

Out reach Centre : An Innovative Institutional Approach for Agricultural Technology Application in Andaman and Nicobar Islands

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ABSTRACT

In a complex agro-ecosystem like Andaman & Nicobar Islands, difference in natural resource base and socio-economic setup of farmers inhabited across far flung areas necessitates thorough field evaluation and refinement of technologies before adoption. In the absence of a KVK, an Out Reach Centre (ORC) was established at Diglipur in North & Middle Andaman District in 2009 which is 290 km away from Port Blair. An Automatic Weather Station was established in 2011. Pekin duck, an improved breed introduced in 2011 has spread from a single farmer to around 100 farmers by 2017. A "Bio-mass Fired Copra Dryer" was installed in 2010 to produce quality copra. To reduce the dependence of pulse farmers on Mainland for processing, a community Dal Mill was established in 2011. To address the issue of poor yield in rice due to admixed varieties, farmers were encouraged to produce Truthfully Labeled Seeds under Seed Village Concept since 2011. Satellite nurseries of fresh water Indian Major Carps were established since 2012 to cater quality fingerlings. Many varieties of rice, vegetables and pulses developed by CIARI were validated in farmers' field and released since 2013. Farmers' clubs were formed in 2014-15 to federate them into a producer group. Market survey on fish, chevon and pork was conducted to get an insight to the problems and prospects of their marketing. Progressive farmers were identified and recognized. Thus, the concerted efforts of ORC to reach out to the unreached have made perceptible improvement in farm management and income leading to socio-economic empowerment of farmers in the far-flung areas of the Islands by adoption of doable technologies.

Key words: Out Reach Centre, Technology application, Seed Village Concept, Institutional Approach

INTRODUCTION

The Union Territory of Andaman & Nicobar Islands is a group of 576 Islands, islets and rocks covering a geographical area of 8249 sq.km with a population of 3.80 lakhs. It is situated in the southern part of the Bay of Bengal between 92.120 E and 93.570 E longitude and between 6.450 N and 13.410 N latitude with 100N channel separating Andaman group from Nicobar group of Islands. Being away from the mainland and with less population pressure, the archipelago is still maintaining almost pollution free virgin environment, harboring pure and rich germplasm resources.

Upto the end of IV Five Year Plan, the major stress was mounted under area expansion of agriculture to achieve food self-sufficiency. However, this programme turned to standstill with the report of McVean in 1976 on 'Land Use in the Andaman and Nicobar Islands,' which emphatically indicated that these islands are essentially forest terrains and not suitable for large scale agricultural

settlement or agriculture based enterprises. From V Plan onwards, the thrust shifted from area expansion to plantation based intensive agriculture. Hence, in spite of having an expansive 8249 sq.km. land area spanning more than 700 km north-south, agriculture in the Islands is restricted to around 51,000 ha (6%) leaving the 86% area under forests undisturbed. Coconut (21915 ha) is the predominant crop of the Islands followed by paddy (6100 ha), vegetables (5335 ha), arecanut (4624 ha), fruits (3946 ha), pulses (1419 ha) and oilseeds (43 ha).

Total farm households in the Islands are 14,000 of which 57% are small and marginal holdings owning only 25% of the total acreage, 43% are medium holdings accounting for 75% of the acreage. The average landholding size in the Islands is only 1.89 ha. About 50% of the population is directly dependant on agriculture and allied activities. Though the Islands receives an annual rainfall of more than 3100 mm spread over more than 7 months in a year, lack of sufficient irrigation infrastructure prohibits second crop after paddy

and affects the productivity of plantation crops. The multifaceted problems emanating from biophysical factors, infrastructure, resources, socio-economic condition, culture, tradition and environmental fragility, represents a typical CDR (Complex diverse risk prone) farming system. Agriculture in the Islands is mainly rainfed, which is done on small holdings, thereby putting limitations on large scale investments for improvement. The contribution of agriculture towards the Island GDP is 17.40% dominated by horticulture, whereas the industries and service sector contribute 6.4 % and 76.2 % respectively.

The geographical situation and agro climatic conditions of the Islands do not permit automatic transfer of agro-technologies developed elsewhere in the mainland. It necessitates in situ development of location specific agricultural technologies to suit Island situations and eco-niche to maximize agricultural production. It also warrants for concerted efforts to develop new agricultural technologies suited for the unique agro-ecological conditions of the Islands. Hence, an effective Transfer of Technology programme is needed to improve sufficiency status in major food items, particularly the perishable commodities and rice.

Diglipur



Figure 1. Location of the Out Reach Centre

Diglipur is one of the three tehsils of North & Middle Andaman district located 290 km north of Port Blair (Figure 1). It is famous for its oranges, rice and marine life. It harbours Saddle peak, the highest point (732 m) in the Islands, Kalpong, the only river of the Islands with the first hydroelectric project. Main attractions around Diglipur are Ross & Smith Island, Saddle peak, National park, Ramnagar beach, Mud volcanoes, Kalipur and Lamiya bay beaches.

Out Reach Centre

Transportation is the major bottleneck for technology dissemination across the Islands. Moreover, there is a lot of variation among natural resource base and socio-economic status of people. Hence, the technologies/varieties/strains developed at ICAR-Central Island Agricultural Research Institute (CIARI), Port Blair could not be straight way transferred to farmers but needed evaluation and refinement to suit local conditions. In the absence of a KVK in North & Middle Andaman district, Out Reach Centre (ORC) - an innovative approach for reaching the unreached was conceptualized and operationalized since July, 2009 at Diglipur for technology application in agriculture & allied fields under the Farmers Technology Transfer Fund (FTTF) of NABARD.

Objectives

To shoulder the responsibility of technology assessment and refinement in agriculture and allied fields for integrated development of villages, the ORC was established with the following objectives:

- To evaluate varieties/breeds/strains and demonstration of production technology/rearing technology through Technological Application and On Farm Trials in the farmers' field,
- To evaluate location specific technologies at farmers fields for their further refinement.
- To impart training to youth and farm women,
- To provide quality planting material, improved

livestock and fish breeds to farmers,

- To maintain demonstration units on scientific lines to provide work experience to the target group and for dissemination of latest technical know-how & do-how,
- To form Farmers' Clubs to federate into Producer Organization, and
- To maintain functional linkages both intra and inter Institutes for optimizing resources and maximize benefits.

Inception of ORC

For the successful implementation of the Transfer of Technology (ToT) programmes, all the

research wings of CIARI were linked with the State Development Departments like Agriculture, Animal Husbandry & Veterinary Services, Fisheries, Rural Development and NABARD for bringing about an all round development in the far-flung areas of the Islands. To plan and monitor the activities of ORC, a Project Monitoring Committee (PMC) was constituted on 30th April 2009. First PMC meeting was conducted on 17th June 2009 at Port Blair to plan and execute the activities with set objectives and thus the ORC came into operation from 15th July 2009. The Horizontal spread of the technologies in the villages, with collaborators and the mode adopted during 2009 to 2017 is represented through a flowchart in the Figure 2.

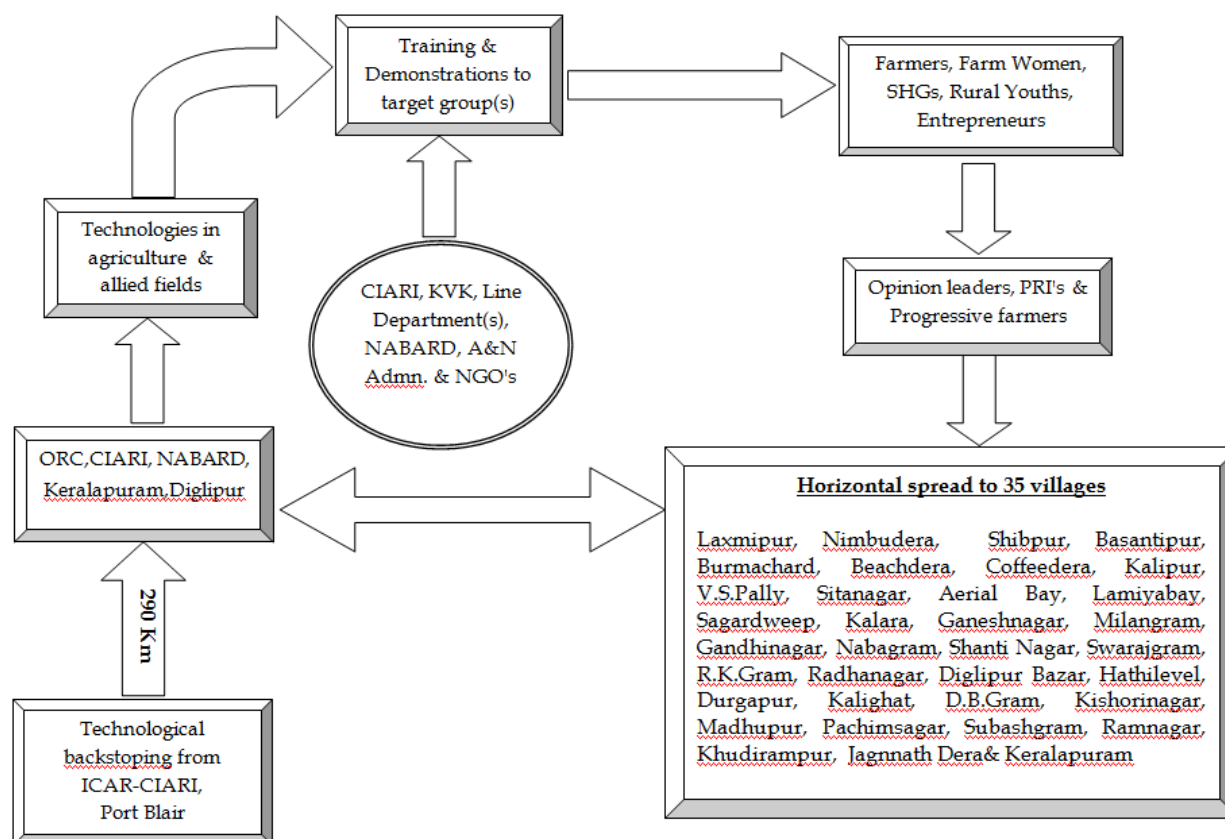


Figure 2. Horizontal spread of the technologies by ORC at Diglipur, North Andaman (2009 to 2017)

Infrastructure Facilities

Out Reach Centre got operational from a hired building located at Keralapuram village of Diglipur. The facilities available includes, a training hall with capacity of 50 trainees with audio visual aids, computer with internet connectivity, library with information materials like pamphlets, training manuals, agricultural journals, videos in agriculture and allied fields.

To advocate e-learning, a kiosk was established in 2010-11, to impart know how & do how in agriculture and allied sectors like vermicomposting, package of practice of rice and brinjal, rodent management and trichoderma production. Besides, marketing information on perishable items like fish, vegetables, pork and chevon; training and visits of Experts, agromet advisory were provided through phone & personal contacts.

Approach and Intervention

To give impetus to the ToT programmes self designated leaders in different fronts at village level were identified as key informants/opinion leaders.

These leaders acted as ambassadors for dissemination of technologies in far flung areas. Mentioned below are the interventions made in participatory mode across 35 cluster villages in North Andaman:

Capacity building of farmers and other stakeholders

Based on the felt needs followed by feedback from the stakeholders, training programmes of 3 to 4 days in interactive mode were conducted with the objective to deliver the knowhow and do how, to further the development of knowledge, skill and positive change of other attributes of the target clientele. Scientists/faculty from ICAR-CIARI, KVK, NABARD, Development Departments, trainees-turned-trainer and NGOs were involved as resource personnel with pre and post evaluation as the main mandate of the program.

Overall, 149 trainings in crop production, horticulture, livestock, fisheries, natural resource management, plant protection and post harvest/processing were conducted for 10,715 trainee days benefitting 6,592 stakeholders (73% male & 27% female) (Table 1).

Table 1
Training programmes offered through ORC during 2009-17

Enterprise	Training (No.)	Participation			Trainee Days
		Male	Female	Total	
<u>Crop production</u> SRI, PoP for HYV of rice, pulses, maize and oil seeds, seed production	44	1423	641	2064	2351
<u>Horticulture</u> organic spice cultivation, scientific block cultivation of drumstick, noni and agathi, propagation techniques in fruit crops, nutrition kitchen gardening, multi-tier cropping system, non-traditional vegetable production, pre and post harvest management of mango, protected cultivation of vegetables, tubers, flowers and aromatic plants.	29	670	282	952	1488
<u>Livestock</u> pig and goat farming, backyard poultry, quail farming, duck farming	11	395	126	521	1246

Enterprise	Training (No.)	Participation			Trainee Days
		Male	Female	Total	
<u>Fisheries</u> nursery management, integrated fish farming system, cat fish culture and induced breeding, composite fish culture with IMC, carp breeding, satellite nurseries, marine ornamental fish farming, fish feed preparation, fish health and diseases	17	708	121	829	1017
<u>Natural resource management</u> mat nursery, soil sample collection, balanced fertilizer application in plantation crops, management of degraded land, Vermicomposting	09	248	98	346	901
<u>Plant protection</u> rodent management, protected cultivation of high value vegetables, pest, disease and weed management in rice, vegetable and cole crops	18	542	211	753	1427
<u>Post harvest/processing</u> bio-mass fired copra drier, dal mill, post harvest management of mango, ginger, turmeric & rice	11	154	129	283	294
Others	10	609	235	844	1090
Total	149	4749	1843	6592	10715

While imparting training, the principles of 'Teaching by Doing' and 'Learning by Doing' have been followed thoroughly. The trainees were administered with a pre and post evaluation proforma to access the change in knowledge level. Supportive literature provided after the completion of the training programmes helped in the reinforcement of technology taught. These training programmes enabled the farmers to adopt new technologies successfully which, in turn, have resulted in giving them high productivity in agriculture and allied fields. The adoption of improved technologies in different areas has led to the diversification of enterprises, thereby offering greater self-employment opportunities and higher income to the farm families.

Technological demonstration of HYV of rice

Technologies of high yielding varieties and advanced package of practices were demonstrated at the farmer's field to popularize cultivation of high yielding varieties of rice.

Kharif technological demonstrations (KTD)

Between 2010 and 2017, 373 KTDs were conducted with improved rice varieties viz. CARI Dhan 1, CARI Dhan 2, CARI Dhan 3, CARI Dhan 4, CARI Dhan 5, CARI Dhan 6, CARI Dhan 7, Ranjeet, CSR 36, CSR 23 and Gayatri covering 100.09 ha across 118 cluster villages of North & Middle Andaman district to disseminate and promote the cultivation of high yielding rice varieties among the farmers (Table 2).

Table 2
KTDs conducted between 2010-11 and 2016-17

Year	KTDs conducted (Nos.)	Village covered (Nos.)	Area covered (ha)
2010-11	53	10	19.60
2011-12	31	27	4.85
2012-13	53	14	14.70
2013-14	56	17	14.70
2014-15	120	28	31.03
2015-16	35	12	9.93
2016-17	25	10	5.28
Total	373	118	100.09

Rabi technological demonstration (RTD)

Between 2009 and 2017, 423 RTDs were conducted with high yielding green gram, black gram, cauliflower, chilli, cabbage, groundnut, potato, okra and tomato covering 47.05 ha across 123 cluster villages of North & Middle Andaman district (Table 3).

Seed Village Concept for production of quality rice seeds

Rice is the principal cereal crop of Andaman and Nicobar Islands, and the major constraint for productivity enhancement is non-availability of

quality seed of high yielding varieties. Hence, Seed Village Concept was introduced in 2011 to produce Truthfully Labelled Seeds (TFL) of CIARI rice varieties in participatory mode involving breeders, farmers and social scientists (Table 4). A total of 38 progressive farmers across 21 villages have participated in the seed production. Regular field visits were undertaken throughout the season to ensure seed purity and quality. A total of 202.11 Q of TFL seeds of rice was produced between 2011-12 and 2015-16. The TFL seeds thus produced were purchased from farmers, cleaned, packed and distributed/sold to other farmers.

Table 3
RTDs conducted between 2009-10 and 2016-17

Year	RTDs conducted (Nos.)	Village covered (Nos.)	Area covered(ha)
2009-10	51	10	5.96
2010-11	63	27	8.45
2011-12	-	-	-
2012-13	14	14	0.08
2013-14	50	17	5.03
2014-15	42	28	4.0
2015-16	25	12	4.44
2016-17	178	15	19.09
Total	423	123	47.05

Table 4
TFL rice seed produced through Seed Village Concept between 2011 and 2016

Year	Villages covered	Farmers involved	Area covered (ha)	Seed produced (Q)
2011-12	4	6	3.0	28.94
2012-13	4	9	3.0	41.08
2013-14	4	5	2.5	36.48
2014-15	5	8	6.0	34.28
2015-16	4	10	10.0	61.33
Total	21	38	24.5	202.11

Satellite Fish Nursery for production of fresh water

Fresh water fishes have huge demand in the Islands. Though there are around 700 ponds in Diglipur for fish cultivation, timely availability of good quality fish seeds was a major bottleneck faced by the fishers. To mitigate the problem, Satellite Fish Nursery Technique was introduced in 2012 at Diglipur under the technical guidance of Fisheries Science Division of CIARI in association with Department of Fisheries and KVK. The technology

was well received by farmers as it exhibited a return of Rs. 2.70 lakh in a span of 4 to 6 months. Presently 12 farmers have adopted the technology into practice and many more youth are coming forward to adopt the same. Department of Fisheries promoting the concept across the Islands.

Community Dal Mill for processing of pulses

The Islands produce around 1154 tonnes of pulse annually of which Diglipur is a major hub. Apart from indigenous processing of a small

quantity for local consumption, more than 85% of the pulse are sent to the mainland for processing. To offset this extravagant logistic expenditure, the farmers were paid low. Hence, ORC in collaboration with the Natural Resource Management Division of CIARI has arranged for establishment of a mini dal mill by a SHG in 2011 in association with ACANI, an NGO. This intervention has benefitted the pulse farmers in getting their produce processed and sell at remunerative price.

Pekin duck under backyard

To provide livelihood as well as nutritional security to small farmers, 3 Pekin ducklings were provided to a farmer in 2011. Over the time it spread to 81 farmers with 3-5 ducks in the backyard, totaling 466 numbers spread across 15 villages by 2015.

Automatic weather station

As there was no mechanism to measure the rainfall in the area, a manual rain gauge was installed in 2010 at Keralapuram. After a year, an Automatic Weather Station was set up at Diglipur on 10th December 2011, which was first of its kind in North & Middle Andaman district.

Technological demonstration on spices under arecanut

Demonstration on "Black Pepper under Arecanut" was undertaken in two cluster villages of R.K.Gram and Kerelapuram in an area of 0.10 ha each in five farms to set a model for the farmers. The plan of action with cost involved and returns after fifth year is detailed in Table 5.

Table 5
Technological Demonstration of black pepper under arecanut @ 0.10 ha

A.	Cost of Cultivation	Cost (Rs.)
1st year		
a)	Cost of seedlings	150 nos. (3nos. each) @ Rs.5
b)	Labour charges for pitting, farm application & planting	5days @ Rs.300
c)	Cost of FYM	(1/2 truck)
d)	Labour charges for maintenance	5 days/month x 12 months @Rs.300
Total		24000
2nd year		
a)	Cost of FYM	(1/2 truck)
b)	Labour charges for maintenance	5 days/month x 12 months @Rs.300
Total		21000
3rd year		
a)	Cost of FYM	(1/2 truck)
b)	Labour charges for maintenance	5 days/month x 12 months @Rs.300
Total		21000
4th year		
a)	Cost of FYM	(1/2 truck)
b)	Labour charges for maintenance	5 days/month x 12 months @Rs.300
Total		21000
Total cost for 4 years		87000
B.	Returns over investment on 5th year (Yield 1Kg/plant x 150 plants @ Rs.350)	52500

Bio-mass fired copra dryer

A Bio-mass fired copra dryer was introduced to facilitate better recovery of copra in less time and labour. It was installed in one of the progressive farmer's field at Diglipur on 12th August, 2010 to

disseminate the information on the technology to peer groups across the region.

Rodent management in paddy

In view of rampant rodent infestation in the rice fields at Subashgram, a training program on

"Rodent Pest Management in Paddy" was conducted in September 2012 at Diglipur, wherein 35 farmers (27 male and 8 female) participated. Various management practices viz. bund trimming, weed free cultivation, installation of indigenous trap, application of rodenticide was taught. Rodent baits were provided to the farmers for placing in the fields.

Integrated pest management in Okra

On-farm trials of pest management in okra by integration of cultural practices, pheromone traps, botanicals and need based application of insecticide were carried out in 3 farmers' field at Diglipur in an area of 400m² each (Figure 3 and 4).

Among the 3 treatments viz. IPM module, chemical module and untreated control the IPM module was found to perform well in all the farmers' field with significant reduction in the incidence of Fruit and Shoot Borer. It reduced the number of pesticide sprays to 2 from 5-6 and achieved a much higher yield of 8.1-9.6t/ha than 5.5 to 6.5 t/ha obtained in non-IPM fields. Though the cost of production was slightly higher in IPM fields, higher income was obtained because of higher yields in IPM fields. Moreover, less pesticide sprays resulted in buildup of large natural enemies especially predatory spiders in IPM fields.

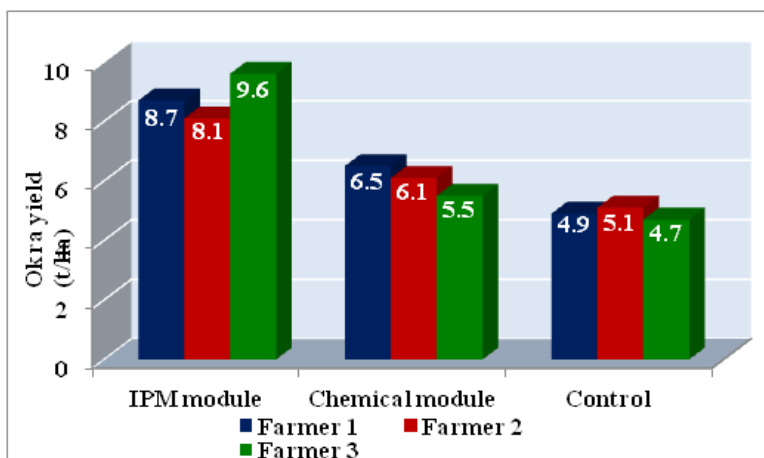


Figure 3. Yield performance of Okra under IPM

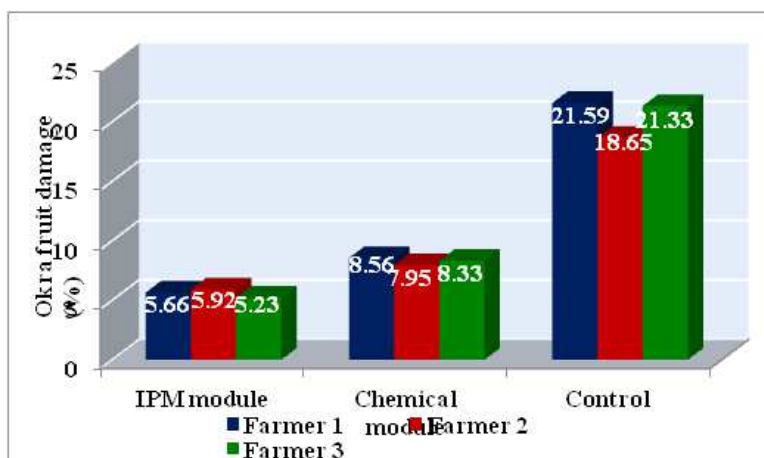


Figure 4. Reduced fruit damage in Okra under IPM

Farmer's club for effective ToT

A total of 201 farmers were formed into 16 clubs for effective ToT. These clubs empowered the farmers to disseminate the latest agricultural techniques, establish better relationship with banks, adopt latest post-harvest technology and value addition etc. and enjoy the benefits of collective bargaining power both for procuring inputs and selling their produce.

Exposure visit

During the ORC period, a total of 169 farmers from 10 different villages attended 4 Kisan Melas held at CIARI to get an exposure to different avenues in agriculture and allied fields for livelihood. On the occasion, they have participated in Kisan gosti, Kullah manch, quiz and training at KVK. Knowledge through video films on Integrated Farming System, poultry farming, Broad Bed and Furrow System, goat farming, pig farming etc. were also imparted. Many queries regarding pest and disease management were suitably attended by the experts. They displayed their various innovative products/processes during the occasion. Besides, 4 farmers from North and Middle Andaman district attended the National Conference on Spices production held at CIARI premises on 27- 28th February 2012.

Market study of marine and fresh water fishes

During the ORC period, a research has been undertaken to analyze the efficiency of fish market in Diglipur, the findings of which are detailed below:

Price trend of marine fishes

Seventeen varieties of marine fishes were found to be sold at Diglipur fish market which accounts for 60% of total fish consumption in the region. Based on the regular availability and consumers' price, the marine fishes were grouped into 3 categories viz. those which are sold at more than Rs. 150/kg, those which are sold between Rs.100 to 150/kg and those

which were sold below Rs.100/kg. The average price of Group I fishes was Rs.150.04 in 2009 followed by Rs.144.12, Rs.163.06, Rs.178.53, Rs.195.38, Rs.229.26 and Rs.195.67 in the succeeding years till 2015. Thus, in a span of 7 years, the price has increased by 30.41%. Moreover, the price has registered a 13% hike during the third quarter (July to September) every year.

The price movement of marine fishes in Group II has started with Rs.95.18 in 2009 and changed as Rs.102.56, Rs.108.25, Rs.120.14, Rs.148.17, Rs.191.39 and Rs.193.30 during the successive years till 2015. Thus, in a span of 7 years, the price has increased by 103%. Moreover, the price has registered a 15% hike during the third quarter (July to September) every year. The price movement of marine fishes in Group III has started with Rs.40.78 in 2009 and changed as Rs.49.12, Rs.52.30, Rs.56.06, Rs.61.63, Rs.69.89 and Rs.64.84 in the succeeding years till 2015. Thus, in a span of 7 years, the price has increased by 58%. Moreover, the price has registered a 8% hike during the third quarter (July to September) every year.

Price spread of marine fishes

Overall, the average farmer's price ranged between Rs.145.25-150.00 in Group I, Rs.90.00-153.00 in Group II and Rs. 25.00-65.00 in Group III fishes while average consumer's price ranged between Rs.171.86-218.36 in Group I, Rs.105.25-163.16 in Group II and Rs.33.56-77.38 in Group III. Thus, the proportion of producer's price in consumer's price was estimated as 82% for Group I, 88% for Group II and 83% for Group III fishes which reveals the high efficiency of marine fish market in view of short supply chain.

Price trend of fresh water fishes

Eleven different types of fresh water fishes were found to be sold at Diglipur fish market. Here, the average price of Group I fishes was Rs.156.91 in 2009 followed by Rs.167.87, Rs.184.82, Rs.207.27, Rs.228.15, Rs.256.11 and Rs.255.42 in the succeeding years till 2015. Thus, in a span of 7 years, the price

has increased by 62%. Moreover, the price has registered a 7% hike during the second quarter (April to June) every year.

The price movement of fresh water fishes in Group II has started with Rs.95.33 in 2009 followed by Rs.102.82, Rs.114.73, Rs.127.90, Rs.140.45, Rs.162.87 and Rs.169.39 during the successive years till 2015. Thus, in a span of 7 years, the price has increased by 77%. Moreover, the price has registered a 11% hike during the second quarter (April to June) every year. The price movement of fresh water fishes in Group III has started with Rs.67.43 in 2009 followed by Rs.72.30, Rs.75.15, Rs.79.53, Rs.86.46, Rs.95.34 and Rs.93.79 in the succeeding years till 2015. Thus, in a span of 7 years, the price has increased by 39%. Moreover, the price has registered a 6% hike during the third quarter (July to September) every year.

Price spread of fresh water fishes

Overall, the average farmer's price ranged between Rs.150.00-180.00 in Group I, Rs. 90.00-120.00 in Group II and Rs. 50.00-70.00 in Group III fishes while average consumer's price ranged between Rs.183.24-232.91 in Group I, Rs.106.20-138.94 in Group II and Rs.76.77-86.08 in Group III.

Thus, the proportion of producer's price in consumer's price was estimated as 79% for Group I, 76% for Group II and 74% for Group III fishes which reveals the high efficiency of marine fish market in view of short supply chain.

Market study of Chevron and Pork

Livestock contributes more than 30% to the Island's agricultural GDP. The normal flow of marketing channel of pork and chevon is from North Andaman to South Andaman i.e. to Port Blair. However, due to increase in tourism activities in North Andaman, particularly at Diglipur, the local demand for pork and chevon has increased considerably over the years. The analysis of pork and chevon market during 2013-2016 revealed that 313 goats and 1049 pigs were slaughtered in a year. The average selling price of goat was found to hover between Rs.450 to 480 per kg with a marketing margin of Rs.163.33 to 190.00 while the average selling price of pork was found to hover between Rs.190 to 225 per kg with a marketing margin of Rs.67.90 to 102.92. The overall market efficiency of chevon and pork was found to be around 54 to 66% due to lack of market regulation in the region (Figure 5).

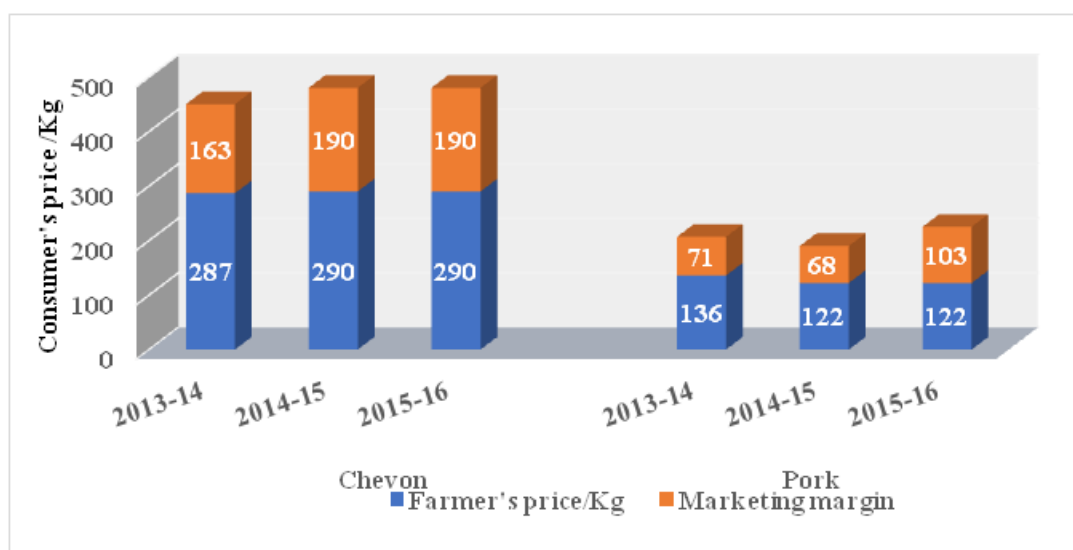


Figure 5. Market trend of chevon and pork at Diglipur market (2013-16)

Output, outcome and impact of the technological interventions

Training manuals developed

Training manuals in Hindi, Bengali and English were developed and provided to the farmers during training and visit programme for reference purpose

on subject such as Vermicompost, goat farming, quail farming, protected cultivation of vegetables, marine ornamental fish and carp fish breeding which acts as a ready reckoner.

Income enhancement of stakeholders

Table 5
Performance of technological interventions vis-a-vis farmers' practice

Technology	Net Income (in Rs.)		Additional income over farmers' practice	Benefit-Cost Ratio
	Farmers practice	Improved practice		
Induced Breeding of fish/ha	-	1,25,000	1,25,000	6.00
Earthworm/unit	-	60,000	60,000	2.46
Yorkshire pigs/unit of 2 pigs	-	39,375	39,375	3.25
Broad Bed & Furrow/0.20 ha	1,500	30,500	29,000	2.90
HYV of Rice /ha	18,200	37,400	19,200	1.01
Pekin duck under Backyard/ unit of 3 birds	940	3,800	2,860	7.33

Among the technological interventions made by the ORC, induced fish breeding was found to give maximum additional income followed by earth worm production, Yorkshire pig rearing, Broad Bed and Furrow System, CIARI rice cultivation and Pekin duck under backyard (Table 5). All these technologies were overwhelmingly accepted by farmers as a livelihood option and their adoption is gaining momentum in the far flung areas of the Islands.

Rice variety CARI Dhan 5 popularized

CARI Dhan 5, a rice variety developed for problem soils was demonstrated and popularized across different cluster villages of North & Middle Andaman district through Seed Village Concept. Impressed by its performance, an NGO "West Bengal Voluntary Health Association of India" (WBVHAI) working for the welfare of Ranchi community at Middle Andaman has procured 47 Q of TFL seeds in 2012 and distributed them to 50 farmers for cultivation in 17 ha problem soils at Baratang. The farmers were happy with the

performance and went on with the variety in subsequent years.

High yielding varieties of CIARI entered the farmers' seed chain

HYVs of rice introduced by ORC have significantly replaced the local varieties and entered the farmers' seed chain. A PRA conducted in December 2015 to assess the adoption and spread of HYV rice varieties in the region revealed that a total of 4919 farmers have adopted the HYV of rice in an area of 2109.063 ha spread across 35 cluster villages in North & Middle Andaman district (Figure 6). Variety Gayatri shared 1259.31 ha of area followed by CARI Dhan 5 (284.82 ha), CSR 36 (225.61 ha), CARI Dhan 4 (181.06 ha), CARI Dhan 3 (79.41 ha), CSR 23 (55.11 ha), Ranjeet (20.68 ha), CARI Dhan 6 (2.53 ha) and CARI Dhan 7 (0.54 ha).

Productivity enhancement

A study carried out from 2013-14 to 2015-16 at farmers field in 16 villages of rice dominant district of North & Middle Andaman district revealed an

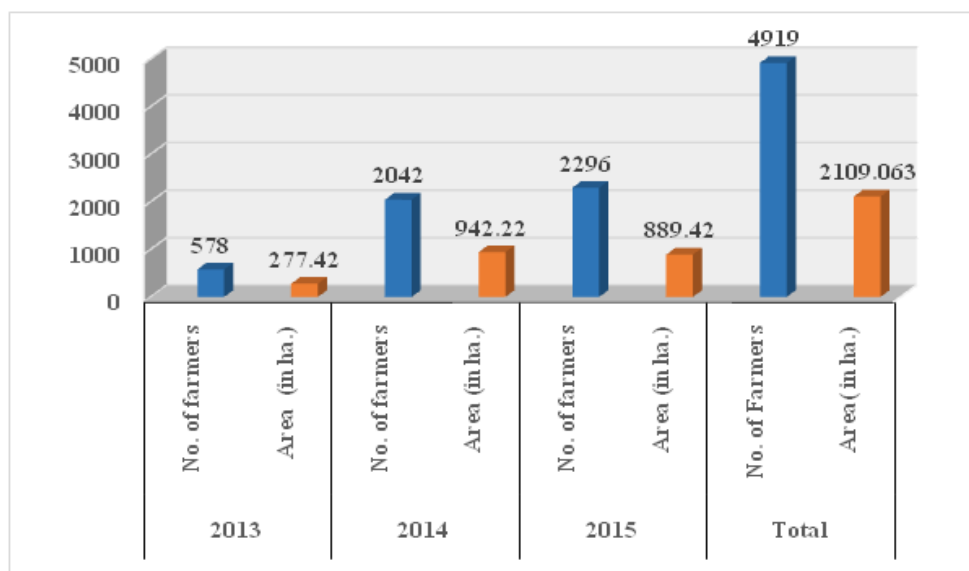


Figure 6. Horizontal spread of HYV of rice in North Andaman

increase in the productivity of improved rice varieties developed by CIARI over the local varieties by 14-50% (average 30.4%). But the actual yield realized by farmers was found to be much below the yield potential of the varieties (Extension Gap) by 0.84 to 1.62 t/ha which necessitates the need to educate the farmers for adoption of improved varieties and follow proper package of practices.

The Technology Gap attributed to the varying soil fertility and weather conditions across the region ranged between 0.13–1.50 t/ha which underscores farmers' cooperation in carrying out such demonstrations for achieving encouraging results.

Increase in seed and variety replacement rate

A substantial amount of farm-saved rice seeds are being used by the farmers in the Islands. With regular Front Line Demonstrations, the Seed Replacement Rate (SRR) has increased from 1.7 to 9.6% during 2010-15. Similarly, the HYV of rice popularized through Front Line Demonstrations and Seed Village Concept have replaced the old traditional low yielding rice varieties.

Success stories

Trainings imparted on agriculture, horticulture,

livestock and fisheries followed by result and method demonstrations led to the improvement in knowledge and skill of the stakeholders. The technical folders provided during the programmes acted as a reference material followed by continuous motivation led to reinforcement of the technology learnt leading to adoption for up scaling. Given below are our ambassadors who have set an example for adoption of technologies.

Shri Sajib Kumar: Satellite Fish Nursery for fresh water fish seed production

Shri Sajib Kumar, aged 34, a resident of V.S. Pally was facing problems in getting quality fish seeds from mainland. From the knowledge gained by attending an ORC program on "Carp Breeding and Model for Satellite Nurseries in Andaman" in 2012, he established 5 satellite nurseries of size 10x10x1.5 m. He devoted 5 hours per day in breeding fishes during the breeding season, apart from employing 4 full time and 10 part time employees to assist him in carrying out the fish breeding, management and selling of the fishes in time.

He started selling his first installment of fish seeds of various sizes at the price ranging from Rs.1-8. On knowing about the availability of quality fish

seeds, 20 to 25 farmers from Kalipur to Keralapuram purchased around 40,000 seeds at the rate of Rs.5. Thus he earned an additional income of Rs.2.70 lakh in a span of 6 months by adopting Satellite Nursery Technique. For his innovativeness to take up this technology for the first time in the region he was recognized and bestowed with "Best Farmer Award" by CIARI during the Kisan Mela 2013.

Shri Alok Biswas: Farm Diversification

Shri Alok Biswas, aged 41 is a progressive farmer with good leadership skill for which the ORC selected and designated him as the Opinion Leader of Madupur Panchayat. In September, 2010 he was selected for the demonstration of SRI paddy. By adopting proper management practices, he achieved a yield of 6.16 tonnes/ha, beside an additional yield of 1.12 tonnes from the ratoon crop. Further, he intensified his 1 ha arecanut garden with various fruit and spices crops. In 2012, he diversified his farm by adopting Broad Bed Furrow System wherein he planted vegetables like cucumber, okra and brinjal on the beds and raised fresh water fishes in the furrows. He also supplemented his farm with 30 Nicobari fowls.

The best part of his venture was his all through practice of organic farming. For his innovativeness to take up SRI for the first time in the region, he was bestowed with "Best Farmer Award" by CIARI during the Kisan Mela 2011. He was also recognized as Best Farmer of the Island in 2014 by the Andaman & Nicobar Administration.

Shri Shyampada Roy: Agripreneurship

Shri Shyampada Roy, aged 50 years, of Nimbudera village attended a training on Vermicomposting and rearing of earthworms in 2010. From 3 worms which he took from the training, he reared quite a good number of worms and started selling them to fellow farmers within a span of 6 months. Gaining confidence on worm rearing and sensing a perpetual demand for worms he availed a loan of Rs.11,000 under RKVY and

expanded the earthworm production. He also took up induced breeding of fishes in 2012 along with two other farmers and produced 4.5 lakh fish seeds.

He innovated new grafting and layering techniques by using poon and sea mova which grow in brackish water and withstand salinity and sold grafted/layered seedlings of Bush pepper (Rs.130/plant), Nutmeg (Rs.130/plant), Tejpatti (Rs.40/plant), Pome (Rs.50/plant), lemon (Rs.130/plant), Black pepper (Rs. 3/plant) and Alovera (Rs.30/plant). The Department of Agriculture has selected him for an exposure visit to Gujrat, Mumbai, Maharashtra and Chennai as a reward for his enterprising quality. For translating his knowledge and skill into lucrative enterprise, he was bestowed with "Best Farmer Award" by CARI during Island Kisan Mela 2012.

Shri E. D. Menon: Pekin Seed Bank

Non-availability of ducklings and eggs is a major constraint in popularization of Pekin Duck in North Andaman. To meet the demand of eggs, Shri E. D. Menon of Keralapuram established a Seed Bank. For his contribution for popularizing Pekin Duck in the region, he was bestowed with "Best Farmer Award" by CIARI during the Island Kisan Mela 2015.

Shri Parimal Das: Technology ambassador

Shri Parimal Das, aged 39, resident of Keralapuram village, is a hard working and progressive farmer, has undergone various trainings on poultry, paddy and vegetable cultivation in 2010. Being in the proximity of ORC, a Technological Demonstration Plot with paddy, Pekin duck, sweet potato variety CARI SP2, Burma Dhaniya and Poi bhajji was laid in his farm with an objective to provide a platform for the neighboring farmers to see the field performance of CIARI technologies. In 2011, when ORC introduced the Seed Village Concept for the production of Truthfully Labeled rice seeds, he produced 100.20Q seeds of CARI Dhan3, CARI Dhan 5 and

CSR 36; and earned about Rs.95,920 during 2011-15. His rice crop productivity has increased from 3.5 t/ha to 4.5 t/ha after adoption of new HYVs. Over the years, he emerged as a Seed Ambassador of the region. For his contribution to disseminate CIARI technologies, he was bestowed with "Best Farmer Award" by CIARI during the Island Kisan Mela 2013.

Indigenous Technical Knowledge of farmers

Beyond being a formal messenger of hope to the farming community, ORC has transcended the lives of its stakeholders to explore quite a few innovations and technical knowledge which are depicted below:

Paddy Threshing Machine:

Shri Tapas Biswas of R.K. Gram has invented a low cost electrical paddy threshing machine which can run continuously for 12 hours with a capacity to thresh 40kg of paddy per hour.

Khoon phal

Shri Manindra Mistry has discovered a wild berry rich in iron. Fascinated by its taste, he propagated the climber in his field and markets it as Andaman grapes @ Rs.250/Kg.

To cure foot disease in cattle

- Neem leaves are grounded and applied on the infected area and administered orally.
- Arecanut leaves are soaked in water and applied on infected area for one week.
- One handful of potash and two hands full of salt mixed in 500 ml of water are applied in affected area.

To cure retention of placenta in cattle

- Bamboo leaves feed.
- Crushed coconut is fed thrice a day along with cattle feed.
- Mango leaves feed.
- 1 bottle gourd is fed with gur.

To increase body weight and milk yield in cattle

- Boiled jaggery and bottle gourd are fed for a week.
- Tapioca and groundnut leaves are fed in equal proportions.
- Sweet potato is fed daily.
- Betel and arecanut leaves are fed in equal proportions to increase digestion.

Broken horn

- Crushed tobacco leaves along with lime are applied on the wound until it gets healed.
- Ground garlic, neem oil, lime and a spoon of salt are applied on the wound.
- Turmeric powder, lamp carbon and neem oil are mixed and applied as a paste.
- Mustard oil and salt are mixed and applied on the wound with a bandage.

Wound

- Turmeric and neem oil paste is applied twice daily.
- One cup of mustard oil and a spoon of salt is boiled and applied on the wound.
- Wound is washed, and neem oil and crushed garlic is applied.
- 100 gm Naphthalene powder is mixed with equal amount of coconut oil or neem oil and applied on the wound.

Diarrhea and stomach problem

- Adhatoda leaves are feed to cattle twice a day for 3 to 4 days.
- Un-ripened bhel fruit is crushed and boiled in water and feed to animal twice a day.
- Sapota fruit is fed regularly.
- Handful of bottle gourd leaves are fed thrice a day.
- Equal amount bottle gourd and bamboo leaves are fed to the animal thrice a day.

- Matured tamarind leaves are boiled in water to form a slurry and fed to animal.
- Booty leaves are grounded and applied on the injured muscles.
- Leaves of patharkuchi (*Bryophyllum pinnatum*) are fed to goat to relieve stomach problem.
- *Jatropha* leaves are crushed and mixed with water and given to cattle and goats to treat constipation.
- Bamboo leaves are fed to the cattle to relieve constipation.
- Two handful of neem leaves are crushed, mixed with water and administered to animals.
- Neem leaves mixed with sumaloo root and mango tree bark are crushed and boiled and applied on the affected portion.
- Burnt ash of rice husk is ground with bottle gourd leaves and applied on infected area

Tick infection

- Equal amount of kerosene and coconut oil are mixed and applied on the animal.
- Tobacco leaves or neem leaves are crushed and applied on the animal.
- Paste made of ginger, black pepper and alcohol is applied on the animal.

Hump sore

- 10 bottle gourd leaves and 100 gm salt are grounded and applied on the infected area until the sore is healed.
- Paddy straw ash is mixed with neem oil and applied on the infected area.
- Grease is applied on the infected area until the wound is healed.
- Fresh cow dung is applied on the affected area.

Worm infection

- Human urine is taken in a container and covered with cow dung after storing for 14 days is fed to cattle.

- Turmeric powered, hadjor, jeera and chilli is grinded and the juice is fed to cattle.
- Tald fish is fed to cattle for 10 days.
- Chirata is soaked in water overnight and given to animal to kill worms.
- 100 ml of mustard oil is given with feed for 2 days in a month for 4 months.
- Feeding bamboo leaves daily kills ecto parasites.

Fractures

- Hadjor plant is crushed and mixed with egg white and applied on the broken bone with bamboo bandage as support.

Sore tongue

- Paddy grains are rubbed on the soared tongue.
- Salt is fed along with sugarcane or bamboo leaves.
- 2 spoon of salt is fed with 100ml of mustard oil.

Cold and fever

- Smoke is created by burning jute bag and animals are compelled to take the smoke.
- Mustard oil is applied on the horns.
- Chilli powder is mixed in feed for poultry during fever.
- Lime is applied on the horns 2 to 3 times a day until the fever heals.

Mastitis

- Tamarind leaves are boiled and applied in the affected area.

Snake bite

- Booti plant root is crushed and fed.
- 50 gm black pepper is mixed with 1 kg of ghee and fed to animals.

IPM

- Cow dung is mixed with water to make slurry and sprayed to avoid mites and ants.

- Gunny bag or old cloth dipped in cow dung slurry and placed in shade attracts earthworm which can then be used for vermicompost production.
- Neem cake is mixed with sand and placed in the base of leaf sheath to control Rhinoceros beetle in coconut.
- Spraying of papaya leaf extract can control bacterial diseases.
- 1 litre Kerosene is mixed in 50 l of water and sprayed in paddy field with standing water to control leaf folder and stem borer.
- Skin of cucumber is grounded to liquid and spread on the plants affected by red ants.
- Turmeric power is mixed with water and sprayed to control pests, aphids and hoppers
- Placing containers and plastic bags at 2 m interval in the field will scare birds and squirrel.
- Wilt diseases can be controlled by dipping the seedlings in a solution containing 10 gm of turmeric powder, 10 gm of asaphoetida in 10 liters of water

CONCLUSION

In the absence of a KVK in North & Middle Andaman district, an Out Reach Centre was established at Diglipurin 2009 to customize various agriculture and allied technologies developed by CIARI and other mainland Institutes to suit the local conditions for the integrated development of the far flung villages of the Islands. Until 2017, ORC has undertaken various interventions across 35 cluster villages in coordination with various Divisions of CIARI, KVK-South Andaman, State Development Departments like Agriculture, Animal Husbandary & Veterinary Services, Fisheries, Rural Development etc., NABARD and NGO.

Need based trainings were conducted to improve the knowhow and dohow of various agricultural and allied technologies, demonstrated

the performance of high yielding varieties of rice, green gram, black gram, cauliflower, chilli, cabbage, groundnut, potato, okra and tomato, produced and distributed TFL seeds of CIARI rice varieties through Seed Village Concept, introduced Satellite Fish Nursery Technique to augment the availability of quality seeds, installed a community dal mill to promote forward linkage among pulse farmers, promoted Pekin Duck under backyard for livelihood and nutritional security of small farmers, established an Automatic Weather Station to provide weather updates to farmers, set up a model farm of black pepper under arecanut, introduced a Bio-mass fired copra dryer for efficient recovery of copra, equipped the farmers to manage rodents in rice fields, demonstrated the benefits of IPM in okra, empowered the farmers through farmers' clubs, documented the ITKs of the community, analyzed the efficiency of fish, chevan and pork markets

The interventions have successfully propagated the agricultural and allied technologies of CIARI and other mainland Institutes in the far-flung regions of the Islands and thereby enhanced the income and livelihood of the stakeholders. Various progressive farmers were identified and recognized for their innovativeness, entrepreneurship, leadership qualities. The icing on the cake was the felicitation of Karen Community of Webey village with "Plant Genome Saviour Award" by Protection of Plant Varieties & Farmers' Rights Authority, India (PPV & FRA) in 2016 for their efforts to conserve the traditional rice varieties for more than 125 years. Recognizing the need to augment the achievements of ORC and sustain the agricultural development in the North & Middle Andaman district, CIARI has established a KVK at Nimbudera village in 2015. To sumup, Out Reach Centre, an innovative Institutional approach for technology application in remote areas has played a pivotal role in first line transfer of selected doable technologies for doubling the income of farmers in sustainable manner.

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