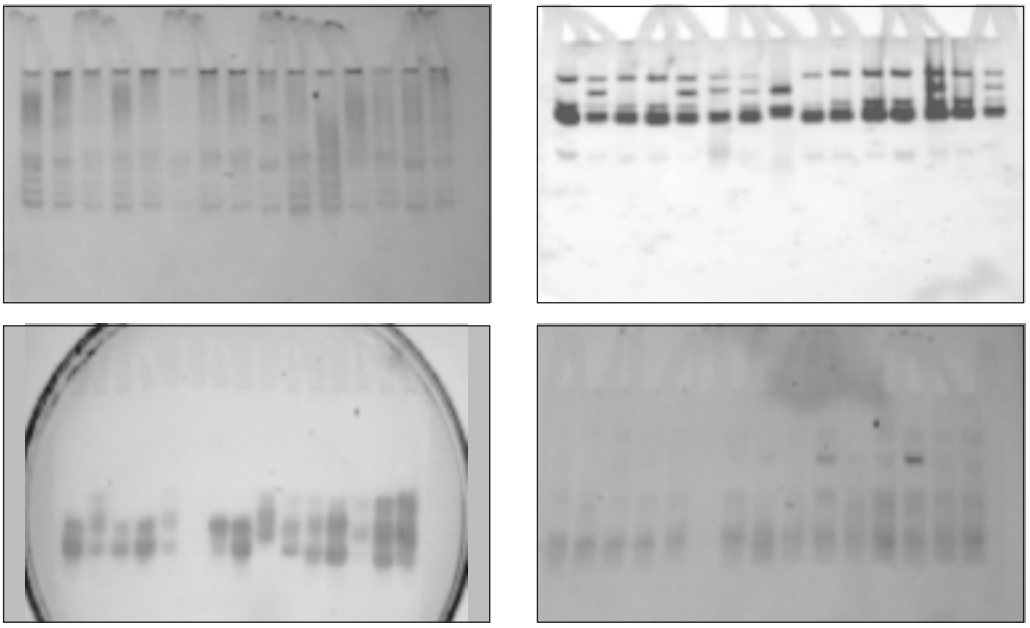
Figures in the parenthesis indicate range.

MOLECULAR CHARACTERIZATION OF BACKCROSSED CARPS

N.Sarangi

Selected F_2 back cross between Catla and Rohu were matured in 3 years and subjected to induced breeding and seed production. Induced breeding was successful with the administration of pituitary gland extract at a recommended dose of catla and a total of 3.0 lakh spawn recovered from breeding of one pair of brood stock under normal breeding in hapa with 99% fertilization and 90% hatching. The fecundity was 3.0 lakh like that of rohu and backcross 1 (B_1). Fingerlings of B_3 were subjected to morphotyping studies. The fishes were observed with least variations in morphotype but 3 distinct growth patterns were observed with comparatively small head and intermediate body depth. The fast growing individuals were segregated for further studies.

Isozyme profiles of this progeny were analysed through liver tissue samples across 15 polymorphic enzymes to analyze the extent of genetic variation with respect to the parent generation. Distinct polymorphic loci could be detected in enzyme profiles of Esterase(Est), Phospho-glucomutase(PGM), Super-oxidedimutase(SOD),6-phospho-gluconate dehydrogenase (6 PGD), Malic enzyme(ME), Lactate dehydrogenase(LDH) and μ-Glycerophosphate dehydrogenase (μ GPDH).



Isozyme profile through liver tissue of backcross B-3 of *Catla catla* and *Labeo rohita*.
Lanes 1-5 & 10-15 = Backcross 3; Lane 7 = F$_1$; Lane 8 = Catla; Lane 9 = Rohu

DEVELOPMENT AND CULTURE OF MONOSEX TILAPIA

S. Dam Roy and R. Soundararajan

The fingerlings of *Oreochromis urolepis* were stocked in 0.05 ha earthen pond and a stocking density of 8000 No./ha. The size of fish ranged from 73 to 165 mm and 5 to 83 g. At harvest, after 6 months of culture, a production of 1036 kg/ha was obtained. The percentage of survival was 87%. The average size of male tilapia was 220 mm and 178 g and the average size of female tilapia was 187 mm and 111 g.

Electrophoresis in *O. urolepis*

The samples of skeletal muscle from female and male were subjected to PAGE following standard protocol. The protein profile observed in the form of 12 bands in the molecular weight range of 14 to 95 kd in female and 14 to 98 kd in male. The present study also revealed that the sera of male *O. urolepis* had male specific protein having molecular weight of 182 kd and 92 kd.

Proximate Composition

Proximate composition of tilapia flesh was analysed. Though the average moisture content of male and female was same (77%), the male was having higher protein content (13.91%) than female (11.82%). On the other hand, the average fat content in males was observed to be 3.98% and in females 5.0% and the average ash content in males was 6.07% and in females it was 5.08% (Table 28).

Table 28. Proximate composition of tilapia Oreochromis urolepis (Norman) (on wet weight basis)

Sample No.	Sex	Length (cm)	Weight (gm)	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
1	Male	12.00	45.0	76.50	10.3 (60.30)	3.6 (14.2)	6.45 (22.73)
2	Male	10.00	35.0	78.30	8.3 (56.70)	3.8 (16.30)	6.75 (23.09)
3	Male	26.20	340.0	74.95	19.5 (62.90)	4.6 (22.10)	5.85 (22.54)
4	Male	17.60	95.0	79.30	12.75 (60.62)	5.7 (13.20)	6.1 (19.10)
5	Male	18.90	145.0	75.50	15.12 (63.75)	2.2 (16.10)	5.2 (18.70)
6	Female	20.50	280.0	77.65	12.70 (55.70)	7.8 (20.50)	(4.62)
7	Female	19.50	135.0	78.45	13.25 (63.12)	3.5 (9.6)	4.21 (19.10)
8	Female	22.00	160.0	76.40	11.25 (57.50)	4.7 (9. 4)	5.6 (27.4)
9	Female	14.30	60.0	78.45	10.37 (56.87)	4.0 (15.5)	5.9 (23.6)

Figures given in parenthesis are in % dry weight basis

DOCUMENTATION AND ANALYSIS OF INFORMATION AND FORECASTING OF FISHERIES IN BAY INLANDS

S. Dam Roy, M. Balakrishnan, R. Soundararajan, N. Sarangi, B. Ganesh Kumar, Nagesh Ram and Benny Varghese

Available information was documented as a base line information through a publication"Diversified fishery resources around the seas of Andaman & Nicobar Islands (Table 29, Figure 2).

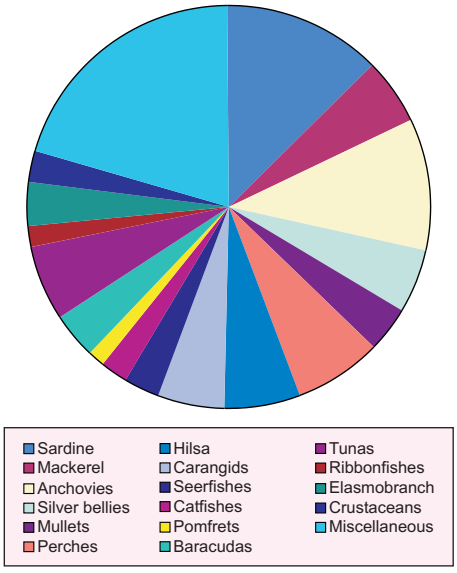


Figure 2. Percentage composition of fish landing in A & N Islands (1995-98)

Table 29. Region wise fish landing (in tonnes) in Andaman and Nicobar islands.

Region	1991	1992	1993	1994	1995	1996	1997	1998
Diglipur	842	1251	1241	1662	1306	1478	1954	1100
Mayabunder	624	953	982	1166	784	797	898	816
Rangat	2650	2715	1985	2360	2090	2128	3558	2727
South Andaman	16396	17993	16931	18874	19560	19744	16872	22755
Little Andaman	585	895	760	902	1045	1013	800	836
Car Nicobar	177	224	210	277	261	222	121	93
Nancowry	515	620	582	692	552	650	319	135
Campbell Bay	550	753	643	762	522	519	452	461
Total	**22339**	**25404**	**23334**	**26695**	**26120**	**24974**	**24974**	**28983**

CULTURE POSSIBILITY OF MARINE ORNAMENTAL FISHES (*AMPHIPRION* SPECIES) IN ANDAMAN AND NICOBAR ISLANDS

K.Madhu, Rema Madhu and R. Soundararajan

In the laboratory condition, each female *Amphiprion percula* laid 300-800 capsule shaped, light orange coloured eggs at every spawning and the size ranged between 1.9 mm and 2.1 mm long with a width of 0.8 to 1.0 mm and adhered to the sides of tank with stalk. In each spawning, 100 % hatchability had been achieved and larval survivability was 90%. Hatching was taken place after 6-7 days of incubation and darkness accelerated hatching. The larvae broke the egg capsule and the hatchling emerged tail first on 7th day of incubation and the hatching occurs soon after sunset. The developmental larval stages of *A. percula* from the hatchery spawned eggs had

been studied. Intraovarian egg (3.0 mm stage), prolarva (3.25 mm immediately after hatching), prolarva (4 hrs, 16 hrs and 24 hrs after hatching), 4.0 mm stage, early postlarva (4.69 mm), late postlarva (5.13 mm), 6.0 mm stage, 8.2 mm stage, 9.5 mm stage, post larva (10 mm), 10.5 mm stage, 10.5 mm stage, late poatlarva (11.75 mm), 13.0 mm stage, 13.3 mm stage, 15.7 mm stage, 18.0 mm stage, late postlarva (20 mm) 20.4 mm stage, 20.4 mm stage, 24 mm stage, late post larva (25 mm) late post larva (30 mm), 35 mm stage, 43.5mm stage, 45.7 mm stage and 69 mm stage were documented. The results of the present study evinced that major technological aspects of larval rearing from the hatchery seed production of clown fish such as provision of suitable environmental conditions, biological detoxifying filter system, supply of nutritionally adequate feed for larval rearing and settlement could now been successfully overcome and seed production of *A. percula* is promising to enhance and stabilize its population in these islands.

Different age group of *A. sandarocinos* had been collected from wild and reared in captive conditions for the development brood stocks. The brood stock were reared in 500 litre FRP tanks fitted with biological filter. The rearing experiment had been continued up to 6 months for putative brooders. The brood stock thus developed were fed twice a day with a mixture of high cholesterol foods enriched with vitamins, minerals and algal powder (which apparently improves egg quality and colour) along with live feeds.

The brood stocks of *A. sandaracinos* had been successfully bred under captive condition for the first time in the world. To find out suitable salinity, the size of 60 to 80 mm, 5 numbers of *A. percula* were reared in 100 litres capacity tanks for 80 litres water with different salinity (25, 30, 35 and 40 ppt). 3 replicates were kept for each range of salinity for statistical analysis. This study showed that salinity ranging between 30 and 35 ppt were suitable for survival of juvenile fishes of *A. percula* for its maximum growth and colour retention. Evaluation of the protandrous hermaphroditism in *A. percula* through histological studies is in progress.

BIOCHEMICAL GENETICS STUDIES ON ECONOMICALLY IMPORTANT SHELL AND FIN FISHES OF ANDAMANS

K.Madhu, Rema Madhu, N.Sarangi,
R. Soundrarajan and S. Dam Roy

In this project, population structure of mullet, *Liza tade* of South Andaman (Junglighat, Chouldari and Coriyaghat) and Middle Andaman (Rangat Bay) was carried out on the basis of morphometric characters, general proteins and isozyme patterns. To obtain consistent banding pattern, various continuous buffer system were used. The enzymes used are Acid phosphatase (*ACP-2**), Alcohol dehydrogenase (*ADH-2**), Aldehyde oxidase (*AO—2**), Esterase(*EST-1*, EST-2*, EST-3**), Fumarate dehydrogenase (*FH-1*, FH-2**), Glucose-6-phosphate

dehydrogenase (*G6PDH-*1*), Glutamate dehydrogenase (*GDH-2**), Glycerol-3-phosphate (*G3PDH-1**), Glucose Phosphate Isomerase(*GPI-1**), Hexokinase (*HK-1**), Isocitrate Dehydrogenase (*IDH-1**), Lactate dehydrogenase (*LDH-1**,*LDH-2**), Malate dehydrogenase (*MDH-1**, *MDH-3**), Malate dehydrogenase (NADP+), *MDHP-1**, Malic enzyme (NADP+)(*MEP-3**), Mannos 6-phosphate isomerase (*MPI-2**), Octanol dehydrogenase (*ODH-2**), Phopogluco dehydrogenase (*PGDH-2**), Phopoglutamase (*PGM-1**), Sorbitol Dehydrogenase (*SDH-1*,2**) Super oxide dismutase (*SOD-1**), Tetrazolium oxidase (*TO-1**), Xanthin oxidase (*XO-1**), Protein (*PT-1**), Protein (*PT-4**) and Protein (*PT-5**). These enzymes showed consistently polymorphism in South Andaman and Middle Andaman. Out of 38 enzymes loci observed, 32 presumptive loci were consistent. Allelic frequency, heterozygosity, genetic identity and distance. F_{IS}, F_{ST}, F_{IT}, statistics were carried out to understand the population complexity of *L. tade.* The temporal variation of these enzymes need to be studied and these works are in progress.

MICRO ALGAL CULTURE FOR LARVAE OF SELECTED MARINE SHELL FISHES OF ANDAMANS

Rema Madhu, K. Madhu and
R. Soundararajan

Stock culture of micro algae

The culture of isolated species was carried out in 9 different media such as Guillard f, f/2, f/4, Walnes, Miquel, TMRL, Suto, PM and SEAFDEC to find out the suitable media for their stock culture under laboratory condition and the experiment revealed that maximum multiplication of *Dicrateria inornata* was obtained on 8th day in the Walnes medium (14.325 lakshs cells/ml) followed by Guillard f (13.825 lakhs cells/ml on 8th day), Guillard f/2 (12.35 lakhs cells/ml on 9 th day). The study also revealed that these 3 media could be used for the stock culture maintenance of this algae. Culture of *Chlorella marina* divulged that Wales media gave the highest population growth and attained peak (15.85 lakhs cells /ml) on 9 th day of culture and the relative growth constant during its exponential phases was 2.13/day. The stock culture experiment of *Chlorella miniata* showed that Walnes media gave the highest population growth (14.175 lakhs cells/ml) and attained peak on 9th day of culture. The results of the culture of *Chromulina pleiodes* showed that Walnes media gave the highest population growth (14.875 lakhs cells /ml)and attained peak on 6th day of culture. The results of the culture of *N. occulata* showed that Walnes media gave the highest population growth (18.625 lakhs cells/ml) and attained peak on 7th day of culture. The results of the culture of *Nitzschia vitrea* showed that Walnes media gave the highest population growth (10.725 lakshs cells per ml) and attained peak on 6th day of culture. The stock culture of *T. caeca* showed that Walnes media gave the highest multiplication (10.35 Lakhs cells/ml) and attained peak on 8th day of culture and the relative growth constant

during its exponential phases was 1.57/day.

Mass culture of micro algae

The results of the mass culture of *Isochrysis galbana and Pavlova lutheri* showed that Walnes media gave the highest population growth (14.7 lakhs cells /ml) on 8th day) and attained peak on 8th day of culture and 15.2 lakhs cells /ml) on 8th day respectively. Mass culture of *A. ocellariodes* revealed that out of the 8 media tested for mass culture, Guillard f media gave the highest population growth and attained peak on 10th day of culture.

Shelf life period of different micro algae under 200 lux

For this purpose, cultures of *N. elegans*, *Isochrysis galbana, C. salina, C. gracilis, C. regularis , Chaetoceros lorenzianus, S. costatum* were kept under 200 lux after attaining exponential phase. The study revealed that *N. elegans, Isochrysis galbana, C. salina, C. gracilis , C. regularis , Chaetoceros lorenzianus* could be kept for 1 week, 1 month, 2 months, 2 weeks, 3 weeks and 5 days respectively whereas *S. coastatum* did not show any shelf life.

SOCIAL SCIENCE SECTION

TECHNOLOGY ASSESSMENT AND REFINEMENT - INSTITUTE VILLAGE LINKAGE PROGRAMME

S.C.Pramanik

This project is operating in 8 villages in South Andaman (Mithakhari, Ograbraj, Calicut, New Bimblitan, Maccapahar) Middle Andaman (Uttara, Dasrathpur, Govindapur) and also in Neil and Havelock Islands encompassing about 500 farmers. 20 technologies on rice, pulses, oilseeds, vegetables, flowers, animal husbandry and fisheries encompassing the varietal replacement, integrated pest management, natural resource management, disease and health care of animals had been successfully assessed in the farmers field during the year.

Assessment of salt tolerant rice variety in lowlying saline acid sulphate soils in Andaman

Ingression of sea water in the low lying fields in 37.0 ha areas in Dasrathpur village had been a severe problem for cultivation of rice over the decades. Therefore, with the help of development Departments peripheral bunds along the sea cost were constructed with the provision of drainage facility. The salt tolerant variety BTS 24, developed by the Institute, was assessed in 17 farmers field covering 10 ha in the saline acid sulphate soil of the village during 2002 –2003. Results revealed that BTS 24 recorded 35% higher yield than the farmers variety (Jagannath). The other high yielding variety Quing Livan No.1 also recorded significantly higher yield than the local variety. Farmers in the area accepted and adopted the variety by multiplying of seeds for the next year. Seeing the higher yield performance of BTS 24, farmers came back and resettled in the village for extensive cultivation of rice and rice based crops.

Participatory management of water stress in vegetables in low-lying rice fallow

Three low cost checkdams with dimension of 4.13 m length, 1.30 m height and 0.60 m width (Table 30) were constructed by the farmers under the technical guidance and supervision of the IVLP team in Ograbraj village. These checkdam could harvest 5,999 m^3 volume of run off water which was utilized for cultivating vegetables like okra, cowpea, bottle gourd, pumpkin, bitter gourd, cucumber, maize, water melon etc. during dry periods extensively. The yield of these vegetables increased to the extent of 65% through supplemental irrigation from checkdam as

Check dam in Ograbraj village, South Andaman

Table 30. Specification of the check dam constructed

Village	: Ograbraj
No. of participating farmers	: 10
No. of checkdam	: 3
Avg. Distance between checkdam	: 80 – 175 m
Dimension	: L 3.81m X W 0.60m X H 1.3m
Water collected	: 5,999 m^3
Irrigation potential	: 5 ha
Total cost	: Rs. 2200/- per check dam
Cost sharing	: 2/3rd by farmers + 1/3rd by the project
Crops under evaluation	: Okra, cowpea, bitter gourd, bottle gourd, pumpkin, maize, water melon, brinjal.

compared to completely rainfed crops. One third of the total cost of the checkdam was borne by the IVLP and rest by the farmers. Construction of low cost checkdam had not only made the vegetable cultivation possible but also encouraged the participatory approach in solving common problem of the farmers in the village.

Evaluation of high yielding varieties of cut flowers on hilly areas

After surveying the field conditions and farmers problems through PRA methods, 3 cut flower variety, viz. crossendra var. Aboli, tuberose var. single, double and marigold var. African dwarf were assessed in the farmers field for large scale cultivation in these islands. Crossendra and tuberose recorded an average yield of 2.20 q/ha and 2.50 q/ha, respectively (Table 31). The introduction of African dwarf variety in marigold (74.50 q/ha) recorded 19.2% higher

Crossendra (var. Aboli)

Marigold (var. African dwarf)

flower yield over the farmers variety. Accordingly, there was significant increase in net return of the farmers by Rs. 10000/ha from the cultivation of flowers over his previous income. The farmer's wife and children were engaged in value addition of flowers through making of garlands and gajra and thereby more employment was generated. Thus, through the introduction of floriculture, a positive and significant impact was created in the village.

Table 31. Improvement in yield and Generation of household economy through floriculture

Particulars	Before	After
Yield of flowers (q/ha)		
Crossendra	-	2.20
Tuberose	-	2.50
Marigold	62.5	74.50
Net return (Rs/ha)	12,500	22,500
Employment generation (mandays/ha)	45	109.5

Technologies Assessed and Evaluated in the Field

- Evaluation of salt tolerant medium duration HYV of rice for improving productivity
  No. of farmers : 18 Area covered : 9000 sq. mt.
- Performance of pre-emergent herbicide Butachlor for control of grassy weeds in rain fed transplanted rice.
  No. of farmers : 15 Area covered : 7500 sq. mt.
- Evaluation of medium duration HYV for improving rice productivity in medium upland valley.
  No. of farmers : 15 Area covered : 7500 sq. mt.
- Assessment of improved Nicobari fowl under backyard farming system.
  No. of farmers : 29 No. of birds distributed : 575 nos.
- Evaluation of high yielding arecanut variety "Samrudhi".
  No. of farmers : 9 Area covered : 9000 sq. mt.
- Evaluation of bacterial wilt resistant varieties of tomato.
  No. of farmers : 12 Area covered : 6000 sq. mt.
- Assessment of disease (bacterial wilt) and pest (fruit borer) tolerant varieties of brinjal.
  No. of farmers : 12 Area covered : 6000 sq. mt.
- Evaluation of disease tolerant varieties of chilli.
  No. of farmers : 12 Area covered : 6000 sq. mt.
- Assessment of disease resistant high yielding varieties of okra.
  No. of farmers : 80 Area covered : 40,000 sq. mt.
- Evaluation of cowpea varieties for their performance in rice fallow.
  No. of farmers : 75 Area covered : 37,500 sq. mt.
- Assessment of mulching technique for soil moisture conservation in okra, tomato and brinjal.
  No. of farmers : 4 Area covered : 2000 sq. mt.
- Evaluation of low cost rainwater harvesting and recycling technique for supplemental irrigation of dry season vegetable crops.
  No. of farmers : 10 Irrigation potential : 5 ha
- Assessment of HYV of marigold varieties for improving yield and economy.
  No. of farmers : 1 Area covered : 500 sq. mt.
- Evaluation of high yielding tuberose varieties in slopping hilly areas.
  No. of farmers : 1 Area covered : 500 sq. mt.
- Assessment of chemotherapeutic measures for control of humpsore diseases in cattle.
  No. of farmers : 35 No. of animals treated : 66 nos.
- Assessment of Composite fish culture in farm pond.
  No. of farmers : 4


FARMERS MEET

KRISHI VIGYAN KENDRA

TRAINING ACHIEVEMENT

A total of 23 training courses was conducted/facilitated by the faculty members, wherein 231 men and 291 women totaling to 522 got trained in agriculture and allied fields (Table 32).

FLD on Pulses

Sixteen demonstrations with 2 **Black gram** varieties, viz. PDU1 and CO5 were put in 0.40 ha demonstration plots totaling to 6.40 ha. The result showed that PDU1 gave an average yield of 7.95 q/ha and CO5 gave an yield of 7.67 q/ha in comparison to local check with an yield of 6.0 q/ha registering 39.50% increase in the yield.

Sixteen demonstrations were undertaken with 3 **Green gram** varieties, viz. PDM 54 and PDM 11 and CO5 in a total area of 7.20 ha. The results showed that PDM 54 gave an average yield of 8.76 q/ha over the local check (5.0 q/ha) giving 75.20% increase in the yield PDM 11 and CO5 gave yields of 6.96 and 6.92 q/ha, respectively.

FLD on Oilseeds

Fourteen demonstrations with 2 HYVs of sesame crop, viz. VRI1 and Swetha were taken up in farmers field covering a total area of 4.0 ha. Swetha gave an average yield of 6.27 q/ha over the local check (3.50 q/ha) registering an yield increase of 79.14% VRI1 gave an yield of 5.53q/ha.

FEED BACK ON PULSES AND OILSEEDS

Technical

Non-availability of quality and improved seeds during peak period was a major constraint.

Farmers

Very short duration crop is preferred (60-70 days).

They are unsure of plant type.

They are unfamiliar to technical know-how for HYV cultivation.

FLD on HYV of Rice

Under Kharif season 2002, 25 demonstrations on HYVs of rice with 4 selected varieties, viz. Krishna Hamsa, Quing Livan No.1, S1P1 681032 and CARI 145 were taken up in an area of 0.40 ha each covering a total area of 10.0 ha in 3 villages, namely Chouldhari, Humphrygunj and Wandoor of South Andaman. Among the 4, Krishna Hamsa performed the best and gave an average yield of 5.48 t/ha which showed 68.61% increase in the yield against the local check Puttu Jaya 3.25 t/ha. Quing Livan No.1 gave an yield of 5.07 t/ha, S1P1 681032 4.58 t/ha and CARI 145 4.50 t/ha, respectively.

FLD on HYV of Rice

FLD on Vegetables

Three crops, viz. ridgegourd, cowpea and brinjal were selected for taking up 29 demonstrations in farmers' field. The result showed that in ridgegourd variety Arka Sujat gave an average yield of 204 q/ha followed by IAHS1 (187 q/ha) and Arka Sumeet (178 q/ha). In cowpea variety, Arka Garima gave an average yield of 104 q/ha in comparison to Creeper Long which gave an yield of 65 q/ha. In brinjal, BB45C variety registered an yield of 412 q/ha followed by BB 66 with 325 q/ha.

FLD on Livestock

Eighteen demonstrations with Nicobari fowl (10), Khaki Campbell duck (3), Quail (3) and Chicken Broiler - Samrat 2000 (2) were undertaken. From the result, it could be inferred that Nicobari fowl gave an average yield of 140 eggs/bird which was 75% more than the local bird.

The Khaki Campbell duck yielded 230 eggs/bird, which was 76.92% more than the farmers' breed. Quail could give 17.5 kg of birds from an unit of 100 birds in 42 days, whereas the Broiler (Samrat 2000) could give 180 kg birds/batch of 100 birds in 45 days.

Field day

On Farm Testing with Super Rice for Normal soil

For the first time in the Islands, 8 strains of super rice were put into test in the farmers field covering a total area of 0.80 ha. Yield obtained was below their potential, as the major loss was primarily due to multi-storey nature of maturing and poor threshing yield. Nevertheless, the super rice strains, namely, S4, S12 and S13 gave average yields ranging between 4.20 and 4.56 t/ha.

On Farm Trial on HYV of rice for Normal Soil

NARDI 110, a HYV of rice was put into trial for the second consecutive year in plots measuring 0.05 ha each following RBD with 6 replications and 2 treatments covering a total area of 0.30 ha. An average yield of 4.56 t/ha with 42.50% increase in yield was recorded which was higher compared to the local variety Puttu Jaya (3.20 t/ha).

On Farm Trial on HYV of rice for Problem Soil

BTS 24, a variety suitable for problem soil, was put into trial in plots of 0.05 ha each following RBD with 6 replications and 2 treatments covering a total area of 0.30 ha. The average yield obtained was 2.75 t/ha with 25% increase in yield in comparison to the local cultivar C-14-8 (2.20 t/ha).

On Farm Testing on French Bean and Leafy Mustard

French bean varieties Contendar and Arka Komal were put into performance test. The former gave an yield of 53 q/ha and the latter 66 q/ha. The mustard leafy

vegetables could give yields around 100 q/ha.

The impact of intervention with 6 technologies was assessed and the result showed that the percentage of adoption was 100% with regard to use of Ethrel in Cucurbitaceos crops, followed by pickle making (83.33%), Nicobari fowl (68.42%), air layering (57.14%), mushroom cultivation (36.36%) and quail rearing (30.00%).

Table 32. Training programmes (on and off campus, sponsored and FLD)

Discipline	No. of training courses	No. of participants		
		Men	Women	Total
Practicing farmers				
Agronomy/Extension	6	68	34	102
Horticulture	5	43	116	159
Livestock production	4	58	18	76
Home science	1	3	47	50
TOTAL	16	172	215	387
Rural Youths				
Horticulture	3	26	19	45
Livestock production	1	15	-	15
Home science	3	18	57	75
TOTAL	7	59	76	135
GRAND TOTAL	**23**	**231**	**291**	**522**

TECHNOLOGIES ASSESSED AND TRANSFERRED

- Disease tolerant (bacterial wilt, YVMV) varieties in brinjal, tomato, chilli and okra
- Cultivation of gerbera, gladiolus, tuberose, marigold and anthurium
- Production technology for *Eulophia* orchid
- Production technology for Soursop and West Indian Cherry
- Black pepper cultivation on *Gliricidia* standard in open condition

Computer Cell

Summer course on 'MS OFFICE-2000' and 'Local Area Network and Internet' was organized at Computer Cell, CARI, Port Blair during 15th – 30th April 2002 and 1st - 11th May 2002. This programme was designed/intended to provide the participants an overview of the recent advances and developments in Computer Applications and Information Technology. Altogether 40 students from different schools of Port Blair attended the training. Dr. S.P.S. Ahlawat, Director, CARI issued certificates to the successful participants of the training programme in a valedictory function arranged in the Conference Hall of CARI on 21st June 2002. Director expressed happiness and emphasized that such trainings should be conducted in future also to build up educational and career prospects for the school children.

Dr. S.P.S. Ahlawat, Director, CARI distributing certificates to the school children

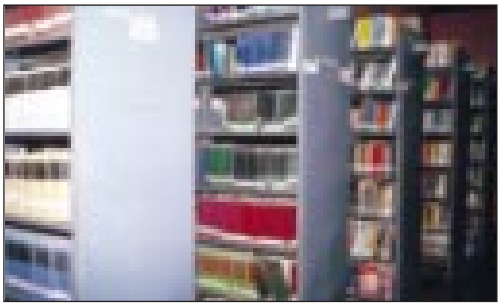
Krishi Vigyan Kendra

A total of 23 training courses were conducted/facilitated by the faculty members, wherein 231 men and 291 women totaling to 522 got trained in agriculture and allied fields during the year 2002-03.

INFORMATION ON OTHER SECTIONS

LIBRARY

Central Agricultural Research Institute has a well-organized library and plays an important role in this island as a centre for literature and information related to the institute mandate. The library serves and fulfills the needs of the scientists of this institute as well as scientist, research workers and students from other research and educational institute. The library had been enriched during the year with 185 Journal through subscription gifts and on exchange basis. The existing collection of books was further enriched by adding more current, important scientific and technical books. The library has an extensive collection of resource materials in the fields of Animal Sciences, Horticulture, Field crops, Biotechnology, Social Science and many other related areas. The library has an user-friendly reference collection system under the NATO Scheme such as CD-ROM Discs of AGRIS databases (1975-2000), which can be accessed through LAN in all Divisions/Sections. The CARI library has a precious special collection of islands related books and publications alongwith reprographic facility. Besides, efforts have been made to acquire non-conventional literatures such as technical reports, reports on socioeconomic study and annual report from various institutions.



PLANNING, MONITORING AND COORDINATION CELL

The Planing, Monitoring and Coordinaiton cell reviews and scrutinizes the research projects/proposals and coordinates the activities within and outside the institute. The section serves as a coordinating link between the Institute and Council (ICAR), Government, Semi-Government and other R&D organizations in addition to providing information on various research, training and extension activities of the institute to these agencies. During the period under report, the section had:

Prepared the following reports

- CARI Annual Report 2001-2002
- Material for DARE's Report 2002-2003
- Monthly Reports to Cabinet Secretariat for the year 2002-2003
- Report on RAC meeting.

Processed the following documents

- Papers (Research articles - 30; Abstracts - 17; Popular articles - 17) of the scientists for publication in Indian as well as foreign journals
- Technical bulletins of the Institute for publication
- Papers pertaining to various ICAR and other organisational awards applied from the Institute
- Material for updating the Directory of Agricultural Institutions in India
- Questionnaire regarding National survey on resource devoted to scientific and technological (S&T) activities by the Ministry of Science and Technology, Govt. of India.

Performed the following activities

- Monitoring and Coordination of research projects and maintenance of project files of the Institute
- Conducted two SRC and one mini SRC meetings
- Assisted in research project auditing
- Provided information regarding projects (RPFs) as and when required by the Council
- Provided information regarding Scientific Manpower in the Institute to the Council
- Prepared the replies to parliament questions
- Assisted the Director in all research and scientific matters as well as in planning and policy making as per the directives of the Council.

COMPUTER CELL

Home Page of http://cari.and.nic.in

Relaunching of CARI Website

First website of CARI with a URL of www.carian.org was launched during January, 2002 by Dr. Panjab Singh, Former Director General, ICAR. It was launched through VPAS infoway and it got expired during January, 2003. Website of CARI was modified with the new home page and other sub pages. It was launched on 14th February, 2003 through National Informatics Centre, Port Blair. The new URL of CARI website is http://cari.and.nic.in and its size is 19.4 MB. The new website contains detailed information about CARI, its mandate, divisions, publications, awards, accommodation details for visitors, welfare activities, ongoing projects, achievements and technology assessed and transferred etc. Apart from this, the site has been linked to various agriculturally important sites such as ICAR, Agricultural Gateway of India, IARI etc. In future, services provided by CARI will also be added and the site is being updated on fortnightly/monthly basis.

Training imparted

Sl.No.	Name of the training	Date	Number of participants
1.	MS OFFICE-2000	15th April 2002 to 30th April 2002	30
2.	Local Area Network and Internet	1st May 2002 to 11th May 2002	10

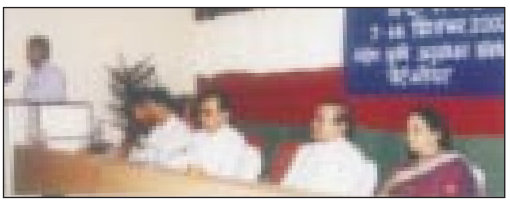
Databases developed

Two databases were developed during the year. Database on `Home gardens of A&N Islands' gives the complete details of the family members, crops and cropping pattern, details of animal/poultry, agricultural inputs used, consumption pattern of the family etc. in the homestead farming. Database on 'Coconut Germplasm in Bay Islands' is designed to give information such as variety details, establishment of plantation, plant protection measures, harvesting and yield etc.

OFFICIAL LANGUAGE CELL

To create a conducive atmosphere for working and to popularize official language among the staff and to promote the use of Hindi in the official work of the institute, various steps were taken during the year.

- Efforts have been made to promote and implement the official language policy during this period. Lots of bilingual scientific articles/publications were made.
- Speech competition were organised on 23rd July, 2002 for all Central Govt. staff and students of Jawahar Lal Nehru Rajkeeya Mahavidyalaya (JNRM).
- Efforts were made for doing maximum work in official language for the successful implementation of the official language policy and the targets fixed in the Annual Programme. The targets were achieved in using Hindi fully in the field of transfer of technology and extension. All the training materials used are bilingual.
- With a view to accelerating the pace of implementation, bilingual scientific bulletins/pamphlets for farmers and half yearly newsletter 'SAMACHAR DARSHAN' in Hindi were published.
- Article 3(3) is being followed *in toto* in the institute. All administrative meeting are being conducted in Hindi.
- During 'Hindi Week', various programmes like quiz, extempore, dictation and essay competition for scientist/staff were organized. During the year, Dr. S.C.Pramanik, Senior Scientist got special prize for his contribution and co-operation in implementation of the official language programme.
- The employees of the Institute were motived to write original noting and drafting in Hindi.
- Hindi workshop was launched to increase the strength of the staffs for implementation of official language and to bring awareness about the importance of increasing use of Hindi in official dealings.



AWARDS AND RECOGNITION

Dr. S. Dam Roy and Dr. R. Soundararajan was given Fakhruddin Ali Ahmed Award for the biennium 2000-01 for outstanding contribution in the development of Coastal Aquaculture, particularly mudcrab culture in Andamans by ICAR, New Delhi.

Dr. S. Dam Roy was given Hooker Award for the biennium 2000-01 for outstanding contribution on Mangrove Ecology and Brackishwater Aquaculture by the Education Department Of IARI, New Delhi.

Dr. K. Madhu was given NATCON Young Scientist Award-2002.

Dr. R. Elanchezhian was given Dr. Sirohi Best Paper Award by the Indian Society for Plant Physiology at 2nd International Congress of Plant Physiology held at New Delhi, India during Jan 8-12, 2003.

Dr. N. Ravisankar was given Dr. K.K. Subbaiah Award for the best Ph.D. thesis in Rice Agronomy from Tamil Nadu Agriculture University, Coimbatore during 2003.

Dr. B. Ganesh Kumar, Scientist (Agricultural Economics) has been awarded 'A' grade for his overall performance in 74th Foundation Course for Agricultural Research Service held during January 3 May 2, 2002 by NAARM, Hyderabad.

LINKAGES AND COLLABORATIONS

ON GOING RESEARCH PROJECTS

EXTERNALLY FUNDED

Project	CCPI
NATP	
Analysis and development of homestead farms of Kerala and Port Blair – A farmer's participatory approach *Mode : Production System Research*	Dr. A. Venkatesh
Sustainable management of plant biodiversity *Mode : Mission mode*	Dr. T.V.R.S. Sharma
Development of IPM technologies for palm based production system *Mode : Production System Research*	Dr. G. Shyam Prasad
Development of rainwater management technology on water shed basis for high intensity - high rainfall areas of Andaman and Nicobar Islands *Mode : Competitive Grant Programme*	Dr. S. Ghoshal Chaudhuri
Identification of molecular markers for natural disease resistance in Nicobari fowl by RAPD-PCR *Mode : Competitive Grant Programme*	Dr. S.P.S. Ahlawat
Productivity enhancement of ducks *Mode : Production System Research*	Dr. S. Senani
Strategies for enhancing the productivity of pigs in Andaman & Nicobar Islands *Mode : Production System Research*	Dr. S. Senani
Animal genetic resource biodiversity *Mode : Mission mode*	Dr. R.N. Chatterjee
Animal health information system through disease monitoring and surveillance *Mode : Mission mode*	Dr. Jai Sunder
Mussel mariculture *Mode : Production System Research*	Dr. R. Soundararajan
Pearl mariculture *Mode : Production System Research*	Dr. R. Soundararajan
"Mangrove ecosystem": Biodiversity and its influence on the natural recruitment of selected commercially important finfish and shellfish species in fisheries *Mode : Production System Research*	Dr. S. Dam Roy
Nutrition and pathology in mariculture *Mode : Production System Research*	Mrs. Rema Madhu
Institute Village Linkage Programme (IVLP-TAR) for Technology Assessment and Refinement *Mode : Production System Research*	Dr. S.C. Pramanik
Agricultural Technology Information Centre *Mode : Production System Research*	Dr. S.C. Pramanik

Project	Principal Investigator
DBT	
Collection, characterization, conservation and enhancement of ecologically and economically important species in Bay islands	Dr. Asit B. Mandal
Collection of the natural enemy resources of Andaman and Nicobar Islands and production of promising species for utilization in biological control programmes	Dr. Shyam Prasad
AP CESS	
Promotion of research on protected cultivation of vegetables in A & N Islands	Dr. R.P. Medhi
Agroforestry for sustainable biomass production in Andaman and Nicobar Islands	Dr. C.B. Pandey
Molecular tagging of excess salt tolerance gene(s) in rice and its significance in marker aided selection	Dr. Asit B. Mandal
Epidemiological survey of livestock and poultry diseases in Andaman and Nicobar Islands	Dr. A. Kundu
Meat Quality Assessment of different indigenous chicken breeds of Bay Islands	Dr. A. Kundu
Studies on important fish diseases in Bay Islands with special emphasis on isolation, identification, virulence factors, antigenic characterization and drug sensitivity of etiological agents	Dr. S. Jeyakumar
Mono and poly culture of fresh water prawn *M. rosenbergii* in the rainfed ponds of Andaman	Dr. N. Sarangi
Identification, isolation and culture of marine micro-algae in A & N Islands	Mrs. Rema Madhu
Genetic characterization of economically important prawns in A & N Islands	Dr. K. Madhu
MISCELLANEOUS SOURCES	
Central sector scheme	
Integrated programme for development of spices	Dr. R.P. Medhi
Medicinal Plants Board (Ministry of Health and Family affairs)	
Biodiversity characterization, conservation and bioprospecting of four economically important medicinal plants species of Bay Islands in Andaman and Nicobar Islands	Dr. Asit. B. Mandal
Space application centre, Ahmedabad	
GIS on island ecosystem	Dr. R. Soundararajan

INSTITUTE FUNDED

Project	Principal Investigator
HORTICULTURE & FORESTRY	
Varietal evaluation and standardization of agro techniques for tropical fruits	Dr. R.P. Medhi
Improvement and agro techniques of vegetable crops	Dr. R.P. Medhi
Ecological sustainability in plantation based land use	Dr. R.P. Medhi
Improvement of coconut and arecanut	Dr. R.P. Medhi
Studies on plantation based spices crops for tropical region	Dr. R.P. Medhi
Introduction and evaluation of exotic and less known indigenous fruit crops	Dr. D.R. Singh
Collection, cataloguing and standardization of agro techniques of native and exotic orchids and other shade loving plants	Dr. D.R. Singh
Collection and evaluation of tuberose, gladiolus, chrysanthemum, gerbera, marigold, balsam and amaryllis	Dr. Sujatha A. Nair
Tree-soil-crop interactions in agro forestry practices in Andaman and Nicobar Islands	Dr. C.B. Pandey
Macro propagation studies on some important timber species of Bay islands	Dr. A. Venkatesh
FIELD CROPS	
Genetic modulation for increased productivity in rice with special reference to biotic and abiotic stress tolerance in Bay Islands	Dr. A.B. Mandal
In vitro propagation and molecular characterization of] valuable medicinal plants of Bay Islands	Dr. T.E. Sheeja
Physiological approaches for improved abiotic stress tolerance in solanaceous vegetable crops	Dr. R. Elanchezhian
Development of IPM practices for key pests of brinjal, tomato, cole crops (Cauliflower, cabbage)	Dr. G. Shyam Prasad
NATURAL RESOURCE MANAGEMENT	
Assessment of soil loss with biological control measures under different crops canopies in hilly slopes of Andaman islands	Dr. S. Ghoshal Chaudhuri
Runoff harvesting and recycling for crop production during dry season on rice fallow in Andamans	Dr. S.C. Pramanik

Project	Principal Investigator
Assessment of quality of soils in plots of known agricultural history in Andaman and Nicobar Islands for development of soil quality index	Dr. R. Dinesh
Status and scope of farm mechanization in Andaman and Nicobar Islands	Dr. M. Din
Evaluation of broad bed and furrow system for vegetable production in rice fields of Andaman and Nicobar Islands	Dr. Anil Kumar Nair
Agro-techniques for direct seeded rice in Bay Islands	Dr. N. Ravisankar
ANIMAL SCIENCE	
Study on the status of minerals profile in bovines in relation to disease and production	Dr. R.B. Rai
Adaptability and productivity of Japanese quail in Andaman and Nicobar Islands	Dr. A. Kundu
Development of economic ration by using locally available energy and protein sources	Dr. S. Senani
Studies on myotoxin in feedstuffs, seasonal variability and detoxification	Dr. S. Senani
Genetic upgradation and evaluation of indigenous cattle of Andamans	Dr. R.N. Chatterjee
Development of a synthetic layer suitable for backyard farming in Bay Islands	Dr. R.N. Chatterjee
Sero-surveillance and antigenic characterization of etiological agents of major livestock and poultry diseases of Andaman and Nicobar Islands	Dr. Jai Sunder
FISHERIES SCIENCE	
Hatchery seed production of marine shellfishes of economic importance	Dr. R. Soundararajan
Studies on recruitment, culture and nutritive value of edible oyster of Andaman waters	Dr. R. Soundararajan
Brood stock raising and maturity studies on groupers of Andaman	Dr. N. Sarangi
Culture of milkfish, sea bass and prawn in tide fed brackish ponds in Andamans	Dr. S. Dam Roy
Development and culture of Monosex Tilapia	Dr. S. Dam Roy

Project	Principal Investigator
Documentation and analysis of fisheries information and forecasting of fisheries in Bay Islands	Dr. S. Dam Roy
Micro-algal culture for larvae of selected marine shellfishes of Andamans	Mrs. Rema Madhu
Artificial feed formulation for selected cultivable marine shell and finfishes of Andamans	Mrs. Rema Madhu
Bio-chemical genetic studies on economically important shell and finfishes of Andaman	Dr. K. Madhu
Culture of marine ornamental fishes in Andaman Islands	Dr. K. Madhu

SOCIAL SCIENCE

Economic analysis of poultry farming enterprise in Andaman and Nicobar Islands	Dr. B. Ganesh Kumar
Assessment of economics and sustainability of the integrated farming system in Andaman	Dr. S.C. Pramanik

LIST OF PUBLICATIONS

RESEARCH PAPERS

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Monoranjan Kumar, B.Ganesh Kumar, A.S.M Raja, V.P. Choudhary, Govind Pal, J. Jayaprakash and R.C. Balai (2002). Group Report on 'Field Experience Training' at College of Agriculture, JNKVV, Indore undergone during March 1 21, 2002.

PATENTS FILED

Patent applications for the following products have been submitted.

Sl. No.	Item/Product	Scientist
1.	Herbal antimicrobial, anti-inflammatory and anti-histaminic formulation (Topical / Oral).	Dr. Asit B. Mandal *et al.*
2.	Herbal mouthwash.	Dr. Asit B. Mandal *et al.*
3.	Herbal vaginal contraceptive (Topical).	Dr. Asit B. Mandal *et al.*
4.	Herbal preparation for curing oral submucus fibrosis (OSF).	Dr. Asit B. Mandal *et al.*
5.	Floricultural operations of *Eulophia andamanesis.*	Dr. D.R. Singh *et al.*

PARTICIPATION OF DIRECTOR IN DIFFERENT COMMITTEES AND PANELS

The Acting Director, CARI, Port Blair served as

Member-Secretary and Coordinator, Zonal Planning Team, Zone XV, Planning Commission.

Member, Medicinal Plants Board, A & N Administration, Port Blair.

Member, State Level Committee for Identification of beneficiaries for supply of tractor on Loan-cum-Subsidy basis, A & N Administration, Port Blair.

Member, Rural Programme Advisory Committee, A & N Islands, Port Blair

President, Andaman Science Association, A & N Islands, Port Blair.

Member, Pollution Control Board, A & N Administration, Port Blair.

Member, UT level Coordination Committee on watershed management, A & N Administration, Port Blair.

Member, UT Coordination Committee, A & N Administration, Port Blair

Member, Coordination Committee, A & N Administration, Port Blair

Important Meeting / Workshop / Symposium etc. attended by The Acting Director, CARI, Port Blair

Meeting on "Leptospirosis" held at IVRI Regional Station, Kolkata on 6th April, 2002.

Meeting of QRT-CARI arranged in the chamber of the Deputy Director General (Hort.) under the Chairmanship of Dr. Kirti Singh held at New Delhi on 19th April, 2002.

Meeting of QRT-CARI arranged in the chamber of Deputy Director General (Hort.) under the Chairmanship of Dr. Kirti Singh at New Delhi on 6th September, 2002.

Assessment Committee Meeting of KVK-CARI staff (Category-III) held at New Delhi on 6th September, 2002.

Assessment Committee Meeting of Technical staff of CARI (Category-III) held at New Delhi on 16th December, 2002.

National Workshop for "Country Report on Animal Genetic Resources" held at National Bureau of Animal Genetic Resources, Karnal on 10th January, 2003.

Consortium for "Unfavorable Rice Ecosystems" (CURE) organized by IRRI at NASC Complex, New Delhi on 23rd and 24th January, 2003.

Dr. A.Venkatesh, Scientist (Forestry) attended the seminar on Solid waste management through vermicomposting organized by Dept. of Science and Technology, Port Blair on 16 October, 2002.

Dr. A.Venkatesh, Scientist (Forestry) attended the summer school on Producton technology and management of Agroforestry models held at PAU, Ludhiana during 10-30 July, 2002.

Dr. B. Ganesh Kumar, Scientist (Agricultural Economics) attended the seminar on Solid waste management through vermicomposting organized by Dept. of Science and Technology, Port Blair on 16 October, 2002.

Dr. B. Ganesh Kumar, Scientist (Agricultural Economics) underwent the 74th Foundation Course for Agricultural Research Service (FOCARS) held at NAARM, Hyderabad during 3 January – 2 May, 2003.

Dr. D.R. Singh, Senior Scientist (Horticulture) attended the seminar on Solid waste management through vermicomposting organized by Dept. of Science and Technology, Port Blair on 16 October, 2002.

Dr. D.R. Singh, Senior Scientist (Horticulture) attended seminar on Orchids - Its scope in A&N Islands held at Secretariat, A & N Administration, Port Blair on 8 January, 2003.

Dr. Jai Sunder, Scientist (Veterinary Microbiology) attended the annual review workshop of NATP project entitled "Animal health information system through disease monitoring and surveillance" held at PD-ADMAS, Bangalore during 28-30 June, 2002 and presented the annual progress report.

Dr. Jai Sunder, Scientist (Veterinary Microbiology) attended the short term training programme on Agricultural research prioritization techniques held at NAARM, Hyderabad during 25-30 July, 2002.

Dr. Jai Sunder, Scientist (Veterinary Microbiology) attended the refresher course on Application of IT in agriculture held at NAARM, Hyderabad during 5-25 February, 2002.

Dr. K. Madhu, Scientist (Fish & Fishery Science) attended the winter school on Recent Advances in Diagnosis and Management of Disease in Mariculture held at CMFRI, Cochin during 7-27 November, 2002 (21 days).

Dr. Kishan Swaroop, Scientist (Horticulture) attended the seminar on Solid waste management through vermicomposting organized by Dept. of Science and Technology, Port Blair on 16 October, 2002.

Dr. Kishan Swaroop, Scientist (Horticulture) attended the seminar on Orchids - Its scope in A & N Islands held at Secretariat, A&N Administration, Port Blair on 8 January, 2003.

Dr. Kishan Swaroop, Scientist (Horticulture) attended the Winter school on Recent advances in vegetable production technology held at IIVR, Varanasi during 3-23 December, 2002.

Dr. Kishan Swaroop, Scientist (Horticulture) participated in the I International conference on Vegetables held at Bangalore during 11-14 November, 2002.

Dr. M.Din, Senior Scientist (Farm Machinery & Power) attended the workshop on Jute Geo textile and Jute reinforced composites organized by Jute manufacturers Development council and Indian Jute Industries Research Association on 11 December, 2002.

Dr. M.Din, Senior Scientist (Farm Machinery & Power) participated in the 37th Annual ISAE convention held at CTAE, Udaipur during 29-31 January, 2003.

Dr. N. Ravisankar, Scientist (Agronomy) attended the training programme on Sustainable ecosystem maintenance through farming system approach held at TNAU, Coimbatore during 27 February – 19 March, 2003.

Dr. R. Elanchezhian, Scientist (Plant Physiology) underwent basic training on Molecular markers in assessment of genetic diversity held at MSSRF, Taramani, Chennai during 10-31 August, 2002.

Dr. R. Elanchezhian, Scientist (Plant Physiology) attended ICAR winter school on Use of isotopes and radiations in soil plant relationships held at IARI, New Delhi during 3 October - 1 November, 2002.

Dr. R. Elanchezhian, Scientist (Plant Physiology) attended 2nd International Congress of Plant Physiology on Sustainable Plant Productivity Under Changing Environment held at New Delhi, India during 8-12 January, 2003.

Dr. R.N. Chatterjee, Senior Scientist (Animal Genetics & Breeding) participated the I National workshop on Animal Genetic Resources held at NBAGR, Karnal during 10-13 January, 2003.

Dr. R.N. Chatterjee, Senior Scientist (Animal Genetics & Breeding) participated in the 2nd National workshop on Animal Genetic Resources held at UAS, Bangalore during 5-6 February, 2003.

Dr. S. Dam Roy, Senior Scientist (Fish & Fishery Science) attended the refresher course on computer education for agricultural scientists held at Haryana Agricultural University, Hisar during 4-31 December, 2002.

Dr. S. Ghoshal Chaudhuri, Senior Scientist (Soil Physics & Water Conservation) attended the Workshop on Jute Geo textile and jute reinforced composites organized by Jute Manufacturers Development Council and Indian Jute Industries Research Association on 11 December, 2002.

Dr. S. Ghoshal Chaudhuri, Senior Scientist (Soil Physics & Water Conservation) attended the training programme on Agroecological zoning for land use planning organized by NBSS&LUP at Nagpur during 17-23 December, 2002.

Dr. S. Jeyakumar, Scientist (Animal Reproduction & Gynaecology) attended the 9th International Congress on Biotechnology in Animal Reproduction held at Madras Veterinary College, TANUVAS, Chennai during 2-4 December, 2002.

Dr. S.C. Pramanik, Senior Scientist (Agronomy) attended the 4th All India National workshop on ATIC held at Rajasthan Agricultural University, Bikaner during 27-29 August, 2002.

Dr. S.C. Pramanik, Senior Scientist (Agronomy) attended the 3rd All India National workshop on IVLP held at UAS, Dharwad during 4-6 September, 2002.

Dr. S. Senani, Senior Scientist (Animal Nutrition) attended the training programme on GIS Application in Agricultural Research held at NAARM, Hyderabad during 20-30 November, 2002.

Dr. S.Senani, Senior Scientist (Animal Nutrition) attended the International Conference on Alternatives to use of Animals in education and research held at New Delhi during 18-20 February, 2003.

ADDITIONAL QUALIFICATIONS OBTAINED

Shri. N. Ravisankar, Scientist (Agronomy) was awarded Ph.D. degree in Agronomy in the month of October, 2002 from Tamil Nadu Agricultural University, Coimbatore.

Smt. Sujatha A. Nair, Scientist (Horticulture) was awarded Ph.D. degree in Horticulture in the month of November, 2002 from Dr. B.R. Ambedkar University, Agra.

Er. M. Din, Senior Scientist (Farm Machinery & Power) was awarded Ph.D. degree in the month of February, 2003 from Indian Institute of Technology, New Delhi.

Smt. T.E. Sheeja, Scientist (Plant Biotechnology) was awarded Ph.D. degree in Botany in the month of March, 2003 from Dr. B.R. Ambedkar University, Agra.

Shri. S.K. Zamir Ahmed, Senior Training Assistant (Agronomy/Extension), KVK was awarded Ph.D. degree in Agricultural Extension in the month of December, 2002 from Dr. B.R. Ambedkar University, Agra.

Shri. V. Damodaran, T-5 was awarded M.Sc. (Ag.) in Agronomy from Tamil Nadu Agricultural University, Coimbatore.

LECTURES DELIVERED

Dr. D.R.Singh Senior Scientist (Horticulture) delivered a lecture to the farmers of Beondnabad area on the topic "Flower cultivation" organized under the NATP-project entitled "Analysis and development of homestead farms of Kerala and Port Blair : A farmers' participatory approach" held during 24 to 27 September, 2002.

Dr. D.R.Singh Senior Scientist (Horticulture) delivered a lecture to the farmers on the topic "Orchid cultivation" organized by Department of Agriculture Andaman and Nicobar Administration during May 2002.

Dr. D.R.Singh Senior Scientist (Horticulture) delivered a lecture to the farmers on the topic "Fruit cultivation" organized by Department of Agriculture Andaman and Nicobar Administration during May 2002.

Dr. D.R.Singh Senior Scientist (Horticulture) demostrated a propogation techniques of Mango grafting during state exhibition held during December 2002 organized by Andaman and Nicobar Administration.

Dr. Kishan Swaroop, Scientist (Horticulture) delivered a lecture to the farmers of Beondnabad area on the topic "Vegetable cultivation in plantation based multiple cropping systems" organized under the NATP-project entitled "Analysis and development of homestead farms of Kerala and Port Blair : A farmers' participatory approach" held during 24 to 27 September, 2002.

Dr. M. Din, Senior Scientist (Farm Machinery & Power) delivered a lecture on *Andaman Aum Nocobar Dweepon Me Krishi Urja Prabandhan* at Central Scientific Instruments Organization, Chandigarh in April,2002.

Dr. S. Ghoshal Chaudhuri, Senior Scientist (Soil Physics & Water Conservation) delivered a lecture for popularizing social forestry in the seminar organized by Andamans Nature Club, Directorate of Education and Department of Science and Technology, Andaman Administration in September, 2002.

Dr. S. Ghoshal Chaudhuri, Senior Scientist (Soil Physics & Water Conservation) delivered a lecture on Agro ecosystem and Bio diversity in the seminar organized by Andamans Nature Club, Directorate of Education and Department of Science and Technology, Andaman Administration in December, 2002.

Smt. Kanak Lata, Senior Training Assistant, KVK delivered a lecture on ''Services rendered by KVK to self help groups'' during April 2002 organized by NCUI in Port Blair.

Dr. S.K. Zamir Ahmed, Senior Trining Assistant, KVK delivered a lecture on ''Suitable spices crop for multi layered cropping system'' during July 2002 at Horticulture and Forestry Division, CARI, Port Blair.

RADIO TALK

Title	Date of Broadcast	Expert
Dweep samuh me krishi me pasu urja yogdan	07.01.2002	Dr. M. Din
Dweepon key lia upyukat krishi yantra	07.05.2002	Dr. M. Din
Health management of livestock (In Hindi)		Dr. Jai Sunder
Lavang ke paudhon kee dekhbhal- Kuch sujhav	01.06.2002	Dr. V.B. Pandey
Dweepon ke liye upyuket dhan kee kishmen	03.06.2002	Dr.S.K.Zamir Ahmed
Dhan ki nursery ki taiyari	10.06.2002	Sh. L.B.Singh
Dhan ke liye mukhya bhumi ke taiyari	05.07.2002	Sh.R.L.Sagar
Batcheet : Sabjiyon mein vridhi niyamakon ka prayog	14.07.2002	Dr. R. Elanchezhian
Farm interaction on vegetable cultivation	10.08.2002	Sh. L.B.Singh
Farm interaction for rearing quail and poultry	11.08.2002	Sh. N.C.Choudhuri

TELEVISION SHOW

Title	Date of Telecast	Expert
Prospects of fruit cultivation	17.04.2002	Dr. D.R. Singh
Bilimbi – a multipurpose fruit	03.09.2002	Dr. D.R. Singh
Banana cultivation	22.10.2002	Dr. D.R. Singh

QUINQUENNIAL REVIEW TEAM (QRT) MEETING

The QRT for the Institute was constituted by ICAR under the Chairmanship of Dr. Kirti Singh, Ex-chairman, ASRB to review the research activities of the Institute for the period from 1996 to 2001. The team comprised of eminent scientists and educationists like Prof. K. Pradhan, Prof. K.S. Chauhan, Prof. A.N. Mukhopadhyay, Prof. R.C. Tiwari and Prof. K.Dorairaj. Dr.N. Sarangi, Principal Scientist of the Institute was the Member Secretary. During the period of review, the QRT conducted three meetings in the months of March, April and September 2002 at the Office of the Deputy Director General (Hort.) at KAB-II, New Delhi. The team visited CARI, Port Blair during April and December 2002 and reviewed the farm and laboratory activities of the Institute and interacted with the scientists. The Chairman convened meetings with the Director and the scientists of the Institute. The team also made a field visit to North and Middle Andaman by road to have an information on farming system being practiced by the farmers of these islands, their socio-economic conditions and the impact of training, extension activities and TOT programmes of CARI in various remote localities of the islands. The Chairman and members had a lively discussion with farmers of adopted villages and ex-trainees of KVK in a farmers meet organized by KVK-CARI.

The Members attended a meeting at Raj Niwas convened by Hon'ble Lt. Governor of A&N Islands, Shri. N.N. Jha, to discuss the future plan on developmental programmes of these islands with QRT in the presence of Development Commissioner and the Directors of the development departments and emphasized the role of CARI, the only multi-disciplinary agricultural research organization in the islands. The visiting team, before finalizing the report, met with the staff members of the Institute and members of Institute Joint Staff Council. The QRT made 65 recommendations alongwith the critical review and valuable suggestions for the overall development of research for islands and welfare of the staff and expressed high appreciation for the achievements made by the Institute. The Chairman submitted the final report of QRT to Council in January 2003.

QRT members in a meeting convened by Hon'ble LG of A&N Islands, Shri. N.N. Jha

QRT members on a field visit to Garacharma farm

RESEARCH ADVISORY COMMITTEE (RAC) MEETING

The second meeting of the third RAC was held under the Chairmanship of Dr. O.P. Pareek, Emeritus Scientist, CIAH, Bikaner on 21st and 22nd March 2003 at CARI, Port Blair. Other members present were Dr. J.P. Tandon, Ex-Assistant Director General (FC), Dr. M.J. Devraj, Emeritus Professor, CMFRI, Dr. R.B. Rai, Acting Director, CARI, Port Blair and Dr. R.P. Medhi, Member Secretary. Another member Dr. B. Panda, Ex-director, CARI, Izatnagar visited this Institute during 21st to 23rd May 2003. Apart from the above members, the Directors of Agriculture, Fisheries and Animal Husbandry & Veterinary Services of A&N Group of Islands were also invited. All the scientists of the institute participated in the meeting.The research committee gave the detailed guideline for formulating new research project for next year and division wise recommendations.

Dr. O.P. Pareek, Emeritus Scientist, CIAH, Bikaner in RAC meeting 2002-2003

STAFF RESEARCH COUNCIL (SRC) MEETING

During the period under report, there were two SRC meetings and one Mini SRC meeting organized in the institute.

The SRC Meeting for the year 2001-2002 was held on 8th-9th April 2002 under the chairmanship of Dr. S.P.S. Ahlawat, Director, CARI, Port Blair. Dr. A.K. Bandyopadhyay, Ex-Director, CARI, Port Blair and Dr. P.C. Sentiago, Principal Scientist, CIBA, Chennai were the experts on the occasion. Dr. S. Dam Roy, Senior Scientist, CARI, Port Blair was the Member Secretary, SRC. The pricipal investigators of all the 35 existing institute projects presented the progress of their respective projects. Two new projects were also approved.

The Mini SRC meeting was held on 12th September 2002 under the chairmanship of Dr. S.P.S. Ahlawat, Director, CARI, Port Blair. The experts for this meeting were Dr. Harpal Singh, Professor and Ex-Dean, College of Veterinary Sciences, GBPUA & T, Pant Nagar, Dr. Babooji Gangwar, Programme Facilitator, PDCSR, Modipuram, Meerut and Er. K.P. Tripathi, Principal Scientist, CSCWR & TI, Dehradun. Dr. S. Dam Roy, Senior Scientist and Member Secretary, SRC conducted the Mini SRC proceedings. Altogether 8 new institute funded projects and 5 externaly funded project proposals were presented by the Principal Investigators. All the projects were discussed thoroughly and appropriate suggestions were made by the experts.

The SRC Meeting for the year 2002-2003 was held on 4th-5th March 2003 under the chairmanship of Dr. R.B. Rai, Acting Director, CARI, Port Blair. Dr. Mohan Joseph Modayil, Director, CMFRI, Cochin and Dr. Appukuttan, Principal Scientist and Head, CMFRI, Cochin were the experts. Dr. R. Elanchezhian, Scientist, CARI, Port Blair was the Member Secretary, SRC. The pricipal investigators of all the 37 existing institute projects presented the progress of their respective projects. Two new projects were also presented and approved.

Dr. Mohan Joseph Modayil, Director, CMFRI, Cochin in SRC meeting 2002-2003

INSTITUTE MANAGEMENT COMMITTEE (IMC) MEETING

The 23rd Meeting of the Institute Management Committee of CARI, Port Blair was held on 3rd March 2003 under the chairmanship of Dr. R.B. Rai, Acting Director, CARI, Port Blair. The other members participated in the meeting were Dr. R.P. Medhi, Principal Scientist, Dr. R. Soundararajan, Principal Scientist, Dr. S. Senani, Senior Scientist and Shri. V.S. Subramanian, FAO, CMFRI, Cochin. Dr. A. Kundu, Administrative Officer i/c and Member Secretary conducted the IMC proceedings. Altogether 8 agenda items were discussed during the meeting.

DISTINGUISHED VISITORS

Dr. A.K. Bandyopadhyay, Ex-Director, CARI, Port Blair visited on 09.04.2002.

Dr. S.P.S. Raghava, Professor of Horticulture, IARI, New Delhi visited on 17.04.2002

Dr. S.V.S. Verma, Retd. Principal Scientist & Head, Central Avian Research Institute, Izatnagar visited on 22.04.2002.

Dr. S.P. Yadav, Principal Scientist, Seed Science & Technology Division, IARI, New Delhi-110012.

Shri. S. Hemachandran, Development Commissioner, Andaman & Nicobar Administration visited on 03.06.2002.

Shri. Arun Goyal, Commissioner-cum-Secretary to LG and Commissioner (Power, Tourism & Financ), A&N Administration, Port Blair visited on 20.06.2002.

Shri. D.P. Singh, Retired Sessions Judge, Dehradun visited on 20.06.2002.

Shri. Tamigo Taga, Speaker, Arunachal Pradesh Legislative Assembly visited on 26.06.2002.

Dr. W.S. Lakra, Principal Scientist, CIFE Mumbai visited on 12.07.2002.

Sisters. Amicia, leela, Mary Lucy and Joyery Rose, Carmel School, Port Blair visited on 27.07.2002.

Shri. Ved Prakash, Section Officer, Indian Council of Agricultural Research, Krishi Bhavan, New Delhi visited on 06.08.2002.

Dr. Harpal Singh, Former Dean, G.B. Pant University of Agriculture and Technology, Pantnagar visited on 10.09.2002.

Dr. R. Padmanabhan, Chief Secretary, A&N Administration, Port Blair visited on 13.09.2002.

Shri. S.S. Patnaik, Principal Chief Conservator of Forest & Secretary, Environment & Forest, A&N Administration visited on 17.09.2002.

Dr. Rameshwar Singh, NDRI , Karnal visited on 21.09.2002.

Dr. Inderjit Singh, Principal Scientist & Head, Central Institute for Research on Buffaloes, Hisar visited on 21.09.2002.

Dr. Shashi Kumar, General Manager, ANIFPDC visited on 10.10.2002.

Dr. O.P. Gupta, Ex-Director Research, Raj Nagar Agricultural University visited on 14.10.2002.

Dr. K.K. Appukuttan, Head of Department, Molluscan Department, Cochin, Kerala visited on 06.11.2002.

Dr. T.S. Velayudhan, Principal Scientist, CMFRI, Cochin, Kerala visited on 06.11.2002.

Dr. B.K. Jaiswal, Manager, Punjab National Bank, Zonal Office, Patna, Bihar visited on 11.11.2002.

Shri. R. Narasimha Rao, Scientific Officer, NIC, Port Blair visited on 16.11.2002.

Shri. A. Sankaralingam, Joint Registrar / Special Officer, Madurai District Central Co-operative Bank, Madurai visited on 29.11.2002.

Shri. K. Natarajan, President, Flower Growers Association of India, Chennai visited on 09.01.2003.

Dr. Y.S. Yadav, Member Secretary, Aquaculture Authority, Ministry of Agriculture, Govt. of India, Shastri Bhavan, Chennai visited on 22.01.2003.

Dr. J.S. Yadav, Director, NIAM, Jaipur visited on 11.03.2003.

IMPRESSION OF THE VISITORS

I came to inaugurate a training programme. I am impressed by the technologies, strains and research findings of CARI. The administration and farming community should make best use of these for the economic development of the Islands.

- **Shri. S. Hemachandran, IAS, Development Commissioner, A & N Administration.**

I find the contribution of CARI to the development of agriculture and allied sectors substantial and hope that the efforts are sustained in future too. This will help in improving the socio economic conditions of the people residing in A & N Islands. I wish CARI all the best.

- **Dr. Y.S. Yadav, Member Secretary, Aquaculture Authority, Ministry of Agriculture, Govt. of India.**

PERSONNEL

DIRECTOR	**Dr. S.P.S. Ahlawat (till October 16, 2002)**
ACTING DIRECTOR	**Dr. R.B. Rai (since October 17, 2002)**

HEAD / IN-CHARGE, DIVISIONS / SECTIONS

Head, Division of Animal Science	Dr. R.B. Rai
Head, Division of Field Crops	Dr. T.V.R.S. Sharma
Head In-Charge, Division of Fisheries Science	Dr. N. Sarangi
Head In-Charge, Division of Horticulture & Forestry	Dr. R.P. Medhi
Head In-Charge, Division of Natural Resource Management	Dr. S. Ghoshal Chaudhuri
In-Charge, Social Science Section	Dr. S.C. Pramanik
In-Charge, Planning, Monitoring & Coordination Cell	Dr. B. Ganesh Kumar
In-Charge, Computer Cell	Dr. N. Ravisankar
In-Charge, Library	Shri. Gangopadhyay
In-Charge, Central Instrumentation Facility	Dr. Jai Sunder
In-Charge, Garacharma Farm	Shri. Gopal Nair
In-Charge, Sipighat Farm	Dr. C.B. Pandey
In-Charge, Bloomsdale farm	Dr. Asit B. Mandal
In-Charge, Desk Officer Estate	Dr. M. Din
In-Charge, Workshop	Dr. M. Din
In-Charge, Guest House	Dr. V.B. Pandey
Administrative Officer In-Charge	Dr. A. Kundu
Finance & Accounts Officer	Shri. Mithlesh Kumar
Assistant Director, Official Language	Smt. Sulochana
Security Officer	Shri. N.K. Pushp
In-Charge, Krishi Vigyan Kendra	Dr. R. Soundararajan

LIST OF SCIENTIFIC STAFF

ACTING DIRECTOR

Dr. R.B. Rai, Principal Scientist (Veterinary Pathology) & Head, Division of Animal Science

DIVISION OF HORTICULTURE & FORESTRY

Dr. R.P. Medhi, Principal Scientist (Horticulture) & Head In-Charge
Dr. C.B. Pandey, Senior Scientist (Forestry)
Dr. D.R. Singh, Senior Scientist (Horticulture)
Shri. T. Damodaran, Scientist (Horticulture) *on Study Leave*
Dr. A. Venkatesh, Scientist (Forestry)

DIVISION OF FIELD CROPS

Dr. T.V.R.S. Sharma, Principal Scientist (Plant Breeding) & Head
Dr. Asit B. Mandal, Senior Scientist (Plant Breeding)
Dr. T.E. Sheeja, Scientist (Plant Biotechnology)
Dr. G. Shyam Prasad, Scientist (Entomology)
Dr. R. Elanchezhian, Scientist (Plant Physiology)
Shri. Someshwar Bhagat, Scientist (Plant Pathology)

DIVISION OF NATURAL RESOURCE MANAGEMENT

Dr. S. Ghoshal Chaudhuri, Senior Scientist (Soil Physics & Water Conservation) & Head In-Charge
Dr. R. Dinesh, Senior Scientist (Soil Chemistry / Fertility & Microbiology)
Dr. M. Din, Senior Scientist (Farm Machinery & Power)
Dr. N. Ravisankar, Scientist (Agronomy)
Dr. R. Raja, Scientist (Agronomy)
Shri. Deshmukh Prasanth, Scientist (Farm Machinery & Power)

DIVISION OF ANIMAL SCIENCE

Dr. R.B. Rai, Principal Scientist & Head
Dr. A. Kundu, Senior Scientist (Livestock Production & Management)
Dr. S. Senani, Senior Scientist (Animal Nutrition)
Dr. R.N. Chatterjee, Senior Scientist (Animal Genetics & Breeding)
Ms. Deepa Bhagat, Scientist (Organic Chemistry) *on Study Leave*
Shri. Satyapal Yadav, Scientist (Animal Biotechnology) *on Study Leave*
Dr. S. Jeyakumar, Scientist (Animal Reproduction & Gynaecology) *on Study Leave*
Dr. Jaisunder, Scientist (Veterinary Microbiology)

DIVISION OF FISHERIES SCIENCE

Dr. N. Sarangi, Principal Scientist (Fish & Fishery Science) & Head In-Charge
Dr. S. Dam Roy, Senior Scientist (Fish & Fishery Science)
Mrs. Rema Madhu, Scientist (Fish & Fishery Science)
Dr. K. Madhu, Scientist (Fish & Fishery Science)
Shri. P. Krishnan, Scientist (Fish & Fishery Science)

SOCIAL SCIENCE SECTION

Dr. S.C. Pramanik, Senior Scientist (Agronomy) & In-Charge
Shri. M. Balakrishnan, Scientist (Computer Applications) *on Study Leave*
Dr. B. Ganesh Kumar, Scientist (Agricultural Economics)

KRISHI VIGYAN KENDRA

Dr. R. Soundararajan, Principal Scientist (Fish & Fishery Science) & In-Charge
Dr. S.K. Zamir Ahmed, Senior Training Assistant (Agronomy / Extension)
Shri. Nagesh Ram, Senior Training Assistant (Fisheries) *on Deputation as Director of Fisheries, A & N Administration*
Smt. Kanak Lata, Senior Training Assistant (Home Science)
Shri. L.B. Singh, Senior Training Assistant (Horticulture)
Shri. N.C. Choudhury, Training Assistant (Animal Science)
Shri. D. Bhaskar Rao, Training Assistant (Art cum Audio visual aids)

VARIOUS COMMITTEES OF THE INSTITUTE

OFFICIAL LANGUAGES IMPLEMENTATION COMMITTEE

Dr. R.B. Rai	Chairman
Dr. Swaraj Senani	Member
Dr. S.C. Pramanik	Member
Dr. Jai Sunder	Member
Smt. Kanaklatha	Member
Shri. Phalguni Gangopadhyay	Member
Finance & Accounts Officer	Member
Administrative Officer	Member
Shri. Arvind Kumar Tripathi	Member
Smt. Sulochana	Member Secretary

INSTITUTE JOINT STAFF COUNCIL

(Staff Side)

Shri. Benny Varghese , T-5
Shri. K. Babu Rao, T-2
Shri. Karuppaiah, Jr. Clerk
Smt. Saida Bibi, Jr. Clerk
Shri. K. Ali, S.S.Gr.II
Shri. T. Kurma Rao, S.S.Gr.II

(Official Side)

Administrative Officer
Finance & Accounts Officer
Dr. S. Senani
Dr. Jai Sunder
Shri. Phalguni Gangopadhyay
Dr. S.K. Zamir Ahmed

GRIEVANCE COMMITTEE

Dr. R.P. Medhi	Chairman
Dr. S. Senani	Member
Administrative Offier	Member
Finance & Accounts Officer	Member
Dr. S. Dam Roy	Member
Shri. Abdul Majeed	Member
Shri. S.K. Biswas	Member
Shri. B.Mahadevaiah	Member

CONSTRUCTION COMMITTEE

Dr. S. Senani	Chairman
Dr. C.B. pandey	Member
Desk Officer (Estate)	Member
Finance & Accounts Officer	Member
Administrative Officer	Member
Asstt. Admn. Officer(I)	Member

PURCHASE COMMITTEE

Dr. R.P. Medhi	Chairman
Dr. R. Dinesh	Member
Dr. Jai Sunder	Member
Finance & Accounts Officer	Member
Administrative Officer	Member Secretary

PRICE FIXATION COMMITTEE

Dr. S. Senani	Chairman
Shri. A.K. Samanta	Member
Shri. Gopalan Nair	Member
Shri. M.B. Pandey	Member
Shri. Ambika Singh	Member
Finance & Accounts Officer	Member
Administrative Officer	Member
Secretary, IJSC	Member

SPORTS COMMITTEE

Dr. A.K. Nair	Chairman
Dr. Jai Sunder	Secretary
Shri. D. Banerjee	Member
Shri. N.C. Choudhuri	Member
Shri. John Chrisostom	Member

OFFICERS CLUB

Dr. R.B. Rai	Patron
Dr. R. Soundararajan	President
Dr. S. Ghoshal Chaudhuri	General Secretary
Dr. Jai Sunder	Joint Secretary
Dr. B. Ganesh Kumar	Treasurer

NEW ENTRANTS / TRANSFER / PROMOTION

New Entrants

Dr. R. Raja
Scientist
w.e.f. 06.03.2003

Shri. P. Krishnan
Scientist
w.e.f. 10.03.2003

Shri. Someshwar Bhagat
Scientist
w.e.f. 11.03.2003

Shri. Deshmukh Prasanth
Scientist
w.e.f. 20.03.2003

Transfer

Name	Designation	Date
Dr. Anil K. Nair	Scientist Sr. Scale	20.03.2003
Dr. Sujatha A. Nair	Scientist Sr. Scale	20.03.2003
Dr. M.A. Suryanarayana	Scientist Sr. Scale	09.01.2003
Dr. S.K. Saha	Scientist Sr. Scale	27.01.2003
Shri. L.K. Bharathi	Scientist	31.12.2002
Shri. R.K.S. Yadav	T-3	02.01.2003
Smt. Krishna Kumari	T-3	07.11.2002
Shri. R.B. Rai	Junior Clerk	18.04.2002

Promotion

Name	Designation	Date
Shri. Benny Varghese	T-4 to T-5	15.10.2001
Shri. V. Damodharan	T-4 to T-5	25.07.2002
Shri. Ambika Singh	T-3 to T-4	02.07.2001
Smt. Ani Dath	T-3 to T-4	03.10.2002
Shri. Sunil Chakraborthy	T-1 to T-2	29.06.2001
Shri. K.C. Debnath	T-1 to T-2	29.06.2001
Shri. K. Narayanan	T-1 to T-2	29.06.2001
Shri. U. Bhaskar Rao	T-1 to T-2	31.09.2001
Shri. P.A. Shanmugham	S.S.Gr.III to IV	26.08.2002
Shri. Silvanus Soreng	S.S.Gr.II to III	26.08.2002
Shri. Bennu Kerketta	S.S.Gr.II to III	26.08.2002

Cultural programme

During the year 2002-2003, Central Agricultural Research Institute Employees Welfare Association (CARIEWA) organized various activities. A sum of Rs. 40,700/- as interest free short-term loan was distributed to 17 needy members. On the eve of New Year, CARIEWA had organized a cultural programme on 31st December, 2002 in CARI guest house. On this eve, staff and children took active participation and presented colorful cultural programs. During the year under report, several functions like farewell to outgoing staff (13) and welcome to newly joined staff (4) were organized. The CARIEWA had arranged working of a canteen to provide snacks and meals on reasonable payment on all working days as well as on the holidays. For smooth running of the canteen, CARIEWA had provided wet grinder and purchased new utensils for the canteen. For proper maintenance of the canteen minor repairing work was carried out. For creating an atmosphere for sport events, CARIEWA had provided financial assistance for preparation of volleyball and badminton ground, which is now functioning well. The executive committee of the CARIEWA is as follows:

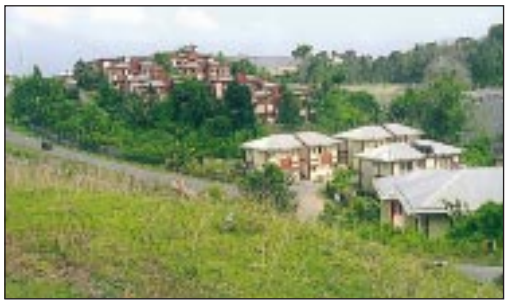
Dr. R.B. Rai	:	Patron
Dr. N. Sarangi	:	Chairman
Dr. Jai Sundar	:	Secretary & Jt. Secretary
Shri. T. Ravi	:	Treasurer
Shri. S.K. Biswas	:	Member
Shri. Karupaiah	:	Member
Shri A. Ali	:	Member
Shri A. Dorairaj	:	Member


Farewell party of Dr. S.P.S. Ahlawat, Director


Dr. R.B. Rai, Acting Director in the farewell party to Dr. Anil K. Nair and Dr. (Mrs.) Sujatha A. Nair

INFRASTRUCTURE DEVELOPMENT

- New Residential complex buildings
- Establishment of Marine hatchery
- Construction of Scientist Apartment
- Boundary wall of Garacharma Farm
- R.C.C. water tank for the Residential Complex
- Land development for various experiments
- Extension and modification of power house
- Construction of car and scooter garages at Garacharma Farm
- Construction of Retaining well and tap well at Garacharma Farm and Marine hill
- Construction of Ring well at Garacharma Farm
- Construction several check dams at Sipighat and Garacharma Farm
- Renovation of irrigation pond at Garacharma Farm
- Construction of pig and rabit shed at Garacharma Farm
- Renovation of prawn feeding shed and pump house at Marine Hill and Garacharma Farm.
- Fixing of Grills and Guand rails at Garacharma Farm
- Construction of approach road and steps at Sipighat and Garacharma Farm.



New Residential complex in Garacharma

Ring well in Garacharma farm

INDEPENDENCE AND REPUBLIC DAY CELEBRATIONS

Independence Day and Republic Day were celebrated in the Institute with gaiety and fervour. In both the occasions, Director gave inspiring speechers befitting the occasions. Director lauded the effort of the scientists, technical and administrative staffs of the institute. He also impressed upon the staff to strive for further achievements. During the occasions Director gave away commendations certificates to the deserving staffs for their commitment and devotion to the duty.

Dr. S.P.S. Ahlawat, Director in Independence Day, 2002

Dr. R.B. Rai, Acting Director hoisting the National Flag on Republic Day, 2003

प्रस्तावना

अण्डमान एवं निकोबार द्वीप समूह अपने अनोखे जैव विविधता के लिए विश्व विख्यात है। यहाँ की विविध वनस्पतियाँ तथा जीव-जन्तु न केवल राष्ट्रीय अपितु अर्न्तराष्ट्रीय विकास में महत्वपूर्ण भूमिका निभाते हैं। इन द्वीपों की गर्म तथा आर्द्र जलवायु जहाँ एक ओर हानिकारक सूक्ष्म जीवों को बढ़ावा देता है, वहीं दूसरी ओर बहुमूल्य वनस्पतियाँ तथा जीव-जन्तुओं को अनुकूल वातावरण भी प्रदान करती है, जिसका द्वीपों के आर्थिक विकास में महत्वपूर्ण स्थान है। द्वीपों की जन-जातियों एवम् निवासियों को यहाँ की वनस्पतियों एवं जीव-जन्तुओं के उपयोग का ज्ञान उनके पूर्वजों द्वारा विरासत में प्राप्त हैं जो जन-कल्याण में वैज्ञानिक उपयोग एवम् वैज्ञानिक विश्लेषण के लिए अनेक दरवाजे खोलता है। हाल ही में पर्यटन में बढोत्तरी तथा कृषि उत्पाद की गुणवत्ता बढ़ाने का संकल्प इन द्वीपों में एक नये अध्याय की शुरूआत है।

केन्द्रीय कृषि अनुसंधान संस्थान ने 23 जून, 2003 को इन द्वीपों में अपने 25 वर्ष पूरे किरेंगा है। अन्य विभागों के साथ मिलकर कृषि तथा उससे जुडे अन्य क्षेत्रों में अनुसंधान कार्य किया और सामने आने वाली चुनौतियों से अच्छी तरह निपटने के लिए द्वीपों को इस संस्थान के वैज्ञानिकों ने जहाँ संस्थान को एक ओर कई सम्मानित पुरस्कार दिलवाए, वहीं अंर्तराष्ट्रीय समझौते तथा WTO का ध्यान पूरी तरह से इस संस्थान की ओर मोड़ने में सफल रहें।.

यह संस्थान केवल नई-नई खोज तथा तकनीकी सुधार करने तक ही सीमित नहीं रहा, बल्कि किसानों के खेतों में नई तकनीक को कार्य रूप देने में भी अथक प्रयास किया, जो न सिर्फ पुन: नयी खोज के लिए एक दिशा प्रदान करेगा, वल्किकिसान वर्ग और समाज के कमजोर वर्ग के हित में लाभदायक सिद्ध होगा। नई कृषि तकनीक ने कुछ हद तक इन द्वीपों की बढ़ती बेरोजगारी को कम किया है तथा उनकी कृषि संबंधी समस्याओं को दूर करने में सफल रहा है।

यही सही वक्त है, जब हम अपने मन में यह निश्चय कर लें कि हमें खुद को संसार के सामने लाना है तथा खुद को आने वाली चुनौतियों का सामना करने के लिए तैयार रहना है। द्वीपों को आत्मनिर्भर बनाने के लिए पैदावार बढ़ाना होगा, जिससे हमारे स्वयं के रोज़गार उपलब्ध होंगे तथा द्वीपों का विकास होगा। किसानों तथा वैज्ञानिकों को एक जुट होकर एक साथ चलना होगा, तभी ये द्वीप विकास के पथ पर अग्रसर होंगे। मुझे पूर्ण विश्वास है कि आने वाले कुछ वर्षों में द्वीपों में कृषि के विकास में आशातीत वृद्विहोगी।

डॉ. आर.बी.राय
कार्यपालक निदेशक

उद्यान एवं वानिकी

विभिन्न प्रजातियों वाली सब्जियों का मूल्यांकन किया गया, जिनमें तुरई प्रजाति का पूसा नसदार, लोबिया में लाफा, चौलाई में CO-2 से अधिकतम उपज प्राप्त की गई। अधिक कीमत वाली सब्जियों की खेती जैसे शिमला मिर्च, बीन्स, टमाटर आदि संभव था और सुरक्षित खेती के अंर्तगत आर्थिक रूप से योग्य था। ओकरा और अमरेन्थस के लिए पोषकता की आवश्यकता का मानकीकरण किया गया। ओकरा और अमरेन्थस के लिए 75:120 कि.ग्रा. NP/ha खाद की मात्रा उचित पायी गई।

- टमाटर (BT-1, BT-105, BT-116-8-1, BT-118-4-1(CHDT), बैंगन (BB-93c, BB-64, BB-40) और मिर्च (LCA-334, Pant-C-3BC-14-2, Surakta, AC-92-4) में बैक्टीरियल विल्ट प्रतिरोधक पंक्तियाँ पहचानी गई।

- फसल चक्र और मिश्रित सब्जी फसल प्रणाली के लिए सब्जियों की फसलों का अध्ययन किया गया। पालक-भिंडी फसलों के चक्र से अधिकतम उपज प्राप्त हुआ {781, 90 क्विं/हे.}

- केले की दस प्रजातियों का मूल्यांकन करने पर ड्वार्फ कैवेन्डिश की अधिकतम उपज दर्ज की गई। आम की सात प्रजातियों/संकर का अध्ययन किया गया। नीलम और अर्का पुनीत प्रजाति से अधिकतम फल प्राप्त हुआ।

- अच्छी गुणवत्ता एवं मात्रा के क्रम में स्थानीय आम की पंक्ति 6-1-7 उत्तम पायी गई।

- शरीफा फल के चार सेलेक्शन का मूल्यांकन करने पर सेलेक्शन-1 से {6.175 कि.ग्रा./वृक्ष} अधिकतम उपज प्राप्त हुआ। पैसन फल की तीन प्रजातियों का रोपाई के बाद पहले वर्ष में उसकी वृद्धि के लिए अध्ययन किया गया।

- Alligater Apple के बीज एवं पत्ती का उनकी विभिन्न पोषक अवयवों के लिए विश्लेषण किया गया जिससे Cotyledon की मात्रा (43%) वसा में अधिक देखी गई।

- वेस्ट इंडियन चेरी, बिलम्बी, कैरमबोला और चालता फलों का उनके प्राकृत रसायन लक्षणों के लिए विश्लेषण किया गया। बिलिम्बी में अधिकतम एसिडिटी 4.57 प्रतिशत रिकार्ड की गई। इन सभी फलों में प्रचुर मात्रा में कैल्शियम और फॉस्फोरस पाई गई।

- जरबेरा प्रजाति में रेड गोल्ड की खेती से अधिकतम संख्या में फूल रिकार्ड की गई {प्रति वर्ष प्रति पौधा 155} जबकि नीलिमा प्रजाति से भी अधिकतम फूल प्राप्त हुआ।

- देसी आर्किड की 31 प्रजाति और कैटलेया की 22 संकर प्रजाति अंडमान की परिस्थिति के अंतर्गत मुख्य भूमि से लाकर मूल्यांकन हेतु इकट्ठा किया गया। देसी आर्किड का Vase life अध्ययन करने पर यह पाया गया कि यूलोफिया अण्डामानेनसिस अधिक समय तक {49.5 दिन} रहता है। यूफोरिबिया एपिफायलॉइड उत्तम Indoor plant पाया गया।

- नारियल बागान के अंतर्गत फ्यूरेरिया द्वारा अधिकतम बॉयोमास {11 टन/हे.} और पोषक तत्व {72.9, 3.9और 86.4 कि.ग्रा. NPK/हे.} पाया गया।

- नारियल की स्थानीय जर्मप्लाज्म के एकत्रित करने पर रंगत स्वीट की सबसे अधिक उपज {125 नट/पॉम/वर्ष} रिकार्ड की गई। देसी जर्मप्लाज्म के मध्य न्यूलेखा उपयुक्त पायी गई जिससे अधिकतम कोपरा अवयव 245 ग्रा./नट मिला।

- सुपारी की G-215 से अधिकतम उपज {1468 नट/पॉम/वर्ष} प्राप्त की गई। सुपारी आधारित खेती में कुल एवं शुद्ध राशि क्रमश: रू0 25,500/- और 12,500/- से 94,000/- हे. प्राप्त किया गया ।

- नियंत्रण की तुलना में मिश्रित प्रणाली में मक्का की उपज में 23 प्रतिशत् कमी हुई। इन द्वीपों में काली मिर्च की खेती के लिए ग्लीरिसीडिया (Gliricidia) उत्तम पायी गई।

क्षेत्रीय फसल

- खाडी के द्वीपों की आर्द्र परिस्थिति के अंर्तगत धान की प्रजातियाँ Quing livan no.1, मिल्यांग.55, ननजिंग57161, ताईचुंग सेन यू, एम.डी. एल. 113 {5 टन/ हे.} उपयुक्त पायी गई ।

- खरीफ 2002 में धान की 17 नई पौध प्रकार की प्रजातियों का परीक्षण किया गया और आई.आर. 67964-46-1-3-2 अधिकतम उपज के लिए उपयुक्त पाई गई।

- पोकाली सोमाक्लोन्स का मूल्यांकन किया गया जिसमें SC_{12} और BTS 24, BTS18, BTS 14-2-1 और BTS 10-5 क्षारीय मिट्टी अच्छी उपज {3टन /हे.} के लिए उपयुक्त पायी गयी।

- टमाटर की प्रजातियों का वृद्धि एवं उपज के लिए मुल्यांकन किया गया।

- एग्रो मॉरफोलॉजिकल लक्षण के लिए टमाटर की प्रजाति का मूल्यांकन किया गया। KS-118 से प्रति पौधा अधिकतम उपज प्राप्त हुआ।

- बैंगन प्रजातियों के सोमाक्लोन्स का विकास किया गया। BB 66 C, SM 141 और BB 60C का मूल्यांकन करने पर रोग प्रतिरोधक व कीट प्रतिरोधक पायी गई और 149 उपयुक्त सोमाक्लोन्स का चुनाव किया गया।

प्राकृतिक संसाधन प्रबंधन विभाग

- BBF मृदा दस्तकारी से एक हेक्टेयर भूमि को 0.6:04 अनुपात में क्रमश: धान एवं सब्जियों के लिए विभाजित किया गया है। इस पद्धति में मेड़ 4.5 मीटर चौड़ा तथा फरो 6.7 मीटर उपयुक्त पायी गई।

- अमरेन्थस-भिन्डी-रटून भिण्डी के फसल चक्र को काफी लाभदायी पाया गया जिससे रू. 81600 का मुनाफा दर्ज किया गया। B:C अनुपात 2.74 रहा। इसी प्रणाली के अतंर्गत मिर्ची-फूलगोभी-बैंगन मिर्च-लोबिया-मूली फसल चक्र को भी लाभदायी पाया गया।

- खूड़ सिंचाई के अंतर्गत Quing livan no.1 रैटून फसल चक्र प्रणाली को काफी लाभदायी पाया गया जिसकी उपज क्षमता 3232 किलोग्राम/हेक्टेयर पायी गई ।

- Anaerobic water seeding प्रणाली की जांच के बाद पाया गया कि इस विधि के लिए 145 Nanging –57161 , C14-8, Zen GUI-AT, NARDI-110,BTS-24 तथा Quing livan No –1 धान की प्रजातियाँ सफल रही और बीज को करीब 5 से.मी. जमीन के अंदर बोने पर सी-14-8 किस्म में सबसे अधिक अंकुरण क्षमता (94.5%), Seedling ऊँचाई {31.5 सेंमी.}, Seedling DMP (842 कि. ग्रा-हे.) और Seedling Vigor Index (2448) पायी गई।

- C 14-8 धान की बीज की Anaerobic seeder प्रणाली से बुआई के पश्चात् उपज क्षमता 2063 कि. ग्रा./हेक्टेयर रिकार्ड की गई।

- इस वर्ष के दौरान दक्षिणी अण्डमान के 5 ग्रामीण क्षेत्रों का पूर्ण रूप से निरीक्षण किया गया और इस दौरान किसानों को कृषि के विभिन्न उपकरणों व औजारों का प्रयोग बताया गया।

- इन द्वीपों के सर्वे के बाद यह देखा गया कि बैल व भैंसे ही मुख्य रूप से कृषि प्रणाली में पावर ऊर्जा के रूप में उपयोग में लाए जाते है। हालांकि काफी काम यहाँ के किसान खुद ही करते हैं जिससे काफी समय लगता है और श्रमिक खर्च भी काफी बढ़ जाता है।

- खेती के लिए मुख्य रूप से देसी हल व तख्ते का ही उपयोग होता है और इसे चलाने के लिए बैलों की मदद ली जाती है। आधुनिक कृषि उपकरणों का इस्तेमाल एकदम नहीं के बराबर है। Prismatic प्रकार के उपकरण साधारणत: कृषि बागानी व अन्य कार्यों में उपयोग में लाया जाता है। इस कारण यह देखा गया है कि ये न सिर्फ उपज क्षमता पर प्रभाव डालती है बल्कि इसमें श्रमिक खर्च भी काफी बढ़ जाता है।

- वन कटाई तथा इसका मृदा पर सीधा प्रभाव के अंतर्गत जीव रासायनिक परिवर्तन, मृदा में सूक्ष्म जीवों की मात्रा Community structure तथा यहाँ की जलवायु पर विस्तृत अध्ययन किया गया है। अध्ययन से यह ज्ञात हुआ है कि सूक्ष्म जीवों की मात्रा मृदा में मौजूद खनिज तत्वों तथा पोषक तत्वों की मात्रा पर निर्भर करती है।

- विभिन्न फसलों के कैनोपी क्षेत्रों {ऑयल पाम, नारियल, सुपारी, कृषि वानिकी, चारा वन} तथा ढलान वाले क्षेत्रों के अंर्तगत runoff नुकसान तथा मृदा के नुकसान व इसके संरक्षण पर भी काफी अध्ययन चल रहा है। यह देखा गया है कि ढ़लान वाले क्षेत्रों में विभिन्न फसल कैनोपी में मृदा तथा runoff की नुकसान की मात्रा बढ़ जाती है। जबकि कृषि वानिकी तथा वन क्षेत्र में इसकी मात्रा कम है और फसल कैनोपी तुलना में मृदा की आद्रता भी कम पायी गई है। मुख्यत: सुपारी व ऑयल पाम एवं चारा फसलों के क्षेत्र में कम आद्रता रिकार्ड की गई है। सबसे अधिक आद्रता 60-90 सें.मी. क्षेत्र में रिकार्ड की गई है।

मात्स्यिकी विज्ञान विभाग

- क्लॉन मछली तथा एम्फीप्रीओन परकुला का प्रजनन सफलतापूर्वक किया गया। प्रत्येक मादा द्वारा हर एक अण्डजनन में 300 से 800 अण्डे देती है जो 7 दिनों बाद स्फुटन (Hatching) द्वारा लार्वा में बदल जाते हैं। इनकी देखरेख तरूण अवस्था तक करनी पड़ती है। फिर भी 90 प्रतिशत ही इनमें से सुरक्षित बच पाते हैं। दूसरी प्रजाति *Sandarocinos* का पहली बार सफलतापूर्वक प्रजनन किया गया जो उचित चारा देने के कारण संभव हुआ।

- *Walne's medium* में जनसंख्या वृद्धि 6-9 दिन में बताया है। तरह-तरह के *Microalgae* का स्वजीवन ही 5 दिन से 2 महिने का होता है।

- खाद्य आयस्टर सीपी की दो जातियाँ *Crassostrea rivularis* तथा *Saccostrea cucallata* अण्डमान के जल क्षेत्र में पायी गयी है।

- ''ग्रुपर'' मछलियों में *P. Pesuliferus* तथा *Veriola louti* निर्यात मछलियों के लक्ष्य को पूरा करने में अपने महत्व को दर्शाती है।

- खारे पानी में तिलापिया *Oriochromis urolepis* संवर्धन से 6 महीने में 1 टन/हेक्टेयर की दर से मछली प्राप्त हुआ है।

- मीठे पानी के बड़े झींगों की उत्पादन क्षमता का परीक्षण के साथ-साथ भारतीय बड़े कार्प की संवर्धन घनत्व *Macrobrachium rossenbergii* द्वारा 8000 झींगा बीज प्रति हे. के साथ किया गया तथा पाया गया कि 7 महीनों में झींगों का 500 कि.ग्रा. प्रति हैक्टेयर की दर से उत्पादन हुआ। तरूण अवस्था में ये 100 ग्रा. के होते है तथा इन्हे अच्छी तरह तैयार करने में 7 से 8 महीने लग जाते है।

पशु विज्ञान विभाग

- 50 प्रतिशत और 62.5 प्रतिशत जर्सी गुण वाली F2 गायों F1 पीढ़ी से चुनाव और कलिंग पद्धति से पैदा की गई। मुख्य गुण था - उनका प्रदर्शन, बीमारी से प्रतिरक्षण तथा जलवायु में ढ़लने की क्षमता। इन उन्नत गायों की देसी गायों से वृद्धि, उत्पादन और प्रजनन गुणों के लिए तुलना की गई। गायों में थनैला, कंधे का घाव तथा इटराइटिस रोगों पर काबू किया गया और यह रोग इस साल कम हुए । बछडों की मृत्यु दर शून्य रही तथा दुधारू गायों के प्रबन्धन की तकनीक का मानकीकरण, गर्म और आर्द जलवायु के लिए कर लिया गया हैं। गायों में इन्ड्रोमेट्राइटिस, रिटेन्ड प्लेसेंटा, बच्चा देने के बाद की मेट्राइटिस तथा गर्भधारण के लिए बार-बार इनसेमिलशन कराना आदि की विशेष उपचार द्वारा रोकथाम की गई ।

- व्हाइट निकोबारी–1L1-80, ब्लैक निकोबारी–1LI-80 और ब्राउन निकोबारी–1L1-80 के संकरण द्वारा मुर्गियाँ पैदा की गई तथा इनकी वृद्धि और उत्पादन क्षमता की मूल्यांकन, इंटैसिन और बैकयार्ड सिस्टम में किया गया। शरीर भार की दृष्टि से ब्लैक निकोबारी–1L1-80 संकर सभी कासेस में

बेहतर रहा। इंटेसिन मैनेजमेंट सिस्टम में 1L1-80 –व्हाइट निकोबारी मुर्गियों को फीड कनवर्जन इफीसियेंसी 1L1-80 ब्लैक निकोबारी के मुकाबले अच्छी रही। इसी प्रकार वयस्क वय व्हाइट निकोबारी–1L1-80 कास में ब्लैक निकोबारी–1L1-80 कम के मुकाबले कय थी तथा अंडा उत्पादन अधिक था ।

- कुल 343 परीक्षणों में 77.4 प्रतिशत में सालमोनेला पुलोरम पाया गया। 9.02 प्रतिशत माइकोप्लाज्मा गैलीसेप्टिकम, 91.3 प्रतिशत चिकन एनीमिया वाइरस, 95.6 प्रतिशत रिओ वाइरस तथा 46.15 प्रतिशत ऐवियन एनसिफेलो माइलाइटिस 13.3 प्रतिशत केस ब्रूसेला मिलीटेन्सिस के लिए पासिटिव पाये गये। सुअरों के 32 सीरा सैम्पल में 43.75 प्रतिशत स्वाइन फीवर के लिए पॉसिटिव पाये गए तथा अधिकांश निकोबार द्वीप समूह से थे । गायों के 122 नमूनों में 20.47 प्रतिशत EL1SA द्वारा ब्रूसेल्ला पॉसिटिव तथा 20.79 प्रतिशत SAT पॉसिटिव पाये गये। 23.56 प्रतिशत EL1SA द्वारा 1BR पॉसिटिव पाये गये। 26 बोवाइन सैम्पल्स में 42.3 प्रतिशत और 46.15 प्रतिशत TB और JD के लिए पॉसिटिव पाये गये। दूध के सैम्पल्स टेस्ट करने पर 45.3 प्रतिशत में Streptococci पाया गया जो थनैला रोग का कारण था। ABST द्वारा जैन्टामाइसिन सबसे प्रभावी ऐंटीबायोटिक पाया गया। परजीवी जनित रोगों में 38.26 प्रतिशत कंधे का घाव 27.82 प्रतिशत स्ट्रान्गाइलोसिस, 16.52 प्रतिशत फेशिओलिएसिस तथा 0.86 प्रतिशत सिस्टो सोमिओसिस पाया गया।

- यह द्वीप खाद्य पदार्थो के लिए मुख्यभूमि पर निर्भर है। इसी कारण मुर्गी और दूध उत्पादन की लागत अधिक होती है। उत्पादन की लागत को स्थानीय सस्ते प्रोटीन और ऊर्जा के स्रोतों से कम किया जा सकता है। कोलोकेसिया एक जंगली पौधा है जिसका चारे रह इस्तेमाल किया जाता है। पौधों के सभी भाग पत्ती, कंद, पोषक तत्वों का अच्छा स्रोत है जिनमे सेल्यूलोस हेमी सेल्यूलोस व अन्य घुलनशील कार्बोहाइड्रेटस प्रमुख है। इस अध्ययन में कोलोकेसिया कंद का पाउडर बना कर मक्का के स्थान पर ऊर्जा स्रोत के रूप में किया गया। 30 बटेर के चूजों को 10-10 के तीन वर्गों में बाँटा गया तथा दो वर्गों में 50 व 100 प्रतिशत मक्का के स्थान पर इस पाउडर का इस्तेमाल किया गया तथा कन्ट्रोल में मक्का का प्रयोग दिया गया, सभी वर्गों में खनिज मिश्रण व विटामिन्स तथा साधारण नमक को मिलाया गया। छः हफ्तों के बाद 100 प्रतिशत कोलोकेसिया वर्ग के चूजों में कन्ट्रोल के बराबर वृद्धि दर पाई गई जबकि 8 हफ्तों के बाद वृद्धि अन्य दोनों वर्गो से अधिक थी। इस प्रयोग का यह निष्कर्ष निकला कि कोलोकेसिया कंद पाउडरो को मक्का के स्थान पर ऊर्जा स्रोत के रूप में इस्तेमाल किया जा सकता है ।

- जापानी बटेर का केज और फर्श पर पालन की तुलना करने पर केज में रखी बटेर ने जल्द अंडा उत्पादन शुरू किया तथा 50 प्रतिशत् अंडा उत्पादन भी जल्द प्राप्त किया। साथ ही फर्श पर रखी गई बटेर के मुकाबले ज्यादा अंडा उत्पादन तथा अधिक हैचेबिलिटी मिली। ईस्ट *(S. cerevisal-49)* को बटेर को खिलाने से उनकी वृद्धि और भोजन को मांस में बदलने की क्षमता में वृद्धि हुई। नीले और हरा प्रकाश में बटेर उत्पादन के लिए अच्छा साबित हुआ। जापानी बटेर में लहसुन का पाउडर अथवा 1 प्रतिशत ऐक्सट्रेक्ट राशन में मिलाने से प्लाज्मा कोलेस्ट्रोल की मात्रा में कमी पाई गई। बटेर पालन के लिए नर तथा मादा 1:1 या 1:2 होना चाहिए। 1:3 अनुपात में अंडों की हैचेबिलिटी में कमी पाई गई। अधिक भार वाली बटेर में रक्त द्वारा मापी जाने वाली रोग प्रतिरक्षा प्रणाली, कम भार वाली बटेर के मुकाबले कम पाई गई।

सामाजिक विज्ञान

इस वर्ष के दौरान कृषि में 16 तकनीकियों का प्रदर्शन किया गया और संबंधित विषय क्षेत्रों में दक्षिण और मध्य अण्डमान के 8 गॉव में 330 से भी अधिक किसानों के खेतों में प्रदर्शन किया गया। दशरथपुर गॉव की क्षारीय सल्फेट मिट्टी में धान की खेती की उपयुक्त प्रजाति का प्रदर्शन, नाला पर चेक डेम निर्माण के माध्यम से सब्जियों के लिए जल प्रबंध, किसानों द्वारा कट फ्लावर की व्यावसायिक खेती, अधिक आय के लिए घर के पिछवाड़े उन्नत निकोबारी मुर्गियों का पालन काफी महत्वपूर्ण रहा। साथ ही दक्षिणी अण्डमान द्वीपों में सब्जियों में विशेष कीट व्याधि प्रतिरोधक सोलनेसियस सब्जियों के क्षेत्रों की खोज करने का प्रयास भी किया जा रहा है। इस वर्ष के दौरान किसानों के लिए पर्याप्त प्रशिक्षण कार्यक्रमों का भी आयोजन किया गया जो कि काफी सफल रहा।

कृषि विज्ञान केन्द्र

कृषि विज्ञान केन्द्र-केन्द्रीय कृषि अनुसंधान संस्थान द्वारा प्रसार कार्यकर्ताओं, ग्रामीण महिलाओं, युवकों और किसानों के लिए 23 प्रशिक्षण पाठ्यक्रम का आयोजन किया गया जिनमें 231 पुरूष व 291 महिलाओं ने कृषि एवं संबंधित विषय क्षेत्रों में प्रशिक्षण प्राप्त किया।

अग्रिम पंक्ति प्रदर्शन के अंतर्गत दाल, उरद, फसलों की प्रजाति PDU1 से 7.95 क्विंटल/हे. औसत उपज प्राप्त हुआ जबकि मूंग की प्रजाति PDM 54 से 8.76 क्विंटल/हे. औसत उपज मिला। तिलहन में श्वेता प्रजाति द्वारा 6.27 क्विंटल/हे. औसत उपज प्राप्त हुआ। HYV धान की कृषणा हम्सा प्रजाति उत्तम {5.48 क्विंटल/हे.} साबित हुआ।

सब्जियों में तुरई की सुजात प्रजाति {204 क्विंटल/हे.} लोबिया की अर्का गरिमा प्रजाति {104 क्विंटल/हे.} और बैंगन की BB 45C प्रजाति {412 क्विंटल/हे} उत्तम रहा।

निकोबारी मुर्गी से औसतन 140 अंडे प्राप्त हुए जबकि KC Duck से प्रति मुर्गी 230 अंडा मिला। बटेर से 17.5 कि.ग्रा. {42 दिन} और ब्रायलर से {सम्राट 2000} 180 कि.ग्रा. {45 दिन} प्रति 100 मुर्गी प्राप्त हुआ।

NARDI 110 HYV धान की नई प्रजाति से सामान्य म५दा में 4.56 टन/हे. प्राप्त हुआ जबकि खराब मृदा में BTS 24 से 2.75 टन/हे. उपज मिला।