Presidential Address

Andaman Science Association

International Conference on

"*Climate Change Adaptation and Biodiversity: Ecological Sustainability and Resource Management for Livelihood Security*"

Respected Prof. Ramesh Chand, Hon'ble Member of NITI Aayog, Govt. of India and the Chief Guest of the Inaugural Function, The Guest of Honours, Dr.AshokKumarSingh, Deputy Director General (Agricultural Extension)and In-charge Deputy Director General (Horticultural Sciences),ICAR, New Delhi, Dr R. R. Hanchinal, Chairperson, PPV& FRA,ShriAnindoMazumdar, Chief Secretary, Andaman & Nicobar Administration, Prof.Subodh K.Bhatnagar, Dean, College of Biotechnology and Secretary General, Society for Plant Research, Dr. J. P. Sharma, Joint Director (Agricultural Extension),IARI New Delhi,Prof. A. K. Dhawan, President, Indian Ecological Society, Ludhiana, Dr A.K.Singh, General Secretary, Andaman Science Association (ASA), Dr. A.Velmurugan,Secretary, Technical Affairs (ASA). I would like to extend my welcome to Dr. Gurbachan Singh, Chairman, ASRB, who will be amongst us during the deliberations and also for the Valedictory Function.

The other dignitaries of thedaisDr.R.C.Srivastava,Vice-Chancellor, Dr.Rajendra Prasad Agriculture University, Samastipur, Dr Ajay Kumar Singh, Vice Chancellor, Bihar Agricultural University, Sabour,Prof.M.C.Vashney, Vice Chancellor, Kamdhenu Agricultural University, Gujarat, Dr. A.R.Pathak, Vice-Chancellor, Junagarh Agricultural University, Gujarat, Dr. Dilip Kumar, Former Director and Vice-Chancellor, CIFE, Mumbai,Dr. Paramjit Singh, Director,BSI, Prof.Dandian, Former Vice Chancellor, University of Horticultural Science, Bagalkot and Liaison Officer Biodiversity International, Dr R.C.Agrawal, Registrar General, PPV& FRA, Prof. Rishi Muni Singh, Former Dean, Institute of Agricultural Sciences,Prof.Geetalaxmi, Director, Climate Change Studies, Chennai, Shri K. Madan,Country Manager,Biodiversity International, Dr C. Raghunathan, Officer In charge, ANRCZSI, DrVinith,OIC NIOT, Dr J.K.Mishra and Dr. P. M. Mohan, Pondicherry University.

Foreign delegates Prof.MadanK.Bhatacherya, Iowa State University, USA, Dr Chanda S. Atwal, Canada, Dr R.K.Singh, IRRI Philippines, Prof AbhayaBalasuirya, Srilanka, Prof B Lalljee, University of Mauritus,delegate from Sweden, Miss Ruhi, Deol, Germany.

Dr.Shivananda Murthy, Registrar, KVSFU,Bidar, Dr.R.K Sohane, Director Extension Education, BAU, Sabaur,Dr R.R.Singh, Director Seeds, BAU, Sabaur, Dr.R.S.Verma,

Registrar,IGKV, Raipur, Dr. Sabalpare, Director Research,Navasari Agricultural University, Gujrat, ladies and gentleman.

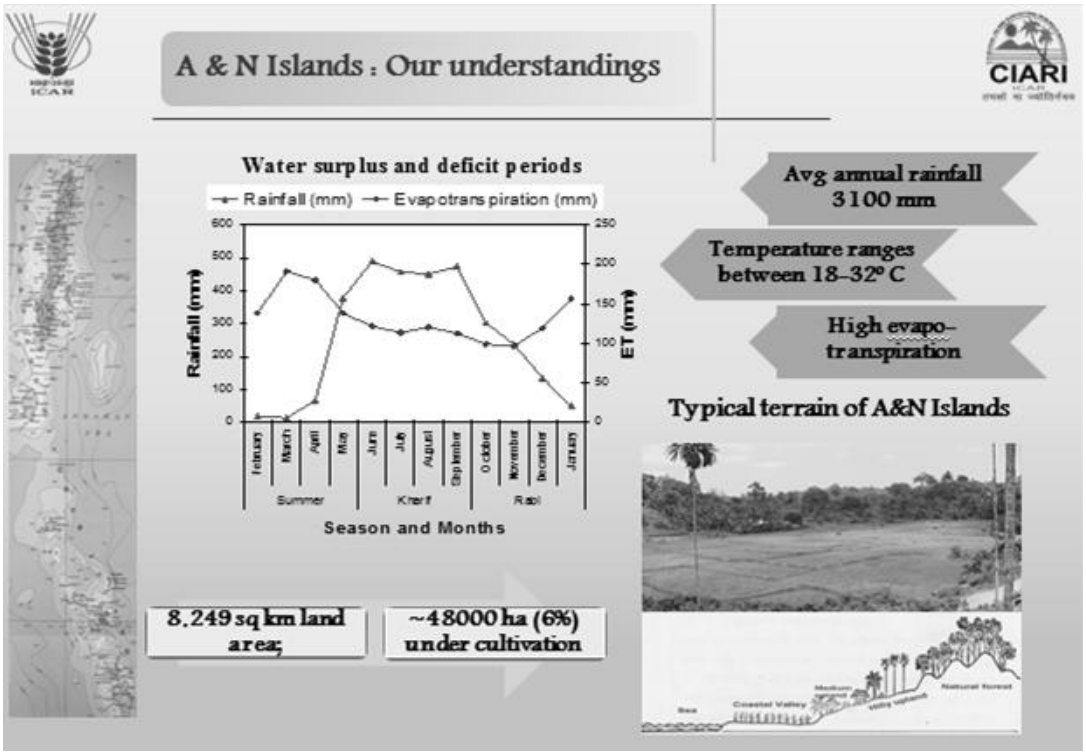
First of all, I welcome all the delegates from different parts of India and abroad for having taken the effort to come to these remote islands to participate in this International Conference on**"*Climate Adaptation and Biodiversity: Ecological Sustainability and Resource Management for Livelihood Security*".** This global conference is second in its series, organized by Andaman Science Association (ASA)on the issue of climate change and biodiversitysince the "***TICON 2011 –International Conference on Tropical Island Ecosystems – Issues related to livelihoods, sustainable development, climate change***".

At this juncture, I would like to mention some important facts about Andaman Science Association (ASA),Port Blair. This Association was established in the year 1984 under the able guidance, inspiration and vision of Prof.N.T.Singh, the then Director of Central Agricultural Research Institute with an objective to promote research and development in the unique Island Agro ecosystem. To conduct research in these small and fragile islands, we have a number of organizations such as Central Island Agricultural Research Institute, Zoological Survey of India, Botanical Survey of India, Anthropological Survey of India, National Institute of Ocean Studies, Pondicherry University,Regional Centre of Medical Research, Centre for Ayush, Jawarlal Nehru RajkiyaMahaVidyalya etc. ASA is a unique body that provides platform for those associated with the management of tropical and Island Agriculture inclusive of Horticulture, Fisheries, Animal Sciences, Oceanographic and Marine biological studies, disaster management, issues related to Science and Technology, Environment and Forest, Social Science etc. ASA intermittently organizes National and International Seminars, Conferences, Knowledge Sharing Meets etc. So far the Association has organized five National Seminars and two International Symposiums since 1984.I would like to take this opportunity to acknowledge the past Presidents, Vice Presidents, Secretaries, Joint Secretaries and Treasurers of the Association who through their unflinching hard work and dedication have brought this Association in its glorious period. ASA also publishes one peer reviewed journal named "***Journal of Andaman Science Association***" which deals with the scientific and technological aspects of A&N Islands with special emphasis on island biodiversity. I also would like to thank the former Editors and present Editor of the journal for bringing out the journal regularly and religiously. The journal is now accredited in the list of National Academy of Agricultural Sciences' journal list.

My heartfelt congratulations to the Executive body members of the Conference such as Dr P. M. Mohan, Dr A.Kundu, Dr. R.K Gautam,Dr. B. Gangaiah, Dr A.K. Singh, Dr A. Velmurugan, Dr. I.Jaishankar,Dr. C.Raghunathan,Dr.Lalji Singh, Dr.J.K.Mishra,Dr. P.T.Rajan, Dr.Vinith Kumar, Dr Mane,Dr. M.S. Kundu,Dr. Jaisunder, Dr. Zamir Ahmed, Dr.P.K.Singh, Dr. Nagesh. Ram, Dr.Kasinathan, Dr. Kirubasankar, Dr. Baskaran, Dr. Lohit Kumar, Dr. Anuraj, Dr. Raymond Jani Angel, Dr.I Satish, Dr. Arun Kumar De, Dr. P.

Krishnan and all other who are associated with this endeavorfor their tireless efforts to make this event a success.I would also like to congratulate all the committee members inclusive of the Chairman of the Committees for the successful conduct of the International Symposium.

First of all I would like to give a glimpse of Andaman and Nicobar Islands (ANI) to the respected delegates. ANI is situated at latitude 6^0-14^0 N and longitude 92^0-94^0 E, consists of 572 Islands, Islets and rocky outcrops, and is stretched to length of 1912 km. Most of the islands are originated due to volcanic eruption in the sea and few of them originated by coral formation. All these islands are biological and geological paradise of indigenous biota of flora and fauna and geological wonders which are yet to be unearthed. Another important fact about these islands is that about 82% of the land is under forest cover which is virgin rain forest. In the fringe of the coast, you can find the littoral forest like mangrove etc. The islands are also bestowed with mesmerizing coral reefs, plethoraof marine flora, fauna as well as seaweeds, many of them are yet to be explored and documented. Theendemicity of the flora and fauna are also very high,close to 30%.I take this opportunity to inform the audience that ANI is one amongst the 12 Mega biodiversity hotspots of India. The climate of these islands is hot and humid,with rainfall averaging to 3000mm influenced by both North West monsoon as well as South East monsoon.



Central Agricultural Research Institute, Port Blair which was established in the year 1978 by amalgamating various research centresof organizations like IVRI, IARI,CMFRI, NEH Research complex, CPCRI etc.has made a long journey of about four decades and has been renamed as the Central Island Agricultural Research Institute recently to address the emerging issues of Island Agriculture. Perhaps it is the only multidisciplinary organization

addressing the issues related to island ecosystem andisland agriculture in the South East Asian countries and is poised to provide a pivotal leadership role amongst Tropical Island Nations. During the last four decade 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. It is my pleasure to inform to the delegates that the Institute has been very successful in this endeavour. Since there has been no significant increase in the land area under cultivation, the increase in agricultural production has come mainly from the technological interventions in which the Institute played a vital role.Some of the technological milestones of the Institute worth mentioning are 'Establishment of Tropical Fruits Germplasm Bank', 'Establishment of World Coconut Germplasm Centre', development of several high yielding varieties of coconut, arecanut like "Samrudhi", development of several salt tolerant varieties of rice, pulse and other major crops and vegetables. Since inception the Institute is dedicated to fulfil the protein requirement of these islands through extensive research in Animal Science and Fisheries sector. Nicobari Fowl, the highest egg producer among indigenous birds of the country is the pride of Andaman and Nicobar Islands. The Institute has also devised several innovations to reduce the land degradation such as broad bed furrow system and for the conservation of natural floral and faunal biodiversity of these islands. CIARI has evaluated and transferred different Integrated Farming System (IFS)models for different micro-farming situations in hilly upland, medium upland and valley areas.In brief, the Institute since its birth is playing the holistic role for sustainable growth of agricultural sector of Andaman and Nicobar Islands. The role of the Institute is even more important in the context of UNO declaration on small Island Nations.

I am sure that all of you are aware of the deadly event of the century, i.e. the mega earth quake of 8.9 Richter scale which struck at the early morning of 26th December 2004, followed by Tsunami which devastated the region, consequently killing thousands of people and livestock. During these catastrophic events due to subduction of lands by 1.25 meter, the Andaman & Nicobar Islands got inclined, consequently sea water ingressed in the land area and never receded. These caused loss of about 4000ha area of cultivated land and the coconut and arecanut plantations were devastated as the plantation could not cope with the constant salinity exposure. Paddy and vegetable cultivation were no longer possible in those inundated areas. The Institute played a vital role to restore the normal life of these islands. The Institute came up with measures/technologies to address the situation and provide alternative livelihood. The Institute made extensive survey and brought a plan for providing livelihood through aquaculture in the inundated areas to the farmers earlier engaged in paddy/ vegetable cultivation. The broad bed furrow technologies, raised bed technologies, land shaping etc were adopted with perceivable results. Salt resistant varieties of paddy which were developed by the Institute, were extensively used; some of the climate resilient vegetable varieties of

Brinjal (CARI Brinjal), Poi, Tuber crops, coconut and arecanut were developed or under the process of development. The Institute also helped in skill development through training and capacity building through our extensive network of KVKs and outreach centre of Diglipur funded by NABARAD. I am glad to mention that during all these years the Institute has done work under the close co-operation with all the line Departments of Andaman & Nicobar Islands.

Our studies show that there is significant change in rainfall patterns in these islands for past several years and we have also observed that ANI are frequently hit badly Cyclone and storm surges like Phylene, Lehar and HudHud. This change in rainfall pattern and increase in natural stressors can be attributed to the climate change. There are about 30 tropical island nations all over the world in addition to numerous groups of islands, which are part of large nations spread over mainly in Indian and Pacific Ocean. These islands have similar set of problems of environmental degradation, limitation of livelihood options and constraints of natural resource availability.

Benchmarking of Andaman & Nicobar Islands *vis-a-vis* Large Tropical Islands Nations (Area greater than 1,000 sq km)

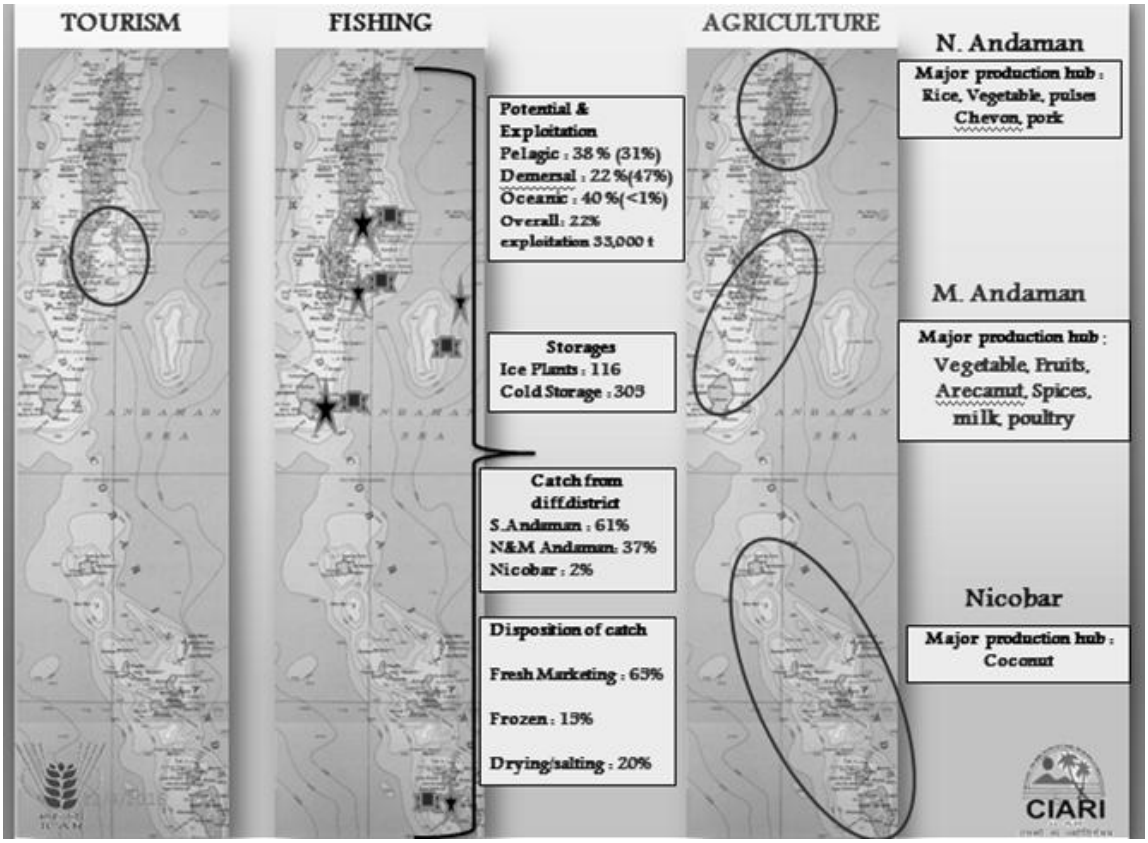
Name of Island/ Island nation	Land Area (Km)	Population in lakh 2001-05	Density of population (net density of population)	Per Capita Income in 2005 in US $	Area under Forest (%)	Area under agriculture (%)	Tourist Arrivals (in Lakhs) 2005
Andaman & Nicobar Islands	8249	3.56	43 (431)	67	90	2.3	0.56
Solomon Islands	28896	5.81	20 (180)	1900	88.8	0.03	0.09
Trinidad and Tobago	5128	10.56	206 (416)	21700	50.5	26	4.63
Fiji	18274	9.18	50 (91)	4100	44.6	35	5.50
Samoa	2831	2.17	77 (122)	5400	37.2	33	1.01
Vanuatu	12189	2.11	17 (27)	2900	36.7	12	0.62
Jamaica	10830	27.8	257 (367)	4800	30	47	14.78
Cape Verde	4033	4.99	124 (157)	7000	21.1	18	1.97
Barbados	430	3.56	656 (688)	18900	4.7	-	5.47
Maldives	300	3.86	1287 (1331)	4600	3.3	-	89.43
Seychelles	451	0.82	182 (546)	16600	66.7	-	1.29
Singapore	707.1	46.08	6517 (679)	49990	3.3	-	89.43

➢ Based on Tourism Policy issued by Andaman & Nicobar Islands Administration, net density of population excludes area under forests.
➢ Lakh – One Hundred Thousand.

Source: Andaman and Nicobar Islands: India's Untapped Strategic Assets By Sanat Kaul(2015)

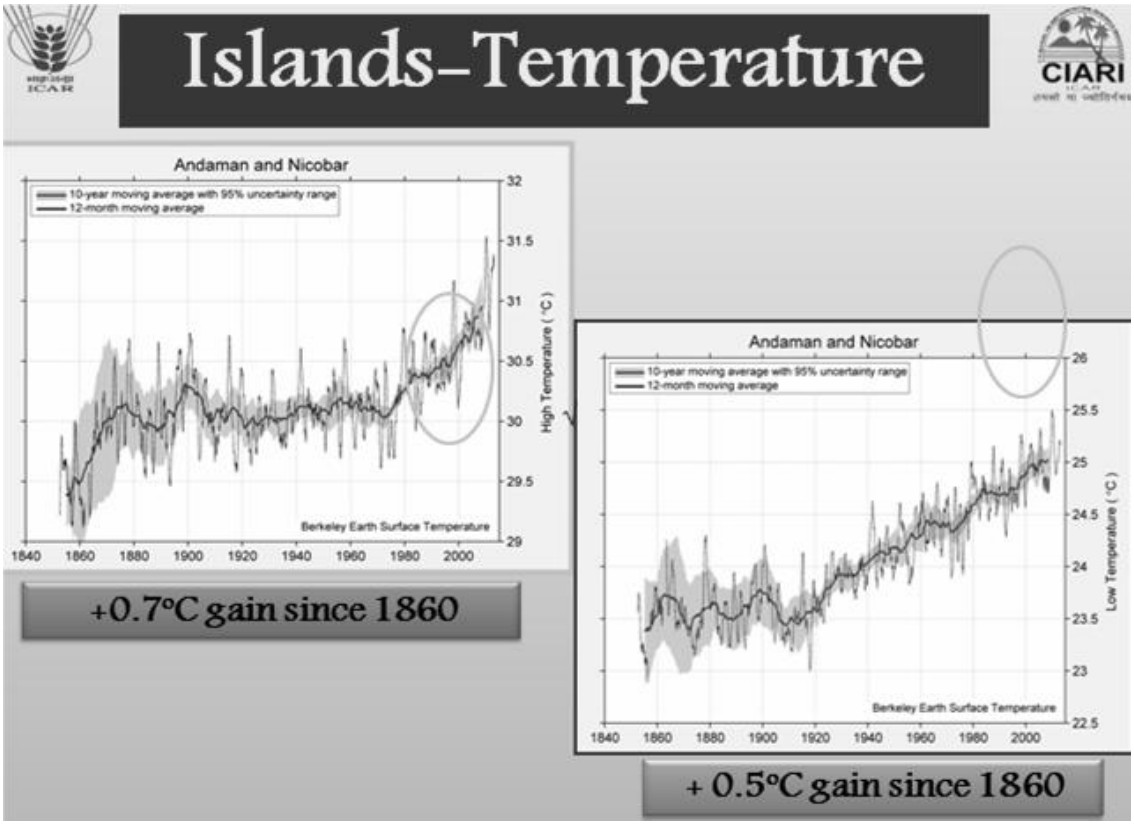
India has a long coastline of 8118 km including island territories, and encompasses total 73 districts in the 9 maritime states and 2 Union Territories. The coastal districts house 14.2% of India's total population. India has been identified as one of the countries which are most vulnerable to the impact of accelerated sea level rise due to global warming. Nearly one-fourth of the country's population lives within 50 km of the coast. There are 1,382 islands in India, including those along the mainland states, comprising 1093 shapes and 289 points or rocks. There are two major island groups on its both flanks, Andaman and Nicobar

on eastern and Lakshadweep on western seas, which comprise of 836 and 32 islands, respectively. It may bepertinent to point out that the Lakshadweep islands are also brought under the domain of Central Island Agricultural Research Institute, Port Blair; already we have made one KVK at Kavarathifunctional and one farm in Mincoy Island, which is at present under CPCRI Kasargod will be taken over.



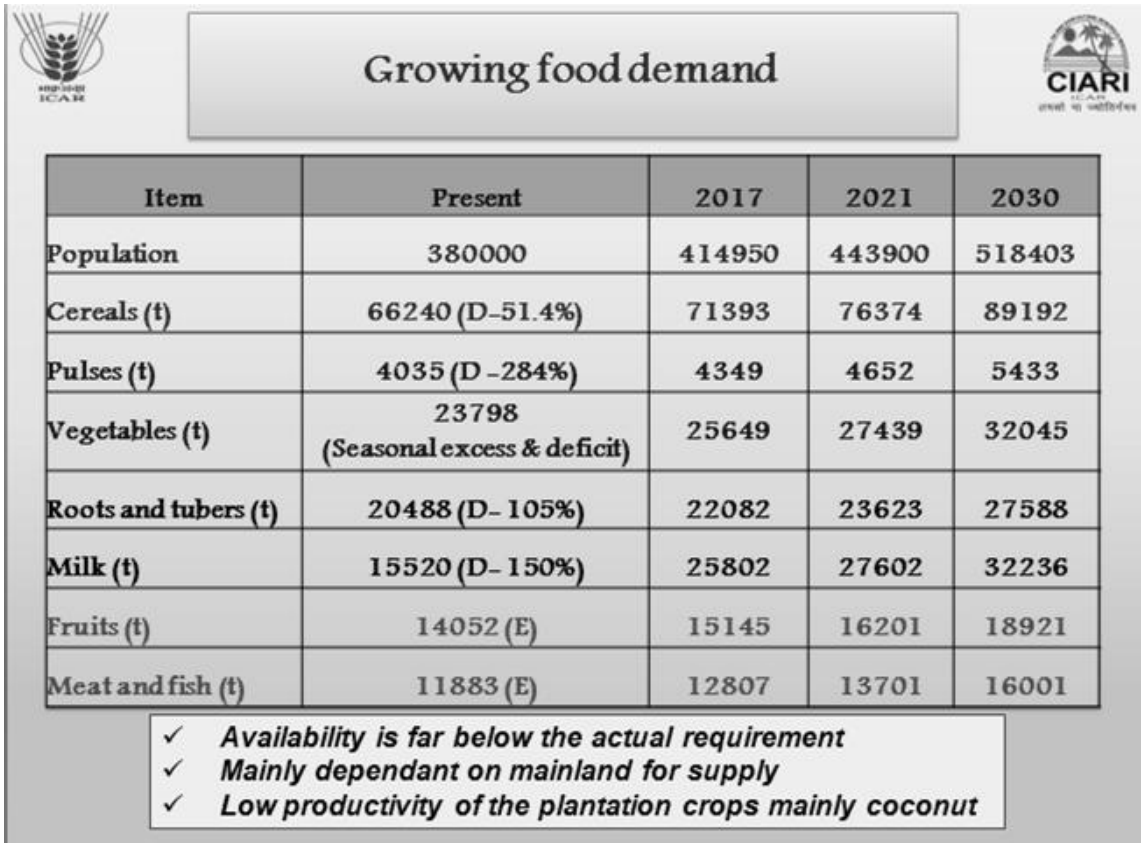
Three of the founding pillars of the economy of any islands rest on tourism, Fishing and Agriculture. Andaman and Nicobar islands are no exceptions.With changing climate, islands are highly susceptible to frequent and intense tropical cyclones and associated storm surge, droughts, tsunamis and volcanic eruptions, which will have adverse impact on the economy of these islands and health of their inhabitants.

Coastal ecosystems such as mangroves, sea grass and coral reefs are very efficient **carbon sinks** and have a major role in sequestering atmospheric carbon dioxide. India has about 3,703,970 hectares of coastal wetlands, which accounts for ~25% of the total wetland areas of the country. Overall, Indian mangroves are able to sequester about 1.5 metric tons of carbon per hectare per year. Recent data estimate that sea grasses together with salt marshes and mangroves are responsible for capturing up to 70% of the organic carbon in the marine realm making them one of the most intense carbon sinks on the planet.The raise in sea surface temperature can adversely affect the coral and coral habitat as has been observed in 2005, 2010 etc.



Few countries in the world are as vulnerable to the effects of climate change as India is, with its vast population that is dependent on the growth of its agrarian economy and its expansive coastal areas and islands. It is often said that the impact of climate change will be more felt in the Islands than the mainland.

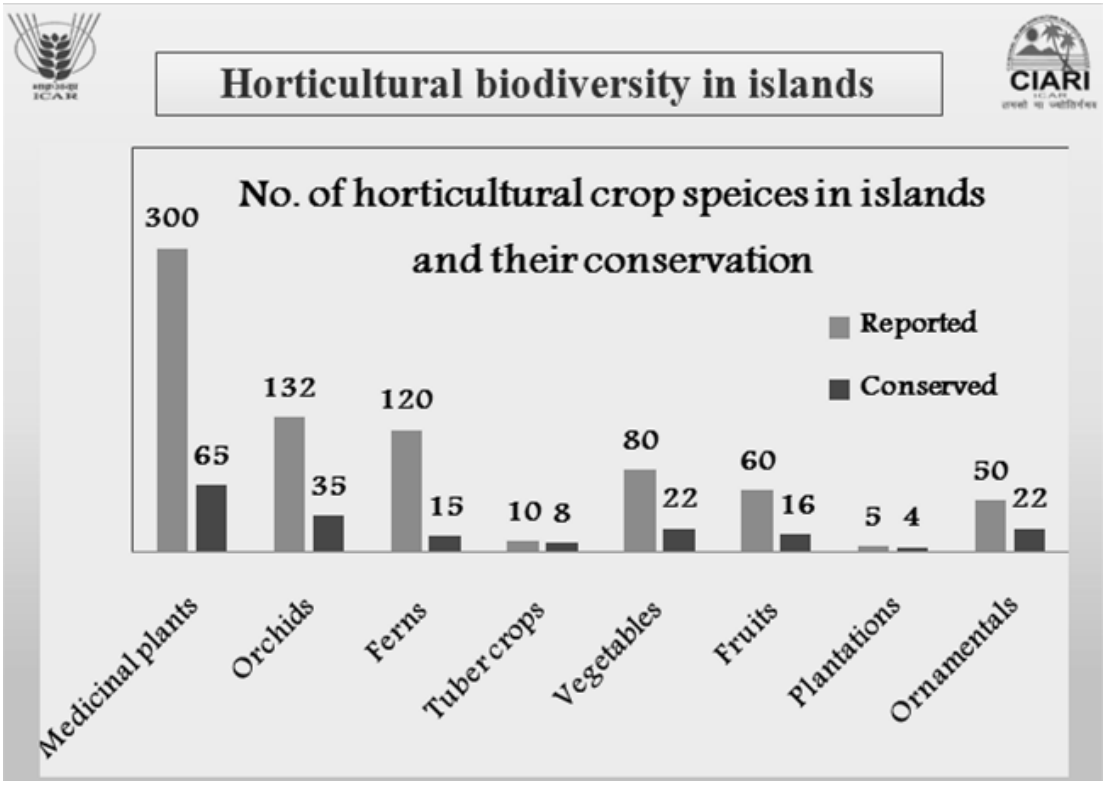
India accounts for 2.4% of the world surface area, but supports around 17.5% of the world population. It houses the largest proportion of global poor (30%), around 24% of the global population without access to electricity (304 million), about 30% of the global population relying on solid biomass for cooking and 92 million without access to safe drinking water. There is growing demand of food within the limited agricultural land available in the Islands, close to 6%. However in the island we are not aiming for self sufficiency in crop or vegetables, we are rather concentrating in increase in production in the plantation crops, spices,vegetables, fodder etc.utilising the open space available. The aim is to develop a brand Andaman, and market the product like spices,mushroom,honey etc. to the domestic and foreign market.



Climate change is considered to be one of the principal threats to biodiversity and to the structure and functioning of ecosystems. The rise in average global temperature may affect many species which are unable to quickly adapt to new conditions.Millennium Ecosystem Assessment indicated that in the past 50 years, 60 percent of the world's ecosystems are degraded. Loss of biodiversity reduces our food, medicine, clean air and water. The ecosystem that human beings rely on is fragile. The protection of biodiversity and ensuring that our use of nature is sustainable is a global mission. To meet this challenge, India and 193 other countries joined the Convention on Biological Diversity, to set common goals and targets and to make strategies and action plans to meet them. In October 2010, 20 Aichi Targets were agreed on at the Convention on Biological Diversity's COP 10 in Japan, which laid a roadmap and timeline for global bio-diversity protection. INDIA has prepared its Strategy and Action Plan for Bio-diversity Conservation for the period 2012-20.

As already mentioned, Andaman and Nicobar Islands are known for its bio diversity both Flora and Fauna. The Floral biodiversity encompasses around 2500 species of Angiosperms of which 200 species are endemic. Amongst the agro-biodiversity, more than 150 species of fruits and vegetables, 10 species of oil yielding plants, 20 species of pulses and cereals are endemic.Other important fruit varieties worth mentioning include Wild mango germplasm, Neil Island mango with purple skin, NicobariAlu, KhoonFhal, Important land races preserved by the Karen tribes, who will be receiving plant genome award this year. The

island is also rich in medicinal and aromatic plants, which include 300 species of medicinal plants, 130 species of orchids and 120 species of fern.



In the domain of Faunal Biodiversity, 215 species of Butterflies, 68 species of birds, 1434 species of fishes, 300 species of corals, 120 species of sponges, 34 species of true mangroves have been documented from these islands. Apart from these, ANI is renowned for its unique biodiversity of livestock and poultry germplasm. I am extremely glad to share to the house that one poultry (Nicobari fowl) and two livestock germplasm (Teressa goat and Nicobari pig) from these islands have been registered by National Bureau of Animal Genetic Resources, Karnalas independent breeds.

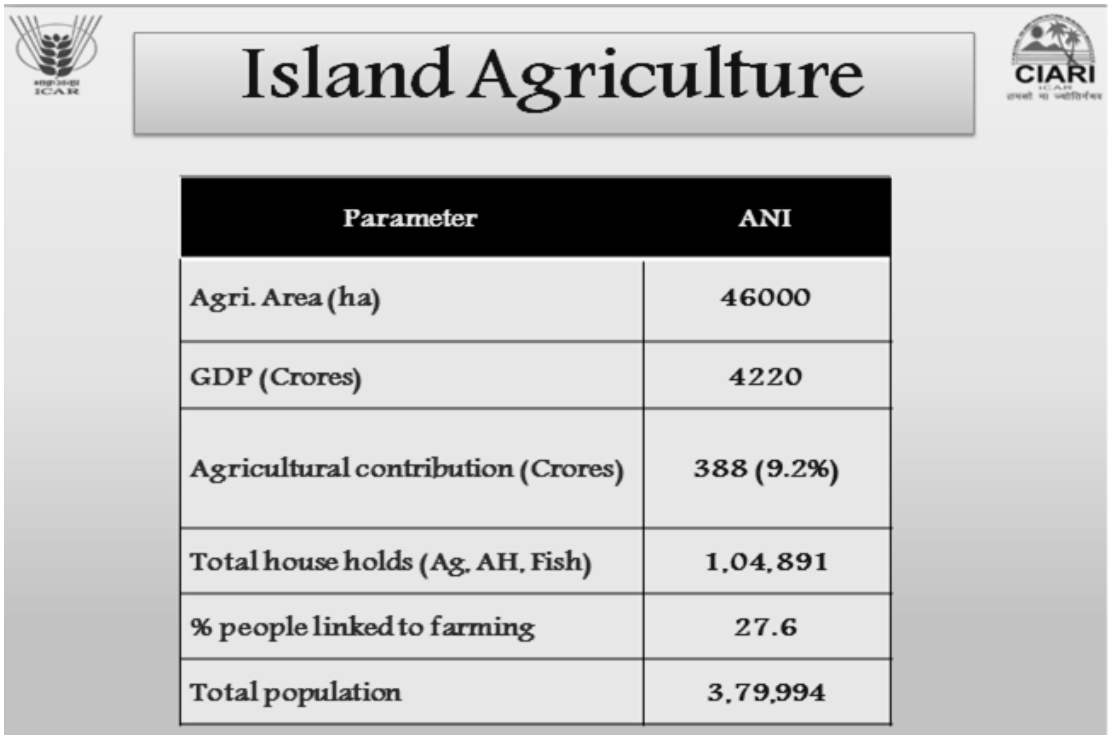
The Institute has done exemplary work in documenting the biodiversity of coconut, rice, butterflies, goat and corals. Mention may be made of a few books authored by the Scientists of this Institute, they are Reef biodiversity of North Andaman, Mangroves of A& N Islands, Compendium of mangrove biodiversity of A & N Islands, Butterflies of Andaman & Nicobar Islands, Descriptor of world coconut germplasm conserved in Andaman,Ethno-medicines of Bay Islands: Pharmaceutical evaluation and bio prospecting etc.

For the work on documentation of Natural Resources Management and Bio diversity conservation numerous Awardshave been bestowed on this Institute. They are Fakhruddin Ali Ahmed Awards for research in tribal areas, ICAR Team Research Award in Animal Science, Crop improvement, Fisheries, Horticulture and Forestry, Natural Resource Management etc; Hooker Award, DrRajendra Prasad Puruskar, Hari Om Ashram Award, Lieutenant Governor's commendation Award,RajashriTandon Award, SardarVallabBhai Patel best

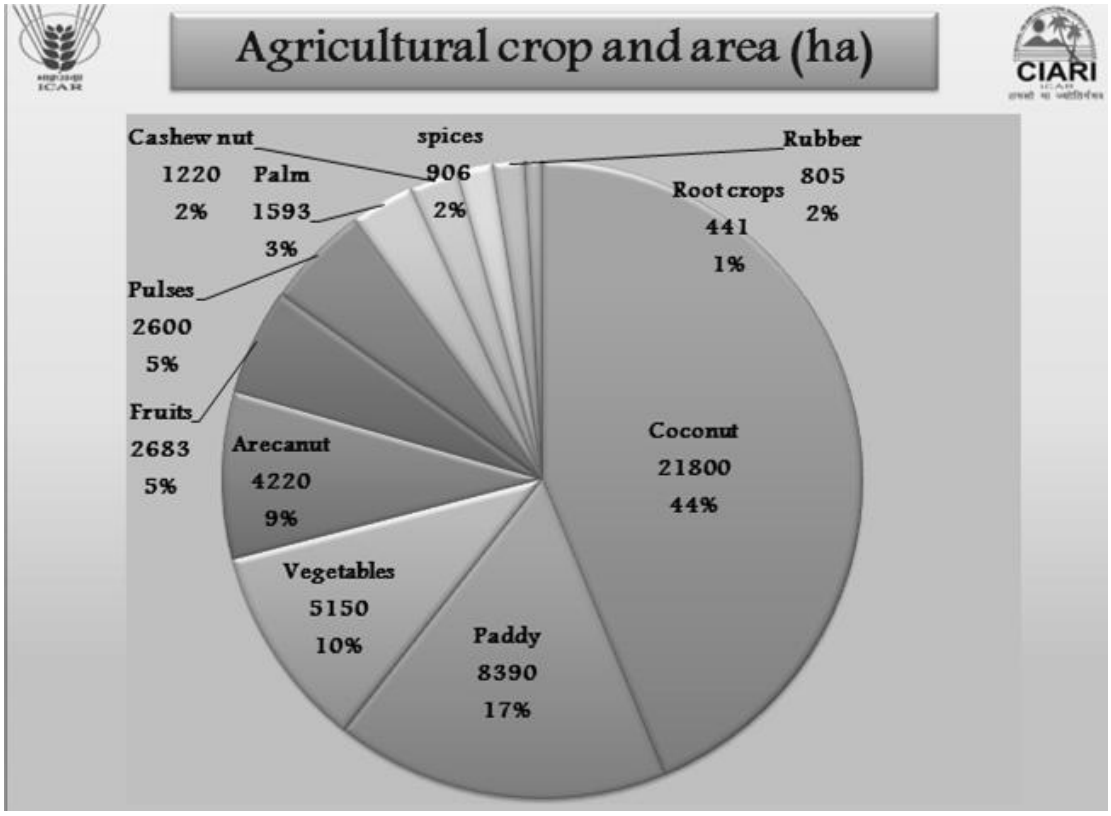
Institution Award, best KVK award etc.The Institute is also engaged in imparting environmental education to the stake holders in collaboration with C P Ramaswamy foundation, Chennai for considerable period.

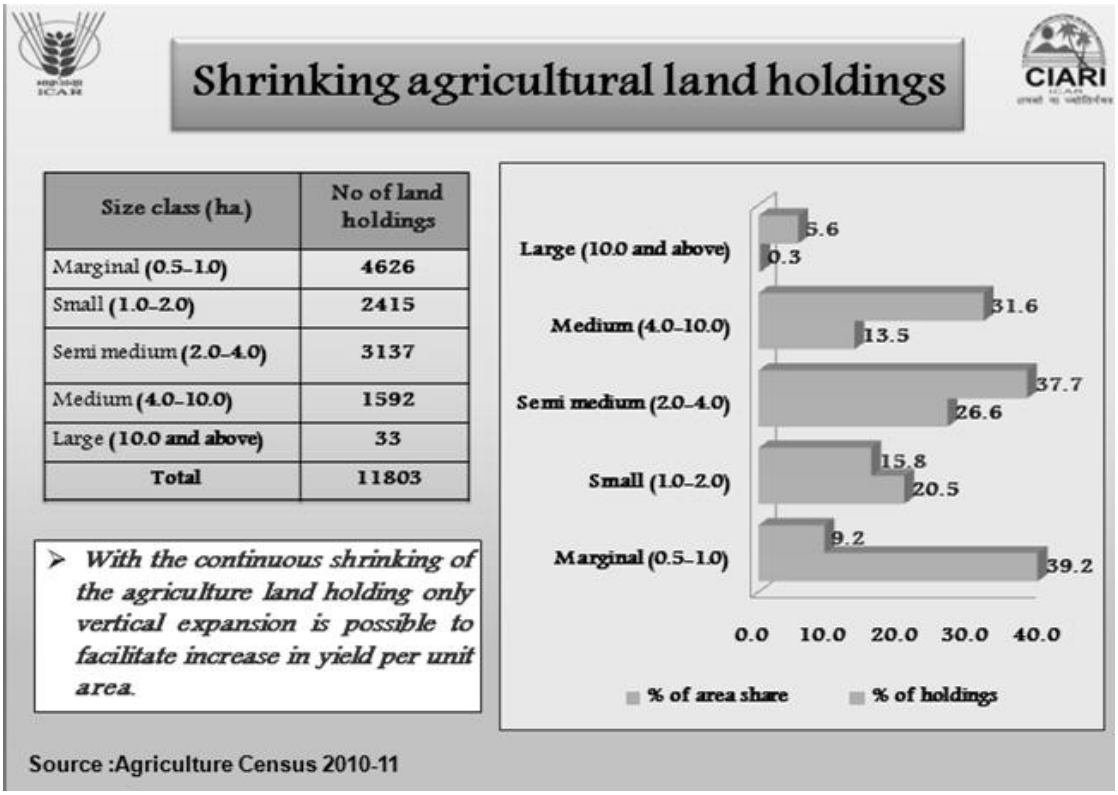
India has a long history and tradition of harmonious co-existence between man and nature. Much before the climate change debate began, Mahatma Gandhi had said that we should act as *'trustees'* and use natural resources wisely as it is our moral responsibility to ensure that we bequeath to the future generations a healthy planet. The first step towards building a sustainable communityis to correct one of the biggest misconceptions about the environment - that natural resources are infinite. Protection of our resources is a joint responsibility of local government units and the community. Local communities should be empowered through a transparent system that clarifies access and ownership of resources. We need to promote green skills and green jobs such as management in agriculture, forestry, horticulture, environmental, information technology and other careers that contribute to environmental preservation.

In A & N Islands, agriculture contributes to 9.2 % of state GDP but the percentage of population dependent upon agriculture is much higher, with majority of them residing in far off islands. In view of above, it is necessary that agriculture is given due importance to ensure inclusive growth.



Parameter	ANI
Agri. Area (ha)	46000
GDP (Crores)	4220
Agricultural contribution (Crores)	388 (9.2%)
Total house holds (Ag. AH, Fish)	1,04,891
% people linked to farming	27.6
Total population	3,79,994





CIARI, with its network with various ICAR institutions and other research laboratories in mainland and abroad, has committed itself to develop appropriate technologies for all facets of agriculture including, field and horticulture crops, nutrition and health management of animals and poultry as well as fisheries, both culture and capture.

Climate change, along with the extreme weather events it causes, knows no boundaries and the only way forward is a united global action towards mitigation, adaptation, and resilience.Cooperation with other island nations would be important to explore ways to ensure sustainable development and to address emerging threats due to climate change, which will affect the islands the most. A dozen of foreign researchers and over 200 participants from different parts of India along with several researchers from different institutes of Andaman and Nicobar islands are participating in this International Conference to deliver their work and discuss about the possible action plans to address the emerging issue of climate change.I sincerely hope, the conference will facilitate fruitful discussions and develop a road map for action in the emerging global scenario through global initiative and partnership.

With these words, I declare the International Conference open for deliberation.

Thank you all.

Jai Hind