## Visits of Hon. Former
## Lt. Governors of A&N Islands to CIARI

Shri T.S. Oberoi

Shri Ranjit Singh Dayal

Shri Vakkom Purushothaman

Shri I.P. Gupta

Prof. Ram Kapse

Lt. Gen. (Rtd) Bhopinder Singh

## Visit of Present Hon,ble **Lt. Governor**

**Lt. Gen (Retd.) A. K. Singh, PVSM, AVSM, SM, VSM**

# CIARI

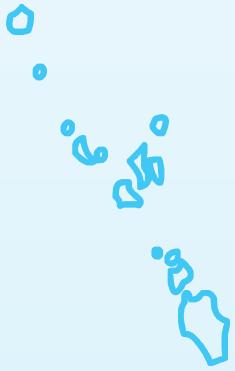
*the journey and the road ahead.....*

Central Island Agricultural Research Institute (ICAR)
Port Blair, Andaman and Nicobar Islands

# CARI

*the journey and the road ahead…*

**September 2014**




**Central Island Agricultural Research Institute**
(*Indian Council of Agricultural Research*)
Port Blair – 744 101
Andaman & Nicobar Islands

**Citation :**

Dam Roy, S., Gautam, R.K., Velmurugan, A., Zamir Ahmed, S.K., Jai Sunder, Kiruba Sankar, R. Sankaran, M. (2014). CIARI – The Journey and the Road Ahead, CIARI, Port Blair, India. p. 24

**Published by :**

Director,
Central Island Agricultural Research Institute,
Indian Council of Agricultural Research
Port Blair-744 101, A&N Islands
E.Mail: directorcaripb@gmail.com
Ph: 03192-250436/ Fax : 03192-251068
www.http://cari.res.in

**Printed at :**

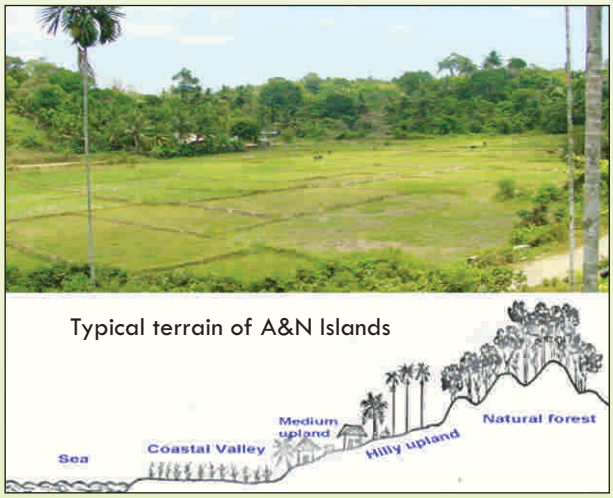
M/s Capital Business Service & Consultancy
B-51, Sahid Nagar
Bhubaneswar-751007
E-mail: capital.a1press@gmail.com

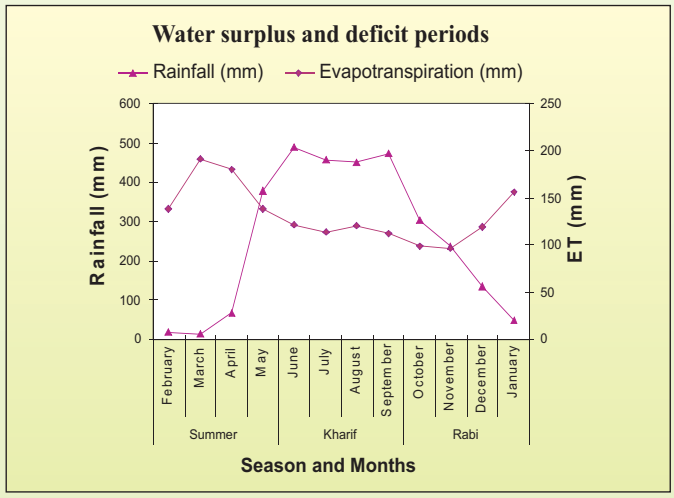
# CONTENTS

## Agriculture in Andaman and Nicobar Islands

The humid tropical Islands of Andaman and Nicobar located strategically in the Bay of Bengal constitute one of the most important biodiversity centers of the world. These Islands harbour multitude of land and marine bioresources. Most of them are very unique of its kind and have the potential for commercial exploitation to enhance the livelihood of the islanders and future use for the well being of the country. Modern agriculture is of recent origin to these islands and relatively large expansion took place with the allotment of land to the settlers and native population.

Till the end of 70's the major emphasis was given to area expansion of agriculture to achieve self-sufficiency in food grains. But from V Plan onwards, prominence was given to intensive agricultural practices and development of plantations on the hilly slopes. Presently, the emphasis is on increasing the area and production through crop diversification from traditional plantation and food crops and optimum exploitation of cultivable wastelands. Nevertheless, agriculture is the main occupation in A&N Islands as 50% of the total population is directly dependant on agriculture and allied activities. Small and marginal farmers constitute nearly 57% of the 14000 farm families but own only 25% of the cultivated area. The average size of the agriculture landholding in the islands is only 1.89 ha.




In A & N Islands more than 85% of the 8249 sq. km total geographical area is covered under forests and only limited area (6%) is available for cultivation. Though islands receive an annual rainfall of more than 3100 mm spread over more than 8 months, due to undulated land and high evapotranspiration, the irrigation during dry period is very essential for achieving higher productivity. Creation of large scale reservoir is not possible due to limitation imposed by the terrain. The major crops grown in these islands are coconut, arecanut, rice, vegetables, fruits and spices in which plantation crops occupy nearly 69% of the total cultivated area. Among the field crops paddy is cultivated in about 8139 ha area followed by pulses and oilseeds. In agriculture sector the production of food grains, vegetables and fruits has been far below the local demand. Consequently, the Union Territory Government has been importing rice, wheat, pulses, vegetables and other agricultural commodities from the mainland recurrently.

The contribution of agriculture towards the Islands GDP is 17.40%, whereas the industries and service sector contribute 6.4 % and 76.2 %, respectively. However, new work opportunities are growing at a moderate pace thereby increasing the specter of unemployment in the islands. The marine fisheries with a potential of 1.48 lakh ton comprises of vast array of pelagic, demersal and oceanic fishery resources. The Exclusive economic zone (EEZ) of Andaman and Nicobar Islands is about 0.6 million km2 which is almost one fourth of Indian EEZ (2.02Million km2). This offers tremendous scope to commercially utilize them for the economic development of the islands. However, the gap between supply and demand of agricultural goods is expected to increase. This calls for concerted efforts to develop new agricultural technologies suited to the specific agro-ecological conditions of these islands.

## About ICAR

The Indian Council of Agricultural Research (ICAR) is an apex organization working under Ministry of Agriculture, Govt. of India spearheading the agricultural research and education in the country. It is one of the largest National Agricultural Research Systems (NARS) in the world having 97 ICAR Institutes, 46 State Agricultural Universities, 5 Deemed Universities and one Central Agricultural University and 589 KVKs spread throughout the country including Andaman & Nicobar Islands. It broadly aims at enhancing the agricultural productivity and production on a sustainable basis, diversification of agriculture, management of natural and biological resources through science led development and innovations. Due to its continuous strides for the upliftment of Indian agriculture sector and alleviation of poverty and journey towards excellence, ICAR has been accredited with ISO9001-2008 certification.

## Background of CARI

The Central Agricultural Research Institute (CARI), an ICAR unit for A & N Islands established on 23rd June 1978 by merging different Regional Research Stations of the ICAR Institutes viz., Central Marine Fisheries Research Institute, Indian Veterinary Research Institute, Indian Agricultural Research Institute, and Central Plantation Crops Research Institute. CARI caters to the specific needs of agricultural research and development of the Union Territory of Andaman and Nicobar Islands. It was entrusted with the task of developing technologies for enhancing the productivity and production of crops, livestock and fishery through adoptive and basic research to bridge the gap between requirement and the local production. The institute is unique in ICAR system which is engaged in multidisciplinary research benefiting island ecosystem. It has several accomplishments during the last thirty five years of its service despite various unsurmountable constraints. The research activities are carried out under five divisions viz., Natural Resource Management, Horticulture & Forestry, Field Crops, Fisheries Science, Animal Science and one Social Science Section. The Institute has its main campus located at Garacharma farm and is spread over 62 ha of land wherein research work related to field crops, horticulture, animal sciences and fresh water fisheries are being carried out. In addition, it has 3 Krishi Vigyan Kendras located one each at Sippighat, Car Nicobar and Nimbudera covering all the three districts of the Islands and an Out Reach Centre funded by NABARD is established at Diglipur (2009) to cater to the technological needs of farmers of North Andaman.

## Mission

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

## Vision

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

## Mandate

i. 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.

ii. To develop appropriate plans for conservation of natural resources and their sustainable use.

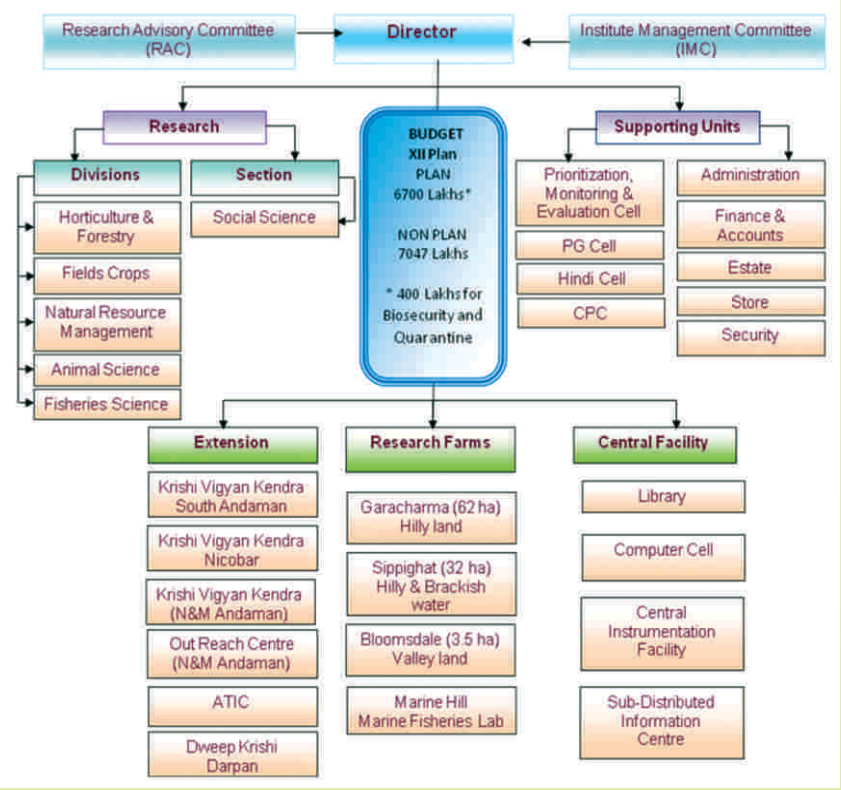
iii. To standardize technologies for animal health coverage and livestock production.

iv. To standardize techniques for capture and culture fishers including coastal aquaculture.

v. First line transfer of technology and training to the relevant state departments.

## Organizational setup

Administration of the institute rests with the Director, who receives support from all research divisions and as well as administration. The Research Advisory Committee (RAC), Institute Management Committee (IMC) and Institute Research Council (IRC) review and monitor the research programmes and facilitate to identify new research thrust areas for the Institute.



## Staff Strength

At present 28 scientists belonging to different disciplines are working in CARI. In addition technical (43), administrative (25) and skilled supporting staff (78) are assisting the various activities of CARI.

## Infrastructural facilities

The institute has four research farms located at Garacharma, Sippighat, Bloomsdale and Marine hill. The main campus located at Garacharma (62 ha) wherein research related work on field crops, horticulture, animal sciences and fresh water fisheries are carried out. In Sippighat farm (32 ha) research work mainly on plantation crops, spices and brackish water fisheries are carried out. In addition to this, World Coconut Germplasm Centre is located inside the farm. Bloomsdale research farm (3.5 ha) is well equipped to support research work on field crops, natural resource management and fisheries. At Marine Hill state of the art fisheries informatics lab has been established and engaged in marine fisheries research.

The institute has adequate laboratory facilities to conduct soil, plant and water sample analysis, in vitro testing, biotechnological work, microbial studies and biochemical analysis. Central Instrumentation Facility of the Institute is well equipped with sophisticated instruments. In addition, huge green house facilities have been created to cater to the research needs of different disciplines.


Bloomsdale Farm
(Field crop research)


Marine Hill
(Marine fisheries)


Polyhouse complex
(Garacharma)

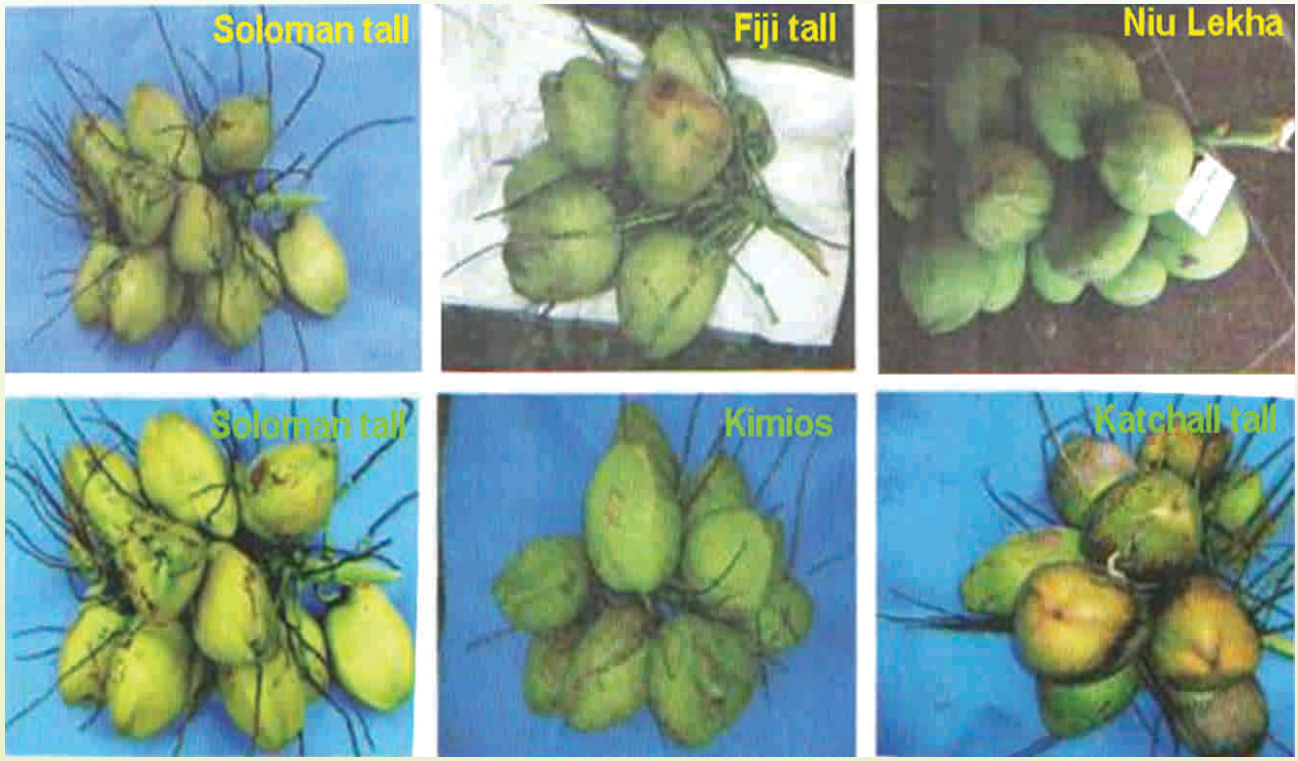
## The Journey since inception

During last thirty three years of its vibrant existence the Institute has contributed significantly to reduce the gap between requirement and local production of different commodities through research and development. The contribution of local production to the requirement has risen during last thirty years (1980-2010) from 25% to 50% for rice, pulses from insignificant to 20%, tropical fruits from 40% to 100%, flowers from insignificant to 25%, vegetables from 20% to 80% except potato and onion, milk from 20% to 70%, eggs from 25% to 90%, chicken from 10% to 100% and inland fishes from 10% to 90%. Since there has been no significant increase in the land area under cultivation, the increase has mainly come from technological interventions in which the institute has significantly contributed.

## Research in the early years

- Within two years of its inception CARI established a 'Tropical Fruits Germplasm Bank' with improved varieties of pomological stock obtained from various sources in the mainland. Later an experimental wind mill and terraced plots were established according to the watershed principles which were the show pieces for visitors and farmers.
- World Coconut Germplasm' Centre was established in 1982 where global coconut collection clones were quarantined and evaluated. At present it has 30 accessions of which 24 are from Pacific Islands and 6 from the Nicobar group of Islands.

- Evaluation of exotic coconut germplasm in World Coconut Germplasm Centre resulted in the identification of Niu Lekha as a promising dwarf cultivar with the highest copra content 245 g/nut). Among the dwarf coconuts (Green, Orange and Yellow dwarf), Green dwarf was found a promising cultivar for tender coconut-water.




- A high yielding variety of arecanut "Samrudhi" was released for commercial cultivation in the Islands by All India Co-ordinated Palm Improvement Project.
- For the first time it was reported that the sap of Ammomum aculeatum Roxb. (to a lesser extent Zingiber squrracbum) could tranquilize the ferocious rockbee Apis dorsata which led to the large scale adoption of bee keeping especially by the farm women.
- During 1985-89 period a 'new genetically improved' strain of Nicobari poultry bird was developed which lays 158 to 160 eggs per year under zero management and was comparatively more resistant to most common poultry diseases. In addition a Barren island Feral goat, the only ruminant in nature known to survive on saline sea water, was also conserved and genetically improved.
- Rice is the staple food for majority of the islanders. Thus systematic rice variety evaluations were started in the 90's for normal soils and salt affected soils for both medium and long durations. CARI has developed two Pokkali somaclones, BTS 24 and BTS 28 suitable for saline soils using biotechnological tools. Also agro-techniques for rice based systems have been developed for different situations. Multi location demonstrations were carried out at farmers' fields in South and Middle Andamans to popularize these varieties.

- Agro-techniques were standardized for production of flowers viz., tuberose, crossandra, gerbera, gladiolus, and marigold. Techniques for enhancing vase life of tuberose, gerbera, gladiolus, anthurium, green orchid (*Eulophia andamanensis*) and fern foliage (*Microscocorium punctatum*) were developed.


- For the first time, CARI scientists in collaboration with National Bureau of Soil Survey and Land Use Planning systematically surveyed, characterized and prepared the soil resource map of the Islands which was instrumental in understanding the fertility and productivity of the soils of A&N Islands.
- The local "Teresa goat" and "Feral goat" were evaluated and improved for their meat quality and increased growth rate and produced "Boer Cross" goats for fast growth and better meat quality. In addition, catalogued prevalent livestock and poultry diseases and developed prophylactic and control measures for widely prevalent diseases e.g., Humpsore (Stephanofilariasis of cattle), IBD and Coccidiosis of poultry birds.

Feral (Barren Island) Goat | Teresa Goat | Trinket cattle

## Salient technologies introduced / refined for Island conditions

- Lab to Land programme came as a boon to CARI in the early years of its technology dissemination. Taking advantage CARI introduced many new varieties such as winged bean, sisal hemp, Queen variety of pineapple and Khaki Campbell ducks in the early 80's.
- Institute Village Linkage Programme (IVLP) through bottom up approach during the 90's led to the productivity and profitability enhancement of farming systems in the islands.
- Moong bean varieties such as Pusa 105, 115 and 117, Pusa 899711 and LK 322 were found suitable for cultivation after rice harvest yielding 1.5 t/ha with a desirable level of resistance to Cercospora leaf spot and powdery mildew. These were disseminated to the farmers to improve the pulse production in the early 90's.

- With the establishment of KVK in 1993 at Sippighat, South Andaman, for the first time 'Village Adoption' programme for the holistic development was introduced at Guptapara in collaboration with line department, lead bank and PRI's. The model was replicated in Manglutan and Manpur villages of South Andaman.

- Evaluation of rice, pulse and vegetable varieties for their suitability, yield potential and resource efficiency was carried out in the 80's. The focus was given to the integrated farming system model with low external inputs. Suitable agro-techniques for rice based cropping system including system of rice intensification and MAT nursery were standardized and disseminated to the farmers through adaptive trials and campaign.

- As plantation crops were the major horticultural crops of the Islands emphasis was given to develop multistoried cropping system to maximise the productivity and efforts were made to utilize the sloppy land to develop spices through technology intervention, inputs and training in collaboration with line departments. Black pepper cultivation on hedge rows and Gliricdia standards between the coconut trees have been standardized and widely disseminated to the farmers.


Shri Bezbaruha, Chief Secretary, A&N Administration participating in the National Workshop on August 1987 at CARI

Black pepper cultivation

Mushroom cultivation

- Cultivation of mushroom on agricultural wastes and byproducts available in the islands was standardized and disseminated through KVK which provided not only employment opportunities to the farm women but supported in achieving the nutritional security.

- Green mussel culture technology in brackish water creeks was standardized and disseminated to the fishers and entrepreneurs.

- To control the rhinoceros beetle menace in the coconut gardens of A&N Islands, CARI has evaluated different IPM modules. Adoption of IPM module against rhinoceros beetle such as release of rhinoceros beetle infected with baculovirus @ 15 no/ha during May-August and treatment of breeding grounds like dead palm, sawdust, cowdung heaps with spores of Green muscardine fungus (*Metarhizium anisopliae*) @ 1012 spores/sq. mt during May-July could give higher cost benefit ratio of 1: 2.47 as compared to 1: 1.97 by conventional pest management practices.

## Significant achievements

Thirty five years is not a long period in the life of an institution, but it is a milestone where one should introspect. Increasing globalization, easing restriction on movement of goods and services has made every nook and corner of the world a part of world economy. This has changed the whole paradigm of the scenario and new challenges have emerged. For Andaman and Nicobar islands this is more true than any other place, which has emerged as a tourist destination. This has changed the requirement pattern of the agricultural products and thus the research challenges have also undergone change. Further, in fast changing world of biotechnology, the bio resources of the region like these islands have assumed greater economic importance. Central Agricultural Research Institute is very much aware of these emerging challenges and has geared itself to serve the island farmers in the changing scenario. The contribution of the Institute in recent years can be viewed in research and development which are interdependent.

## Research

For the last three and half decades the Institute has been actively involved in agricultural research and development to provide technological support to the island farmers/fishers to stride towards achieving livelihood security.

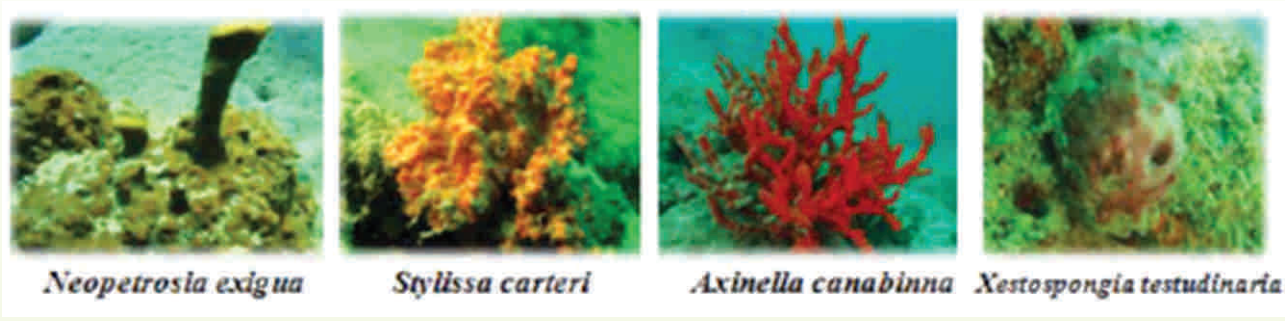
## Biodiversity Conservation

A lost species which might have been beneficial can never be regained and biodiversity ensures and provides all our food and many raw materials for production of essential goods and services for human beings. Thus, CARI concentrated on collection and conservation of biodiversity of crop plants of these islands.

- A total of 238 germplasm of indigenous and exotic horticultural crops belonging to Fruits (53), Vegetables (77), Flowers (03), Tuber crops (33), Plantation crops (36) and Medicinal plants (36) have been collected and maintained.

*Centella asiatica* | *Sauropus androgynous* | *Colocasia esculenta* | *Enhydra fluctuans*

- In rice more than 2000 germplasm lines were collected, characterized and the promising lines were utilized in the varietal improvement programme. A total of 333 germplasm/ landraces of pulses which comprises of mungbean (126), urdbean (163) and pigeonpea (44) have been collected, characterized and conserved.
- A total of 61 species of sponges have been identified through conventional taxonomy of which 43 are new locational records in A&N Islands and 25 are new locational records in India. Seven new marine sponges viz., *Clathria* (Isociella) *eccentrica* (Burton, 1934), *Hemiasterella bouilloni* (Thomas, 1973), *Petrosia* (Petrosia) *nigricans* (*Lindgren,* 1987), *Spheciospongia andamanesis* (Pattanayak, 2006), *Placospongia carinata* (Bowerbank, 1858), *Axinella minor* (Thomas, 1981) and *Xestospongia viridenigra* (Vacelet, Vasseur & Levi, 1976) of the island have also been documented.




- The extent of coral reef area has been recorded as 1025 km2 in collaboration with Space Application Centre, Ahmedabad and 34 mangrove species were identified and documented from Islands of which one species (Sonneratia ovata) was new locational record in India.

## Varieties developed

- Medium duration rice varieties for normal soil (CARI Dhan 1, CARI Dhan 2 & CARI Dhan 3) and saline soil (CARI Dhan 4 and CARI Dhan 5) have been developed and released for cultivation in A & N Islands. These varieties performed better than the local varieties (C 14-8 and Jaya).




- Two varieties of rice (CARI Dhan 6 and CARI Dhan 7) , four varieties of coconut (CARI Annapurna, CARI Surya, CARI Omkar and CARI Chandan), two varieties of sweet potato (CARI Swarna and CARI Aparna), four varieties of Noni (*Morinda citrifolia*) (CARI Sanjivni, CARI-Sampada, CARI Rakshak and CARI Samridhi), one each variety of Poi (*Basella alba*) (CARI Poi 1), Brinjal (CARI Brinjal 1), Ground orchid (CARI Pretty Green Bay), Broad Dhaniya (*Eryngium foetidum L.*) (CARI Broad Dhaniya) and Greater Yam (*Dioscorea alata*) (CARI-Yamini) are developed and submitted the proposal to State Seed Sub Committee on Agriculture & Horticulture Crops in A & N Islands for release.

## Improved livestock

- Dual purpose Nicobari fowl for higher egg production (184 No./annum) and higher body weight ( 1.92 kg at 4 months age) was developed and recommended for rearing.

Brown Nicobari

White Nicobari

Cross bred goat (Local x Boer)

- Dweepika, a dual purpose fowl (White Nicobari X Vanaraja) with higher egg production (185 eggs/ annum), higher body weight (1.920 kg at 16 weeks) and better survivability was developed and recommended for backyard farming.
- Cross- bred goat was developed by crossing Boer goat and Andaman local goat with higher body weight (36 kg) than the Andaman local goat (18 kg) at 12 months of age and the technology has been transferred to farmers through KVK.

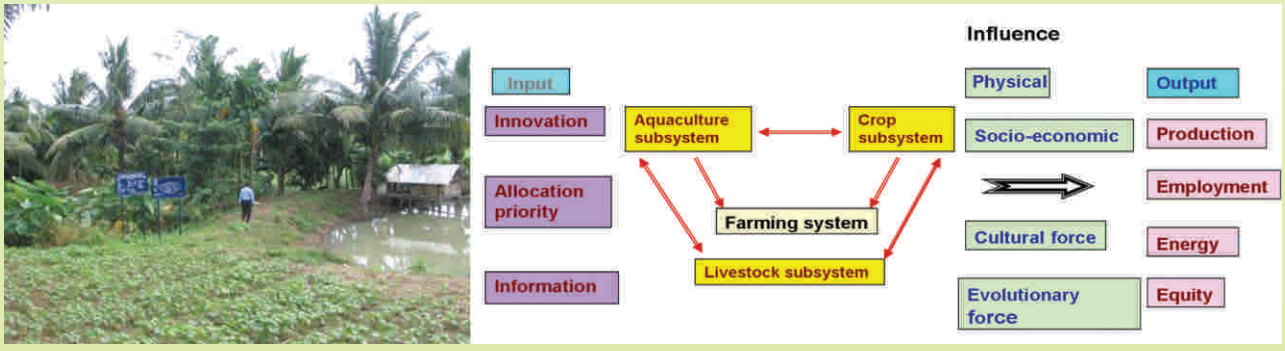
## Soil and water resource management

- Rain water harvesting and its use for crop production is the most important strategy in water resource management. CARI has developed and refined the technique of rain water harvesting through dug out or plastic lined ponds for effective control of seepage losses. The shelf life of lining material can be increased by lining the tank with plastic film and reinforced plaster (1:6) on sides and 15 cm thick soil layer at bottom.
- Soil resource assessment of rice growing areas was carried out which revealed that soil acidity (1.7 to 3.6 cmol (+) kg soil-1), Al toxicity (0.86 to 1.59 cmol (+) kg soil-1) in general and salinity (4.0 - 5.9 dSm-1) along with acidity (pH 4.8 - 5.4) in Dhanikari soil series was the major constraint. Organics such as poultry manure and coconut husk compost have been identified as suitable alternate liming materials for island conditions.

Lining of tank for rain water harvesting

## Integrated farming system (IFS)

- Integrated farming system is the key to improve the resource use and enhance the farm income. CARI has evaluated and transferred different IFS models for different micro-farming situations in hilly upland (plantation + dairy + backyard poultry), medium uplands (crop + cattle + fish + poultry and crop + cattle+fish+poultry+goat) and valley areas (rice + vegetable + fish) at farmer's field which has increased farm income (Rs.3.9 lakhs/ha/yr) besides additional employment generation (163 mandays / ha /year).



## Integrated Pest and Disease Management (IPDM) Modules

- Integrated Pest and Disease Management modules were developed for the management of coconut rhinoceros beetle, yellow stem borer of paddy, fruit borers (Spodoptera litura) of tomato and bhendi, fruit flies and fruit and shoot borer (Leucinodes orbonalis) of brinjal and all the IPM modules were demonstrated at farmers fields.

## Post harvest processing

- Hand and pedal operated coconut dehuskers were developed and standardized to reduce the drudgery. In order to reduce the post harvest losses during drying low cost solar dryers were designed and developed to improve the efficiency of drying and reduce the microbial load in. This is suitable for drying of coconut, black pepper, arecanut, chilles, Jack fruit, mushroom and fish.

Low cost solar dryer

Improved solar dryer

Coconut dehusker

## Adoption of technologies developed/ standardized

- The geographical situation and agro climatic conditions of Andaman and Nicobar Islands do not permit complete transfer of agro-technologies developed elsewhere in the mainland. This necessitates in situ development of location specific agricultural technologies or its suitable modification to suit to Island situations to maximize agricultural production. The following are some of the technologies developed / standardized for local conditions;
- Standardized the technologies for production of table purpose groundnut in coconut plantations during wet season and in post rice dry season.
- Package of practices for cultivation of rice for normal and problem soils of Island have been standardised and disseminated.
- Mud crab fattening (*Scylla serrata*) and captive breeding of marine ornamental anemone fish were developed. Two marine ornamental fishes (*Amphiprion percula* and *Premnas biaculeatus*) breeding and larval rearing technology were standardized at Marine research laboratory.
- Standardized Cat fish (*Clarias batrachus*) seed production and composite fish culture technology.

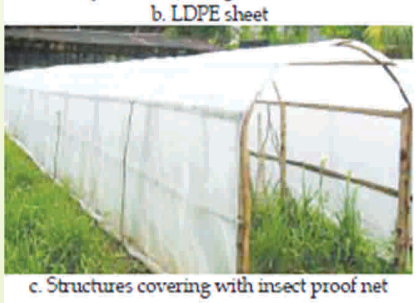
Mud crab culture

Anemone fish culture in captivity

- Designed and standardised the low cost high efficiency polyhouse technology for island conditions. Also production technology for high value crops (flowers and vegetables) under protected structures and open conditions was developed so as to ensure its availability during off-season and high return to the farmers.

a. Polytunnel covering with 200 micron b. LDPE sheet

b. Structures covering with Agro shade net



c. Structures covering with insect proof net

d. Structures covering with polythene sheet and insect proof net for side ventilation

- Comprehensive technology package for Noni (*Morinda citrifolia*) cultivation in the island has been developed.
- Fodder cultivation on hill slopes and in the interspaces between coconut and arecanut plantations has been developed.
- Reproductive health management protocol for cattle, buffaloes and goat was standardized by which highest pregnancy rate was achieved in CIDR insert (81.9%) followed by Ov-synch (28.6%) and PGF2? injection (25.0%).

## Technology dissemination

In order to transfer the technologies developed by CARI and to reach out the farmers of different Islands the Institute has established three KVKs, one each at Sippighat, South Andaman (1993), Car Nicobar, Nicobar (2010) and Nimbudera, Middle Andaman (2012). Besides, an Out Reach Centre funded by NABARD was established at Diglipur (2009) to cater to the technological needs of farmers of North Andaman.

- A total of 240 need based trainings were conducted during XI plan for the benefit of the island farmers in which 40% of them were farm women for upgrading their knowledge and skill. Besides, technology demonstration, adaptive trials were conducted at farmers fields in a participatory mode in agriculture and allied sectors by the extension wings of the Institute viz. KVKs and Out Reach Centre.
- Island Kisan Mela is conducted every year in the month of Jan- Feb for the benefit of the Island farmers during which new technologies are showcased, practices are explained and farmers' doubts are attended. In addition, line departments of A&N Islands are also invited to participate. More than 1500 farmers participate in the Mela. Since last two years CARI has been organising Farm Innovators Day in which farmers display their innovations and products.

Honorable M.P visiting field demonstration during Kisan Mela 13

- Four identified technologies namely Broad Bed and Furrow System, Pond based Integrated Farming System, Tank cum Well System and Micro Irrigation System have been demonstrated in 100 farmers' fields through participatory mode.

- Need based integrated land improvement approach comprising of six different methods viz. broad bed and furrow, rice-fish, three tier farming, farm pond, paired bed and furrow and pond-nursery systems were implemented in degraded coastal areas of Andaman Islands covering 200 acres benefiting more than 500 farmers which led to the crop diversification and livelihood security.

- Location specific integrated farming system is adopted in two villages covering 100 tribal farm families in Car Nicobar in on farm research mode.

Demonstration of BBF system

- Through seed village concept, production of High Yielding Varieties of paddy was conducted in an area of 4.13 ha in farmers' participatory mode. Around 10 ton of truthfully labelled rice seed was produced and distributed among the farmers. In addition 250 kg of Breeder seed was also produced to meet the demand of the stakeholders.

- To meet the need of the quality fresh water fish seeds, the community based nurseries rearing system was introduced successfully under satellite system in South and North & Middle Andaman districts in collaboration with Department of Fisheries, A& N Administration.

- Water Users Association (WUA) promoted by CARI for the development and efficient utilization of water was the first of its kind in the Manjeri village of South Andaman. Total memberships has increased from initial sixteen farm families to forty five at present besides the area under the cultivation of the crops also increased from 29% to 71%.

- Weather based Agromet advisories are issued on every week through print and electronic media for better crop planning in the Islands. Also Potential Fishing Zone forecasts are periodically issued for the benefit of fishers of the islands resulting in 34.35% increase in catch per unit effort and reduction in scouting time by 50%.

- Convergence of 14 technologies as micro business modules has been developed in association with NABARD so as to retain farm youth in agriculture and allied fields for providing decent livelihood options to the youths of the island.

- Success stories of five farmers technologically supported by CARI has found place among 101 farmers selected from all over country and published in the book "Harvest of Hope" by Union Ministry of Agriculture.

अण्डमान निकोबार द्वीप समाचार

कृषि मौसम पर

15 म्यांमारी घसपैतियों सहित खाद्य व्यवसायियों

कृषि मौसम परामर्श

पोर्ट ब्लेयर, 1 मार्च।

यहां के केन्द्रीय कृषि अनुसंधान संस्थान के प्राकृतिक संसाधन प्रबंधन विभाग द्वारा कल 2 से 8 मार्च, 2011 की समयावधि के लिए अंडमान जिले के लिए जारी कृषि मौसम परामर्श बुलेटिन के मध्यम अवधि मौसम पूर्वानुमान में बताया गया है कि अंडमान के द्वीपों में अगले पांच दिनों के दौरान तेज धूप के साथ-साथ कभी-कभी बादल छाए रहने की संभावना है। इस अवधि में 4,5 और 6 मार्च, 2011 में अधिकतम 3 मिलीमीटर वर्षा के साथ कुल 11 मिलीमीटर वर्षा होने की संभावना है।

अधिकतम तापमान क्रमश 280 से 320 सेल्सियस एवं न्यूनतम तापमान क्रमश 240 से 260 सेल्सियस रहेगा। अधिकतम सापेक्षिक आर्द्रता 81 से 87 प्रतिशत तथा न्यूनतम सापेक्षिक आर्द्रता 77 से 80 प्रतिशत रहने की संभावना है। उत्तर पश्चिम दिशा से 5 से 9 किलोमीटर प्रति घंटे की रफ्तार से हवा चलने की संभावना है।

इस अवधि के दौरान मौसम आधारित कृषि सलाह में कहा गया है कि जल भरे क्षेत्र में फसल विविधीकरण के लिए नाली एवं मेड़ी पद्धति का प्रयोग करें, जिसमें 4 से 5 मीटर चौड़ा मेड़ी, 5 से 6 मीटर चौड़ा एवं 1 मीटर गहरा नाली होनी चाहिए। मूंग एवं उरद में अच्छे कुसुम एवं फली गठन के लिए 20 ग्राम अमोनियम फासफेट 1 लीटर पानी में मिलाकर प्रयोग करें। स्थानीय पशु चिकित्सक की सलाह से मुर्गियों को रानीखेत रोग से बचाने के लिए 1 दिन, 1 सप्ताह तथा 3 महीने की उम्र में टीकाकरण करें। स्थानीय पशु चिकित्सक की सहायता से दूध न देने वाली गाय एवं बकरियों के शरीर से कीड़ा

## Tsunami and technological interventions

Immediately after the devastating Tsunami in December 2004, CARI has carried out Tsunami damage assessment in collaboration with NRSA (ISRO). Later, technology supported rehabilitation programme was initiated in Manjeri village of South Andaman. This included peripheral bunding with one way sluice gates which arrested the ingress of seawater. Engineering and agronomic measures combined together led to restoration of agricultural activities in the intervention areas. Further, under National Agricultural Innovation Project, agriculture has been restored in 200 acres of degraded coastal land and provided livelihood support to more than 500 farmers through technological intervention in Andaman Islands.

- In addition to popularise and facilitate the technologies developed by CARI to reach the beneficiaries we have entered into MoU with private entrepreneur certified by small scale industry, A&N Administration on a Public Private Partnership (PPP) mode.


Recognition for Island farmers

MOU signed with private partner

## Policy documents development

CARI has organized a number of brainstorming sessions on different aspects concerning island agriculture and consequently five following policy documents have been formulated.

- Water Policy for Union Territory of Andaman & Nicobar Islands
- Status and Future Strategies for Horticulture Development in the Islands
- Development of Island Fisheries
- Biodiversity Conservation and Environmental Biotechnology
- Livestock Production Policy for A & N Islands
- Human Resource Development in Agriculture and allied areas

## Tribal sub plan

Under Tribal Sub Plan (TSP) empowerment of tribal population through training cum technology dissemination was carried out. It was aimed to improve the existing practices of agriculture and allied sectors, dissemination of need based improved production technologies so as to improve the quality of life. To maximize the benefit to tribal farmers through technological interventions and knowledge support, some of the livelihood options identified are given below;

- Special initiatives for integrated farming system
- Scientific cultivation of field and horticultural crops
- Scientific pig and poultry farming
- Modern fishing technologies
- Technological interventions for improving production of pulse and maize crops through sensitization and awareness programmes
- Post-harvest processing and value addition of various agricultural commodities

A total of 28 training programmes in the field of fisheries, horticulture, field crops, animal husbandry, post harvest, crop protection and value addition technologies were conducted for the benefit of the tribals in Nicobar District and Little Andaman by the scientists of CARI and KVKs in collaboration with development departments. The effort has benefited a total of 1515 participants spread across the Nicobar Islands.

Tribal farmers have been provided with seeds and planting materials of improved varieties, livestock, farm tools and support to properly utilize soil and water resources to improve the farm productivity.

Besides an exposure visit of 5 Tribal Captains from Nicobar to Central Plantation Crops Research Institute, Kasargod and Central Tuber Crops Research Institute, Thiruvananthapuram was arranged to give them a glimpse of technologies for improved coconut based farming system, intercropping with spices, pineapple and tuber crops along with value addition.

CARI team interacting with DC, Nicobar and representatives from line departments

Field demonstration at Hut Bay

Field demonstration of GPS use

## Linkages

The Institute has established linkages with regional, national and international organizations with a view to strengthen its scientific outcome and technology dissemination.

### Collaboration with line departments of A&N Administration

- Dr. T. R. Dutta, served as one of the members of Board of Directors of the A & N Islands Forest and Plantation Development Corporation in the early 80's during which Red Oil Palm plantation in Little Andaman and Spices Plantation in the Middle Andaman was carried out.
- Directors and Heads of Divisions of CARI served as Directors of Fisheries and Agriculture departments of A&N Administration establishing strong and fruitful interrelation between research and development in these Islands.
- Heads of Division and Scientists of CARI have been actively involved as chairman and members of different technical committees of development departments in the last three and half decades. Similarly, Heads and their representatives of developmental department of A&N administration are regularly invited to attend various scientific deliberations and farmers programmes held at CARI. This enabled CARI to have prolific two way communication and cooperation in its endeavours to increase the agricultural production and productivity in these Islands.
- In a lighter sense, at the request of Lieutenant Governor of A&N Administration, CARI scientists were involved in successful replanting of age old Peepal tree in association with A&N Administrative staffs, in front of Cellular Jail. The joint effort was very well appreciated by his Excellency.
- CARI has been receiving good support from the line department and got the financial assistance to carry some of the research projects, seminars and meetings.

Shri Vivek Rae, Chief Secretary, A & N Adm. addressing the participants

Shri. Shakti Sinha, Chief Secretary, A&N Admin. having a glimpse during Kisan Mela

### Regional organizations

- Tribal Council (Nicobar Islands)
- Botanical Survey of India, Port Blair
- Zoological Survey of India, Port Blair
- Fisheries Survey of India, Port Blair
- ICMR, Port Blair
- Andaman Nicobar Center for Ocean Science Technology, NIOT Port Blair.
- NGO's : Surabhi, West Bengal Voluntary Health Association, Salvation Army, Action Aid, Friends Society, World Vision etc.

Interface meet of stakeholder on revitalizing island fisheries

## National organizations

Department of Biotechnology, New Delhi

Department of Science and Technology, New Delhi

Space Application Center, Ahmedabad

National Remote Sensing Agency, Hyderabad

Indian Center for Ocean Information Services, Hyderabad

Defence Research & Development Organization (DRDO)

National Bank for Agricultural and Rural Development (NABARD)

National Institute of Ocean Technology

Coconut Development Board

Directorate of Arecanut and Spices Development Board

## International organizations

World Bank- Global Environment Fund

International Rice Research Institute - Philippines

Bill and Melinda Gates Foundation, USA

## Future thrust areas

The Institute is at a critical juncture in its progress, from where it has to carve out a new path based on the changing scenario of the Island. At the one hand there is shrinkage of agricultural land and on the other hand there is ever increasing population (inclusive of the floating population of tourist) in the Island. Hence, there is a need to increase the yield of crops, give adequate focus on development of post - harvest technologies value added products and marketing. A brand name of "Andaman" can be tagged on the organically produced agro-products of Andamans. The same can fit in agri-business modules with a production to consumption chain to provide a livelihood option compatible to the aspiration of youth of farm families. In addition it has to address the emerging challenges posed by climate change, land degradation and diversion of agricultural land, water scarcity, demand for quality seed

Honorable Union Minister for Agriculture interacting with the farmers supported by CARI technologies

Honorable Members of Parliament interacting with the farmers supported under NAIP / CARI

Honorable DDG (Horticulture) interacting with the scientist at WCGC, Sippighat farm

## The strategies devised to address these issues are given below;

(i) Technological innovations to achieve double cropping in suitable lands to attain local level food security by genetic, agronomical, soil and water management and post harvest technology interventions.

(ii) Development of suitable technologies to attain substantial increase in productivity and production of vegetables, milk egg, meat, fish, fruits and flowers to meet the requirement of island population and tourist.

(iii) Comprehensive technology package for organic farming for spices.

(iv) Transfer of technology in agri-business modules to create a production to consumption chain involving SHGs and retailer/processor.

(v) Exploration of biodiversity of the region for its collection, cataloguing and identification of suitable genetic material for further use in breeding program both locally and nationally.

(vi) Sustainable utilization of marine biotic resources.

Based on this vision and strategies, following broad based programs have been identified to be taken up in next twenty years at this institute;

(i) Characterization and management of natural resources; Micro level water resource development and its efficient utilization;

(ii) Improving the productivity of the rice based cropping system;

(iii) Improving the productivity of plantation and fruit crop based systems;

(iv) Evaluation of vegetables for increased productivity;

(v) Improving the productivity of livestock, poultry and aquaculture;

(vi) Development of location specific integrated farming system models for resource conservation and increased farm return

(vii) Management of emerging pests and diseases apart from biosecurity;

(viii) Post harvest technologies and high value agriculture;

(ix) Organic farming inclusive of production technology for inputs; and

(x) Transfer of technology and socio-economic impact analysis.

## XII Five Year Plan

One of the major thrust of XII five year plan is to establish a composite Bio-security and Quarantine facilities in Andaman & Nicobar Islands and a Flag ship programme on Integrated Agriculture System for Tropical Islands.

**Composite Bio-security & Quarantine facility:** A & N Islands constitute one of the richest repositories of both terrestrial and marine biodiversity in the whole of South and South East Asia. The Island is free from several devastating pest and diseases of crops, animals and fishes which are prevalent elsewhere. However, the unscreened transport of various agricultural commodities into the Islands poses serious threat of introduction of new pathogens and pests which may be detrimental to both the biodiversity and agricultural ecosystem of the Islands. Therefore, it is envisioned to develop a state-of-art 'Composite Bio-security and Quarantine' facility in the Island for scrupulous monitoring and surveillance of contagious pest and diseases to uphold the strategic importance of these Islands.

**Flagship programme:** Integrated Farming System holds the key to provide the rural youth a decent livelihood and ensure the sustainability of the agro-ecosystem in the future. Hence, CARI has taken up a flagship programme on 'Integrated Agriculture system for Tropical Island' to develop island specific, climate resilient farm technologies.

**Tribal Sub-Plan and North Eastern Hill Component:** The primary focus of CARI under Tribal Sub Plan and NEH Plan in the 12$^{th}$ Plan is to improve the livelihood security and socio-economic status of the tribal farmers of Nicobar Islands and North East India through appropriate technological intervention and capacity building.

**Gender component:** CARI will make all efforts to mainstream the gender component in all the research and developmental programmes of the Institute. Appropriate sensitization programmes will also be organised involving different stakeholders for highlighting the problems of farm women and focusing on gender specific technologies.

**Research on policy support for agriculture:** Shrinkage of area under agriculture, demand for water for multiple uses, climate change, increasing demand for diversified agricultural commodities, decreasing farm income and unemployment of rural youth have creating a new paradigm in the island agriculture. We have to ensure that the trends are predicted; changes are quantified and scenario be understood so as to move on the developmental path. This necessitates proper policy initiative, therefore, CARI will make efforts to bring the stakeholders together to develop appropriate policy and its implementation to move towards sustainable agricultural development of these Islands to benefit all concerned.

## Role of CARI in Island agriculture and allied sector development

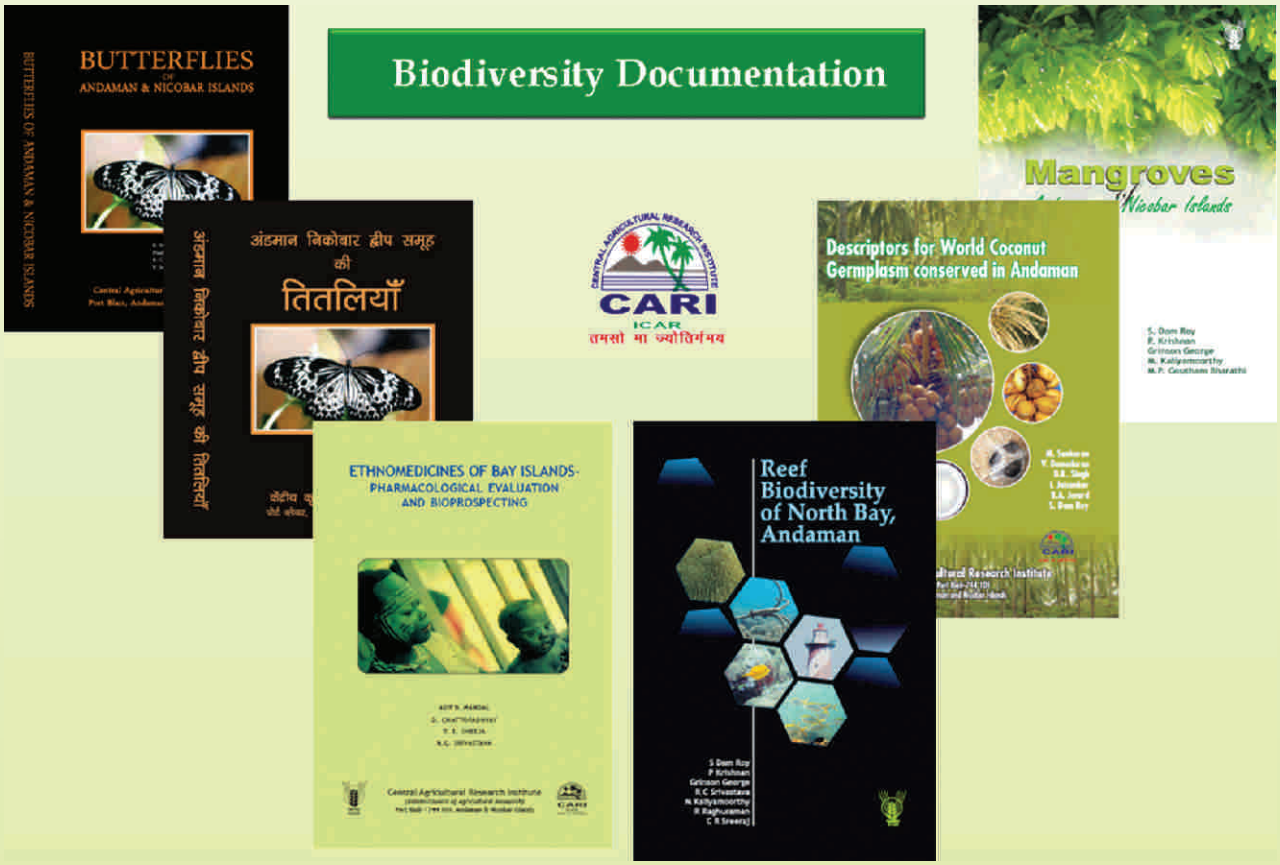
- Agriculture and rural development in the future will essentially be technology driven. In the process, due care should be taken to address the local issues and locational problems. CARI is well equipped with research facilities and scientifically ignited minds to address any future challenges concerning technology led agricultural development.
- CARI is equipped with three KVK's one each in every district, one Out Reach Centre at Diglipur and functional link with several NGO's active in the Islands which can be utilized for the dissemination of agricultural technologies to the farmer's fields. It can also play a significant role in capacity building of farmers and stakeholders of A & N Islands even in far flung areas.
- CARI being a partner of the vast network of National Agricultural Research Systems (NARS) and though All India Coordinated Research Projects can bring appropriate technologies to the benefit of Island farmers with suitable modifications. The services of any experts both in research and developmental activities can be utilized and in all this line departments of A&N administration can be actively involved.
- CARI being the multidisciplinary institute can provide its expertise to address the issues related to pests & diseases pertaining to agricultural crops, livestock, poultry and fisheries. In addition, in recent times CARI has gained knowledge through experience on degraded land and water resource management and integrated farming systems. This will be of immense help to the administration in its efforts for agricultural development in a partnership mode.
- CARI can enhance cooperation with National Bureaus of Plant, Animal, Fish & Insect genetic resources for documentation, registration and preservation of germplasm of Andaman & Nicobar Islands.
- CARI can provide breeder seed, truthfully labelled and quality seeds of different released varieties and the same can be multiplied in state farm for further distribution to the farmers.
- Being situated at the very hub of Island ecosystem, CARI has developed expertise on mangroves and coral ecosystem. CARI is in a position to provide suitable support and guidance to A & N Administration for conservation & preservation of our vital ecosystem.
- Over last 35 years CARI has gained rich experience on Island Agriculture and can provide its expertise on lots of issues concerning agriculture, ecosystem and sustainable development of the Islands. The scientific strength of CARI in addition to expert from mainland can be effectively used to discuss and develop suitable policy for the holistic agricultural development of the Island.

- In addition, CARI can do technology led significant agricultural developmental work to limited extent through externally funded projects. Through National Agricultural Innovation Project, Farmers Participatory Action Research Programme and Tribal Sub Plan, CARI has already made significant impact among the Island farmers and tribals in Nicobar Islands.

Over the years, CARI and A&N Administration have been working together in the area of common interest to achieve self sufficiency in food crops and animal products in addition to providing livelihood security to the island farmers. The Institute and A&N Administration have evolved into establishing a cordial relationship and functional linkages for transfer of technologies, knowledge sharing and addressing the issues concerning the development of Island agriculture. We can rely on our strength to compliment each other and continue the active cooperation with zeal and energy which will immensely benefit the farmers and other stakeholders in agriculture and allied sectors of the Islands.

## Publications

Scientists of this institute have published more than 300 scientific papers in the internationally reputed journals. Lot of literature covering different aspects of agriculture have been published in English and vernacular languages which are of interest to the farming community and other stakeholders of these Islands. More than 50% of the research articles are published in journals with NAAS rating above 5. The scientists have also published an impressive number of books and database on the biodiversity of soil, crop, livestock, butterflies, mangroves, corals and fish genetic resources of this Islands.



## Significant Awards and Honours

During the last two decades CARI scientists have received National Awards (16); Society Awards (30); State Awards (07), Young Scientist awards (9); Best Paper & Poster Awards (50). The Institute has also been awarded "Sardar Patel Best Institute Award" by Indian Council of Agricultural Research for the year 2010. Some of the important awards are mentioned below:

| Awards | Awarding body |
|---|---|
| Lieutenant Governor Commendation Certificate | A & N Administration |
| Best ICAR Institute Award – 2010 | ICAR, New Delhi |
| Hooker award | ICAR, New Delhi |
| Fakhruddin Ali Ahmed Award for Eesearch in Tribal area | ICAR, New Delhi |
| Rajshri Tandon Award for best use of official language | ICAR, New Delhi |
| ICAR Team Research Award | ICAR, New Delhi |
| Hari Om Ashram Trust Award | ICAR, New Delhi |
| Dr Rajendra Prasad Purushkar for Best Hindi Publication | ICAR, New Delhi |
| Jawaharlal Nehru best PhD Thesis Award | ICAR, New Delhi |
| Best KVK Award | ICAR, New Delhi |

### Golden moments of CARI


# Visits of Hon. Presidents & Prime Ministers

Gyani Zail Singh

Dr. A.P.J. Abdul Kalam

Shri Morarji Desai

Shri Rajiv Gandhi

# Visits of Ministers of Agriculture

Shri Bhajan Lal

Shri K.C. Lenka

Shri Sharad Pawar

# Distinguished Visitors

Prof. Saiyid Nurul Hasan
Hon'ble Governor of West Bengal

Shri. P.C. Alexander
Hon'ble Governor of Maharashtra

Prof. Kirti Singh
Chairman ASRB (ICAR)

Shri. Jairam Ramesh
Hon'ble Minister of State for Commerce

Henry V. Jardine
Consulate of USA

Shri. Shamsher K. Sheriff
CS, A & N Administration