



# Vision 2030



**Central Agricultural Research Institute**

Port Blair - 744 101

Andaman & Nicobar Islands

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**Central Agricultural Research Institute**  
Port Blair - 744 101  
Andaman & Nicobar Islands

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# Foreword

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डा.एस. अय्यप्पन

सचिव एवं महानिदेशक

**Dr. S. AYYAPPAN**

SECRETARY & DIRECTOR GENERAL

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The diverse challenges and constraints as growing population, increasing food, feed and fodder needs, natural resource degradation, climate change, new parasites, slow growth in farm income and new global trade regulations demand a paradigm shift in formulating and implementing the agricultural research programmes. The emerging scenario necessitates the institutions of ICAR to have perspective vision which could be translated through proactive, novel and innovative research approach based on cutting edge science. In this endeavor, all of the institutions of ICAR, have revised and prepared respective Vision-2030 documents highlighting the issues and strategies relevant for the next twenty years.

Andaman and Nicobar Islands are our eastern most frontier and a warehouse of vast biodiversity, both floral and faunal. Recognizing the importance of island ecosystem for providing livelihood to the people through agricultural development, Indian Council of Agricultural Research established Central Agricultural Research Institute (CARI) at Port Blair in 1978. The Institute has contributed significantly to socio-economic development of these islands through

development of cultivars, breeds and technologies which have enhanced income of the people and reduced the dependence for perishable produces from outside. The island has emerged as a popular tourist destination which requires a paradigm shift on research programmes to meet the emerging challenges of inclusive growth and sustainable economy. To make island farmers a real partner in this economic activity, it is essential that our agricultural research programmes are geared up and re-oriented to develop technologies which will enable the farmers to be an equal partner in tourism based economy.

It is expected that the analytical approach and forward looking concepts presented in the '*Vision 2030*' document will prove useful for the researchers, policymakers, and stakeholders to address the future challenges for growth and development of the agricultural sector and ensure food and income security with a human touch.

Dated the 11<sup>th</sup> July, 2011  
New Delhi



**(S. AYYAPPAN)**

Secretary, Department of Agricultural Research & Education (DARE)  
& Director-General, Indian Council of Agricultural Research (ICAR)  
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# Preface

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Agriculture and allied sectors have played a major role in the economy and providing livelihood to the people of this island. The institute has contributed very significantly to the growth of island agriculture i.e. from a share of about 20-30% of the local requirement to more than 50% for most of tropical items. However, in view of population growth and booming tourism, the research program has been reoriented to meet the future challenges. This Vision 2030 considers new paradigm shift created by upcoming constraints and challenges. The theme of the document is to utilize strengths and convert constraints into opportunities alongwith basic research programs which should receive emphasis during the next 20 years.

I express my sincere gratitude to Hon'ble Dr. S. Ayyappan, Secretary, DARE and DG, ICAR for his constant guidance and encouragement for preparing this document. I acknowledge Hon'ble Dr. H.P. Singh, DDG (Hort.) for his keen interest in island agriculture and vital inputs in preparation of this document. Dr. S.S. Magar and Dr. K. Pradhan, Chairman and all the members of Research Advisory Committee for their unflinching support in our endeavors. I shall also thank Dr. Umesh Srivastava, ADG (Hort.II) for his support. I would like to express my sincere thanks to Shri Vivek Rae and Shri Shakti Sinha, Chief Secretaries of Andaman Nicobar Administration and all officers and staff of A&N Administration who supported us in our effort to serve the island farmers.

I also thank to all my scientists and staff of CARI for the timely assistance and inputs in compilation of this document.



(S.K.Ambast)

Director (Act.)

Central Agricultural Research Institute  
Port Blair, A&N Islands

# Preamble

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The agriculture in the A&N Islands is about 100 years old. Up to the end of IV Five Year Plan, the major stress was mounted under area expansion of agriculture to achieve self-sufficiency in food grains. From V Plan onwards, the thrust was diverted from area expansion to intensive agriculture practices and development of plantations on the hilly slopes. Presently, the emphasis is on increasing the area and production through crop diversification from traditional food crops and optimum exploitation of cultivable wastelands. The demand for produce from allied sectors like horticulture, animal husbandry and fisheries far exceeds the supply opening greater avenues for further development. Besides ensuring nutritional security, these products have the potential for exports in value added form. Diversification towards horticulture and livestock therefore has to be very major component to achieve expected growth rate under agriculture sector. The major crop-wise distribution of the area is about 8139 ha under paddy followed by pulses and oilseeds during rabi, about 21760 ha under coconut and 4152 ha under arecanut.

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 gap between supply and demand would increase as population of the island increases. This warrants for concerted efforts to develop new agricultural technologies suited to the specific agro-ecological conditions of these islands. The effective transfer of technologies so developed to the farming community is needed to improve sufficiency status in major food items, particularly the perishable commodities and rice at sustainable scale.

Livestock farming is considered to be a profitable complementary enterprise in agriculture and constitutes an important activity for

accelerating the rural economy. The climatic conditions, topography and land holding pattern in the island calls for an alternative strategy of technology utilization in this sector compared to mainland. As per livestock census of 2007, the cattle, buffalo, goat, pig and poultry population in the island is 60,180, 14,204, 70,923, 42,836 and 8, 00,950 (nos) respectively. Except for the few animals or birds that could maintain their genetic identity due to their habitat in isolated islands, the livestock in general is non-descript in nature. The major bottlenecks for low productivity are indiscriminate inbreeding and free mixing of the animals led to dilution of genetic superiority, long inter-calving period, inadequate availability of feed and fodder and high parasitic load.

The fisheries sector has a coastline of about 2,000 km, encompassing about 16,000 sq. km. of continental shelf area and about 6 lakhs sq.km. of 'Exclusive Economic Zone' (EEZ), which is about 30% of India's total EEZ. Besides, there are several protected bays, inlets, brackish water creeks and shallow inshore areas available in the islands, which are suitable sites for the development of aquaculture farms. The estimated fishery potential in the 'Exclusive Economic Zone' is 8.21 lakh tonnes and in the continental shelf area 1.60 lakh tonnes. It is mentionable that the present fish production is only 30,000 tonnes/year, as there are inadequate facilities for fish seed production as well as storage.

In sum, A&N Islands are blessed with wide bio-diversity and vast natural resources. Vision 2030 is an attempt to enlist the potential thematic areas and analyse the strength and weakness of this sectors to focus research activities so that the expected outcomes can be delivered within the stipulated time to developmental departments and other implementing agencies.



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# Island Agricultural Scenario

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THE archipelago of Andaman and Nicobar islands is a chain of 572 islands stretched from North to South and located about 1200 km from mainland having total geographical area of 8,249 sq km. Of the total agricultural area of 50,000 ha, plantation crops occupies 25912 ha, field crops 11384 ha, spices 1592 ha, fruits 3118 ha, vegetables 5200 ha and root crops 435 ha (Table 1). Agriculture in the island is carried out under rainfed conditions which is important for both income and food security. About 50% of the total population is directly dependant on agriculture and allied activities. Though islands receive an annual rainfall of more than 3100 mm spread over more than 7 months in a year, there are no fresh water perennial rivers, which can be used as a source of irrigation during dry spell. The dry spell prohibits growing second crop after paddy as well as it affects the productivity of the plantation crops. Rice is the major cereal crop occupying 8139 ha, with a production of 24907 MT and actual production of 14944 MT of rice.

As per 2007 census the population of livestock is about 1.73 and poultry is 9.71 lakhs. Among the different types of livestock, pig constitutes about 24% while cattle and goat each constitute 37% of the total population. The growth of livestock sectors suffers from various bottlenecks viz. poor germplasm, acute shortage of feed and fodder, transportation, climate and topography.

The island encompasses 0.60 million sq. km of the Exclusive Economic Zone (EEZ), which constitutes about 30% of the EEZ of India. The territory has a coastal line of nearly 2,000 km with several protected and semi-unprotected bays and inlets, which have a vast potential for capture fisheries and agriculture operations. The Andaman Sea is also potentially rich in grouper, snapper, lobster and shrimp resources that are having export potential. Out of the potential harvestable fishery resources of 1.48 lakh tonnes, Tuna resources alone account for 67,000 tonnes. The potential for prospective species and their stock assessment

will be an ideal area for investigation. A glimpse at the present catch which stands at 28,000 tonnes per annum against the estimated potential indicates the extent of under-utilization of resources in Andaman.

**Table 1. Area and Production of Major Crops (2009-10)**

| Crops                   | Area (ha) | Production (MT) |
|-------------------------|-----------|-----------------|
| Paddy                   | 8139.85   | 24907.01        |
| Pulses                  | 2971.09   | 1890.66         |
| Oilseeds                | 110.80    | 69.80           |
| Black Pepper            | 600.40    | 58.31           |
| Clove                   | 155.90    | 4.82            |
| Coconut ( million nuts) | 21760.22  | 84.97           |
| Arecanut                | 4152.50   | 5200.00         |
| Cashewnut               | 1077.85   | 332.13          |
| Banana                  | 1596.30   | 14872.95        |
| Pineapple               | 224.71    | 608.42          |
| Sapota                  | 156.40    | 2914.60         |
| Sugarcane               | 141.80    | 2007.60         |
| Vegetables              | 5200.00   | 41500.00        |
| Tapioca                 | 274.65    | 2120.00         |
| Sweet potato            | 161.90    | 912.02          |

(Source: DoA, A&N Administration, 2011)

### **Agriculture and economy**

Agriculture contribution towards the Island GDP is 17.40%, whereas the industries and service sector contributes 6.4 % and 76.2 % respectively. The share of agriculture and allied activities has fallen sharply to 17.40% from 31.3% in 1999-2000. The sharp fall was in agriculture, forestry & logging. However, new work opportunities are growing at a tepid pace thereby increasing the specter of unemployment in the islands. Although the contribution of agriculture sector is low

over the period but the thrust has been given in horticulture and fisheries which has been identified as the potential sector by the Island Development Authority. In non-agricultural sector, tourism is the other area which is booming up to provide sustainable income and livelihood security. Despite being bestowed with abundant rainfall, agriculture in Andaman is waiting for a paradigm shift in its cropping pattern, genetic improvement, production techniques, market interventions, credit delivery etc. Perceptible shift in the farmers' mindset as well as reaching him the technology needed at an affordable cost and appropriate time are the trigger points for heralding the needed change in this sector which still employs more than 21% of island's population directly and indirectly.

Hence, reorientation of research to develop new technologies for enabling island farmers to derive decent livelihood from agriculture and allied fields is the need of the hour. Efforts have to be made to sustain the productivity of the fragile island ecosystem which is being threatened by climate change as well as abiotic and biotic stresses

### **Smallholder's agriculture**

The land distribution system was 2 ha each of paddy and hilly land and 0.4 ha of homestead land to each settler during the settlement, however with time, this holding has been fragmented. Island agriculture is rainfed, carried out on small holdings thereby putting limitations on large scale investments. Agriculture farm families in the islands is 14000 wherein small and marginal farmers have 57% of the land holdings and own only 25% of the total area, while 43% of the land holdings owned by medium and big farmers have 75% of the area. The average size of the agriculture landholding in the islands is only 1.89 ha which is declining rapidly; if this trend continues in the same pace the average size of holding will be reduced to threshold level by 2030.

The livelihood opportunities in the island are limited to tourism, agriculture & allied sectors. With tourism being Port Blair centric, agriculture & allied sectors are only option for livelihood for people located in far flung islands. With the limited land availability only vertical

expansion is possible to facilitate increase in yield per unit area to meet up the food demand of the increasing population.

### **Deteriorating production environment**

The availability of limited agricultural land and near absence of water resources development for irrigation coupled with biotic and abiotic stresses are the major factors responsible for the present state of agriculture scenario of the islands. After the tsunami a huge area of about 4000 ha has been permanently submerged which has resulted in reduction of total agriculture land. Soil erosion is the major problem in these islands due to intense rainfall. Most of the bases and nutrients are leached out of the system and siltation often damages the corals, the habitat and breeding ground of many shell and fin fishes. There is no sufficient underground water source in these islands. Minor irrigation projects are also extremely limited. Though island is receiving more than 3000mm of rain annually, still there is acute shortage of water for irrigation and drinking during the dry spell of the year. Presently only 3% of the total agricultural area is under the cover of irrigation. The nutrient content of the soils is also depleting. The degradation of soil, water quality can be easily overcome by systematic and efficient utilization of the natural resources and recharging of the soil with the macro and micro nutrients sources for long term effective use of the soil.

### **Growing food demand**

The population of the island is 3.80 lakhs as per the 2011 census which recorded a growth of 7.5% over the 2001 population census. Apart from the food demand for the fixed population the burgeoning tourist population have to be provided with the sustainable food with the limited natural resources. It is projected that the demand of food grain would be double than the actual production by the end of 2030. The demand of cereal, tuber crops and milk needs to be increased to more than 100%. The present area under paddy is about 7900 ha with production of 21864 tonnes against the requirement of 33210 tonnes which accounts for 51%

deficit. The demand of the meat, milk and other byproducts of livestock and poultry need to be doubled to meet the requirement of the fast growing population and tourism. The commodity wise projected requirement of food articles in A&N Islands is given in Table 2 and Fig.1.

**Table 2. Production requirement of different food items for projected population**

| Item                  | 2011 (Present )                   | 2021   | 2030   |
|-----------------------|-----------------------------------|--------|--------|
| Population            | 386000                            | 443900 | 518403 |
| Cereals (t)           | 66240(D-51.4%)                    | 76374  | 89192  |
| Pulses (t)            | 4035(D -284%)                     | 4652   | 5433   |
| Vegetables ## (t)     | 23798 (Seasonal excess & deficit) | 27439  | 32045  |
| Roots and tubers* (t) | 20488(D- 105%)                    | 23623  | 27588  |
| Milk (t)              | 23940(D- 44%)                     | 27602  | 32236  |
| Fruits (t)            | 14052 (E)                         | 16201  | 18921  |
| Meat and fish** (t)   | 11883 (E)                         | 13701  | 16001  |

D: Deficit; E: Excess

# Assuming 50% of cereal requirement from rice and rest from imported wheat

\*Deficit is mainly on account of potato which can be transported easily

\*\* The excess is due to production of marine fish. However the production of chevon and fresh water fishes has to be increased to cater the taste of local population, tourists as well as armed forces

## However the excess is only on paper as actual availability is less than demand due to high post harvest losses

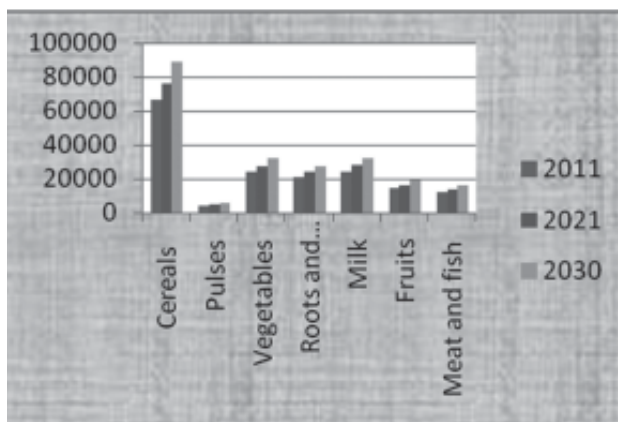


Figure 1. Production requirement of food items

Therefore, to meet the challenge of growing food demand crop intensification/diversification with vegetable, spice and fruit crops are considered to be the better options of farm income. However, considering the growing importance of agriculture in the islands, macro-management of agriculture is necessary for proper planning and evaluating technological options for possible interventions for improvements.

### **Climate change and agriculture**

The most important change in the climate is the increase in the global mean surface temperature, which has risen by approximately 0.74 °C since the beginning of the 20<sup>th</sup> century. The major consequences of the global warming will be increased frequency and intensity of heat waves, heavy precipitation, tropical cyclone and increase in sea level between 0.18 and 1.90 m by 2100 according to varying estimates. This will have direct effect on the productivity of the agriculture, livestock and fisheries, the coastal areas are likely to get inundated, disease and malnutrition may increase and freshwater availability may get reduced. The impact of climate change on the fragile ecosystem is more evident as the islands have witnessed the tragic incidence of earthquake followed by devastating tsunami in 2004. The predicted negative impact of climate change on agriculture would also adversely affect livestock production by aggravating the feed and fodder shortages. Two major coastal bio resources- corals and mangroves are also vulnerable to climate change. Therefore, research effort should be diverted towards developing strategies for adaptation and mitigating the impact of climate change on the agriculture and allied sector for sustainable development.

### **Technology landscape**

The institute has developed numerous technologies for the island farmers for providing decent livelihood through technological intervention. The major goal of the institute is to provide a research base to improve the productivity of important agriculture, horticulture, livestock and fishery sector through basic, adaptive and strategic research. A major constraint towards enhancing profitability is the cost

of inputs which have to be imported from mainland. Thus the major focus should be to provide technological backstopping in water, soil nutrients, feed and fodder from local resources. In addition given the scattered location of production centers, local level processing and value additions technologies are required to reduce wastage and enhance shelf life.

The challenge is to develop/innovate new agricultural technologies for enabling island farmers to derive decent livelihood from agriculture while sustaining the fragile island ecosystem which is being threatened by climate change as well as abiotic and biotic stresses. The use of modern biotechnological tools, nanotechnology, and frontier science along with the basic conventional technologies will play an important role in enhancing the productivity of agriculture, horticulture, livestock and fishery sector in this island.

### **Emergence of agri-business**

Presently there is no regulated market or Marketing Board to systematically organize the market for agricultural produce. Most of the seasonal agricultural produce is sold to middlemen who collect the same at the local sub market centers at a very low rate depending on the supply and demand situation for the respective produce irrespective of MSP declared by the State. Sufficient marketing facilities are also lacking, which is responsible for low remunerative prices for the agricultural products of the farmers. Excess produce, be it in vegetables or spices or coconut instantly slash the price since the demand is extremely limited and outside market is almost inaccessible.

The institute is at a critical juncture in its progress curve, from where it has to carve a new path to develop agricultural production technologies which can feed the burgeoning population and tourism economy and 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. There are plenty of opportunities for promoting agribusiness by establishing terminal market with hub and spoke model on PPP basis. The clusters have to be organized at



spoke level. Workshops to be organized on price discovery through Forward Market Commission since three major commodities viz. copra, arecanut and spices are actively traded in the market. The production to supply chain of the essential commodity shows that there are more than 50% losses in the entire supply chain. Efforts should be made to link between the production centre to the consumer chain through the agribusiness model that would lead to assured market benefit to the producer and reduction in the post harvest and production loss of the agriculture produces. Industrial promotion strategy should be based on encouraging private investment not through subsidies but by improvements in infrastructural facilities and easing the process of various approvals. In promoting the growth of exports of fresh horticulture, marine, and agro products, and processed food (both agro-based and seafood), the first step would be identification of a few items keeping in mind their commercial value and the comparative advantage of the island. The second step would be to focus on commercialization of identified products. This would imply establishing effective forward and backward linkages so as to sustain a symbiosis between industry and agriculture, encouragement to the use of modern technology and scientific techniques, investment in irrigation, development of fast means of intra-island transportation, and strengthening of farmers' training and extension services. The third step would be to ensure availability of storage, processing, marketing, and transport facilities.

## CARI-in Service of the Island Farmers

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**R**EALIZING the importance of islands agriculture to provide better livelihood to the people with integrated approach in these remote islands, ICAR established Central Agricultural Research Institute (CARI) in 23<sup>rd</sup> June 1978 by merging regional stations of IARI, IVRI, CPCRI and CMFRI. Since then CARI is conducting research work for the farming community of these Islands. Presently, the research work has been conducted under five division viz., Field Crops, Natural Resource Management, Animal Science, Horticulture and Forestry & Fishery Science and Social Science section.

The institute has four research farms, main campus at Garacharma of 62 ha area, where work on field crops, horticulture, Animal Sciences and fresh water fisheries are carried out. Another one is at Sippighat having an area of 32 ha where research work on horticulture and brackish water fisheries is carried out. Third farm is located at Bloomsdale which has flat lands of 3.5 ha and this is used for research work on Natural Resource Management and field crops. The fourth farm is at Marine Hill where state of the art fisheries informatics lab has been established. The institute has fairly adequate laboratory facilities for all divisions in addition to a well equipped Central Instrumentation Facility with all possible sophisticated instruments. To reach the farmers of different Islands and transfer the technologies developed by CARI, an Out Reach Centre funded by NABARD has been established at Diglipur. This centre has become operational from 15<sup>th</sup> July, 2009. ICAR has sanctioned one KVK in Nicobar district.

The institute has been doing work for the island farmers to provide decent livelihood through technological intervention. The major mandate of the institute is to provide a research base to improve the productivity of important agriculture, horticulture, livestock and fishery sector of A & N Islands through adoptive, basic and strategic research. While earlier focus was to attain self sufficiency for island, the situation has changed in recent years. Due to the impact of the climate change and changing

scenario of the agriculture practices, focus will now be to make self sufficiency by enhancing the productivity without disturbing the fragile ecosystem.

**Mandate**

- To provide a research base to improve the productivity of important agri-horticulture, livestock and fisheries sector 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

# CARI 2030

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**T**HE institute has made tremendous progress in the agriculture development of the islands during the last three decades. Keeping in view the natural resources of the islands diversity, fragile ecosystem, research program would be designed to maximize the productivity without disturbing to the islands ecosystem to provide better and decent livelihood and as a source of revenue and resource generation. Research and development in agriculture sector should cover all disciplines in order to have a balanced progress in all disciplines for the overall benefits of the farmers of these islands. Based on above following vision of the institute has been envisaged.

## **Vision**

Sustainable development in agri-horticulture, livestock and fisheries sector in the changing climatic scenario to ensure decent livelihood in the fragile island ecosystem

## **Mission**

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

## **Focus**

The Island economy has undergone a sea change in recent past. From forest based and Government job based economy, it is shifting to tourism based economy. This shift requires a rethink on research programmes to meet the emerging challenges of inclusive growth and sustainable economy. With this in view, following focus has been envisaged for CARI.

- Development of suitable technological innovations for enhancing rice production and efficient processing to meet Individual Island level requirement in view of the forthcoming Food Security Act.
- Reorientation of agricultural production system to meet the demand of perishable products, *viz.* milk, egg, meat, fish, fruits,

vegetables and flowers with specific reference to demand of booming tourism industry.

- Suitable processing and value addition technologies for organic farming system to market with a decoratively packaged Andaman brand organic farm products.
- Development of suitable production to consumption level chain involving SHGs and retailers / armed forces / processors.
- Conservation and bio-prospecting of biodiversity richness of the Islands.
- Appropriate rain water management technology to create micro level water resources to increase irrigated area from present 3 % to a significant level.
- Linking CARI with other educational institutions for creating local level skilled human resources in field of agriculture and allied sciences.
- Making CARI a model for NARS of small island Nations and collaborating with them with special reference to post disaster restoration of agriculture.

# Harnessing Science

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CENTRAL Agricultural Research Institute has been doing research and development to enhance the productivity and to provide decent livelihood to the farmers, farm youth and women through the technological backup and innovative approach. The growing demand of food security and livelihood security is more challenging in the changing climatic scenario and the limited bio-resources of the island ecosystem. However, the efforts would be to exploit the maximum productivity with the available limited inputs. The new challenges in the future will be to continue to develop technologies for livelihood security of islanders while sustaining the fragile island ecosystem which is being threatened by climate change as well as abiotic and biotic stresses. This livelihood security can be achieved by providing water security, soil nutrient security, feed and fodder security and local level processing and value addition.

## **Characterization, management and utilization of natural bio-resources**

The island is bestowed with wide variety of crop, animal, fish insects, microbes and horticultural diversity. The utilization of the genetic richness of the island diversity for the sustainable production of the agri-horticulture, fishery and livestock components has been done in the past and will be continue to exploit the fullest potential. The augmentation of the productivity will be achieved through collection, conservation, characterization and utilization of horticultural crops, conservation, characterization and utilization of lesser known indigenous livestock and herbal bio-resources, development of biopesticides from indigenous bio-resources and propagation of rare and elite macapuno type coconuts in Andaman and Nicobar Islands through embryo culture. The extracts of indigenous plants have been found antagonistic to pathogens and fungi in lab studies. There is need to upscale these studies for developing bio-pesticides. Tsunami has severely damaged the natural resources. Its long-term effect and required technological inputs for rehabilitation

of natural resources as well as livelihood option requires a different look to the problem. Two major coastal bio resources; corals and mangroves are vulnerable to climate change. Recent extreme events and field surveys corroborate this fact. But the adaptation level of these resources and monitoring mechanisms are less evolved. A standard decision support system has to be developed for assessment of the vulnerability of coastal bio-resources to climate change.

### **Improving productivity of agriculture, livestock and fisheries**

Demand of the agriculture, livestock and fishery produce is being increasing steadily with the growth of the population. To cater the need of the growing population and the burgeoning tourist population the production level and the productivity of the major crops, livestock and fishery needs to be augmented. As expected the horizontal expansion of the agricultural land is not possible, the efforts should be made to increase the productivity in more sustainable manner in the vertical direction. The thrust should be given on the major crops which are congenial for the island ecosystem like plantation crops, spices, and the fisheries. Among the livestock components the poultry has been doing very well in the backyard components, therefore, efforts will be given to enhance the productivity of the backyard system with the disease resistant low cholesterol free poultry. The rice is the major field crops being grown by the farmers. Efforts are required to improve the genetic potentiality of the rice for higher productivity. Research prioritization will be done to improve the productivity of the perishable vegetable crop. The augmentation of the productivity will be achieved by Improving production and productivity of horticultural and forestry crops, genetic improvement of rice for higher productivity, genetic enhancement of rice for tolerance to salinity and resistance to biotic stresses, enhancing productivity of post rice crops and characterization and enhancement of island livestock farming system for milk, meat and egg.

The tourism has become a major economic activity and in next five years, high end tourism will emerge as major component. This will alter the requirement pattern of the vegetables and flowers. To make

farmers a partner in this growth, it is essential that production of vegetable and flowers is ensured round the year. This will require large scale protected cultivation which needs intensification of research both on structural design as well as package of practices compatible to different requirements and farmers' socio-economic conditions. A & N Administration has launched an organic farming mission. CARI has to provide technological backstopping for this mission. Studies are required to standardize production technology. The vegetable production has increased considerably. However, there is over use of chemicals which is detrimental to health of the people as well as aquatic marine life. There is need of evolving suitable IPM and IDM modules for disease management as well as assessment of pesticide residues. Strengthening of IPM programme along with establishment of pesticide residue lab is essential.

The globalization and information explosion has raised the aspiration level of youth. Due to this the quality of employment created by the traditional farming is not compatible to the expectation of the farm youth. There is need of identification, and modification of suitable machineries to meet this challenge.

### **Frontier research for knowledge and increased productivity**

To improve the research efficiency the frontier research areas have been identified as research on biotechnology, nanotechnology, climate change, assessing carbon dynamics, bioprospecting of the important resources and use of candidate genes for better health and production. The modern biotechnological tool will be used for the augmentation of the production and the frontier science research. The conventional approaches will be integrated with the advanced biotechnological tools and approaches for improving the productivity and exploiting for agricultural uses of the livestock, fishes, agriculture, insects and microbes.

### **Post harvest technology and value addition**

The post harvest loss to the crop, livestock and fisheries is a major constraint which limits the production of these sectors. The production centers are distributed all over different small islands while the



consumption centre as well as export point is mainly Port Blair. Due to this large scale processing units are not possible. Thus there is need for local level processing technologies to enhance the shelf life, reduce losses, and value addition for crop, horticultural, animal and fish products.

### **Water resource development and utilization**

Islands receives an annual rainfall of more than 3000 mm however, there is acute shortage of water during the dry spell of the year. Agriculture is fully dependant on the rain fed. Technologies for water resource development through rain water management have been developed. There is need for efficient utilization of these developed water resource for enhancing water productivity through efficient irrigation scheduling and compatible nutrient management, resource efficient cropping system, and energy efficient water application methods. Research focus should be given towards the water resource management for sustainable crop production and evaluation of land shaping techniques for *in-situ* rainwater harvesting, crop diversification and livelihood security in degraded areas.

### **Transfer of technology and socio-economic impact analysis**

Status of dissemination of technologies developed by CARI and quantification of socio-economic impact of CARI technologies will pave the way for future investments in technological development. Each island has different natural resource base and infrastructure level. This information is required to enable us to formulate technology packages for facilitating achievement of individual island level food and livelihood security. In the absence of updated data on market and price behaviors, farmers suffer losses on their production front and at the same time consumers are hard hit. Almost negligible studies have been conducted on tribal livelihood systems and their ITK. This Information is required for formulating research program for their upliftment. Weather vagaries and climatic change force farmers continuously to change farm management and other decisions pertaining to their enterprises. The system will help us guide the farmers rightly.

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## **Management of energy and agricultural waste**

Island ecosystem is a closed system. In view of agriculture intensification, agriculture waste management will be a major issue. Energy is considered to be one of the serious concerns in the growing agriculture sector. Presently, the agriculture machinery is totally dependent on the oil which incurs a huge expenditure and narrowed the profit margin. The research on the use of unconventional energy resources need to be explored to minimize the dependency on the oil based farming system. Island agriculture terrain is undulating which limits the use of farm machinery. Therefore, efforts should be made to evolve the location specific agriculture machinery which suits to the island ecosystem and terrain to minimize the drudgery and efficient utilization of energy. The efficient utilization of the fallow land and the non-agricultural land should be explored for production of bio-fuel plants and trees such as jatropha and karanj. Alternate bio-fuels and energy sources will have to be identified and worked upon.

The waste management is another issue which needs priority as the island is very fragile and any change may affect the agriculture productivity and livelihood. The agricultural and animal wastes mainly the crop residues, animal urine, dung, by product wastes etc needs to be converted into organic manure by composting. The proper disposal of the animal wastes is very important thus it can be converted from waste to a precious material by composting. A & N Administration has launched an organic farming mission. CARI has to provide technological backstopping for this mission. Studies are required to standardize production technology and package of practices. Islands are dependent upon imported fuel for power generation.

## **Education and human resource development**

Human resource development is vital for implementing and upgrading research programmes and the institute has given priority in this field to enable the scientist to conduct research on various disciplines of Agricultural sciences, Animal Husbandry, Fisheries sciences and Extension education. Institute has been instrumental in providing Post

Graduate Dissertation research to the students from various parts of the country. However with a view to upscale our research on Tropical Island Agriculture System the institute will make effort to develop state-of-the art facilities, strengthening collaboration with SAU's, Research and Extension Organizations and to enhance faculty competence for improving higher education and research in agriculture and allied disciplines.

### **Technology transfer system**

The institute has undertaken numerous interventions on developed technologies in Agricultural and allied fields and popularize the same suitable to the agro-ecological and socio economic condition of the island ecosystem. Keeping this in view demand driven technologies will be identified and effective delivery system would be developed in public-private partnership mode. Considering the remoteness and inter island connectivity, the focus is to reorient technodelivery system through participatory and teleagricultural communication system with the involvement of local Administration and NGO to bridge the demand and production.

# Strategy and Framework

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**T**HE strategies devised to achieve the mandate of the institute are:

- 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 bio-diversity of the region for its collection, cataloguing and identification of suitable genetic material for further use in breeding programme both locally and nationally.
- VI. Identification of indigenous fruits and plants for their medicinal exploitation.

## **Thrust Areas**

- Development of suitable technologies to attain substantial increase in productivity and production of perishable products, viz., vegetables, fruits, flowers, spices, milk, egg, meat, and fish to meet the requirement of island population and tourists both normal and high end
- Increasing exploitation of marine resources through stock assessment and mariculture

- 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.
- Exploration of bio-diversity of the region for its collection, cataloguing and bio-prospecting.
- Transfer of production technology of various products to create a production to consumption chain involving SHGs and retailer / processor/ armed forces
- Climate change and island ecosystem.

## Epilogue

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The agro-climatic conditions are ideal for diversification of agriculture that is considered important for enhancing the farm productivity and profitability in the region with specific focus on horticultural, plantation and spice crops, livestock and aquaculture. Further, these islands are endowed with rich marine aquatic resources and therefore the Vision 2030 occupies a great share of focus towards their potential utilization for food and livelihood security. The demand of the burgeoning population with the tourist influx are putting constant pressure on the fragile ecosystem, therefore, as per the carrying capacity of the island the research will be focused to utilize the optimal resources for maximizing productivity. The Institute has been conducting research and developing technologies with an aim to provide a research base to improve the productivity of agriculture, horticulture, livestock and fishery sector of A & N Islands through basic, strategic and adaptive research.

To make island farmers a real partner in this economic activity, it is essential that our agricultural research programmes are geared up and re-oriented to develop technologies which will enable the farmers to be an equal partner in tourism based economy. Concerted efforts would be made to re-orient our research programmes to address the emerging challenges cropped due to climate change, coupled with biotic and abiotic stresses in this fragile ecosystem. Further, development of demand driven technologies in agricultural and allied fields for the benefits of the stakeholders in the public private partnership mode will be given top priority.

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## Annexure 1 : Strategic framework

| Goal   | Approach  | Performance Measures   |
|--|---|--|
| Conservation and utilization of island biodiversity                        | <ul style="list-style-type: none"> <li>• Collection, conservation, characterization and utilization of agri-horti, livestock and aquatic biodiversity</li> <li>• Bio-prospecting and exploitation of horticultural, mangrove and coral resources</li> </ul>   | <p>Documentation and establishment of germplasm repository</p> <p>Developed technologies for product formulation</p> |
| Enhancing the productivity of agriculture, livestock and fisheries sectors | <ul style="list-style-type: none"> <li>• Improving production and productivity of horticulture, field crops, livestock and fisheries sector for demand driven high-value products through island specific farming system model</li> <li>• Frontier research for knowledge and increased productivity</li> </ul> | Improved production and sustainable livelihood   |
| Management of biotic and abiotic stress                                    | <ul style="list-style-type: none"> <li>• Approach for adaptation and mitigation of climate change</li> <li>• Developing eco-friendly module for health management of plants animals and fish</li> </ul>   | <p>Strategies to mitigate and adapt climate change</p> <p>Improved crop, livestock and fish health</p>               |



|   |  |   |
|---|--|---|
| <p>Post harvest technology and value addition</p>       | <ul style="list-style-type: none"> <li>• Value addition and shelf life extension of horticultural, dairy, poultry and fish products through improved post harvest processing, storage.</li> <li>• Facilitating production to consumption chain through improved linkage</li> </ul> | <p>Developed production techniques for value added products</p> <p>Reduced post harvest losses</p> <p>Established Agripreneurs through Public Private Partnership</p> |
| <p>Water resource development and utilization</p>       | <ul style="list-style-type: none"> <li>• Technologies for rainwater harvesting techniques and water use efficiency</li> </ul>  | <p>Developed model for effective water use efficiency</p>   |
| <p>Capacity building and socio economic development</p> | <ul style="list-style-type: none"> <li>• Innovative techno delivery system through participatory and tele-agricultural communication models.</li> <li>• Impact assessment of technological intervention</li> <li>• ToT and capacity building of stake holders</li> </ul>           | <p>Developed networking system between research-extension-farmers-market.</p> <p>Improved quality of life of stakeholders</p>   |



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किसानों का हमसफर

भारतीय कृषि अनुसंधान परिषद

*Agri*search with a *h*uman touch