TECHNOLOGY MANUAL

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INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)

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ICAR-Central Island Agricultural Research Institute
Port Blair- 744 105, Andaman and Nicobar Islands, India

TECHNOLOGY MANUAL

Edited by

A. Kundu
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INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)
ICAR-CENTRAL ISLAND AGRICULTURAL RESEARCH INSTITUTE
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FOREWORD

The Andaman and Nicobar Islands are blessed with a distinctive tropical ecosystem, which comprises of a mixed flora and fauna of Indian, Myanmarese, Malaysian origin. It characterizes one of the biodiversity hotspots in India. The favourable climatic condition in Bay Islands offers great opportunity for cultivation of various Agri-horti crops, rearing of livestock, fishing and marketing of fisheries products. Therefore there is a vital need to protect the Island resources as it plays a vital role against rural poverty, hunger, malnutrition and environmental degradation.

The Central Island Agricultural Research Institute (CIARI), an ICAR unit for A & N Islands was established on 23rd June 1978 by merging different Regional Research Stations of the ICAR Institutes viz., Central Marine Fisheries Research Institute, Indian Veterinary Research Institute, Indian Agricultural Research Institute and Central Plantation Crops Research Institute. The Institute has developed many technologies for enhancing the productivity and production of crops, livestock and fishery through adoptive and basic research for the livelihood security of local farmers.

The Institute is unique in ICAR system which is engaged in multidisciplinary research, benefiting island ecosystem. The research activities are carried out under five divisions viz., Natural Resource Management, Horticulture & Forestry, Field Crops, Fisheries Science, Animal Science and one Social Science Section. The Major aim of the Institute is to enhance productivity through characterization and conservation of Island genetic resources, development of genetically superior varieties/breeds, systems approach in Island farming, development of climate resilient agricultural technologies suitable for the agro-ecological conditions of these Islands and effective management of post-harvest losses. The effective transfer of technologies would help to achieve self-sufficiency in major food items, particularly the perishable commodities and to ensure nutritional and livelihood security to the Island farmers/ fishers/farm women especially the tribal farmers of the Nicobar group of Islands.

The introduction of new cultivated species, improved varieties of crop is a technology aimed at enhancing plant productivity, quality, health and nutritional value and building crop resilience to diseases, pest organisms and environmental stresses and reducing environmental pollution. Sustainable agricultural practices are

intended to protect the environment, expand the Island's natural resource resources, and maintain and improve soil fertility. It enhances quality of life for farm families and communities and increase production for human food and fibre needs.

In this book all the new technologies, resistant varieties of rice, coconut, fruits crops, flower crops, horticultural crops and plantation crops, superior breeds of pig, goat, fowl, cattle developed by ICAR-CIARI are document for the knowledge and benefits of Island farmers, stakeholders and scientists etc.

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Plant Varieties Developed

RICE

1. Technology: CARI Dhan 1

Scientists associated in developing technology

Asit B. Mandal, T. V. R. S. Sharma, P. K. Singh and R. C. Srivastava

- **Technology description**

  It is a medium duration variety which matures in about 122-125 days with plant height of 115 cm, with 7-8 panicle bearing tillers. It gives 4.0-4.5 t/ha yield in normal soils of Andaman and Nicobar Islands (ANI) and possesses long medium grains. It is moderately resistant to sheath blight, bacterial blight, leaf spot and tolerant to stem borer and water logging. It has been released by State Variety Release Committee, Andaman and Nicobar Administration in 2009.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A&N Islands and fits well in rice - vegetable cropping system of Islands.

- **Benefit**

  It has medium slender grains, medium duration and gives 10-15% more yield (4-4.5 t/ha) compared to local check varieties.

2. Technology: CARI Dhan 2

Scientists associated in developing technology

Asit B. Mandal, T. V. R. S. Sharma, P. K. Singh and R. C. Srivastava

- **Technology description**

  It is medium duration (120 days) variety and has medium slender grains and plant height of 110-125 cm. It bears 7 to 8 effective tillers/plant and has panicle length of 25 cm. It gives yield from 5.0 to 5.5 t/ha in lowland rainfed conditions in coastal areas. It is resistant to sheath blight, leaf spot and tolerant to water logging. It has been released by State Variety Release Committee, Andaman and Nicobar Administration in 2009.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A&N Islands and fits well in rice - vegetable cropping system of Islands.

- **Benefit**

  It is medium slender grain, medium duration variety which gives 15-20% more yield (5-5.5 t/ha) compared to local check varieties.

3. Technology: CARI Dhan 3

Scientists associated in developing technology

Asit B. Mandal, T. V. R. S. Sharma, P. K. Singh and R. C. Srivastava

- **Technology description**

  It is a medium statured (115 cm) variety having medium duration (120 days). It bears 7-8 tillers per plant with panicle length of 26 cm. Its yield ranges from 4.5 to 5 t/ha. It has medium slender fine grains and resistant to sheath and bacterial blight and tolerant to stem borer and water logging. It has been released by State Variety Release Committee, Andaman and Nicobar Administration in 2009.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A&N Islands and fits well in rice - vegetable cropping system of Islands.

- **Benefit**

  It is medium slender grained and medium duration variety. This gives 10-15% more yield (4.5–5.0 t/ha) compared to local check varieties.

4. Technology: CARI Dhan 4

Scientists associated in developing technology

Asit B. Mandal, T. V. R. S. Sharma, P. K. Singh and R. C. Srivastava

- **Technology description**

  It is a long duration (140 days) and salt tolerant variety. It has intermediate stature (120 cm) with 6-8 tillers per plant and panicle length of 25 cm. It gives yield of about 4.5 - 5 t/ha in normal soils and about 3.2 t/ha in moderately saline conditions under island conditions. It is resistant to sheath blight and leaf spot. It has been released by State Variety Release Committee, Andaman and Nicobar Administration in 2009.

- **Subject Area/ Industry (in which it used)**:

  It is suitable for coastal saline soils of A&N Islands.

- **Benefit**

  It has medium bold grains, long duration and gives 20-25% more yield (3-3.2 t/ ha) compared to local check varieties in coastal saline soils.

5. Technology: CARI Dhan 5

Scientists associated in developing technology

Asit B. Mandal, T. V. R. S. Sharma, P. K. Singh and R. C. Srivastava

- **Technology description**

  It is a long duration (150 days) variety for saline soils with short stature (95.5 cm) and higher yield. It bears 9-10 tillers per plant with panicle length of 24 cm. Its grain yield ranges from 5.0 to 5.5 t/ha in normal soils and 3.2 to 3.7 t/ha in saline soil conditions. Due to its higher yield and other favourable characters, this variety has become very popular among farmers of A&N Islands. It has been released by State Variety Release Committee, Andaman and Nicobar Administration in 2009.

- **Subject Area/ Industry (in which it used)**

  It is suitable for coastal saline soils of A & N Islands.

- **Benefit**

  It has medium bold grain, long duration variety and gives 20-25% more yield (3-3.2 t/ha) compared to local check varieties in coastal saline soils.

6. Technology: CIARI Dhan 6

Scientists associated in developing technology

P. K. Singh, Krishna Kumar, Ajanta Birah, R. K. Gautam, Naresh Kumar, T. V. R. S. Sharma, A. K. Singh, S. K. Zamir Ahmed and S. Dam Roy

- **Technology description**

  It is a medium duration (125 days), long slender grain, high yielding (5 to 5.5 t/ha) rice variety for rainfed low land conditions of Andaman and Nicobar Islands. It is short statured (100 cm) and bears 7-8 effective tillers (panicle bearing) per plant with panicle length of 24 cm. It is resistant to bacterial leaf blight disease which is number one disease of Andaman and Nicobar Islands. It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI, Port Blair in 2013.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A & N Islands and fits well in rice - vegetable cropping system of Islands.

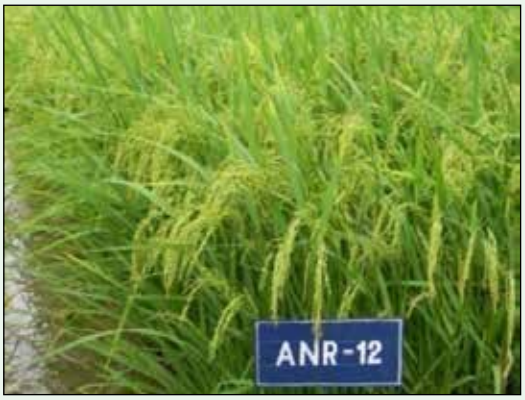
- **Benefit**

  It is long slender grain and medium duration rice variety. This gives 15-20% more yield (5-5.5 t/ha) as compared to local check varieties and resistant against bacterial leaf blight disease of rice.

7. Technology: CIARI Dhan 7

Scientists associated in developing technology

P.K. Singh, Krishna Kumar, Ajanta Birah, R.K. Gautam, Naresh Kumar, T.V.R.S. Sharma, A.K. Singh, S.K. Zamir Ahmed and S. Dam Roy



- **Technology description**

  It is medium duration (130 days), medium slender grains with higher yield (5 to 5.5 t/ha). It is resistant to bacterial leaf blight disease and is suitable for rainfed low land conditions of Andaman and Nicobar Islands. It is short statured (100 cm) and bears 6-7 tillers per plant with panicle length of 25cm. It is also resistant to lodging. It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI Port Blair in 2013.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A & N Islands and fits well in rice - vegetable cropping system of Islands.

- **Benefit**

  It is a medium slender grain, medium duration variety which gives 18-20% more yield (5-5.5 t/ha) compared to local check varieties, and has resistance against bacterial leaf blight disease of rice.

8. Technology: CIARI Dhan 8

Scientists associated in developing technology

R. K. Gautam, P. K. Singh, A. K. Singh, S. K. Zamir Ahmed, K. Sakthivel and S. Dam Roy

- **Technology description**

  It is a long duration (215 days) high yielding, tall statured (188 cm), bears 6-7 tillers per plant, long panicle with low spikelet fertility, medium bold grains with yellow husk and good grain quality. It is suitable for low input management conditions and also gives good straw yield for fodder purpose. It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI Port Blair in 2014.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A & N Islands for late sowing.

- **Benefit**

  It is suitable for low input management conditions and also gives good straw yield for fodder purpose which gives 18-20% more yield (3.0 t/ha) compared to parent mixed variety C14-8.

9. Technology: CIARI Dhan 9

Scientists associated in developing technology

R. K. Gautam, P. K. Singh, A. K. Singh, S. K. Zamir Ahmed, K. Sakthivel and S. Dam Roy

- **Technology description**

  This is a long duration (216 days) high yielding, tall statured (200 cm), bears 6-7 tillers per plant, long panicle with low spikelet fertility, medium bold grains with brown husk and good grain quality. It is suitable for low input management conditions and also gives good straw yield for fodder purpose. It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI Port Blair in 2014.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A & N Islands for late sowing.

- **Benefit**

  It is suitable for low input management conditions and also gives good straw yield for fodder purpose which gives 20-24% more yield (3.5 t/ha) compared to parent mixed variety C14-8.

PULSES (GREEN GRAM/MUNG)

10. Technology: CIARI Mung 1

Scientists associated in developing technology

A. K. Singh, Krishan Kritania, R. K. Gautam, Sanjeev Gupta, G. P. Dixit, Naresh Kumar, P. K. Singh, Krishna Kumar, S. K. Zamir Ahmed and S. Dam Roy.

- **Technology description**

  This is medium duration (66-70 Days) variety with synchronous maturity (at 75-80% physiological maturity), high yielding, bold seeded, brown and long pods with more number of seeds per pod, medium statured variety, profuse branches, test weight (>5.42g) and appreciable field resistance to charcoal rot, powdery mildew and MYMV. It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI Port Blair in 2014.

- **Subject Area/ Industry (in which it used)**

  It is suitable for rainfed lowland ecosystem of A& N Islands for late sowing.

- **Benefit**

  Yield is 1.8 t/ha and the variety is resistant to charcoal rot, powdery mildew and MYMV.

11. Technology: CIARI Mung 2

Scientists associated in developing technology

A. K. Singh, R. K. Gautam, Khokan Mondal, Sanjeev Gupta, G. P. Dixit, Naresh Kumar, P. K. Singh, Krishna Kumar, S. K. Zamir Ahmed and S. Dam Roy

- **Technology description**

  This is medium duration (66-70 days) variety with synchronous maturity (at 80% physiological maturity), high yielding, bold seeded, black and long pods with more number of seeds per pod, medium statured variety, profuse branches, test weight (>5.06g) and appreciable field resistance to charcoal rot, powdery mildew and MYMV. It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI Port Blair in 2014.

- **Subject Area/ Industry (in which it used)**:

- **Benefit**

  Yield is1.6 t/ha and variety is resistant to charcoal rot, powdery mildew and MYMV.

12. Technology: CIARI Mung 3

Scientists associated in developing technology

A. K. Singh, R. K. Gautam, Prashant Mondal, Sanjeev Gupta, G. P. Dixit, Naresh Kumar, P. K. Singh, Krishna Kumar, S. K. Zamir Ahmed and S. Dam Roy

- **Technology description**

  This is medium duration (64-68 days) variety with synchronous maturity (at 80% physiological maturity), high yielding, medium seeded, black and long pods with more number of seeds per pod, medium statured variety, profuse branches, test weight (>4.9g) and appreciable field resistance to charcoal rot, powdery mildew, terminal drought and MYMV. This variety is suited for rice-fallow conditions. It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI Port Blair in 2014.

- **Subject Area/ Industry (in which it used)**:

- **Benefit**

  Yield is1.4 t/h and the variety is resistant to charcoal rot, powdery mildew and MYMV.

13. Technology: CIARI Mung 4

Scientists associated in developing technology

A. K. Singh, Sudhir Tirki, P. K. Singh, R. K. Gautam, Naresh Kumar,
T. P. Swarnam, T. Subramani, A. Velmurugan, S. K. Zamir Ahmed and S. Dam Roy

- **Technology description**

  This is a medium duration (61-70 days) variety, synchronous maturity (at 90 % physiological maturity), determinate plant type having high yield potential (1.92 t/ha), bold seeded, 100 seed weight (6.1-6.9 g), long pods (12.3 -15.6 cm), more number of seeds per pod (12-16), medium statured (59.2 -70.1 cm) variety with black pods, profuse branches (3.0-7.0) and appreciable field resistance to charcoal rot, powdery mildew prevailing in the Islands and mungbean yellow mosaic virus (MYMV).

- **Subject Area/ Industry (in which it used)**:

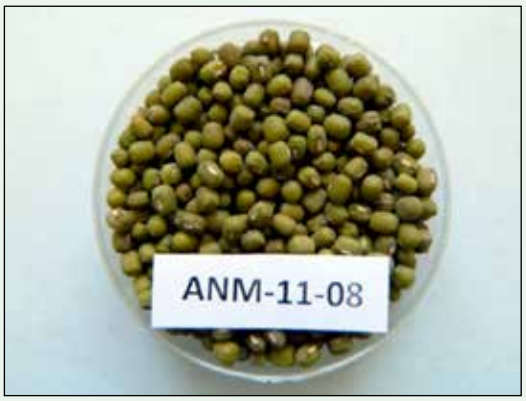
- **Benefit**

  Yield is 1.49 t/h and the variety is resistant to charcoal rot, powdery mildew and MYMV.

14. Technology: CIARI Mung 5

Scientists associated in developing technology

A. K. Singh, Niranjan Roy, P. K. Singh, R. K. Gautam, Naresh Kumar,
T. P. Swarnam, T. Subramani, A. Velmurugan, S. K. Zamir Ahmed and S. Dam Roy



- **Technology description**

  This is medium duration (58-69 Days) variety with synchronous maturity (at 85% physiological maturity), determinate plant type having high yielding potential (1.27 -1.94t/ha), medium seeded, 100 seed weight (4.2 -4.9 g), long pods (9-13 cm), more number of seeds per pod (10-14), medium statured (63-79 cm) variety with black pods, profuse branches (3-5) and appreciable field resistance to charcoal rot, powdery mildew prevailing in the Islands and mungbean yellow mosaic virus (MYMV).

- **Subject Area/ Industry (in which it used)**:

- **Benefit**

  Yield is 1.27 -1.94t/ha and the variety is resistant to charcoal rot, powdery mildew and MYMV.

PULSES (URD)

15. Technology: CIARI Urd 1

Scientists associated in developing technology

A. K. Singh, P. K. Singh, R. K. Gautam, Naresh Kumar, T. P. Swarnam, T. Subramani, A. Velmurugan, S. K. Zamir Ahmed and S. Dam Roy

- **Technology description**

  This is medium duration (62-70 days) variety with synchronous maturity(at 80% physiological maturity), indeterminate plant type having high yielding potential (9-13 q/ha), medium sized seeds, 100 seed weight (4.5-5.1 g), long pods (4.8-5.7 cm), more number of seeds per pod (5-8), medium statured (34-59 cm) variety with black pods, profuse branches (4-9) and appreciable field resistance to charcoal rot, leaf crinkle and powdery mildew diseases prevailing in the Islands and mung bean yellow mosaic virus (MYMV).

- **Subject Area/ Industry (in which it used)**:

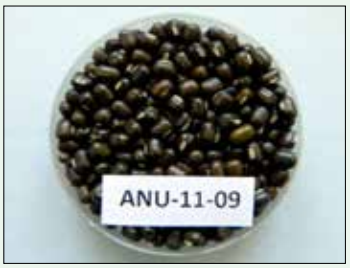
- **Benefit**

  It is high yielding variety and resistance to charcoal rot, leaf crinkle and powdery mildew diseases prevailing in the Islands and mung bean yellow mosaic virus (MYMV).

16. Technology: CIARI Urd 2

Scientists associated in developing technology

A. K. Singh, P. K. Singh, R. K. Gautam, Naresh Kumar, T. P. Swarnam, T. Subramani, A. Velmurugan, S. K. Zamir Ahmed and S. Dam Roy



- **Technology description**

  This is a medium duration (64-72 days) variety with synchronous maturity (at 80% physiological maturity), indeterminate plant type having high yield potential (9-14 q/ha), bold seeded, 100 seed weight (5.2-5.9g), long pods (5.3-5.7 cm), more number of seeds per pod (5-8), medium statured (37-73 cm) variety with black pods , profuse branches (4-8) and appreciable field resistance to charcoal rot, leaf crinkle and powdery mildew diseases prevailing in the Islands and mung bean yellow mosaic virus (MYMV).

- **Subject Area/ Industry (in which it used)**:

- **Benefit**

  It is high yielding variety and resistance to charcoal rot, leaf crinkle and powdery mildew diseases prevailing in the Islands and mung bean yellow mosaic virus (MYMV).

COCONUT

17. Technology: CARI- Annapurna

Scientists associated in developing technology

M. A. Suryanarayana, M. Sankaran, V. Damodaran, D. R. Singh, S. Dam Roy, T. Damodaran, R. P. Medhi, E. V. V. Bhaskar Rao, P. K. Khosy, B. C. Viraktamath, Joshi Joseph, S. Chander Rao, R. Dhanapal, B. Augustine Jerard, P. M. Kumaran, M. J. Rathnambal, R. V. Nair, P. M. Jacob, V. Arunachalam, S. K. Rizal, K. V. K. Nampoodhiri and George V. Thomas

- **Technology description**

  This variety is a dwarf palm with large size nuts, variant of the Niu-lekha, one of the collections from Fiji Islands. The peculiar feature of this selection is that it is dwarf to semi-tall with the nut characters of tall which is desirable for copra yield. The copra out turn/palm (13.70 Kg) and spacing adopted is 6 x 6 m instead of 7.5 x 7.5m.Drought tolerant, and cultivable in Island conditions. It has been released by Institute Variety Release Committee, ICAR-CIARI, Port Blair, in 2013. Yields: High copra content (245g/nut).

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands**.**

- **Benefit**

  The palms are very attractive and have a good ornamental value. Drought tolerant, and cultivable in Island conditions.

18. Technology: CARI-Surya

Scientists associated in developing technology

M. A. Suryanarayana, M. Sankaran, V. Damodaran, D. R. Singh, S. Dam Roy, T. Damodaran, R. P. Medhi, E. V. V. Bhaskar Rao, P. K. Khosy, B. C. Viraktamath, Joshi Joseph, S. Chander Rao, R. Dhanapal, B. Augustine Jerard, P. M. Kumaran, M. J. Rathnambal, R. V. Nair, P. M. Jacob, V. Arunachalam, S. K. Rizal, K. V. K. Nampoodhiri and George V. Thomas

- **Technology description**

  This variety is a dwarf palm with crown shape in circular, spherical nut shape, palms are dwarf with closer, internodes, compressed crown and shorter petioles. The palms are very attractive and have a good ornamental value. Drought tolerant, and cultivable in Island conditions. It has been released by Institute Variety Release Committee, ICAR-CIARI, Port Blair, in 2013.Yields: average 104.9 nos. nuts/palm/year.

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands.

- **Benefit**

  The palms are very attractive and have a good ornamental value. Drought tolerant, and cultivable in Island conditions.

19. Technology: CARI-Omkar

Scientists associated in developing technology

R. P. Medhi, T. Damodaran, R. C. Srivastava, D. R. Singh, M. Sankaran, V. Damodaran, M. A. Suryanarayana, E. V. V. Bhaskar Rao, P. K. Khosy, B. C. Viraktamath, Joshi Joseph, S. Chander Rao, R. Dhanapal, V. Arunachalam, B. Augustine Jerard, P. M. Kumaran, M. J. Rathnambal, R. V. Nair, P. M. Jacob and George V. Thomas

- **Technology description**

  This variety is a dwarf palm with close internodes, short petioles and compressed crown, semi-circular crown with less than 20 leaves on the crown. Nut shape is pear with less meant content. The palms are very attractive and have a good ornamental value. Drought tolerant, and cultivable in Island conditions. It has been released by Institute Variety Release Committee, ICAR-CIARI, Port Blair, in 2013. Yields: 110.8 nuts / palm/ year in average.

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands

- **Benefit**

  The palms are very attractive and have a good ornamental value. Drought tolerant, and cultivable in Island conditions.

20. Technology: CARI-Chandan

Scientists associated in developing technology

M. A. Suryanarayana, M. Sankaran, V. Damodaran, D. R. Singh, S. Dam Roy, T. Damodaran, R. P. Medhi, E. V. V. Bhaskar Rao, P. K. Khosy, B. C. Viraktamath, Joshi Joseph, S. Chander Rao, R. Dhanapal, B. Augustine Jerard, P. M. Kumaran, M. J. Rathnambal, R. V. Nair, P. M. Jacob, V. Arunachalam, S. K. Rizal, K. V. K. Nampoodhiri and George V. Thomas

- **Technology description**

  This variety is a dwarf palm with close internodes, short petioles and semi-circular compressed crown. Spherical nut shape and smooth without prominent ridges. Nut shape is spherical. A promising cultivar for the island conditions and coastal ecosystem. The palms are very attractive and have a good ornamental value. Drought tolerant, and cultivable in Island conditions. It has been released by Institute Variety Release Committee, ICAR-CIARI, Port Blair, in 2014. Yields : 98.10 nuts / palm/ year in average

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands

- **Benefit**

  The palms are very attractive and have a good ornamental value. Drought tolerant, and cultivable in Island conditions.

SWEETPOTATO

21. Technology: CARI-Swarna

Scientists associated in developing technology

M. Sankaran, V. Damodaran, D. R. Singh, T. Damodaran, R Sudha, Shrawan Singh, L. B. Singh, R. P. Medhi and S. Dam Roy

- **Technology description**

  It is a seedling selection from the South Andaman. The plants are spreading, emerging leaves colour - light purple, petiole purple colour and tubers- light pink, orange fleshed. Moderate resistant to weevil and cultivable in island conditions. Duration is 110 – 120 days. It has high yield potential of 20 – 21 t/ha. It has been released by Institute Variety Release Committee, ICAR-CIARI, Port Blair, in 2013.

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands.

- **Benefit**

  Resistant to weevil and cultivable in island conditions.

22. Technology: CARI-Aparrna

Scientists associated in developing technology

M. Sankaran, V. Damodaran, D. R. Singh, T. Damodaran, R Sudha, Shrawan Singh, L. B. Singh, R. P. Medhi and S. Dam Roy

- **Technology description**

  It is a seedling selection from the South Andaman. The plants are semi-spreading, emerging leaves colour - light purple, petiole purple colour and tubers- light pink, white fleshed. Moderate resistant to Weevil and cultivable in island conditions. Duration is 110 – 120 days. It has the yield potential of (20-21t/ha). It has been released by Institute Variety Release Committee, ICAR-CIARI, Port Blair, in 2013.

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands.

- **Benefit**

  Moderate Resistant to Weevil and cultivable in island conditions.

GREATER YAM

23. Technology: CARI-Yamini

Scientists associated in developing technology

M. Sankaran, V. Damodaran, D. R. Singh, R. C. Srivastava, L. K. Bharthi and R. P. Medhi.

- **Technology description**

  Clonal selection from accessions collected from Little Andaman. Pink, and Tubers - conical shape and white flesh. Ideal as the plants are leaf shape – cordate, petiole greenish, inter crop in the coconut and arecanut plantations. Moderate tolerant to anthracnose disease and leaf spot and cultivable in island conditions. Immune to anthracnose disease (*Collectotrichum gloeosporioides*) and leaf spot (*Cercospora sp.)*. It has been released by State Variety Release Committee, Andaman and Nicobar Administration in 2010.Yields is 45 – 50 t/ ha.

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands

- **Benefit**

  Highly suitable for islands & coastal areas. This crop could be the ideal inter crop in the coconut and arecanut plantations.

GREEN ORCHID

24. Technology: CARI-Pretty Green Bay Orchid- ornamental purpose

Scientists associated in developing technology

D. R. Singh, R. C. Srivastava, Sujatha Nair, Shrawan Singh, R. P. Medhi and T. V. R. S. Sharma

- **Technology description**

  Ground orchid (*Eulophia andamanensis Rchbf.*) is CARI-Pretty Green Bay identified as potential terrestrial orchid and considered as export potential commodity owing to its good keeping quality and long attractive spike with many green florets. An ornamental plant, 35-45 flower / spike and 4-5 spike / plant. Small flower with 120-150 cm spike length and cultivable in island conditions. It has been released by State Variety Release Committee, Andaman and Nicobar Administration in 2010.Yields is 5 t/ ha.

- **Subject Area/ Industry (in which it used)**

  Sub-Tropical coastal areas of Islands.

- **Benefit**

  Potential terrestrial orchid and considered as export potential commodity owing to its good keeping quality and long attractive spike with many green florets.

NONI

25. Technology: CIARI Samridhi (*Morinda citrifolia L.*)

Scientists associated in developing technology

D. R. Singh, Shrawan Singh, Krishna Kumar and Ajanta Birah

- **Technology description**

  CIARI Samridhi variety is Dwarf statured, consistent yielder, above bearer, richest in phytochemical compounds with high antioxidant activity. Fruiting start at 10-12 months. It matures early in about 100 -105 days and can be harvested from fruit setting to full maturity stage. The average yield is 16.0-20.0 t/ha/year. It can be grown round the year. This variety is released by IVRC (ICAR-CIARI, Port Blair) in 2014. Suitable as intercrop in arecanut and coconut plantations.

- **Subject Area/ Industry (in which it used)**

  Rainfed conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  Suitable as intercrop in arecanut and coconut plantations.

26. Technology: CIARI Sanjivini (*Morinda citrifolia L.)*

Scientists associated in developing technology

D. R. Singh, Shrawan Singh, Krishna Kumar and Ajanta Birah

- **Technology description**

  CIARI Sanjivini variety is Dwarf statured, consistent yielder, above bearer, richest in phytochemical compounds with high antioxidant activity. Fruiting start at 12-14 months. It matures early in about 100 -105 days and can be harvested from fruit setting to full maturity stage. The average yield is 14.0-17.0 t/ha/year. It can be grown round the year. This variety is released by IVRC (ICAR-CIARI, Port Blair) in 2014. Suitable as intercrop in coconut plantations.

- **Subject Area/ Industry (in which it used)**

  Rainfed conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  Suitable as intercrop in arecanut and coconut plantations.

27. Technology: CIARI Sampada (*Morinda citrifolia L.)*

Scientists associated in developing technology

D. R. Singh, Shrawan Singh, Krishna Kumar and Ajanta Birah

- **Technology description**

  CIARI Sampada variety is vigorous, consistent yielder, medium sized fruits, above bearer, rich in phytochemical compounds with high antioxidant activity as demanded by industry. Well suited to tropical climatic conditions of Islands. Fruiting start at 12-14 months. It matures early in about 110 -120 days and can be harvested from fruit setting to full maturity stage. The average yield is 15.0-17.0 t/ha/year. It can be grown round the year. This variety is released by IVRC (ICAR-CIARI, Port Blair) in 2014. Suitable as intercrop in coconut plantations.

- **Subject Area/ Industry (in which it used)**

  Rainfed conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  Well suited to tropical climatic conditions of Islands. Suitable as intercrop in coconut plantations.

28. Technology: CIARI Rakshak (*Morinda citrifolia L.*)

Scientists associated in developing technology

D. R. Singh, Shrawan Singh, Krishna Kumar and Ajanta Birah

- **Technology description**

  CIARI Rakshak variety is Dwarf, well adaptive to sea water affected lands, consistent yielder, showed high level of phytochemicals and antioxidant activity which is comparable with Noni genotypes grown in normal soils. Fruiting start at 10-12 months. It matures early in about 100 -110 days and can be harvested from fruit setting to full maturity stage. The average yield is 7.0-9.0 t/ha/year. It can be grown round the year. This variety is released by IVRC (ICAR-CIARI, Port Blair) in 2014.

- **Subject Area/ Industry (in which it used)**

  Sea water challenged lands in humid tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  Well suited to tropical climatic conditions of Islands. Suitable as intercrop in coconut plantations.

MUSHROOM

29. Technology: CARI Mushroom 1

Scientists associated in developing technology

K. Sakthivel, R. K. Gautam, V. K. Pandey, Archana Sharma, N. C. Choudhari, P. K. Singh, K. Abirami and S. Dam Roy



- **Technology description**

  It is a local collection from Mangultan. This is a cream coloured little slimy mushroom with irregular and curvy margins with no or very short stipes. The yield ranges is 700 g to 1 Kg per kilogram of substrate. The total life cycle of the mushroom is 25 days. It has been released by Institute Variety Release Committee, Andaman and Nicobar Administration in 2016.

- **Average Yield**

  700 g-1 Kg per Kilogram of substrate

- **Subject Area/ Industry (in which it used)**

  It is suitable for growing in Islands conditions

- **Benefit**

  It is a high yielding variety

30. Technology: CARI Mushroom 2

Scientists associated in developing technology

K. Sakthivel, R. K. Gautam, V. K. Pandey, N. C. Choudhri, P. K. Singh, A. S. Krishnamoorthy, S. Nakkeeran, Archana Sharma, T. Subramani and S. Dam Roy

- **Technology description**

  It is a National collection from Tamil Nadu and Karnataka farmers. This is a white coloured mushroom with normal texture. The margins are regular with long stipes. The yield ranges from 800 g to 1 kg per kilogram of substrate. The total life cycle is 45 days. It has been released by Institute Variety Release Committee, Andaman and Nicobar Administration in 2016.

- **Average Yield**

  800 g-1 Kg per Kilogram of substrate

- **Subject Area/ Industry (in which it used)**

  It is suitable for growing in Islands conditions

- **Benefit**

  It is a high yielding variety

31. Technology: CARI Mushroom 3

Scientists associated in developing technology

K. Sakthivel, R. K. Gautam, V. K. Pandey, N. C. Choudhri, A. S. Krishnamoorthy, S. Nakkeeran, Archana Sharma and S. Dam Roy



- **Technology description**

  It is a National collection from Tamil Nadu and Karnataka farmers. This is a light blue colored mushroom with normal texture. The margins are both regular and irregular. The yield ranges from 800 g to 1 kg per kilogram of substrate. The total life cycle is 40-45 days. It has been released by Institute Variety Release Committee, Andaman and Nicobar Administration in 2016.

- **Average Yield**

  800 g-1 Kg per Kilogram of substrate

- **Subject Area/ Industry (in which it used)**

  It is suitable for growing in Islands conditions

- **Benefit**

  It is a high yielding variety

VEGETABLES

32. Technology: CARI Brinjal 1

Scientists associated in developing technology

Krishna Kumar, P. K. Singh, Ajanta Birah, Shrawan Singh, Naresh Kumar, A. K. Singh, D. R. Singh, R. K. Gautam and L. B. Singh

- **Technology description**

  It is a high yielding and bacterial wilt resistant brinjal variety for island conditions. It givers 25-35 t/ha fruit yield. Its plants are medium tall with profuse branching. Fruits are light green and oblong in shape with less seeds. It is highly resistant to Bacterial wilt disease which is very severe disease of brinjal in India including A & N Islands. This variety also exhibited drought tolerance ability during water stress situations and is thus suitable for growing in islands conditions during dry season (October to May). It has been recommended for cultivation in Andaman and Nicobar Island by Institute Variety Release Committee, CIARI Port Blair in 2013.

- **Subject Area/ Industry (in which it used)**

  It is suitable for growing in Islands conditions and bacterial wilt prone areas.

- **Benefit**

  It has high yielding ability (25-35 t/ha fruit yield) and is bacterial wilt resistance.

33. Technology: CARI Lal Marsha (*Amaranthus tricolor L.)*

Scientists associated in developing technology

Shrawan Singh, D. R. Singh, L. B. Singh, S. K. Zamir Ahmed and S. Dam Roy

- **Technology description**

  It is a promising selection for higher yield, attractive leaf colour and better adaptability to tropical hot humid climate of Islands. It has attractive broad and reddish or purple magenta colour leaves, fast growth habit and more acceptances among the farmers and consumers. It is a non-hybrid variety. Interestingly, it is more preferred in home gardens for its attractive red purple colour which adds aesthetic value. It is rich in anthocyanin a strong antioxidant for better health. It became ready for first harvest within 27-30 days and have yield potential of 14-16 t/ha in island condition. It is released by IVRC (ICAR-CIARI, Port Blair) in 2014. Suitable for round the year cultivation.

- **Subject Area/ Industry (in which it used)**

  Humid tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  It is more acceptable among the consumers due to its attractive and colourful leaves. In islands, it is commonly called as '*Lal Marsha*'. It is rich in anthocyanin, a strong antioxidant for better health.

34. Technology: CARI Poi (*Basella alba L.)*

Scientists associated in developing technology

Shrawan Singh, D. R. Singh, Krishna Kumar, Ajanta Birah, L. B. Singh, S. K. Zamir Ahmed and S. Dam Roy

- **Technology description:** It is attractive green and broad leaves with short internodal length, better shelf-life, tolerance to foliar disease and pests. It is rich in Iron and Calcium, ascorbic acid and carotenoids. It is an early duration crop matures in 40-45 days
- **Recommended manures and fertilizers**
  - 10 t/ha compost
  - 80 kg nitrogen (1/2 as basal dose; ¼ after 1st and ¼ after 2nd harvesting)
  - 40 kg/ha phosphorus
  - 50kg/ha potassium as basal application through organic or inorganic sources
- **Average yield:** 55.0-60.0 t/ha/year
- This variety has been released by IVRC (ICAR-CIARI, Port Blair) in 2013.
- **Subject Area/ Industry (in which it used):** It is highly suitable to tropical climatic conditions.
- **Benefit:** It is rich in Iron and Calcium, ascorbic acid and carotenoids.

35. Technology: CIARI Shan *(Basella rubra L.)*

Scientists associated in developing technology

Shrawan Singh, D. R. Singh, L. B. Singh and S. Dam Roy

- **Technology description:** The 'CIARI Shan' has dark attractive purple/magenta color stems and green leaves with coloured veins and short intermodal length. It is rich in anthocyanin and micronutrients. It is highly suitable to tropical climatic conditions of Islands. It is ready to harvest at 35-40 days stage, when it attains the height of 25-30 cm. It has escaped foliar disease and pests.
- **Recommended manures and fertilizers:**
  - 25 t/ha compost
  - 80 kg nitrogen (1/2 as basal dose; ¼ after 1st and ¼ after 2nd harvesting) 40 kg/ha phosphorus
  - 50kg/ha potassium as basal application through organic or inorganic sources (for multi-harvest crop)
  - This genotype performs well with organic farming practice, for this apply 3-5 tons of vermicompost in addition of 25 -30 tons of well decomposed FYM.
- **(ii) Average yield:** 48 - 52 t/ha/years
- This variety has been released by IVRC of ICAR-CIARI, Port Blair in 2014.
- **Subject Area/ Industry (in which it used):** Irrigated and rainfed conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.
- **Benefit:**It is rich in anthocyanin and micronutrients. It is highly suitable to tropical climatic conditions of Islands.

36. Technology: CARI Broad Dhaniya, Culantro/Burma dhaniya (*Eryngium foetidum L.*)

Scientists associated in developing technology

Shrawan Singh, D. R. Singh, R. C. Srivastava and L. B. Singh

- **Technology description:** CARI-Broad Dhaniya is developed through mass selection method from local collections. It has broad and large sized serrated, acute, dentate and shiny green leaves with small spines. It has excellent vegetative growth, more number of leaves, large sized leaves, rich in phytochemical compounds and micronutrients. Well suited to tropical climatic conditions of Islands. It is suitable for organic cultivation and shaded conditions, fertilizer responsive but nitrogen fertilizers should be avoided as it increases nitrate content in leaves, performs better with application of vermicompost @ 5-8t/ha. Spacing 30cm x 20 cm and suitable as intercrop in plantations. Its richness in micronutrients and phytochemicals shows its potential for making value added products.
- Average yield: 10-12t/ha/year
- This variety has been released by SVRC of A & N Administration, Port Blair in 2010.
- **Subject Area/ Industry (in which it used):** Humid tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.
- **Benefit:** It is rich in phytochemical compounds and micronutrients. Well suited to tropical climatic conditions of Islands.

Animal Breeds Developed

37. Technology: Dweep Raja (Black Rock X Black Nicobari)

Scientists associated in developing technology

R. N. Chatterjee, R. B. Rai, A. Kundu, S. Senani, Jai Sunder, S. Jeyakumar and S.P. Yadav

- **Technology description**

  Dweep Raja (Black Rock X Black Nicobari). Average egg production (nos) : 176, Weight at sexual maturity (g) : 1741.3g, Age at sexual maturity (days): 161 day, average weight of eff (g) : 52.5 g, Mortality : 8%, Feed conversion ratio (Kg/dozen eggs) : 2.52.

- **Subject Area/ Industry (in which it used)**

  Tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  It serves as a genetically better variety having higher body weight and immunity

38. Technology: Dweep Rani

Scientists associated in developing technology

R. N. Chatterjee, R. B. Rai, A. Kundu, S. Senani, Jai Sunder, S. Jeyakumar and S. P. Yadav

- **Technology description**

  Dweep Rani : developed from cross between ILI-80 X Brown Nicobari, suitable for backyard farming with higher egg production. Annual egg production (nos): 226, Weight at sexual maturity (g) : 1193g, Age at sexual maturity (days) : 187 days, egg weight (g) : 49.1 g, Feed conversion ratio (Kg/dozen eggs) : 2.67, Mortality : 9%.

- **Subject Area/ Industry (in which it used)**

  Tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  It serves as a genetically better variety having higher body weight, higher egg production and immunity.

Trademarks

39. Technology: Dweepika (White Nicobari X Vanaraja)

Scientists associated in developing technology

R. N. Chatterjee, R. B. Rai, A. Kundu, S. Senani, Jai Sunder, S. Jeyakumar and S. P. Yadav

- **Technology description**

  Dweepika (White Nicobari X Vanaraja) was developed as a cross of Nicobari fowl suitable for backyard farming with higher egg production, 185 eggs/ annum, and higher body weight of 1923.10 g at 16 weeks of age with better survivability.

- **Subject Area/ Industry (in which it used)**

  Tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.

- **Benefit**

  It serves as a genetically better variety having higher body weight, higher egg production and immunity.

40. Technology: Backyard farming of Nicobari Fowl and Dual - Purpose poultry (Nishibari and Nicorock)

Scientists associated in developing technology

R. N. Chatterjee, R. B. Rai, A. Kundu, S. Senani, Jai Sunder, S. Jeyakumar and S. P. Yadav

Nicorock

Nishibari

- **Technology description**

  Nicobari fowl locally known as "Takniet" meaning 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 vegetation. The birds can also be reared under backyard system using indigenously shelter and deep litter system of management.

- **Benefit**

  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.350 per kg and egg is sold at Rs.12-15 per egg which fetches more money to the farmers. Beneficial for Island farmers and Entrepreneurs.

41. Technology: HERBAL FEED (Grommune and Morical)

Scientists associated in developing technology

Jai Sunder, S. Jeyakumar, T. Sujatha and A. Kundu

- **Technology description** Two herbal based preparation for poultry i.e. Grommune for higher growth and immunity and Morical as a feed supplements for higher egg production and quality.
- **Equipments/Raw Materials**

  Morical: A herbal based feed supplement namely Morical has been prepared by mixing *Morinda citrifolia* dried fruit powder (10% wt/wt). This feed supplement in poultry improves body weight gain, annual egg production and feed conversion efficiency.
- **Recommended dose:** 4 % in feed.
- **Grommune:** is an herbal based tonic prepared by mixing fresh *Morinda citrifolia* fruit juice (25% v/v) in sugar syrup base. The product was evaluated in poultry and it showed higher body weight, better feed conversion ratio (FCR) and immunity in the birds. It improves weight gain and feed efficiency of broilers. It boosts the immunity of broilers and desi birds. It reduces the serum cholesterol and alleviates the stress

Dose : 5 ml / bird / alternate days

- **Subject Area/ Industry (in which it used):** Tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.
- **Benefit:** The feed can be used for promoting higher growth and immunity in poultry

Technologies Developed

42. Technology: IPM Module for Fruit Fly management in cucurbits

Scientists associated in developing technology

Ajanta Birah, Shrawan Singh, Subhash Chand,Krishna Kumar and Jai Sunder

- **Technology description**

  An IPM module has been developed for the successful management of cucurbit fruit fly under island conditions. The IPM module comprising of installation of cue-lure baited traps @ 50 traps/ha for mass trapping, weekly clipping of infested fruits, foliar spray of aqueous leaf extracts of *Morinda citrifolia* @ 100g/l and foliar spray of spinosad 45SC or imidacloprid 17.8SL @ 0.3ml/l alternately at 15 days interval was found effective with respect to less fruit damage due to fruit fly (9%) and maximum fruit yield (10.75 t/ha) in bitter gourd and ridge gourd as compared to untreated control (39.3% fruit damage and fruit yield 5.53t/ha).

- **Scope (application of agro-climatic zone**

  It can be adopted for fruit fly management during cucurbit cultivation under islands conditions.

- **Benefit**

  IPM module for cucurbit fruit fly management gives higher cost benefit ratio of 1:3.35 in IPM and 1:2.30 in non-IPM fields of bitter gourd. Similarly, IPM module for fruit fly management in ridge gourd gives cost benefit ratio of 1:1.99 in IPM compared to 1:1.23 in non-IPM fields.

43. Technology: IPM Module for fruit & shoot borer management in okra

Scientists associated in developing technology

Ajanta Birah, Shrawan Singh, Subhash Chand,Krishna Kumar and Jai Sunder

- **Technology description**

  An IPM module has been developed for the successful management of okra pest complex. The IPM module comprising of seed treatment with imidacloprid @ 3-5 g/kg of seed a day before sowing, sowing of maize at the borders as barrier crop for conservation of natural enemies, weekly clipping of infested shoot & fruit, erection of pheromone trap @ 30 traps/ha for mass trapping of fruit & shoot borer, foliar spray of neem seed kernel extract @ 30 ml/lt, spinosad 45SC or imidacloprid 17.8SL @0.3ml/lt and aqueous leaf extracts of *Morinda citrifolia* @ 100g/l at 15 days interval was found most effective in reducing fruit damage. In IPM module, less incidene of shoot and fruit borer (5.64%) and more fruit yield (10.55t/ha) was recorded as compared to untreated control (16.85% incidence and fruit yield 5.90t/ha).

- **Scope (application of agro-climatic zone**

  It can be adopted for fruit & shoot borer management during okra cultivation under islands conditions.

- **Benefit**

  The adoption of IPM technology for okra fruit & shoot borer resulted in higher cost benefit ratio of 1:2.73 in IPM and 1:2.26 in non-IPM fields (Chemical control or farmer's practice)

44. Technology: Production technology of oyster mushroom for tropical Islands

Scientists associated in developing technology

Krishna Kumar, S. Bhagat and A. Sharma

- **Technology description:** Production technology of oyster mushroom has been standardized for tropical Islands of Andaman and Nicobar Islands. Paddy straw substrate showed significantly higher biological efficiency of about 77 %. Sterilized chopped paddy straw is used for filling the bags. The polythene bags are perforated by making holes with a punch machine or similar tool at a distance of about 10cm. The spawning is done by layer method as in case of cube making. The requirement of spawn may vary with size of bags and quantity of paddy straw inside the bag. In general one bottle or packet (250 gm) of spawn is sufficient for 2 bags (60x45cm). The spawn run completes within 15 days and white fungal growth can be seen inside the bags. After the spawn run has completed 3-4 cuts are made longitudinally and upper neck of bag is tied with a thread and then hanged or kept on a shelf or rack made of wood, bamboo, iron etc. at a cool place (25-30^{0}C), humidity (70-90%). Thereafter, water is sprayed regularly to keep it moist. Within 3-4 days after spawn run small mushrooms are seen which become ready for harvest in another 3-4 days. About 1-1.5 kg of fresh mushroom can be harvested from one bag.
- **Subject Area/ Industry (in which it used):** Oyster mushroom production has ample scope in the islands. Humid climate is very much congenial for round the year mushroom production in the A & N Islands.
- **Earnings (Total) Rs./:** Total investment in 12 months for (20 q paddy straw) is Rs. 59000/-. Gross returns from mushroom cultivation (from 5 crops per year) is about Rs. 85000/-.
- **Benefit:** The technology can be utilized for income generation, business or part of suitable agriculture activity. Here the farming community can be motivated to harness plenty of locally available agriculture waste for making monitory returns. It will also improve the protein deficiency among people of Islands.

45. Technology: Biological Control of coconut Rhinoceros Beetle

Scientists associated in developing technology

Ajanta Birah, Krishna Kumar, P. K. Singh and Someshwar Bhagat

- **Technology description:** The management of Rhinoceros beetle by baculovirus is a land mark success in biological control. The baculovirus infests both the grubs and adults of the beetles. The virus is released in the field by infected beetles. Beetles can be collected in large numbers manually from breeding grounds or by deploying the same Rhinoceros beetle pheromone traps. A diseased grub is macerated in 100 ml clean water containing 5 gm sugar, the suspension is taken in shallow container and the collected beetles are allowed to wade in for about half an hour. The healthy beetles during this period take up the virus inoculums and get infected. The beetles are later confined in saw dust overnight. The next day at dusk the beetles visiting breeding sites pass on the infection to both larvae and adults. The transmission is by contamination with healthy partner.
- **Subject Area/ Industry (in which it used):** It has been proved that virus alone can bring down the pest population to a very low level. Other methods such as hooking, destruction of breeding sites on palm if integrated with other measures can be effectively used to manage beetle problem. Its effect is self-perpetuating, long lasting, cost effective and overall pesticide independent.
- **Benefit:** It is eco-friendly as it does not have any pesticide or any harmful chemical to the atmosphere. It will improve the coconut production by controlling *Rhinocerous* beetle population. Its effect is self-perpetuating, long lasting and cost effective.

46. Technology: Rodent control in paddy

Scientists associated in developing technology: Ajanta Birah and K. Sakthivel

- **Technology description**

  Rodents are persistent pests in the island ecosystem. They plunder field crops, rice in particular and also cause severe damage to plantation crops. Following management measures are suggested for controlling rodent menace in the Andaman and Nicobar Islands.

Cultural practices

- Deep ploughing should be done at the time of land preparation to destroy hidden burrows. Bunds should be trimmed to avoid new burrow formations. Weed free cultivation can reduce the rodent infestations to certain level. Periodical trapping and killing of rodents in paddy fields using mechanical traps also avoid rodent menace. In case of storage, keeping the storage area very clean, immediate removal of any spilled over grains, periodical mechanical trapping, and usage of modern storage structures or metal bins which is not having direct contract with floor instead of traditional wooden storage bins helps in reduction of rodent infestations.

Chemical management of rodents

- Locating live burrows in field is the preliminary step before using rodenticides. All the burrows seen in particular field area/storage area have to be closed with

soil. Those burrows reopened by rodents will be considered as live burrows. Bromodiolone (0.005%) cake which is commonly available as Rat Kill can be placed directly in live burrows. This method does not involve pre-baiting. In severe infestations zinc phosphide (2%) can be used with safety precautions. It involves two steps *viz.* pre-baiting and poison baiting.

Pre-baiting

- Baiting should be done 2-3 times without any poison to attract rodents and habituate animal towards the bait.
- One kg of broken rice is mixed uniformly with 20 g of vegetable oil and packed in to small packets in newspaper and kept in live burrows.
- This step is to be repeated twice or thrice before poison baiting.

Poison baiting

- This should be practiced after 2-3 times of pre baiting.
- Uniform mixing of 20g of zinc phosphide + 20g vegetable oil + 900 g of broken rice is used as poison bait.
- **Scope (application of agro-climatic zone:** It is suitable for rodent management in rice under rainfed lowland ecosystem of A & N Islands.
- **Benefit:** It is high yielding effective for management of rodent in paddy fields.

47. Technology: CIARI-Bioconsortia

Scientists associated in developing technology

K. Sakthivel, R. K Gautam, P. K. Singh, T. P. Swarnam, A. Velmurugan, V. Baskaran and S. Dam Roy

CIARI – Bioconsortia

CIARI Bioconsortia untreated fields

Treated fields

- **Technology description:** It is a talc based bioformulation for effective management of soil borne bacterial wilt disease of solanaceous vegetables like brinjal, tomato and chillies caused by *Ralstonia solanacearum*. It is also effective against other soil borne, foliar fungal and bacterial pathogens.
- **Raw materials:** Talc powder, Carboxy Methyl Cellulose (CMC), Bacillus spp. Consortia (Field evaluated)
- **Protocol:** These bio-agents have to be applied right from preparation of field to harvesting stage of crop for better plant disease management and for obtaining higher yield. The four methods of application are as follows.

Soil application

- One kg of the talc based bio-agents should be mixed thoroughly with 50 kg well rotten farm yard manure (FYM).
- Keep in shaded area for 4-5 days. Thorough mixing can be given once in two days along with little spray of water.
- The bio-enriched FYM can spread to one acre of land uniformly before ploughing and transplanting.
- Soil treatment can be continued in standing crop once in 10 days for better disease resistance.

Seed treatment

- Ten gram of talc based formulation can be prepared to suspension by mixing it with enough amount of water.
- Mix one Kilogram of seeds and keep for 30 minutes before sowing.

Seedling treatment

- Five hundred gram of talc based formulation can be prepared to suspension by mixing it in five liters of water.
- Treat the seedlings by root dipping for 30 minutes before transplanting to main field from nursery.

Foliar application

- Ten gram of talc based formulation should be mixed with one litre of water and spraying can be done on leaves, flowers and fruits of standing crop.
- Spray can be done once in 10-15 days to avoid disease incidence.
- **Subject Area/ Industry (in which it used):** It is beneficial for vegetable growers of islands both at farm level and kitchen garden level.

Benefit

- Biological control using Bacillus bioconsortia is less costlier than any other method of plant disease control
- The bio-agents give protection throughout the crop period.
- Highly effective against most of fungal and bacterial plant pathogens.
- Non toxic to plant, soil, environment and other useful organisms
- Bio-agents also enhance the plant growth promotion through secretion of various useful compounds and also encourage other beneficial soil micro-flora
- Bioagents are safer to the handling person unlike chemicals.
- These can also be applied along with other bio-formulations available in market.

48. Technology: CARI-MIN -Growth promoting micronutrient for pig

Scientists associated in developing technology

M. S. Kundu, S. Jeyakumar, Jai Sunder, A.Kundu, S. K. Verma and A. K. De

- **Technology description:** Alternate least cost fortified feed with micronutrients suitable for pig feeding. Average daily body weight gain was significantly more i.e.365.33 g than control i.e.298.8g

Equipments/Raw Materials

- Cobalt Chloride 55g,
- Copper Sulphate 265 g,
- Ferrous Sulphate 500 g
- Zinc Sulphate 750 g
- **Subject Area/ Industry (in which it used):** Tropical climatic conditions of Andaman & Nicobar Islands and similar ecosystem available elsewhere.
- **Benefit:** Alternate least cost fortified feed with micronutrients suitable for pig feeding. It can be used for promoting the growth in pigs

49. Technology: Herbal based ointment for wound healing

Scientists associated in developing technology

Jai Sunder, S. Jeyakumar, M.S. Kundu and A.Kundu

- **Detail description of technology**

  A herbal based ointment prepared based on *Vitex trifolia* and *Eupatorium odoraturm.* It enhances acute and chronic wound healing in cattle. It should be applied on a chronic hump sore of a cow. Wound will be completely healed in 14 days. The ointment can be applied for healing of fresh cut wound with bleeding on a cow. It should be applied after cleaning the blood with water. Wound starts healing in a week unlike chronic wound, which takes two weeks for healing.

- **Year of Release:** 2015
- **Agro Climatic Zone:** Island and coastal

0 day 3 day 7 day

Plate: Different stages of wound healing

- **Recommendation**

  The ointment can be applied on both chronic and fresh wound. It should be applied for 14 to 21 days after cleaning the wound with water.

- **Benefit**

  It enhances acute and chronic wound healing in cattle

50. Technology: Azolla as a feed supplement for backyard poultry

Scientists associated in developing technology

T. Sujatha, A. Kundu, S.Jeyakumar, Jai Sunder and Abhay Kumar Singh

- **Technology description:** 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

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

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 .
- **Earnings (Total) Rs./:** Capital Investment: Nil
- **Benefit:** Simple and low cost technology.

51. Technology: Integrated Faming System model for coastal areas

Scientists associated in developing technology

T. P. Swarnam, A.Velmurugan, T. Subramani, S. Swain, M. Sankaran, Shrawan Singh, M. S. Kundu, R. Kirubasankar, B. K. Nanda and Ajmer Singh

- **Technology description**

  A farming system model for agricultural diversification of coastal low lands of Andaman Islands was developed by integrating dairy, fishery poultry, goat rearing, horticulture, agro-forestry and crop components comprising vegetables, rice and pulses for 0.75ha.

Apart from sustainability of income the required nutritional security of coastal people can be achieved through appropriate integrated farming system models. The crop husbandry component contributes more to net returns (70-80%) in hilly and slopping hilly uplands whereas in medium upland valley and low lying valley areas. 1 to 2.5 lakhs /ha can be obtained depending upon the component selection and integration.

- **Date of Transfer: Earnings (Total) Rs./: Net income**

  Rs.2.02/- lakhs and generated 302 man days year^{-1}

- **Benefit**

  Integrated farming system is a judicious mix of one or more enterprise with cropping in which there is a complementary effect through effective recycling of livestock contributes 49-66% to the net returns.

52. Technology: Seed production of Marine Ornamental Fishes

Scientists associated in developing technology

Grinson George, S. Dam Roy, C. S. Chaturvedi, Kamal Sarma, S. Murugesan and Benny Varghese

- **Technology description:** The reef waters of A & N Islands harbours 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 anarea 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 equipment like hand net, buckets, pipes

Protocol

- Required species of anemone fishes (both male and female) are collected from the wild.
- 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.
- **Benefit:** Due to high demandunit can be a profitable business proposal.

53. Technology: Mud Crab Fattening

Scientists associated in developing technology

Rema Madhu, K. Madhu and S. Dam Roy

- **Technology description:** The present technology can be suitable in brackish water areas where water level can be maintained around 75 cm. Grow-out ponds can be constructed in tide fed estuaries, backwaters and creeks. The crab ponds can also be established in traditional fish/ shrimp farms, by converting one portion adjoining the brackish water 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

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.

Benefit

- 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

54. Technology: Hump Sore ointment

Scientists associated in developing technology

R. B. Rai, S. P. S. Ahlawat, Jai Sunder, S. Jeyakumar, A. Kundu, R. N. Chatterjee and S. P. Yadav

- **Detail description of technology**:
- **Treatment of hump sore with ointment**

  Hump sore is a chronic focal skin disease of cattle and buffalo caused by *Stephanofilaria assamensis*. The sore generally occurs at the hump region,

hence it is called hump sore. The sore also occurs at base of the ear (ear sore), eye (eye sore), horn (horn sore), legs, perineum,, teat, udder, abdomen, sternal region etc. The disease is endemic in these islands and almost 40% of the cattle are affected with this disease. The prevalence rate in male is higher than female. The disease is generally seen more during dry season.

- Hump sore should be cleaned with cleaning and disinfections of sores with potassium permanganate and ointment should be applied for 7-10 days. The best month for treating the animals is September or October.
- Composition of the ointment
- LevamisoleHcl – 100 gms.
- Zinc Oxide – 10 gms.
- Resorcinol – 1 gm.
- Vaseline base – Up to 100 gms.
- Crystal violet – 2-3 drops.
- **Application**

  Wash the affected area with $KMnO_4$ solution (1% W/V) and apply the ointment twice a day for 14-20 days.

- **Benefit**

  The disease is transmitted by house fly (*Musca conducens*), hence the control is very difficult however, it can be treated with the application of the ointment developed by the Institute.

55. Technology: Herbal eye drop for poultry

Scientists associated in developing technology

T. Sujatha, Jai Sunder and A. Kundu

- **Detail description of technology**: Conjunctivitis, a common eye disorder, is usually caused by bacteria, virus and fungus. It is also a symptom of many other medical problems, including respiratory infections. It is a wide spread problem among rural poultry in A&N Islands where more than 80% of poultry population belong to backyard poultry. Eye diseases have significant economic value since they negatively affect birds' health and performance. The conventional treatment for most forms of conjunctivitis is a topical antibiotic or antifungal application that usually involves high cost. Further, it may lead to allergies due to resistance to antibiotics or over usage. Aloevera is readily and naturally available in all over the island. This natural remedy has proven antibacterial, antifungal and antiviral properties in human medicine. With treatment using this eye drops, birds completely recover from swelling of eyes.
- **Recommendation**: For treating acute conjunctivitis in poultry

Application

- Clean the eye with clean water
- Apply daily for 14 -21days
- **Benefit:** This natural remedy has proven antibacterial, antifungal and antiviral properties in human medicine. With treatment using this eye drops, birds completely recover from swelling of eyes.

Post-Harvest Technologies

56. Technology: Biomass Fired Dryer

Scientists associated in developing technology

M. Din, P. S. Deshmukh, R. C. Srivastava, N. Ravisankar, Grinson, George, M. Balakrishnan and R. Sudha

- **Technology description:** A mechanical dryer with capacity of 1000 coconuts per batch is 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 final moisture content of 6.0 % of coconut.
- **Name of Licensee/ Contracting Party:** Shree Hari Fabricators (till 2015)
- **Address and Contact Details of Licensee/Contracting Party:** Shree Hari Fabricators, BathuBasthi (till 2015)
- **Type of Partnership (Technology Licensing/ Consultancy/ Contract Research):** Technology Licensing
- **Benefit**

  Using biomass fired copra dryer, the drying time is 50% less than natural sun drying in addition of 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. The locally available biomass may be efficiently utilized as fuel for drying and thereby enhancing net return to the farmers.

57. Technology: Coconut Dehusker

Scientists associated in developing technology

M. Din, P. S. Deshmukh, R. C.Srivastava, N. Ravisankar, Grinson, George, M. Balakrishnan and R. Sudha

Coconut Dehusker

- **Technology description:** 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 has been evaluated with different sizes of nuts at 12.5% moisture content. The dehusking capacity of dehusker was found to be 125, 72 and 180 nuts/hr respectively for CARI pedal operated, CARI hand operated dehusker and local tool 'sabbal'. In case of CARI deshuker 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.
- **Name of Licensee/ Contracting Party:** Shree Hari Fabricators (till 2015)
- **Address and Contact Details of Licensee/Contracting Party:** Shree Hari Fabricators, BathuBasthi (till 2015)
- **Type of Partnership (Technology Licensing/ Consultancy/ Contract Research):** Technology Licensing
- **Benefit:** It helps the farmer to dehusk with less pain and time.

58. Technology: Spent Chicken meat pickle

Scientists associated in developing technology

A. Kundu, T. Sujatha, Jai Sunder and S. Jeyakumar

- **Detail description of technology**

  Chicken meat pickle is was prepared as a value addition to the meat of spent hen. Spent hen was slaughtered at the age of 60 weeks and approximately 500 gm meat could be dissected out from each bird. The meat was cut into optimum sized and marinated with turmeric and salt and sun dried for 10 – 12 hours to reduce the moisture content. Thereafter, cut the meat into small pieces.

Marination

- Add turmeric and salt
- Keep for 3 hours (under sun is preferred)

Ingredient composition for pickle gravy

- Garlic ginger paste : 50 gm
- Onion paste : 40 g
- Specially designed Mixed masala : 100
- Chilly powder : 50 gm
- Kashmiri chilli powder
- Salt

- Vinegar
- Lemon – 2 nos
- Oil – 1 lit

Pickle preparation

- Deep fry the marinated meat and keep it aside
- Deep fry of onion with garlic ginger paste in oil
- Add masala and boil for 2 minute
- Add the heated and cooled lemon
- Mix the fried meat pieces with fried masala
- Add vinegar
- Ripen for 10 days

59. Technology: Nugget from Culled / spent hens

Scientists associated in developing technology

A. Kundu, T. Sujatha, Jai Sunder and S. Jeyakumar

- **Detail description of technology**

  Meat of spent hen (800 g) was minced in a bowl with salt and condiment mix (onion (3) : garlic (1); 40 g) was added and chopped for 30 sec. Vegetable oil at 10 per cent level was added and chopped for one minute. Spice mix @2.5% was added and chopping was done for 30 seconds. Finally binder (maida (20): Wheat (40): gram dal flour (20)) was added and chopped for 1 minute to make emulsion. Intermittently either ice cubes or little water was added. The emulsion was filled in a box instead of sheep casings and cooked in cooker without weight for 45 minutes under boiling water. Cooked nuggets were then cooled to room temperature by immersing in cool water. The prepared nuggets were served and subjected for sensory evaluation. Higher organoleptic scores were noticed by the panelists. Hence the tough spent hen meat by value-addition and processing can be converted into a highly acceptable product and SHGs will be benefitted

Procedure

- Mince spent hen meat (1 kg) in a bowl .Add salt and condiment mix {onion (3): garlic (1)} of 50 g, Chop for 5 minutes, Add 20 ml of oil, Chop for 5 minute, Add egg 4 nos, Chop for 5 minutes, Add Spice mix (25 g) was added and chopping was done for 30 seconds. Add binder {maida (25): Wheat (50): gram dal flour (25)}, Chop for 5 minute, Add either ice cubes or little water in between, Fill in a box, cook in cooker without weight for 45 minutes under boiling water.

Spice mix

- Coriander 20
- Aniseed 15
- Black pepper 13
- Capsicum 15
- Cumin seed 10
- Dried ginger 10
- Cinnamon 5
- Cloves 5
- Turmeric 5
- Cardamom 2

60. Technology: Pigment Fortified Eggs

Scientists associated in developing technology

T. Sujatha, M. S. Kundu and A. Kundu

- **Detail description of technology**

  Designer egg is a technology to exploit products beyond their traditional food value and is the enrichment of egg retaining their nutritional, functional and sensory qualities. Recent trend in fortification of poultry products is enrichment with natural antioxidants through herbal feed additives since consumer's preferences for natural organic products in their food are increasing. In Andaman & Nicobar Islands, backyard poultry eggs meet out more than 60 per cent of rural requirements of rural people for eggs. Desi laying chicken are generally able to consume grasses and other greens that are rich in carotenoid pigments. Feeding of dried marigold petals up to 3 g per hen per day as supplemental feed additive for rural poultry could enrich carotenoid pigments in desi eggs and thereby could improve yolk colour of consumer's preference under semi-intensive system of management to meet the growing demand and changing consumers need for enriched poultry produce.

- **Dose**

  Dried marigold flower @ 3 gm per 100 g feed.

- **Application**

  Applicable to small scale table egg producer, SHGs and rural poultry farmers

- **Benefit**

  Caroteinoid enriched design eggs enhances the availability of health beneficial lutein pigment to rural farmers

61. Technology: Herbal egg sanitizers for veterinary use

Scientists associated in developing technology

T Sujatha, Jai Sunder, A. Kundu, D. Bhattacharya, Arun Kumar De, K. Abirami and Puro

- **Technology description**

  It is inherent practice of hatchery to decontaminate the surface of hatching eggs shortly after each collection. Hatchable eggs are customarily disinfected with phenolic or quaternary ammonium compounds and formaldehyde fumigation. However, chemical disinfectants have been phased out of routine decontamination

programs for hatching eggs despite its efficacy as a disinfectant because of concern over health hazards from exposure of farm workers or hatchery personnel to a toxic and potentially carcinogenic compound. Poultry industry is in line herbal and medicinal plants research on alternative to synthetic antibiotics. Aqueous extract of *Euphatorium* and *Vitex trifolia* @1:4 reduces total bacterial count and number of putrefied broken eggs during incubation. This composition of herbal extracts is potent preparation for herbal egg sanitizers in the poultry hatchery to address the issue of health hazards by synthetic disinfectants.

- **Subject Area/ Industry (in which it used)**

  Applicable to small scale table egg producer, SHGs, rural poultry farmers as well as poultry industry

- **Benefit**

  This composition of herbal extracts is potent preparation for herbal egg sanitizers in the poultry hatchery to address the issue of health hazards by synthetic disinfectants.

Varieties Registered For Plant Genome Saviour Community Award

62. Technology: Karen Rice

Scientists associated in developing technology

R. K. Gautam, P. K. Singh, S. K. Zamir Ahmed and S. Dam Roy

Genetic diversity of rice land races of *Karen* community represents socio-cultural diversity and uniqueness in Andaman

- **Technology description:** Karen community originally came from Burma (now Myanmar) and settled in 1925 in North & Middle Andaman. Initially, 12 families from Burma came to Andaman after persuasion by Beroti Officer Dr. H. I. Marshall for clearing jungles in A&N Islands. The word "Karen" was coined by British, whereas Burmese called them as "Kaylin" meaning "polite and good hearted" The present population of Karens is about 2000 which lives in Webygram, Karmatang, Lataw, Rampur, Lucknow, Burmadera, Basecamp, Borang and Chipo villages in the Middle Andaman.
- Traditionally they are agriculturist and earn their livelihood by rice farming, making mats, baskets, grain storing bins etc. Karen are by nature artistic and love music, dance, diving, singing and trekking. The senior citizens of Karens mostly lived longer some even up to 100 years which could be due to their love

for nature, plants, herbs and hard work. They practice the concept of "early to bed and early to rise" and have only two meals in a day i.e. early brunch and supper. They brought traditional and unique rice land races viz. Khushbuyya, Black Burma, White Burma, Red Burma, Mushley and Nyaw-in etc suiting to their taste and requirements.

- **IP Protection No. (Patent/Trademark/ Copyright/Design/ Plant Variety):** Registered

Plant Genome Saviour Community Award to Karen Community

- The Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA), Ministry of Agriculture & Farmers' Welfare, GoI, New Delhi has conferred Plant Genome Saviour Community (PGSC) Award of Rs. Ten lakh, Citation and Memento upon Karen community of North & Middle Andaman. The award was conferred by Shri Radha Mohan Singh, Hon'ble Union Minister of Agriculture & Farmers' Welfare, Govt. of India on December 21, 2016 at a function in B.P. Pal Auditorium, Indian Agricultural Research Institute, Pusa, New Delhi to Rev. Saw Saytha, President Karen Welfare Association, Mayabunder, North & Middle Andaman. The community was honoured for its contribution to theon farm conservation and utilization of these traditional and unique rice varieties in A&N Islands which constitute one of the agro-biodiversity hotspots of India. The community was nationally recognised and honoured for its contribution to on farm conservation of traditional and unique rice varieties viz. Khushbuyya, Black Burma, White Burma, Red Burma, Mushley and Nyaw-in etc since 1925.

Shri Radha Mohan Singh, Hon'ble Union Minister of Agriculture & Farmers' Welfare giving PGSC Award

Hon'ble Director General, ICAR & Secretary, DARE, Dr. Trilochan Mohapatra interacting with Karen community regarding traditional foods prepared from Karen rice varieties during Farmers' fair in CIARI, Port Blair

The standing crop of Black Burma(right)

63. Technology: Nicobari Aloo

Scientists associated in developing technology

M. Sankaran, S. Dam Roy, James George and V. Damodaran

- **Technology description:** Among tuber crops, the most preferred one is NicobariAloo which is nothing but Greater Yam (*Dioscorea alata*) belonging to the family "Dioscoreaceae".
- NicobariTribes traditionally cultivate and conserve atleast 7 different varieties of *Dioscorea alata* namely Achin (Purple flesh), Domrit (fragrant type and normal type), Bolta, Paltu, Thirose, Kaniya & Thakniyathakavu.
- In Car Nicobar alone, atleast 450-500 hectare area is under tuber crops of which the major crop is *Dioscorea alata.*
- Three varieties of Nicobari Aloo
- "Achin" variety has purple flesh and it is female type
- "Paltu" variety has white flesh and good cooking quality
- "Domrit" variety has white flesh with

Varieties of Nicobari Aloo

Tradition foods from Nicobari Aloo

Animal Breeds Registered

64. Technology: Nicobari Pig

Scientists associated in developing technology

S. Jeyakumar, Jai Sunder, M. S. Kundu, A. K. De, A. Kundu, S. P. Yadav, Z. George, S. Dam Roy and S. Shivkumar

- **Technology description:** Nicobari pigs (*Sus scrofa nicobaricus*) are indigenous pigs of Nicobar Islands and are reared by Nicoabri tribes since time immemorial. They are sturdy and short with long body and red-brown, black, grey, brown, blackish brown and fawn skin colour. Marked bristle crest (mane) on the back of the pig extending from mid head/shoulder to base of the tail. Facial profile varied from flat to concave. Slightly downward arch/ curvature of the low back. Short neck with very large jowl. Characteristic feature of the tail is having no curling. They are fast runner. Evolved and thriving under plantation based low input production system of the Nicobari tribes.

Traits	Values
Birth wt.(Kg)	0.4-0.9
Adult Body Weight (kg)	34-65
Age at 1st mating	150-260
Age at first furrowing (days)	260-450
Furrowing interval (days)	180-360
Litter size at furrowing	4-12
Lifetime no. of furrowing	5-14
Productive life span (years)	4-9

- **IP Protection No. (Patent/Trademark/ Copyright/Design/ Plant Variety):** Acc No. INDIA_PIG_ 3300_NICOBARI_09005

65. Technology: Teressa Goat

Scientists associated in developing technology

S. Jeyakumar, Jai Sunder, M. S. Kundu, A. K. De, A. Kundu, S. P. Yadav, Z. George, S. Dam Roy and S. Shivkumar

- **Technology description:**It is an indigenous goat breed maintained by Nicobari tribal farmers of Nicobar group of Islands. These goats are generally tall, sturdy, brownish or dark tan or black or white in colour with white and black patches. Black hairs on dorsal midline up to the tail. Black coloured muzzle, eyelids and hoofs. Peculiar white patch/line starting from inner canthus of both eyes or from eye brows and extending up to nostrils or mouth. Tail is medium to long. Large horn with flat base. Erected ears directing downwards. Adult body varies from 15 to 79 kg. Estimated population is about 7,721.

Traits	Values
Birth wt.(Kg)	1.0-1.5
No. of kids	2-4 (2.6)
Wt. at 1 year(Kg)	16-31
Wt. at 2 year(Kg)	35-40
Wt.at 4 year (Kg)	65-70
Milk yield (ml)	250-1100
Single (%)	40.85
Twins (%)	53.52
Triplets (%)	5.63

- **Subject Area/ Industry (in which it used):** The technologies has been adopted in different areas of Andaman and Nicobar Islands
- **IP Protection No. (Patent/Trademark/ Copyright/Design/ Plant Variety):** Registered at NBAGR: INDIA_GOAT_3300_TERESSA_06025)

66. Technology: Nicobari fowl

Scientists associated in developing technology

S. P. S. Ahlawat, M. K. Padhi, R. B. Rai, S. K. Saha, S. Senani, A. Kundu, R. N. Chatterjee, Jai Sunder, T. Sujatha and S. Jeyakumar



- **Technology description:** Nicobari fowl locally known as "Takniet" means short legged is a scavenging bird particularly found in Nicobar group of islands. Compact body with curve shape and hardy. 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 vegetation. Efficient feed convertors under backyard rearing. The birds can also be reared under backyard system using indigenously shelter and deep litter system of management. Unique feature of this indigenous bird is disease resistance character against common poultry diseases. These improved varieties are high egg producers. Very adaptable to high and humid climate of A & N islands.

Production traits	Brown	Black	White
Age at Sexual Maturity (days)	172±1.4	175±2.3	184±1.31
Wt at Sexual Maturity (g)	1362±12.5	1462±13.0	1392±11.74
Ann. Egg Prod.(no)	162±6.30	157±6.80	184±1.31
Egg wt. (g)	43.1±0.70	43.7±0.30	41.7±0.53

- **IP Protection No. (Patent/Trademark/ Copyright/Design/ Plant Variety):** Acc No. INDIA_CHICKEN_3300_NICOBARI_ 12013

67. Technology: Satellite Fish Nursery Technique - A New Tool for Livelihood Improvement for ANI

Scientists associated in developing technology

P. Krishnan, S.K. Zamir Ahmed, R. Kiruba Sankar, Shailesh Kumar, Nagesh Ram, Siba Mahato, R. Jayakumara Varadan and S. Dam Roy

- **Technology description :** Availability of sufficient fish nurseries remains a major issue in the freshwater aquaculture sector of the islands. The fish ponds existing in the farmers' fields are basically irrigation ponds meant for water storing purposes. The demand for freshwater fishes is enormous in island conditions and hence fish culture could be a remunerative option for island farmers. Despite the wide popularization of induced breeding programmes, the availability of well managed nursery ponds with required specifications and sufficient numbers to stock the spawns remains a challenge to address. To overcome the issues, the fish farmers were sensitized on the breeding, seed production and the need for satellite nurseries. Common satellite nurseries were constructed and the spawns reared from the breeding programmes from different farmers field with were stocked in satellite nurseries. This concept was popularized the out reach centre of ICAR-CIARI in collaboration with Department of Fisheries, Andaman and Nicobar Administration, and well received among the farmers of North Andaman. Farmers who do not have nurseries can stock the spawns in satellite nurseries and could earn considerable revenue with their limitations.
- **Subject Area/Industry (in which it used)** : Andaman Islands
- **Benefit :** Sajib Kumar a progressive farmer started selling his first installment of fish seeds at the price ranging from Rs.1-8 of various sizes. He earned an additional income of Rs.70, 000. On knowing about the availability of quality fish seeds by the peer group from Kalipur to Keralapuram, 20-25 farmers placed their demand of fish seeds i.e. around 40,000 seeds which he sold at the rate of Rs. 5.00 per seed. Finally, an additional income of Rs. 2,70,000 was earned by him. Within a span of 6 months, he earned Rs. 2,70,000 as additional income by adopting satellite nursery technique for production of fresh water fishes. Many youth have come forward to adopt the technology.

68. Technology: CIARI Brinjal 5 (*Solanum macrocarpa)* - a bacterial wilt resistant genotype

Scientists associated in developing technology

V. Baskaran, K. Abirami, K. Sakthivel, N. Bommayasamy R. K. Gautam and S. Dam Roy

- **Technology Description :** Brinjal is a widely grown vegetable crop in Andaman and Nicobar Islands. It is used in various culinary preparations. The area under brinjal cultivation is more but the yields are poor due to biotic stresses. Bacterial wilt caused by *Ralstonia solanacearum* is one of the most important diseases of brinjal in most parts of the country including the Andaman and Nicobar Islands. The disease is devastating in hot and humid climate and can cause 100% yield losses in few cases. While screening the germplasm of local collections, CIARI brinjal 5 (*Solanum macrocarpa*) is the genotype identified by selection as a bacterial wilt resistant genotype. The plant is tall with semi spreading habit and smooth stem. The leaves are dark green in colour with purple veins. CIARI brinjal 5 showed complete resistance to *Ralstonia solanacearum*. The nutritional analysis of the fruits revealed that the new CIARI brinjal 5 is highly rich in iron, calcium and ascorbic acid content. This new genotype can be used as a donor for wilt resistance breeding in brinjal and for nutritional security.
- **Subject area/Industry in which it is used** : This is a potential genotype in brinjal breeding programme for gene pyraminding and as rootstock for successful cultivaton of solanaceous vegetable crops.
- **Benefits :** Bacterial wilt is the major constraint for production of solanacous vegetable crops like tomato and brinjal. The wilt resistant genotype identified can be utilized as the source material for resistant genes and as a rootstock.

69. Technology: Pekin Duck under backyard

Scientists associated in developing technology

S.K. Zamir Ahmed, A. Kundu, Siba Mahato, R. Jayakumara Varadan, Jai Sunder and S. Dam Roy

- **Technology description** : Out Reach Centre of ICAR-CIARI introduced Pekin duck in the year 2011 to provide Pekin duck in the year 2011 to provide livelihood as well as nutritional security to the rural households in the remote areas of North & Middle Andaman district. By 2015, the enterprise has spread across 15 villages wherein 81 farmers were rearing 3-5 ducks in their backyard, totaling 466.
- **Subject Area/Industry (in which it used)** : North & Middle Andaman district in the Union Territory of Andaman & Nicobar Islands.
- **Benefit :** A farmer could earn Rs.16 per egg, Rs.400-450 per live adult and Rs.50-55 per duckling of Pekin Duck when compared to Rs.5-7, Rs.200 and Rs.10 respectively from desi duck. Pekin Duck can gain an average weight of 2.637 Kg with low level of mortality when compared to 1.975 kg weight of desi duck with high mortality rate. Thus, Pekin Duck under backyard with a unit size of 3 birds could earn a net return of Rs.4, 350 against Rs.1,140 from desi ducks giving an additional income of Rs. 3, 210.

70. Technology: Seed Village Concept for augmenting quality rice seed production in Andman & Nicobar Islands

Scientists associated in developing technology

S.K. Zamir Ahmed, R.K. Gautham, P.K. Singh, Siba Mahato, R. Jayakumara Varadan and S. Dam Roy

- **Technology description** : Rice is the principal cereal crop of Andaman and Nicobar Islands cultivated in 6,100 ha producing 21,000 tonnes with an underwhelming productivity of 3.4 t/ha. Farmers' preference towards low yielding but abiotic stress-tolerant traditional varieties, admixtures in locally saved seed, improper crop management practices are the major constraints in improving the rice productivity in the Islands. Hence, the out reach centre of ICAR-CIARI introduced "Seed Village Concept" in 2011 to produce Truthfully Labelled Seeds (TFL) of improved rice varieties in participatory mode involving breeders, farmers and social scientists. Under this concept, selective progressive farmers of cluster villages in North & Middle Andaman and South Andaman districts are given hands-on training in quality seed production and TFL seeds of CIARI rice varieties *viz*. CARI Dhan 3, CARI Dhan 4, CARI Dhan 5, CARI Dhan 6, CARI Dhan 7, CARI Dhan 8 and CARI Dhan 9; and other improved varieties *viz*. Ranjeet, Gayatri, CSR 23 and CSR 36 are distributed for cultivation in their farms. Regular field visits are undertaken throughout the season for technical guidance and to ensure seed purity and quality. The TFL seeds thus produced are purchased from farmers, cleaned, packed and re-distributed/sold to other farmers.
- **Subject Area/Industry (in which it used)** : North & Middle Andaman district and South Andaman districts in the Union Territory of Andaman & Nicobar Islands.
- **Benefit** : During 2012-17, 170.32 Q TFL seed of 11 rice varieties *viz.* CARI Dhan 3, CARI Dhan 4, CARI Dhan 5, CARI Dhan 6, CARI Dhan 7, CARI Dhan 8, CARI Dhan 9, Ranjeet, CSR 36, CSR 23 and Gayatri have been produced from 64 cluster villages of Andaman Islands. The initiative has augmented the availability of quality seed of HYV of rice to the Island farmers. Further, traditional and low yielding rice varieties *viz*. C14-8, Jaya, Lal Sanno, Pagla Jaya, Ranchi Dhan and Silver Jaya have been replaced, resulting in the reduction farm-saved seed and significant increase in seed replacement rate (SRR) from 1.5% to 10.2% in the Islands.

71. Technology: Production technology of dragon fruit in Bay Islands

Scientists associated in developing technology

K. Abirami and V. Baskaran

- **Technology description** : Concrete support structures are highly suitable for successful dragon fruit cultivation in Andaman and Nicobar Islands. One year old rooted cuttings about 12 inches in length are selected for planting in structures like unused tyres or concrete square structures which may help to prevent erosion of soil, conserve moisture and also allows internal damage also internal drainage in the media composition. A spacing of 3 x 3 is highly suitable in open condition. Once the planted cuttings start growing, the stems are tied with these columns. Usually four cuttings are planted per pillar. The branching of the main stem is allowed after it reaches a height of 90 cm in the pillar. It is recommended to have round/circular metal frame or concrete square structure at the top of the pillar to maintain the balanced dragon shrub in drooping form. Organic matter plays key role in dragon fruit cultivation. Each plant should be applied with 10 to 15 kg of organic compost/organic fertilizers. Thereafter, increase the organic fertilizer amount by 2 kg per year. Dragon fruit require less water as it belongs to the cacti family. However at the time of planting, flowering, fruit development stage and hot dry climatic conditions, frequent irrigations are required. Drip irrigations can be used for effective water usage. The flowering will initiate in the second year after planting. Flowering initiates in the month of March in the Island and fruiting continues upto November. Pollination is by honey bees and bats. Yield will be stabilized from third year after planting. Once the crop is established in trellis system, the longevity of the crop is upto twenty years. On an average 4 to 5 Kg of fruits can be harvested from a single pole. Fruits are harvested 25 to 30 days after fruit set and the suitable stage of harvesting is when colour changes completely from green to pink/ red colour.
- **Subject area/ Industry in which it is used** : It is suitable for open upland area. This crop for with is high potential for industrial exploitation as it is a high value fruit crop that generate more income per unit area
- **Benefits** : Highly nutritious crop rich in phytochemicals and micro-nutrients. The crop is easy to cultivate with less managemental care. Only initial establishment cost for the support structure is the major investment in this crop. The crop can also be established in a small area and hence is a boon to landless farmers for their sustainable livelihood.

72. Technology: Leaf petiole propagation in *Jasminum sambac* and *Ixora macrothyrsa*

Scientists associated in developing technology

V. Baskaran and K. Abirami

Jasminum sambac

Ixora macrothyrsa

- **Technology Description :** *Jasminum sambac* and *Ixora macrothyrsa* are the two ornamental plants which are usually propagated by stem cuttings. For large scale planting material production, the stem cuttings taken from the mother plant are very limited. The process is also time consuming with poor rooting ability in the field. The success percentage of stem cuttings depends on the season and high relative humidity favours maximum rooting. An alternative and easy propagation technique with limited use of resources will help in meeting the demand for planting material requirement in the Island. One such innovative technology is the propagation by leaf petiole as a propagule. The technology is standardized to select best mother leaf and suitable propagation media for maximum success percentage. Recently matured leaves in the mid of the stem with soil, vermicompost and coir dust in 1:1:1 ratio in root trainers showed best results. The rooting was initiated in 27 to 35 days from leaf petiole. After three months the young plants may be planted in mainfield. This technology is highly suitable for large scale planting material production.
- **Subject area/Industry in which it is used :** This technology is highly utilized in nursery industry where there is a need to produce large quantity of planting material with limited mother plants. It is a simple and easy way to propagate rather than the tissue culture which require more technical input and cost.
- **Benefits :** This technology can be utilized for planting material production throughout the year independent of the seasons. It is a cost effective technology for large scale production of planting material. The technology is easy and can be practiced by any farmer/nursery men.

73. Technology: Year round flowering of *Arachnis* orchid in open

Scientists associated in developing technology

V. Baskaran and K. Abirami

- **Technology Description :** *Arachnis (Arachnis flosaeris)* is an epiphytic, monopodial ordchid commonly called as spider or scorpion orchid. It is an outstanding cut flower with pretty long flower spikes and usually grown under protected condition. To make the production of spider orchid economical, a technology was developed to cultivate the orchid in pandal system in open. The low cost pandal type of support system was established with bamboo from forest and plastic wire. By this new method of cultivation, flowering was observed throughout the year with luxurious growth of the plant, whereas in conventional method of growing spider orchid under protected condition, flowering was observed once in a year during November to January. Flowers are produced once in 13-15 days interval from the axillary bud of a plant. The system of cultivation with bamboo poles will help in harvesting of the flowers for maximum four years due to the less durability of the bamboo standard. However, if the same system of open cultivation is established using thin concrete square pillars as support structures, the constant yield may be reaped for infinite years. Once in three years, 50 to 60 cm terminal cuttings of the stems can be cut and once rooted the same may be planted near the mother plant in the same pole. When the newly planted cuttings start bearing the old plants may be removed based on the vigour. By this way the *Arachnis* orchid system can be maintained permanently for round the year harvest of cut flowers.
- **Subject area/Industry in which it is used :** Orchid is one of the major cut flower with lot of floral utilities. Many of the orchids in the Island are not commercial and highly seasonal. This potential *Arachnis* orchid can be harvested throughout the year by this technology and hence gives enormous economic benefit. When grown in large scale, this orchid may find a major export market
- **Benefits :** This technology can be utilized even by farmers with small holdings since spacing adopted between the poles is 30 cm x 45 cm. This crop is highly suitable for homestead gardening performs well and with minimum organic input in open. The flowers have high aesthetic value with their characteristic long spike, unique colours and long shelf life.

74. Technology: Red Ginger CIARI 1

Scientists associated in developing technology

V. Baskaran and K. Abirami

- **Technology Description :** A local genotype of Red Ginger "*Alpinia purpurata*" Red Ginger CIARI 1, is identified which is very unique in its floral characteristics. Usually in red ginger, only vegetative aerial offshoots are produced in the inflorescence. In this identified genotype, CIARI Red Ginger 1, multiple floral spikelets were observed in the inflorescence instead of vegetative aerial offshoots. The number of floral spikelets ranged from 3-6 in each inflorescence of red ginger CIARI 1. This unique type of multiple floral spikelets, result in additional flowers per plant with multiple spikes in an inflorescence. This may be utilized for aesthetic purpose in flower arrangements and in floral bouquet making and is a potential genotype which may be utilized as effective parent in ornamental breeding programme to produce novel genotypes.
- **Subject area/Industry in which it is used :** This unique genotype is highly suitable for growing it as intercrop in coconut plantation. The beauty of the cut flower is enhanced in this multiple floret genotype which increases the aesthetic value of vase arrangements.
- **Benefits :** Round the year flowering is observed in this genotype and it has more economic value as cut flower. The interspace in plantation crops can be effectively utilized for growing this genotype, which gives additional income

75. Technology: Modified planting system for increased yield in marigold

Scientists associated in developing technology

V. Baskaran and K. Abirami

- **Technology Description :** A new method of planting system developed which is the modified ridges and furrows system with reconstituted media. In this method, the furrow was dug at a depth of 70-75 cm, width 70 cm and 8.5 m length. The width of ridges was 45 cm. The ridges and furrows were lined with weed mulch and the reconstituted media with only top soil and Farm Yard Manure were filled in the furrows. The seedlings of the marigold variety Siracole were planted in the media filled in furrows. The ridges were used as the walking space and for doing intercultural operations. Early flowering was noticed in this modified system (45.12 days) when compared to the normal system of planting (57.2 days). The flower yield of marigold was almost doubled (360.50 g per plant) in the modified system of planting in comparison with the normal system of planting (138.30 g/ plant). Once the modified system is initially established, the additional expenditure involved for intercultural operations like weeding,

manuring, earthing up are highly reduced. Furthermore, this modified system helps in moisture conservation. Once the system is laid out, planting of different crops could be done for a period of five to seven years by enriching the media with organic manure. This system is highly useful in places of problematic soil. The system supports the luxurious growth of the annual crop like marigold because of the enriched and reconstituted organic media.

- **Subject area/Industry in which it is used :** The land area is limited in the Island and hence more flower production per unit area should be aimed for the prosperity of the farmers. Under this condition, this system is highly useful for more economic returns
- **Benefits :** This technology can be utilized even by farmers with small holdings since intensive cultivation of marigold can be done because of the advantages like soil moisture and nutrient conservation and weed control. Yield is doubled by this modified planting system

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