



Instructional Manual on Plant varieties

IMPACT

And Commercializable Technologies


Institute Technology Management Unit
Central Agricultural Research Institute




Plant Varieties



CARI DHAN 1

Salient Features		
Plant height (cm)	115	
Panicle length (cm)	24	
Days to maturity	120	
No. of tillers/plant	06	
Grain type	Long slender	
Yield	4.5 t/ha	
Biotic Stress	Tolerant to BLB and Stem Borer	
Abiotic Stress	Nil	
Area of Cultivation	Rain fed lowland normal soils of Andaman & Nicobar Islands.	

CARI DHAN 2


Salient Features		
Plant height (cm)	110	
Panicle length (cm)	25	
Days to maturity	121	
No. of tillers/plant	6-7	
Grain type	Medium slender	
Yield	5 t/ha	
Biotic Stress	Tolerant to BLB and Stem Borer	
Abiotic Stress	Nil	
Area of Cultivation	Rain fed lowland normal soils of Andaman & Nicobar Islands.	



CARI DHAN 3

Salient Features		
Plant height (cm)	115	
Panicle length (cm)	25	
Days to maturity	120	
No. of tillers/plant	07	
Grain type	Long slender	
Yield	5 t/ha	
Biotic Stress	Tolerant to BLB and Stem Borer	
Abiotic Stress	Nil	
Area of Cultivation	Rain fed lowland normal soils of Andaman & Nicobar Islands.	

CARI DHAN 4

Salient Features:		
Plant height (cm)	110	
Panicle length (cm)	25	
Days to maturity	123	
No. of tillers/plant	6-7	
Grain type	Medium bold	
Yield	3.5 t/ha	
Biotic Stress	Tolerant to BLB, Leaf folder and Stem Borer	
Abiotic Stress	Salt tolerant	
Area of Cultivation	Saline soils of North and South Andaman.	



CARI DHAN 5


Salient Features		
Plant height (cm)	123	
Panicle length (cm)	24	
Days to maturity	140	
No. of tillers/plant	7-9	
Grain type	Medium bold	
Yield	4.4 t/ha	
Biotic Stress	Tolerant to BLB, Leaf folder and Stem Borer	
Abiotic Stress	Salt tolerant	
Area of Cultivation	Saline soils of North and South Andaman	

CARI Brinjal 1


Salient Features:		
Plant height (cm)	75	
Days to first flowering	70	
Fruits/plant	5-7	
Average fruit weight	170	
Yield (t/ha)	20-25	
Fruit colour	Green	
Fruit shape	Oblong	
Yield	20-25q/ha fruits	
Biotic Stress	Bacterial wilt resistant germplasm	
Abiotic Stress	Nil	
Area of Cultivation	South, Middle and North Andaman	



CARI-C-1 (CARI-Annapurna)

Salient Features	It is a dwarf palm with large size nuts	
	Variant of the Niu-lekha, one of the collections from Fiji Islands	
	The copra out turn/palm/year - 13.70 kg	
Yield	High copra content - 245g/nut.	
Biotic Stress	Nil	
Abiotic Stress	Drought tolerant	
Area of Cultivation	High copra content - 245g/nut.	

CARI DHAN 2

Salient Features	Dwarf palms	
	Crown shape is circular	
	Nut shape is spherical	
	Colour of the fruit is red	
	Palms are dwarf with closer internodes, compressed crown, and shorter petioles	
Grain type	Medium slender	
Yield	The average no. of nuts /palm/year -104.90.	
Biotic Stress	Nil	
Abiotic Stress	Drought tolerant	
Area of Cultivation	Island conditions	



CARI-C-3 (CARI - Omkar)

Salient Features	Dwarf palms with close internodes.
	Short petioles and compressed crown
	Semi-circular crown with less than 20 leaves on the crown.
	Nut shape is pear shape with less meat content.
Yield	The average no. of nuts / tree/year - 110.80.
Biotic Stress	Nil
Abiotic Stress	Drought tolerant
Area of Cultivation	Island conditions



CARI-C-4 (CARI - Chandan)

Salient Features	Dwarf palms with close internodes
	Short petioles and semi-circular compressed crown.
	Nut shape is spherical and smooth without prominent ridges.
	A promising cultivar for the island conditions and coastal ecosystem.
Yield	The average no. of nuts / tree/ year - 98.10.
Biotic Stress	Nil
Abiotic Stress	Drought tolerant
Area of Cultivation	Island conditions





CARI-SP1 (CARI - Swarna)

Salient Features	The plants are spreading
	Emerging leaves colour - light purple
	Petiole colour - purple.
	Tubers colour - light pink, orange fleshed.
	Duration - 110-120 days.
Yield	20-21 t/ha
Biotic Stress	Resistant to Weevil
Abiotic Stress	Nil
Area of Cultivation	Island conditions



CARI-SP2 (CARI - Aparna)

Salient Features	The plants are semi spreading
	Emerging leaves colour - light purple
	Petiole colour - greenish pink.
	Tubers colour - light pink, white fleshed.
	Duration - 110-120 days.
Yield	20-21 t/ha
Biotic Stress	Moderately resistant to weevil
Abiotic Stress	Nil
Area of Cultivation	Island conditions





CARI-DA1 (CARI - Yamini)

Salient Features	Leaf shape - cordate
	Petiole colour - greenish pink
	Tuber shape - conical rough and white flesh
	Ideal as inter crop in the coconut and arecanut plantations
Yield	45-50 t/ha
Biotic Stress	Moderately tolerant to anthracnose disease and leaf spot
Abiotic Stress	Nil
Area of Cultivation	Island conditions



CARI-Pretty Green Bay Orchid

Salient Features	No. of Flower/Spike - 35-45
	No. of Spike/Plant - 4-6
	Spike length - 120-150cm
	Flower size - Small
Yield	5 t/ha
Biotic Stress	Nil
Abiotic Stress	Nil
Area of Cultivation	Island conditions





CARI-Broad Dhaniya

Salient Features	Leaves - Broad, serrated, acute, dentate and shiny green with small spines.
	Broad and better shelf life.
	Suitable for organic cultivation and shaded conditions.
	Spacing is 30cm x 20 cm and suitable as intercrop in plantations.
	Its richness in micronutrients and phytochemicals show its potential for making value added products.
Yield	8-10 t/ha/year
Biotic Stress	Nil
Abiotic Stress	Nil
Area of Cultivation	Island conditions





Commercializable Technologies



Raised bed technology with coconut husk burial for year round vegetable production

Description of Technology

Andaman and Nicobar Islands receives more than 3000 mm of rainfall in a year from May-Nov and the weather conditions are very hostile during the period. Due to heavy rains, the vegetable production is very limited in these months and there is always scarcity of vegetables. Under this method beds were raised to a height of 1 foot from the ground level with coconut husk, which was thrown as waste and again covered with soil. The vegetables can be grown on the raised bed and the furrows can be used for growing border row trap crops like *Tagetes* and Swamp taro.

Equipments/ Raw Materials

- Coconut husk
- *Glyricidia* manure
- Compost
- Bio control agents like *Pseudomonas* and *Trichoderma*
- Vegetable seeds
- Soil excavator for bed preparation

Space Required

- Total Area requirement - 1153m²
 - Bed - 10 x 2 x 50 = 1000 m²
 - Furrow - 10 x 0.3 x 51 = 153 m²

Protocol

- Beds of 10 x 2 x 50 are prepared by spreading coconut husks.
- The beds are then sprayed with liquid *glyricidia* manure and low cost compost.
- Bio control agents like *Pseudomonas* and *Trichoderma* are applied on the beds.
- Crops like Amaranthus, Cowpea, Okra, Radish and Brinjal are cultivated on the raised beds from May to August.
- Crops like Coriander, French bean, Cowpea, Palak and Cauliflower are grown from September to December.
- ➔ Crops like Chillies, Capsicum, Cowpea, Brinjal and Okra are grown from December to May.



Raised bed with coconut husk



Vegetables on raised bed

Capital Investment

Rs.18, 981/- for 1153 m²

Net Returns

Total income/year/ha*: Rs.30000/- approx
* Please note the income may vary depending upon the vegetable crops taken in beds

Beneficiaries

Island farmers

Advantages of the Technology

The areas close to the sea or low lands get flooded during heavy rains are left fallow. These lands can be effectively converted into cultivable land by the raised bed method, which helps to overcome the stress of heavy rainfall.

Risks Involved

Crop failure due to aberrant weather conditions

Black Pepper cultivation on hedge rows and *Gliricidia* standards

Description of Technology

Farmers of Andaman and Nicobar Islands are growers of organic spices including black pepper. A total of 29,000 ha (25,000 ha coconut + 4000 ha arecanut) of arable land (50,000 ha) in the islands are under plantation crops which provides suitable environment for the spice production. In addition 3000 ha sloppy lands are under vegetable cultivation. If one fourth of the area under plantation and sloppy lands are utilized for organic cultivation of black pepper, it is estimated to produce 2020 mt annually. The two technologies developed for black pepper cultivation are (i) Design of double hedgerows technology of black pepper cultivation and (ii) Design of black pepper cultivation on *Gliricidia* standards in homegarden/ coconut plantation.

Equipments/Raw Materials

- *Gliricidia* stem cuttings
- Black pepper rooted cuttings
- Seeds of maize and okra

Space Required:

Between Coconut and Arecanut plantations

Protocol

- Pits are made and *Gliricidia* stem cuttings are planted in double row system at 0.5 x 1.0m. The distance between two double hedge rows is maintained to be 6m.
- Black pepper rooted cuttings are also planted along with *Gliricidia*.
- Periodical pruning of hedge rows are done followed by spraying of 1% Bordeaux mixture
- Cultivation of maize and okra are done in between the space available between two double hedge row systems.



Capital Investment:

Rs.67, 760/- for 6 yrs.

Net Returns

Cumulative income for 6 yrs - Rs. 3, 32,740/-

Beneficiaries

Island farmers

Advantages of the Technology

Gliricidia hedge rows system makes the cultivation of black pepper efficiently.

Risks Involved

Quick wilt disease of black pepper

Cultivation of *Morinda citrifolia* in challenge situation

Description of Technology

Morinda citrifolia L. (noni) a dwarf, perennial shrub, capable of yielding upto 40-50 years, grows slowly during first six months and starts commercial production from third year. The plant was looked upon by many during distress and disease. Thus the noni plant got a signified place of honour in several cultures making it divine entity among them. The plant for its beneficial effects for mankind was known for millenniums but recently steps are taken to popularize and commercially exploit the underutilized shrub.

Equipments/Raw Materials

- Quality planting materials
- Farm Yard Manure
- Compost
- Vermicompost
- Neem cake powder along with *Pseudomonas*, *Trichoderma*, and *Azotobacter*.

Space Required

Owned/rented space of approximately 1 acre

Protocol

- Standard package and practices available with the Institute. Specific recommendation can be shared on demand.

Capital Investment

Rs. 55000/-

Net returns

15000/- (3rd year)

Beneficiaries

Entrepreneurs like

- Health India Laboratories, Chennai
- Andaman Plantations, Port Blair
- Infratech, Real estate Pvt. Ltd, Port Blair



Advantages of the Technology

- Noni grows well in salt affected/ unfertile/ wasteland/ shady area intercropped with coconut and areca nut in the Islands.
- Noni cultivation has gained significance as it thrives well in the adverse conditions.

Risks involved

Excess sea water during high tides may damage soil mounts in salt affected area, which may in turn affect the cultivation of Noni.

Orchids in coconut shell

Description of Technology

Orchids are mostly popular for their tremendous long vase life with fascinated colours. The islands have a large area (25000 ha) under coconut plantations and about 90 million nuts are produced annually. The coconut shell with growing media of broken bricks, charcoal, coconut husk in 1:1:2 ratio and with proper provision for drainage has been used successfully to grow tropical orchids viz *Cymbidium bicolor*, *Dendrobium crumenatum*, *Dendrobium formosum* and *Oberonia iridifolia*.

Equipments/Raw Materials

- Dried coconut shell
- Disease free kekis
- Growing media

Space Required:

No additional space is required

Protocol

- Cultural tips of orchids are planted in coconut shells.
- The coconut shells are kept or used as hanging pots under optimum conditions like light, air and humidity.
- The propagation of the orchids in coconut shells is mainly through division.
- The coconut shell contains media of broken bricks + charcoal + coconut husk. Fertilizers like NPK is also added in the ratio 30:10:10 kg/ha.
- The growth of the orchid in coconut shell is monitored regularly after planting with proper ventilation, removal of weed growth, removal of decayed or dried parts and watering twice in a week during dry period.



Capital Investment

Rs 20 per hanging pot

Net Returns

Rs. 30- 40 per hanging bunch per pot

Beneficiaries

Entrepreneurs & Garden lovers

Advantages of the Technology

The coconut shells which are available in plenty in the islands are wasted without any use, which can be utilized as hanging pots after varnishing it, which enhances beauty, and prolongs life.

Risks Involved

The heavy sun light and intense rains may damage quality of flowers

Backyard farming of Nicobari Fowl and Dual - Purpose poultry (Nishibari and Nicorock)

Description of Technology

Nicobari fowl locally known as “Takniet” means short legged is a scavenging bird particularly found in Nicobar group of islands. There are three strains of Nicobari fowl viz. black, brown and white. Nicobari fowl can survive well on kitchen waste, coconut grating, insects, pests, wild seeds, grains, grasses and other vegetations. The birds can also be reared under backyard system using indigenously shelter and deep litter system of management.



Equipments/ Raw materials

- Chicks
- Breeder flock
- Poultry shed

Space Required

- 1 sq.ft / bird under intensive management
- Free range under extensive management

Protocol

- Cross breeding between Black Rock & Black Nicobari for Nicorock in pen mating.
- Cross breeding of Brown Nicobari with White leghorn for Nishibari under pen mating.

Capital Investment

Rs. 1, 00,000 for 100 birds

Net Returns

Rs. 45,000 per year

Beneficiaries

Island farmers & Entrepreneurs



Advantages of the Technology

- Unique feature of this indigenous bird is disease resistance character against common poultry diseases.
- These improved varieties are high egg producers.
- The meat is sold at Rs. 120 per kg and egg is sold at Rs. 6 - 7 per egg which fetches more money to the farmers.

Risks Involved

Outbreak of major poultry disease

Azolla as a feed supplement for backyard poultry

Description of Technology

Azolla is a free floating water fern used as a sustainable feed substitute for livestock and backyard poultry. Azolla can be grown and cultivable under this island ecosystem. Its nutritive value showed the feasibility of its utilization as a feed supplement for livestock and poultry.

Equipments/ Raw materials:

- Silpauline sheets
- Cow dung
- Mineral Mixture
- Azolla seedlings

Space Required:

150 sq.ft. pit for feeding 20 birds

Protocol

- An artificial pond made of silpauline sheets of 2.6 m by 1.6 m is used to grow azolla.
- Initially a pit of 2 m long, 1 m width and 20 cm deep is dug under a tree shade.
- The pit is first covered by used plastic sacks in order to prevent the growth of the roots of trees nearby, which may puncture the silpauline sheets. The silpauline sheet is laid over the pit avoiding any folds.
- About 10 to 15 kg of soil is uniformly spread over the sheet.
- One kg of cowdung mixed in 10 litres of water is poured over it.
- Powdered rock phosphate should be added along with the cow dung slurry at a rate of 10 to 20 g per pit.
- Water is poured into the pond to a depth of 10 cm.
- Then 0.5 to 1 kg of Azolla is inoculated in the pond.
- In about 10 to 15 days, azolla will fill up the pond, and daily 0.5 to 1 kg fresh azolla can be harvested thereafter.



- After harvesting, the fresh azolla should be washed thoroughly to get rid of cow dung smell. The cleaned azolla can be mixed with commercial feed, and the mixture can be directly fed to poultry

Capital Investment:

Nil

Net Returns

10-50 paisa savings in feed cost per bird

Beneficiaries

Island farmers

Advantages of the Technology:

Simple and low cost technology

Risks Involved

- Pest and Disease
- Run off during heavy rainfall in an unprotected raised sides

Boer cross Goat

Description of Technology

Boer cross (Andaman local goat x Boer goat) goat was successfully produced through Artificial Insemination technology. The performance evaluation experiment showed successful adaptability of the new cross bred to the island ecosystem and higher body weight gain (20-40%) than the native goats at the marketable age (12 months). The performance of the upgraded goat is satisfactory. The current technology has brightened the prospects for better economic viability of goat farming and mutton availability in these Islands and created high demand for good meat breeds among the Island farmers. CARI released and distributed boer cross bred goat to the farmers and entrepreneurs of this island for improving the livelihood / employment generation through participatory evaluation mode.



Equipments/Raw Materials

- Frozen semen straw
- Liquid nitrogen container
- A.I. gun
- A.I. sheath
- Hormones/ medicines

Space required

10-20 sq. ft / goat

Protocol

- Artificial insemination using frozen semen technology during natural or induced heat in desi goats.

Capital Investment

Total investment in 25 months is Rs. 270200

Net Returns

After 25 months the net profit is Rs. 8815 with cash return of Rs. 279015

Beneficiaries

Island farmers, Entrepreneurs

Advantages of the Technology

- More kidding rate (twins)
- Higher body weight(20-40%) than local goats
- Higher market value

Risks Involved

- Outbreak of disease

MAT nursery

Description of Technology

MAT nursery would be appropriate for raising of rice nursery in high rainfall areas. The seedlings forms mat, pulling out of seedlings, rolling and transportation is easy and less time consuming compared to traditional method.

Equipments/Raw Materials

- Polythene sheet
- Hand hoe
- Wooden poles
- Seeds
- Farm Yard Manure (FYM)
- Urea solution

Space required

100 m² nursery per ha

Protocol

- A thin polythene sheet is to be evenly spread on the even surface.
- Locally available stem portion of Arecanut is to be used to form the small squares. Mixture of soil and FYM was filled over the frames.
- Compaction is to be given through wooden planks.
- Seeds are to be sown @ 75 g / m².
- After sowing seeds are to be covered with thin layer of dry Farm Yard Manure.
- In order to protect the seeds from the birds and rainfall, the frames must be covered with polythene cover for 2 days.
- Watering is to be given in the evening using rose can water.
- On 8th DAS, depending upon the nutrient requirement judged through Leaf Colour Chart (LCC), 0.5 % urea solution is to be



sprinkled using the rose cane in the evening.

- Healthy and robust seedlings are ready by 14th day after sowing for transplanting.

Capital Investment

Rs.1566/-

Net Returns

In the form of savings on land (300m² area), labour and input cost up to the tune of Rs.5000/- as compared to conventional method of wet nursery.

Beneficiaries

Rice farmers

Advantages of the Technology

- It helps the farmers to save time, space and money.
- It can be given freely to farmers to improve the productivity.

Risks Involved

Likely damage if not protected from heavy rains for the first 5 DAS

System of rice intensification

Description of Technology

System of Rice Intensification (SRI) aims to reduce the number of seedling required to plant but gives maximum care during the growth and development. This is input intensive technology with one seedling per hill, spacing of 25 x 25 cm and 14 day old seedlings are transplanted. The critical stage is the first 20 days of transplanting. Since, bay islands receives higher intensity rainfall, single seedling might get damaged due to continuous rainfall.

Equipments/Raw Materials

- Land
- Tractor or power tiller
- 14 day old Rice Seedlings
- Farm Yard Manure (FYM) or compost
- Urea, SSP or DAP and MOP
- Water
- Need based Pesticides
- Sickle
- Thresher

Space Required

Any available space suitable for rice cultivation.

Protocol

- Raising seedlings by mat nursery method in an area of 1000sq.ft for transplanting 1 ha main field.
- Land preparation. Land leveling, providing drainage channels, making plots, addition of FYM (6 t/ha) & its incorporation
- Transplanting of 10 - 14 day old seedlings at a spacing of 25 x 25cm
- Weed management with Cono Weeder as and when required.



- Excess water should be drained and only 2.5cm water should be maintained from panicle initiation stage until maturity
- Pest management as and when required.
- Harvest & threshing.**Capital Investment:** Only recurring costs of inputs like seed, labour, manure, fertilizer, pesticides etc.

Net Returns

Rs.5000 to 10000.

Beneficiaries

Rice farmers.

Advantages of the technology

- The SRI method outperforms the normal planting in terms of yield attributes and root growth.
- An increase in straw yield by 30 to 45 %, labour productivity increased by 43%, with net returns increase by 67%.
- Resistance to lodging due to storms
- Saving on seed cost as the seed requirement is less

Risks Involved

Likely damage of seedlings by heavy intensive rainfall during first 20 days after transplanting.

Integrated farming system for various Micro farming situations

Description of Technology

There are three situation viz., Hilly (MFS I), Slopping hilly upland (MFS II), Medium upland valley (MFS III) & Low lying valley (MFS IV). Component analysis of Integrated Farming System under various resource conditions (hilly, slopping hilly upland, Medium valley and low lying valley) indicates that cropping contributed more to net returns (69 to 83 %) in hilly and slopping hilly uplands where as livestock components (Cattle, poultry & fish) contributed more to net returns (49 to 66 %) in medium upland valley and low lying valley areas.

Equipments/Raw Materials

- MFS I - Plantation based cropping sequences, backyard poultry and livestock
- MFS II - Short & medium duration paddy, vegetables, floriculture, plantations, fodder, backyard poultry, goat, fish cum poultry cum duck, and cattle
- MFS III - Vegetables, plantations, backyard poultry, fish cum poultry cum duck
- MFS IV - Long and short duration paddy, vegetables, backyard poultry, fish cum poultry and cattle.

Space Required

Model developed for one hectare area and can be replicated with available land at farmer's field.

Protocol

Vary depending on the component selection and its integration.



Capital investment:

Rs. 45000 to 1.5 lakhs/ha depending on farming situation and component integration.

Net Returns

Rs.45000 to 1.5 lakhs/ha/annum depending on farming situation and component integration.

Beneficiaries

Small and medium farmers

Advantages of the Technology

- It helps the farmers to effectively and efficiently utilize their resources for profit maximization.
- Increased productivity
- Nutritional security

Risks Involved

Nil

Broad Bed and Furrow system

Description of Technology

The technology involves making of broad beds and furrows alternatively to provide drainage and standing water to the required crop viz., vegetables and rice respectively. Land manipulation made once can be kept permanently. BBF provides opportunity for better growing conditions for vegetables as they are grown on the raised beds.

Equipments/Raw Materials:

Hitachi for land shaping. Other inputs based on crop selection in beds.

Space Required

Minimum 2000m²

Protocol

- Beds of 4-5 m wide and furrows of 6-7 m wide are made for BBF system of cultivation
- In one hectare area, 10 beds (100 X 4 m) and 10 furrows (100 X 6 m) can be made
- Divides the land to 0.6: 0.40 for rice and vegetables
- Cultivation of vegetables in beds based on season
- Rice and fish in furrows

Capital Investment

Rs.80000 to 1.0 lakhs /ha for land shaping.

Net Returns

Rs.1.5 to 2.0 lakhs/ha/annum depending on crops grown in the beds.

Beneficiaries

Farmers of having waterlogged and flat valley lands.



Advantages of the technology

- The present cropping intensity of 100 to 125 % in rice area can be increased to 300 % in the beds and 200 % in the furrows by adopting BBF land manipulation.
- It helps the farmers to effectively and efficiently utilize their resources for profit maximization.

Risks Involved

Heavy rainfall during initial stages like germination to seedling stage may cause damage to the vegetables.

Dhaincha intercropping in wet seeded rice

Description of Technology

Due to the fast changing scenario of rice production and marketing, farmers are encountering the problem of low returns from rice cultivation. One way is to reduce the cost of production while maintaining productivity at same level. Intercropping of green manures could be a viable strategy to counter the problem of heavy infestation of weeds in wet seeded rice. *S. aculeata* (dhaincha) and *S. rostrata* can be recommended for intercropping in wet seeded rice under island conditions. Among the two green manures, *dhaincha* is best suited in farmer's field.

Equipments/Raw materials

Dhaincha seed at the rate of 40 to 45 kg/ha.

Space required

Grown as intercrop in rice paddy in alternate rows.

Protocol

- Sow the dhaincha seed in alternate rows of rice
- Rice to rice row spacing is 25 cm with dhaincha in between
- Incorporate dhaincha when it attains 40 cm height i.e 27 to 35 days after sowing



Capital investment

Nil

Net returns

Rs. 2500 to Rs.3000 ha⁻¹ depending upon the local wages, soil type etc.

Beneficiaries

Rice grower

Advantages of the technology

Avoidance of separate cultivation of green manure, rice nursery and of transplanting.

Risks involved

Nil

Biomass fired dryer

Description of Technology (Product)

A mechanical dryer with capacity of 1000 coconuts per batch was designed and fabricated using MS frame (2.4 m x 1.2 m x 1.7 m). The drying bed made of M.S bar grill kept at a height of 1.20 m above the ground level. A cylindrical shape heat exchanger was designed and fabricated using a 20 gauge metal sheet. The combustion chamber (2.5 m diameter) is made of 2 mm thick M.S. sheet. Two galvanized pipes have been connected at upper and lower side with combustion and drying chambers. A door is provided for loading and unloading of fuel. Four wheels have been provided at the base of frame for easy transport. Drying took 20 hours from an initial moisture content of 50% to a final moisture content of 6.0% of coconut.

Equipments/Raw materials

Coconut husk or any biomass

Space required

Not applicable

Protocol

Not applicable

Capital investment

Rs.30, 000 - 50,000 for each unit.



Net returns

Using biomass fired copra dryer, the drying time is 50% less than natural sun drying in addition to making good quality copra. It helps in saving time, manpower and energy through use of coconut shell as fuel, thereby enhancing the net return to the farmers.

Beneficiaries

Coconut growers

Advantages of the technology

The locally available biomass may be efficiently utilized as fuel for drying, and thereby enhancing net return to the farmers.

Risks involved

There are chances of accidental fire if no proper supervision during drying process

Coconut dehusker

Description of Technology (Product)

Pedal and hand operated coconut dehusker have been ergonomically designed with aim to easy to operate by an unskilled farmer/farm women. The performance of CARI designed pedal, hand operated dehusker and local tool was evaluated with different sizes of nuts at 12.5% moisture content. The dehusking capacity of dehusker was 125, 72 and 180 nuts/hr respectively for CARI pedal operated, CARI hand operated dehusker and local tool 'sabbal'. In case of CARI dehusker the height can be adjusted as per operator's requirement. It was observed that the bending cycle stress /pain was experienced after dehusking of 80-90 nuts by 'sabbal', 120-130 nuts by CARI hand operated and 150-160 nuts by pedal operated due to picking up of nuts at ground.

Equipments/Raw materials

It is a product manufactured or fabricated.

Space required

Not applicable

Protocol

Not applicable

Capital investment

Rs. 1000 to 1600 for each unit.



Net returns

In terms of reduced drudgery during dehusking of nuts.

Beneficiaries

Coconut growers.

Advantages of the Technology

It helps the farmers to dehusk with less pain and time.

Risks Involved

Nil

Captive seed production of damsel fish

Description of Technology

The reef waters of A & N Islands harbors a variety of exportable and valuable ornamental fishes. Due to high demand of ornamental fishes, in USA, E.U. & Japan, ornamental fish breeding unit can be a profitable business proposal. The technology can be initiated with initial smaller scale with an area of 0.1 ha. The business can be initiated with an amount of 1.5 lakhs for production of 4000 -5000 seed per year

Equipments/Raw Materials

- Hatchery shed (2.5 x 2 x 1) m each
- Glass aquariums with lids and fittings 10 numbers
- Rearing area with FRP tanks (3x 1.0 t)
- Aerators/ blowers (2 nos)
- Other equipments like hand net, buckets, pipes

Space Required

- Hatchery : Brooder tanks and associated paraphernalia = 400 m²
- Rearing tanks : FRP tanks and aeration system with algal tanks and rotifer tanks = 600m²

Protocol

- The required species of anemone fishes (both male and female) are collected from the wild.
- The environmental conditions in the wild are simulated in the lab and the fishes are allowed to form breeding pairs in the cement or FRP cistern.
- Brooders that have formed pairs are transferred along with an anemone into a glass aquarium for spawning.
- The eggs hatch out after about 6 days of incubation and the larvae are maintained in the aquarium provided with nutritious diet.
- After 25-30 days the larvae are suitable for selling.



Capital Investment:

Rs. 1, 65,000

Net returns

Rs. 1, 06,000*

* Income may vary depending upon the rate and market of ornamental fishes

Beneficiaries

Unemployed youth, Tsunami affected farmers, Private entrepreneurs

Advantages of the technology

- Due to high demand of ornamental fishes, in USA, E.U. & Japan. This business can be started as a high profit business.
- Employment generation to rural youth
- Rehabilitation of Tsunami affected people
- Source of foreign exchange

Risks involved

Islands have regulations restricting live germplasm movement; hence hatchery produced marine ornamental fish juveniles cannot be sold outside the islands

Mud crab culture

Description of Technology

The present technology can be suitable in brackishwater areas where water level can be maintained around 75 cm. Grow-out ponds can be constructed in tidefed estuaries, backwaters and creeks. The crab ponds can also be established in traditional fish/ shrimp farms, by converting one portion adjoining the brackishwater canal, which would help increase the overall income of traditional fish/ shrimp farmers. A 2 feet high bamboo fencing on the bund is essential to prevent escape of crabs from the pond. A pond of 0.1 ha area can be used for mud crab culture. With 500 nos /ha stocking density of 50-60g size crab for a period of six months, about 780kg/ ha production can be achieved.

Equipments/Raw Materials

- pH meter
- Weighing balance

Space Required:

0.1 Hectare

Protocol

- Mud crab juveniles of 50-60 g are stocked at 500 no. per hectare.
- In the initial 3 months they are fed at 10% body weight with trash fish/chicken offal in bamboo enclosed ponds.
- For the following three months they are fed at 5-6% body weight with trash fish/chicken offal.
- A harvest of 60% of the stock with average body weight of 260g is obtained with a total yield of 780kg/ha.

Capital Investment

Rs.19, 000

Net returns

Rs. 2080 per culture from 0.1 hectare pond



Beneficiaries

Unemployed youth, Tsunami affected farmers, Private entrepreneurs

Advantages of the Technology

- Mud crabs can be cultured in brackish water ponds with suitable modification
- Culture of Mud crab can also be undertaken in places adjacent to mangrove areas or saline affected soils

Risks Involved

- Availability of uniform size Juvenal is the major problem in the crab culture practice.
- Crab is being exported from Andaman, however, water crab is rejected and fetch very low price. Hence, the present technology is having good potential especially for water crabs.

Small scale seed production and nursery raising of Indian Major Carps (IMC)

Description of Technology

IMC & Exotic cultivable fishes mature at 2+ years of age. Potential carp brooder ranges from 2-5 kg in weight. The breeding season starts in Andaman after south west monsoon and lasts for about 3½ months. In small scale hapa breeding operation, breeding and incubation are carried out in the brood stock pond itself. During a breeding season, three times nursery management can be repeated. Production from the last nursery pond can be raised in the nursery pond itself to become fingerling or yearling. These fingerling and yearling will give an additional income to the farmer.

Equipments/Raw Materials

- Brood stock and Nursery pond construction (using Soil excavator)
- Breeding hapa
- Incubation hapa set
- Conditioning hapa
- Spring balance
- Hand net
- Drag net
- Measuring cylinder, eyes glass syringe

Space Required:

3300 m³

Protocol

- Initially a span of 20 days is required to prepare the pond for breeding of IMC
- Yearlings are collected and stocked in the brood stock pond
- Proper feeding and regular monitoring for growth of the fishes are done till they mature (Usually takes about 2 years).
- Spawning of IMCs mainly occur during the months June - August followed by incubation.
- In the following 15 - 20 days the spawn grows to fry through nursery rearing, which also involves selling of fry.
- The growth from fry to fingerling takes 3 - 4 months. At this stage also the fingerling can be sold for rearing.



Capital Investment:

Rs. 2, 57,000/-

Net returns:

Rs. 1, 63,000 from second year onwards

Beneficiaries

- Few farmers in Andaman have already adopted the technology for seed production.
- At present there is severe scarcity of quality seed in Andaman and many times it is illegally imported from the main land. Hence this technology is having tremendous potential for farmers of Andaman.

Advantages of the technology

- Low cost technology with huge returns
- Establishment of a fish hatchery can generate self employment avenues and will also trigger the development of many subsidiary industries

Risks involved

- There is very good demand for fish seed and hence marketing will not be a problem
- This is a small scale operation and as there will be limited number of brooders, proper maintenance of brooders has to be done for getting good response
- Proper water depth and quality has to be maintained especially during summer months for successful breeding operation

Eulophia orchid

Description of Technology

Eulophia andamanensis is an endemic green orchid in bay Islands. When it is grown in pots, it should be kept in a lath house or in open under shade (55-60%) in suitable locations. It has been evaluated and identified for its potential as potted plants owing to its good quality and other features like long spikes with many green florets.

Equipments/Raw Materials

- Charcoal
- Coconut husk
- Leaf mould
- Organic matter
- Compost

Space Required

1000 m²

Protocol

- Initial propagation is done by division/separation of pseudobulbs
- Then the bulbs are grown in pots (size of pot should be proportionate to the size of pseudobulb)
- Planting is done during March to April
- Potting media comprising Charcoal + Coconut husk + leaf mould in equal parts is utilized (for bed, media should have adequate organic matter, leaf mould and compost)
- Inspection of media is done before watering as different media differ in their capacity to absorb and retain moisture
- Watering is done using a sprayer (Nozzle sprayer), as higher humidity needs to be maintained
- Spikes are harvested when they reach a maximum height of 90-100 cm
- Immediately after harvesting the basal part of spike is immersed in water



Capital investment

Rs. 40000/- per ha

Net returns

Rs. 50000- 60000 per ha per year

Beneficiaries

Entrepreneurs and nurseries

Advantages of the Technology:

Being a terrestrial orchid it can be grown in grounds covered with shade and can be grown in pots in open conditions.

Risks Involved:

Crop failure due to aberrant weather conditions.

Gladiolus

Description of Technology

Andaman and Nicobar Islands are emerging as one of the prominent tourist centers in the country for its scenic beauty and unique landscape. Most of the farmers were unaware about the technical knowhow and do how regarding the cultivation of gladiolus. Scientific cultivation of gladiolus including the complete package of practices stimulated the farming communities in adopting the cultivation in large scale.

Equipments/Raw Materials

- FYM/well rotted cattle dung manure
- Good quality bulbs
- Water for irrigation

Space Required

Owned/ rented space approximately 1 acre.

Protocol

- The field is prepared by thoroughly ploughing 30-40cm deep.
- Weeds are removed and the field is reploughed and leveled.
- Green manuring of the field is done for the mid and late season crop.
- FYM / well rotted cattle dung manure is applied to the extent of 50% of total quantity as basal dose.
- The crop is planted in Nov-Dec i.e. after post monsoon and subsequently irrigated with an interval of 10-15 days.
- Regular weeding and hoeing is also done.

Capital Investment

Rs. 3 lakhs per ha

Net returns

4.5 to 5 lakh per ha year



Beneficiaries

Entrepreneurs and nurseries

Advantages of the Technology

Due to influx of Indian and foreign tourists to these islands, there is a great demand of cut flowers from the hotels catering to the tourists.

Risks Involved

- The requirements of traditional and cut flowers are largely met by airlifting it from the mainland. These results in exorbitant cost of flowers because of the damages caused during the transport of highly perishable commodity and high flight charges.
- Crop failure due to aberrant weather conditions

West Indian Cherry

Description of Technology

West Indian cherry (Barbados cherry) is one of the richest source of ascorbic acid (6-8 times more than the recommended dose). Demonstration of scientific aspects of cultivation will motivate the farmers in adopting the technology on commercial scale.

Equipments/Raw Materials

- Quality planting materials
- FYM
- Fertilizers

Space Required

Limited space

Protocol

- Standard package and practices available with the Institute. Specific recommendation can be shared on demand.

Capital investment

Rs. 40000/-

Net returns

Rs. 20000/-

Beneficiaries

Island farmers



Advantages of the Technology

- West Indian cherry can satisfy daily requirement of Vitamin C of an adult.
- The acid fruits are made into preservatives like jam, candies, preserve (murabba).
- The fruit juice is used commercially to enrich other fruits, which are low in vitamin C.

Risks Involved

The fruit marketing and processing need to be improved.

Marigold

Description of Technology

Floriculture industry has proved to be a highly profitable agro-business generating maximum returns per unit area. Many farmers grow it in small areas in their homesteads due to lack of technical knowhow and do how. Scientific cultivation of marigold by adopting improved varieties viz CO-1, Namdhari marigold, Pusa Narangi, pinching of terminal leaves for better growth and yield has encouraged the farmers in opting the scientific cultivation of marigold in large scale in the islands.

Equipments/Raw Materials

- Quality seeds
- Manures and fertilizer
- Manpower
- Water supply for irrigation

Space Required: Owned/ rented space as per availability

Protocol

- Initially Sandy loam is prepared.
- The propagation of marigold is done both through seeds as well as stem cuttings
- Seedlings are raised in open field with shade
- One month old seedlings along with the stem cuttings are transplanted to a field with spacing of 50 cm x 50 cm
- NPK is added in the ratio of 100 : 200 :100 kg/ha & FYM 15 tones/ha
- Irrigation is done once in 4-5 days during dry period with regular weeding
- Pinching is done after 30-40 days of transplanting
- The flower is harvested and packed in cloth, poly bags or baskets and sold in the local market



Capital Investment

Rs 70,700 per ha

Net returns

80000-90000 per ha

Beneficiaries

Nurseries and Garden lovers

Advantages of the technology

- Marigold gained popularity amongst the farmers and flower dealers on account of its easy culture, wide adaptability and good keeping quality.
- Marigold fetches high prices in the local market.

Risks Involved

The heavy rains may damage the crops, so, protected structures may be used during rainy

Tuberose

Description of Technology

Tuberose as cut flower mainly imported from mainland market leads to exorbitant price in the local market due to huge expenses involved in air cargo. As tuberose fetches high prices in the local market many farmers grow it in small areas in their homesteads due to lack of technical knowhow and do how. Scientific cultivation of tuberose by selection of good quality planting materials of improved varieties viz Kolkata double and Shringar (single) and planting at appropriate time from Nov- Dec encouraged the farmers in systematic cultivation of tuberose on large scale basis in south Andaman district.

Equipments/Raw Materials

- Disease free bulbs
- Manures and fertilizer
- Manpower
- Water supply for irrigation

Space Required

Owned/ rented space as per availability

Protocol

- Standard package and practices available with the Institute. Specific recommendation can be shared on demand.

Capital investment

Rs. 60000 per ha

Net returns

Rs. 70000-80000 per ha



Beneficiaries

Nurseries and Garden lovers

Advantages of the technology

Tuberose occupies a prime position because of its importance as cut flower, loose flower and its profitable cultivation due to lesser incidence of pest and disease and low input requirement.

Risks involved

Crop failure due to aberrant weather conditions

Oyster Mushroom

Description of Technology

Oyster mushroom cultivation is simple, requires less materials time, labour and investment in comparison to button mushrooms. Its cultivation can be started with very low investments in home gardens or as homestead project. The main and most important ingredient for mushroom cultivation is good quality spawn which can be obtained/procured from research laboratories/government organization/reputed spawn production unit dealing in spawn production.

Equipments/Raw Materials

- Wooden or bamboo racks measuring (2m x 1m x 2m)
- Chopped paddy straw (dry) 1.5kg/bag
- Spawn 1 bottle or packet of 250 g
- Chaff cutter - 1
- Punch Machine - 1
- Sprayer -1 (1 liter capacity or more)
- Pesticides Dithane Z-78, Malathion, Kelthane
- Water Boiling Drum and Wire cage 1 and fire wood or any other energy source for boiling the water

Space Required

- Cropping room or thatched house (6m x 5m x 1 Nos) covering area 30 m² with concrete or soil stuffed with pebbles sand floor and, door and window fitted with net (45 mesh).

Protocol

- Chop (about 5 cm long) good quality paddy straw (with a hand- chopper/ chaff cutter).
- Soak the straw in cold water for at least 30 minutes or overnight.
- Take out soaked substrate from cold water and sterilize in boiling water for 15-20 minutes.
- Remove the straw from the boiling water and allow cooling. Squeeze out the excess water.



- Punch holes at 6” intervals in the polythene bags and disinfect with dettol solution (1 table spoon to ½ liter of water) / 4% formaldehyde solution (dilute 1 part with 9 part of water).
- Break the spawn into small bits with a clean stick and put some bits in the bottom of polythene bag.
- Spawning should be done by filling the bags with substrate and spawn @ 2-3% uniformly in 4-5 layers by pressing it with hand and distribute the spawn bits uniformly over the layer. One bottle/ packet of 250 g spawn is sufficient for spawning 10 bags (one kg).
- Place the spawned bags in spawn run room having diffused light. White thread-like fungal growth can be seen originating from spawn-grains inside the bags. The spawn run incomplete with 15 days.
- Than the polythene cover is carefully remove after complete spawn run and placed on bamboo shelf/racks in a well ventilated room and safe from rats.
- Spraying of water should be regularly being done to keep the cropping room moist.
- Within 3-4 days after opening of bags, small mushrooms can be seen which become ready for harvest in another 3-4 days.
- About 1-1.5kg of fresh mushroom can be harvested from one bag.
- Spray regularly with water, and if needed Cythion @ 2g /litre of water or Bavistin @ 1g/litre of water till pin-heads (small mushrooms) are visible.

- After 5-7 days the fruits will be ready for harvest. Harvest matured fruits carefully and gently.
- Use a perforated polythene bag for packing and marketing or storing for 2-3 days. Otherwise dry the fruits fully in sun and store in sealed polythene bags.



Capital Investment

The total investment in 12 months is Rs. 59000/-

Net Returns

Rs. 49000/- from 2nd year onwards

Beneficiaries

Island farmers

Advantages of the Technology

- Oyster mushroom cultivation is simple, requires less materials time, labour and investment in comparison to button mushrooms.
- Its cultivation can be started with very low investments in home gardens or as homestead project.

Risks Involved

Chances of contamination if not maintained properly with high standards of sanitation and sterilization of substrate and cropping room.



Central Agricultural Research Institute

(Indian Council of Agricultural Research)

Post Box No# 181

Port Blair -744 101

Andaman & Nicobar Islands

Phone: 03192- 250341

Email : mail@cari.res.in; cari@and.nic.in