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प्रस्तावना

अंडमान-निकोबार द्वीपों की गर्म तथा आद्र जलवायु अपने अनोखे पारस्थितिक तंत्र के लिए विख्यात है। यहाँ की जैव विविधता, जलवायु तथा लगातार होने वाली बारिश बहुमूल्य वनस्पतियों आौर जीव जन्तुओं के संरक्षण के लिए अनुकूल है। केन्द्रीय कृषि अनुसंधान संस्थान अपनी स्थापना के समय से ही लगातार कृषि आवश्यकताओं को पूरा करने के उद्देश्य से विभिन्न अनुसंधान क्षेत्रों {बागानी, पशु विज्ञान एवं मात्स्यिकी) में प्रयासरत है। संस्थान का प्रमुख उद्देश्य न सिर्फ मूल, प्रायोगिक व अनुकूल अनुसंधान की आवश्यकताओं को पूर्ण करना है बल्कि इसे समन्वित प्रवृतियों के माध्यम से कृषि व्यवसायियों तक पहुँचाना भी है। इससे वैज्ञानिकों को भी अपने प्रयासों से नए-नए तकनीकी क्षेत्रों में अनुसंधान कार्यों के लिए प्रेरणा प्राप्त होगा ।

26 दिसंबर, 2004 को आए भूकम्प और सुनामी के कारण न सिर्फ यह द्वीप, बल्कि पूरा देश स्तब्ध था। इस प्राकृतिक आपदा के कारण इन द्वीपों में जान-माल का काफी नुकसान हुआ। हमारे माननीय महानिदेशक के शब्दों में **''हर प्राकृतिक आपदा उत्तम अनुसंधान प्रयासों के लिए उचित अवसर प्रदान करती है''।** टैक्टॉनिक प्लेट के सरकने से बहुत सारी कृषि उपयोगी भूमि समुद्र में समा गई। मैं धन्यवाद देता हूँ अपने साथियों को और मुझे उन पर गर्व है कि पहले दिन से ही वे स्वयं अपने कार्यों में लगे रहे। उन्होंने नुकसान के परिप्रेक्ष्य में आवश्यक टैक्नोलॉजी और उसके परिष्करण का विस्तृत रूप से सर्वेक्षण किया और अंत में समन्वित प्रस्ताव से किसानों को, जिन्होंने अपना जमीन खो दिया, हिम्मत बंधाई, जिसकी उस समय अत्यंत आवश्यकता थी। यह वह अवसर था, जब पूरा संस्थान आने वाले भविष्य में कृषि और इनसे जुड़े क्षेत्रों की पुर्नस्थापना के लिए सभी आवश्यक टैक्नोलॉजी के साथ तैयार था। संस्थान DBT की सहायता से गुप्तापारा गाँव में तकनीकी हस्तक्षेप सहित मॉडल गॉव के विकास का जिम्मा लिया ताकि सुनामी पीड़ित क्षेत्रों में समन्वित तरीके से सरल व प्रभावी तकनीकियों के द्वारा प्रति यूनिट उत्पादकता में उच्चतम वृद्धि हो।

ग्रामीण युवकों में स्वरोजगार को बढ़ावा देना हमारी दूसरी प्राथमिकता है। कृषि और इनसे जुड़े क्षेत्रों में शिक्षित बेरोजगार युवकों की रूचि के अनुसार इसमें वृद्धि होगी, न सिर्फ उनकी जीविका के लिए, बल्कि स्वरोजगार के तौर पर भी अपनाया जाएगा। संस्थान के तकनीकी हस्तक्षेपों से बाजार में कृषि उत्पादन के मूल्यों में काफी कमी आई है और साथ ही सभी कृषि उत्पाद भी आसानी से उपलब्ध हुआ हैं।

किसान ही वास्तविक रूप से तकनीकियों का अनुकरण करता है, इसलिए हमारे भविष्य की योजनाओं में उनका शीर्ष स्थान है। संस्थान विभिन्न विभागों एवं गैर सरकारी संगठन को भी किसानों व कृषि से जुड़े क्षेत्रों की पुर्नस्थापना में अपना तकनीकी सहयोगी व सलाह दे रहा है। हमारे अनुसंधान सलाहकार समिति के सुझाव के अनुसार इन द्वीपों के पारिस्थितिक तंत्र के अध्ययन द्वारा जितना भी लाभ प्राप्त हुआ है, उसका प्रयोग हमने अनुसंधान क्षेत्रों में बदलाव के लिए किया है।

वर्ष 2004-2005 का संक्षिप्त वार्षिक वैज्ञानिक रिपोर्ट आपके समक्ष है। सुनामी से प्रभावित इन द्वीपों के विकास के लिए हम आपसे बहुमूल्य सुझाव आमंत्रित करते हैं।

डॉ. आर.बी.राय
कार्यकारी निदेशक

PREFACE

The Andaman and Nicobar Islands, possessing hot and humid climate, has fragile but unique ecosystem in many aspects. The prolonged rains, rich biodiversity, unexplored flora and fauna and scattered islands are suitable for conserving the genetic biodiversity. The Central Agricultural Research Institute, from its all along existence in the islands, is constantly catering the research needs in Agriculture, Horticulture, Animal and Fishery sectors. The thrust is not only on basic, applied and strategic research but also on its transfer to stakeholders in an integrated manner. The research, without its reaching to ultimate stakeholders, has little value when it comes to serving the mankind. This also provides impetus to the scientists for excelling in their endeavour as well as constantly exploring the new areas.

The unprecedented earthquake, followed by Tsunami waves in the morning of 26th December 2004, shocked the whole Nation and resulted in vast devastation of both lives as well as land/assets. However, our beloved Director General has rightly told that **"Every disaster provides an opportunity for excelling in their endeavour".** The tilting of tectonic plate due to earthquake resulted in submergence of low lying paddy areas with inundation of sea water. This has increased the misery of farmers. **I am thankful and proud of my colleagues who stood on the occasion and from the first day itself they were on their task.** Detailed survey on nature of damage, technologies needed and their refinement and finally the integrated approach to strengthen the farming communities who have lost their land was the need of the hour and this was the occasion, when the Institute is ready with all the technological back up needed in coming years for rehabilitation of agriculture and allied sectors.

The Institute has taken up development of a model village with technological intervention in Guptapara through DBT support. The simplest and effective approach in integrated manner is going to increase the per unit productivity much higher than pre-tsunami area.

Technological approach for generating self-employment to rural youth is another area of our priority. This will increase the interest of educated unemployed youth in agriculture and allied sectors, not only for their livelihood, but also as a gainful self-employment. The increased availability of agricultural produce with decreasing market prices in most problematic season also is an indicator of all our approach.

Since farmers are real translators, we have placed them on top in our perspective plan. Development Departments and NGOs who are engaged in rehabilitation of farmers and agriculture sectors are constantly being advised and supplied with the required technological interventions. We have also modified our approach as per RAC suggestions to start exploiting the advantages of island ecosystem.

The brief annual scientific report for the year 2004-05 is highlighted in this report and we invite one and all for their suggestions to improve us in helping the tsunami devastated islands.

Dr. R.B. Rai
Acting Director

सारांश

बागवानी एवं वानिकी विभाग

- सोलेनिसियस सब्जियों के मूल्यांकन करने पर पाया गया कि टमाटर की CO-3, आनन्द DT-2, DVRT-2, अर्का विकास, BT-120, BT136, सेलेक्शन 7, DT-1 MDB No-2-3 बैंगन का PB 64 और मिर्च का JCA 283, क्रमशः 100 प्रतिशत्, 80-5 प्रतिशत् और 100 प्रतिशत् बैक्टीरियल विल्ट प्रतिरोधक पाया गया।
- विभिन्न फलीदार सब्जियों का मूल्यांकन किया गया और लोबिया में CHCP-1, फ्रेंचबीन में कोटेन्डर और तोराई में JSGL-55 (जूनागढ़) में अत्याधिक उपज रिकॉर्ड किया गया ।
- फूल खिलने के महीने से बीस दिनों के अंतराल पर स्यूडोमोनास फ्लूरोसेन के प्रयोग से आम में एन्थ्रानोस के नियंत्रण के साथ-साथ अत्याधिक मात्रा में फूल खिला। आम के फूलों में 0.5 प्रतिशत स्यूडोमोनास द्वारा उपचार करने पर गुणवत्ता में अधिकतम वृद्धि हुई।
- नारियल का छिलका और सूखी पत्तियों के खाद की तकनीकी का प्लयूरोटास और यूरिया का प्रयोग करते हुए मानकीकृत किया गया।
- उपयोग के अंर्तगत स्थानीय अपचलित फलो की पोषकता का विश्लेषण किया गया। 54 प्रजातियों में 16 प्रजाति को आर्थिक एवं व्यवसायिक उपयोग के लिए पहचाना गया। तीन प्रजातियाँ मोरीन्डा सिटरीफोलिया, मोरीन्डा ट्रीमेरा और अनोना ग्लैबरा खारापानी प्रतिरोधक के लिए पहचाना गया। NBPGR, नई दिल्ली द्वारा उपयोग के अंर्तगत फलों में से 26 स्थानीय प्रजातियों को उनकी गुणवत्ता के लिए I.C संख्या का आबंटन किया गया ।
- अधिक संख्या में उच्चतम गुणों के फूलों के उत्पादन के लिए 30X20 सें.मी. पर अनुकूल परिस्थिति और गुलदस्ते के लिए जरबेरा का मानकीकरण किया गया। ग्लैडिलोयस में सूक्रोस (5 प्रतिशत) $Ag\ No_3$ (100 ppm) के पाँच दिनों के नियंत्रण द्वारा अधिक समय तक रहता है। अमरीलिस में स्पाइक की लम्बाई के लिए अनुकूलन आकार का बल्ब 3 से 4 सें.मी. का मानकीकरण करने से पुष्पक/स्पाईक अच्छा देखा गया ।
- NBPGR, नई दिल्ली द्वारा 15 स्थानीय आर्किड तथा 10 स्थानीय फर्न और 10 सजावटी पौधों को IC संख्या प्रदान किया गया और यूलोफिया अंडमानेसिस का पंजीकरण दर्ज किया गया ।
- गृह वाटिका वृक्षों अंतर्गत के भौतिक-रसायनिक गुणों के लिए मृदा परीक्षण करने पर पाया गया कि आर्गनिक C, कुल N, कुल P, NH_4, NO_3 परिवर्तनीय K, C_a और M_g कैनोपायी के अंतर्गत अधिक है और खुले प्लॉट में कैनोपायी की स्थिति बीचों बीच है।

क्षेत्रीय फसलें

- इस वर्ष उपज परीक्षण के माध्यम से उपयुक्त अधिकतम उपज वाली किस्मों के निष्पादन को विभिन्न परिपक्व प्रजातियों का आंकलन किया गया। अगेती वर्ग में (सुपर फास्ट) हीरा से सीधी बुवाई और रोपणी परिस्थिति के अंर्तगत 1. 8टन/हेक्टयर और 2.0 टन/हेक्टयर उपज प्राप्त हुआ ।
- Quing Livan 1, BG 1639, ननजिंग 57164 और ताईचुंग सेन यू 5-5.5 टन/हेक्टयर के हिसाब से औसत उत्पादकता का प्रदर्शन किया ।
- धान के प्रकार का {सुपर राइस} तीन उपयुक्त नये पौधों ने एक बार फिर अपनी उत्कृष्टता का प्रदर्शन किया ।
- बडे पैमाने की खेती के अंर्तगत दक्षिणी अण्डमान और दशरथपुर गाँव में किसानों के खेत में BTS 24, खारापन प्रतिरोधक पंक्ति विकसित की गई जिसमें औसत उपज 3.7-40 टन/हेक्टयर प्राप्त हुआ।

- IR 72 और C 14-8 में A1 और Fe विषाक्ता प्रतिरोधक पंक्ति विकसित की गई जो कि मृदा परिस्थिति के अंर्तगत कृषि प्रतिरोधक पाया गया।
- बैंगन की किस्मों जैसे- BB 66C, Sm141 से सोमाक्लोनस विकसित की गई और BB 60c का उन्नत एग्रो मॉरफोलोजिकल लक्षणों के लिए Sc5 और Sc6 प्रजनन का मूल्यांकन किया गया। इनमें से 16 उपयुक्त पंक्तियों को पहचाना
- दक्षिणी अण्डमान में सोलेनिसियस सब्जियों कुकुरबीट और कूसिफर के कीट व्याधियों का निरीक्षण किया और समय-समय पर नुकसान का मूल्यांकन किया गया ।
- वर्षा के दिनों में बैंगन में सबसे अधिक फल व शूट बोरर *L.Orbonalis* का प्रकोप देखा गया। अक्टूबर के दूसरे सप्ताह के बाद मार्च अंत तक अच्छी फसल देखी गई ।
- अंत फसलें जैसे - सोवा, nethium sowa, kenaf; Hibiscus ubdariffa और मक्का Zeamays बैंगन के साथ अनुकूल पायी गई ।
- टमाटर के साथ अंत:फसल Kenaf (4:1) की पंक्ति में 15 दिनों के अंतराल पर 45 DAT से NPV का 250 LE प्रति हैक्टेयर 2 बार प्रयोग करने से फल के नुकसान में 78 प्रतिशत् की कमी देखी गई। फूलगोभी में NPV को 2 प्रतिशत गुड के साथ Phagostimulant के रूप में प्रयोग करने से *S. Liture* के प्रबंध में प्रभावशाली साबित हुआ।
- स्यूडोमोनाडस की 29 प्रजाति एकत्रित की गई ।

प्राकृतिक स्रोत प्रबन्धन

- मृदा कटाव व अवक्रमण (degradation) के बीच संबंध की पहचान के लिए प्रायोगिक फार्म में लगातार अध्ययन के माध्यम से मिट्टी के तुलनात्मक गुणों और तलछट (sediments) का अध्ययन किया गया। वन कैनोपायी के अंर्तगत रनॉफ क्षति और मृदा क्षति दोनों में कमी हुई, जो 3.9 से 31.8 मी.मी. और 2.8 से 13.2 टन/हें$^{-1}$ था, इस बात पर निर्भर था कि सितंबर से अक्तूबर, 2004 को छोड़कर वर्षा कितनी हुई और उसके बाद सुपारी और अन्य कैनोपायी का विस्तार कितना था।
- बी.बी.एफ.पद्धति में, जैसे अमरेन्थस-भिंडी-राटून भिन्डी, लोबिया-बैंगन-राटून बैंगन, बेबीकार्न-लोबिया-चिडन्डा, मल्टीकट फॉडर सॉरगम (COFS-29) और बैंगन-फूलगोभी-तोरई, इन पाँच फसलों की श्रृंखलाओं के मेलजोल से खेती करने की सलाह दी गई ।
- खेत परीक्षण से पता चला कि वर्तमान केज व्हील के बजाय नवीन पारदर्शी आधा और पूरा केज व्हील का उत्तम प्रदर्शन देखा गया।
- ताईचुंग-सेन-यू प्रजाति का प्रयोग करते हुए ''धान वृद्धि प्रणाली'' पर प्रारंमिक अध्ययन किया गया और पाया कि यह विधि रोपाई की कृत्रिम विधि (4347 कि.ग्रा./हे./ग्रा.) के अधिकतम उपज (6222 कि./हे.) देती है।
- सतह (0.20 सें.मी. गहराई) और ऊपरी सतह (20.50 सें.मी.) से मिट्टी का नमूना एकत्रित किया गया और GIS के प्रयोग द्वारा उपजाऊ क्षमता मैप के विकास के लिए भौतिक रासायनिक गुणों का विश्लेषण किया गया।
- निकोबारी जनजातियों के लिए नारियल का छिलका निकालने के यंत्रों का डिजाइन किया गया
- धान में, क्विंवग लिवान 1 अन्य फसलों की किस्मों की तुलना में सबसे अधिक पैदावार देने वाली धान की प्रजाति दर्ज की गई ।
- इन द्वीपों की परिस्थिति में गीला बोया हुआ धान में अंत: फसल के लिए सेसबानिया एक्यूलियाटा और सेसबानिया रोसट्राटा की सिफारिश की गई ।

पशु विज्ञान

- व्हाइट लेगहार्न और ब्राउन तथा काली निकोबारी मुर्गियों के सीधे एवं पारस्परिक संकरण से F_1 चूजा पैदा की गई तथा इनकी वृद्धि, दाना उपभोग क्षमता, उत्पादन क्षमता, मृत्युदर और अंडे व मांस की गुणवत्ता का अध्ययन किया गया और इन मुर्गियों को घर के पिछवाड़े में पालने व गहन प्रणाली अर्थात दोनों प्रणाली के अंर्तगत जांचा गया। निष्कर्ष यह निकला कि नर (ILI-80) और मादा (भूरा निकोबारी) दोनों के संकर प्रजनन करने पर उत्तम पाया गया ।
- टर्की एवं गिनी मुर्गियों की अनुकूलता एवं उत्पादकता का अध्ययन करने पर पाया गया कि दोनों इन द्वीपों की जलवायु के लिए अनुकूल हैं ।
- यहाँ की स्थानीय मुर्गियों निकोबारी मुर्गी (काली व सफेद), नेकेड नेक में माँस की गुणवत्ता का अध्ययन किया गया तथा इन द्वीपों के जनजातियों द्वारा मांस बनाने की विधि पर सर्वेक्षण किया गया।
- गाय, मुर्गी, बकरियों के रक्त परीक्षण करने पर पाया गया कि गाय के ब्रूसेलोसिस (22.2%), IBR (22.82%), लैप्टोस्पाइरोसिस (16.67%), बकरी में माइकोप्लाज्मोसिस (15.7%), ब्रूसोलोसिस (11.96%), लैप्टोइपारोसिस (24.14%) तथा मुर्गियों के IBD (58.5%) सालमोलोसिस (55.4%) IB (69.96%) और माइकोप्लाज्मोसिस (13.12 %) देखा गया ।
- परजीवीयों से होने वाले प्रमुख बीमारियों में कंधे का रोग (35%), फेसिलोयासिस (10.5%), स्ट्रांगगाइलोइडिस (23%), टीनीएसिस (2.6%), ट्राइचूरिस (0.86%) और सिस्टोसोमियालिस (0.86%) देखा गया ।
- गाय में FMD के प्रकोप का विस्तृत अध्ययन करने पर देखा गया कि इस बीमारी का कारण टाइप 'O' FMDV पाया गया ।
- मुर्गियों में IBD रोग का टीकाकरण परीक्षण किया गया और देखा गया कि 2 बूंद की दर से प्रति मुर्गी को पीने के लिए देने पर मुर्गी सुरक्षित पायी गयी ।
- दक्षिण अण्डमान के विभिन्न स्थानों, जैसे इंदिरा नगर, न्यू बिम्बली टान आदि में दूध देने वाली गायों में बांझपन की समस्या अधिक पायी गई । प्रारंभिक सर्वेक्षण करने पर देखा गया कि बांझपन की समस्या खनिज तत्वों की कमी के कारण होती है।
- शुष्क, वर्षा व ग्रीष्म मौसम में नाले व अन्य जल स्रोतो जैसे मिट्टी, घास व पानी के नमूनों को एकत्रित किया गया और इसमें स्थित PH, आद्रता एवं खनिज तत्वों की मात्राओं का अध्ययन किया गया।
- निकोबारी सूअर व तेरेसा बकरी का निकोबार द्वीप में प्रारंभिक सर्वेक्षण द्वारा जनसंख्या, आकार प्रबंधकीय प्रणाली, उत्पादकता, व अन्य विशेषताओं की जानकारी एकत्रित की गई ।

मात्स्यिकी विज्ञान

- मड् क्रैब *Scylla serrata* के विभिन्न कृत्रिम भोजन का तुलनात्मक मूल्यांकन किया गया।
- लॉबस्टर *P. versicolor* को विभिन्न प्रकार का मिश्रित दाना देने पर यह देखा गया कि ''ग्रीन मसल+*Lam*'' का मिश्रण देने पर उनमें सबसे अधिक वृद्धि पायी गई। (सामान्य वजन 125.42 ग्राम, कुल लंबाई 181.98 एम.एम Carapace लंबाई 78.24 एम.एम., पेट की लंबाई 73.69 एम.एम. और telson लंबाई 29.61 एम.एम.)
- ग्रुपर वृद्धि विभिन्न प्रकार का मिश्रित गीला दाना का मूल्यांकन किया गया। "*E.tauvina Sardinet Stolephorust* मान्य सामग्री'' का मिश्रण देने पर अधिकतम वृद्धि देखी गयी । (कुल वजन 500.38 ग्रा.कुल लंबाई 3.330 MM)
- C. argus argus के गीला मिश्रित दाना का मूल्यांकन करने पर पाया गया कि ''Sardinet stolephorust सामान्य मिश्रण'' देने पर अधिकतम वृद्धि देखी मई। वजन 386-02 ग्राम, कुल लंबाई 298.98 एम.एम.

- ब्रूड स्टॉक प्रबंधन के माध्यम से A.Percula के कई प्रजनन जोडियाँ विकसित की गई और इनसे कई Juvemnile बच्चें पैदा किए गये। A.percula का अध्ययन करने पर इनमे शारीरिक संरचना के प्रभाव से लिंग परिवर्तन की क्षमता देखी गई । प्रयोगशाला के अंतर्गत A.Ocellaris मछली के Captive प्रजनन का सफलतापूर्वक अध्ययन किया गया । क्लॉन मछलियों के दाना खाने की आदत का अध्ययन किया गया ।

सामाजिक विज्ञान

- किसानों के खेत में ''इन द्वीपों के आद्र ट्रॉपिक परिस्थिति में विभिन्न स्रोतों के अंतर्गत समन्वित कृषि प्रणाली नमूना का विकास'' पर पिछले अक्टूबर, 2004 से प्रोजेक्ट प्रारंभ किया गया, जिनमें निम्नलिखित गाँव है- कालीकट, गुप्तापारा और छोलदारी। तीन गॉव के 35 किसानों के मध्य सब्जियों में IPM पर FFS कार्यक्रम आयोजित की गई। ये गाँव है- नील द्वीप का भरतपुर, सीतापुर और लक्ष्मणपुर। किसानों के खेत में नीम तेल, नीम तेल केक, NPV और *Trichoderma, Pseudomonas* के प्रयोग द्वारा गहन कीट प्रबंध पर तकनीकी हस्तक्षेप किया गया। पोस्ट हस्तक्षेप प्रभाव का सर्वेक्षण करने पर पाया गया कि सब्जियों में रसायनों का प्रयोग 30.40 प्रतिशत् घट गया ।
- ''धान में आईपीएम'' व ''सब्जियों में कीट व्याधि रोग प्रबंध'' जैसे तकनीकियों को छोटे स्तर पर 100 किसानों द्वारा अपनाया गया।
- इन द्वीपों में ब्रायलर किसानों की सामाजिक आर्थिक प्रोफाइल रिकार्ड की गयी। ब्रायलर किसानों की औसत आयु 40 से 45 वर्ष की और अधिकतर कम पढ़े लिखे हैं, कुछ सेकेण्डरी स्तर तक शिक्षित है। जैसे ही फार्म आकार में वृद्धि हुई, आय के लिए किसानों का ब्रायलर पालन पर निर्भरता घटती गई। उन्होंने अनुभव प्राप्त करके अपने फार्म के आकार में वृद्धि की।
- अध्ययन करने पर देखा गया कि सभी किसानों द्वारा अन्य सामान की तुलना में फीडर और वार्टरर पर सबसे अधिक खर्च किया ।
- ब्रायलर और लेयर फार्मिंग दोनों के मजदूर उपयोग प्रणाली का निरीक्षण किया फार्म के आकार में वृद्धि होते ही मजदूर में भी वृद्धि हुई और इससे परिवार की मजदूरी में कमी आई ।
- ब्रायलरों को मृत्युदर का सामान्य कारण पाया गया IBD, हीट स्ट्रोक, कर्लड टो पैरालाईसिस, विसरल गॉट और *E. coli*, जबकि लेयर में फंफूदी टॉक्सिन, मायकोप्लानमा, हीट स्ट्रोक, विसरल गॉट, *E.coli*, IBD और कर्लड टो पैरालाइसिस के कारण मृत्युदर पाया गया ।

कृषि विज्ञान केन्द्र

- ग्रामीण युवकों, कृषि महिला एवं किसानों के लिए कुल 55 प्रशिक्षण आयोजन किया गया जिनमें 960 पुरूष व 662 महिला शामिल थे।
- प्रथम पंक्ति प्रदर्शन के अंतर्गत किसानों के खेतों के धान की HYV पर 25 प्रदर्शन, सब्जियों पर 22 और पशु पालन पर 657 प्रदर्शन किए गए ।
- कृषि और सम्बद्ध क्रियाकलापों पर चुनी गई तकनीकियों को लोकप्रिय करने के लिए कई प्रसार कार्यक्रम जैसे खेत दिवस, प्रदर्शनी Campaign रेडियो कार्यक्रम लोकप्रिय आर्टिकल और बुलेटिन आदि का आयोजन किया गया ।

EXECUTIVE SUMMARY

HORTICULTURE & FORESTRY

- Evaluation of solanaceous vegetables revealed that Co-3, Anand, DT-2, DVRT-2, Arka Vikas, BT-120, BT-136, Sel-7, DT-1, MDB No-2-3 of tomato, PB-64 of brinjal and JCA-283 of chilli recorded 100 %, 80.5 % and 100 % survival against bacterial wilt, respectively.
- Varietial evaluation leguminous vegetable revealed that CHCP-1 of cowpea, Contender of french bean and JSGL-55 (Junagadh) of sponge gourd recorded the highest yield.
- Application of *Pseuodomonas fluorescens* @ 0.5 % at an interval of 20 days from the month of flower bud initiation (May-June) upto final harvest, resulted in profuse flowering simultaneously with control of anthracnose in Mango. Mango fruits treated with *Pseuedomonads* (0.5%) gave the highest shelf life with quality characters.
- Technology of composting the coir pith and dried leaves was standardized using *Pleurotus* and urea.
- Nutritional analysis of underutilized indigenous fruits was done. Out of 54 species conserved on the land, 16 species were identified for commercial exploitation. Three species, viz. *Morinda citrifolia* , *Morinda trimera* and *Anona glabra* were identified for saline resistance. 26 indigenous species of underutilized fruits were allotted IC numbers by NBPGR, New Delhi.
- The optimum spacing and vase life for gerbera was standardized at 30 x 20 cm for production of more number of quality blooms. In Gladiolus, Sucrose (5%) + $AgNo_3$ (100 ppm) prolonged the vase life by 5 days over control. In Amaryllis, the optimum size of bulbs for length and number of florets/spike was 3 to 4 cm.
- IBA 2000 ppm produced maximum number of suckers (5) and 1.5% urea produced the maximum spike length with more duration of flowering in *Eulophia andamanensis*. 15 indigenous orchids and 10 ferns and ornamental indigenous plants were allotted IC numbers by NBPGR, New Delhi and *Eulophia andamanensis* was registered at NBPGR, New Delhi.
- Soil analysis for physico - chemical properties under homegarden trees revealed that organic C, total N, total P, NH_4, NO_3, exchangeable K, Ca and Mg were higher in the under canopy and between canopy position than that in the open plot.
- Experiment indicated that peak biomass and yield of maize was greater when the leaves were applied green in both incorporated and surface conditions. *Gliricidia* as well as *Leucaena* provided nearly equal yield in maize.

FIELD CROPS

- Performance of promising high yielding varieties belonging to different maturity groups was reaffirmed this year too through yield trials. In the very early group (super fast), Heera produced 1.8 tons/ha under direct seeded condition and 2.0 tons/ha under transplanted condition.
- Quing Livan1, BG 1639, Nanjing 57164 and Taichung Sen Yu displayed average productivity in the range of 5.0-5.5 tons/ha. Scope of double cropping involving a productive very early variety in conjunction with a medium duration variety is distinctly discernible.

- Three promising new plant type rice (Super rice) once again demonstrated their superiority than any other inbreeds alike previous years. However, coarse grain and less amenability to manual thresher are the major bottlenecks, which need to be overcome in future.
- BTS 24, a salt tolerant line developed *in situ* showed 3.7-4.0 tons/ha under farmers' field in Dasrathpur village and in south Andaman under large-scale cultivation.
- Al and Fe toxicity tolerant lines developed in IR 72 and C14-8 background showed appreciable field tolerance under constrained soil conditions.
- Microprojectile based genetic transformation was optimized in Basmati 370 and Taraori Basmati involving diverse physico-chemical parameters. Putative transgenics involving cryI A(b), cryI A(c), Amsod and chitinase were developed. Efforts are underway to pinpoint homozygous lines.
- 150 entries from F_3 population of IR 28 X Pokkali were phenotyped under artificially simulated saline soil condition and were molecularly profiled through RAPD analysis.
- Somaclones developed from brinjal varieties, viz. BB66C, SM141 and BB60C were evaluated at SC_5 and SC_6 generations for improved agro-morphological characters. Among them, 16 promising lines were identified.
- Molecular tagging of salt tolerant gene/s in a mapping population derived from IR 28 X Pokkali was carried out through RAPD analysis.
- Molecular characterization of three economically important endemic medicinal plant species, viz. *Alstonia macrophylla*, *Costus speciosus* and *Hernandia peltata* through RAPD analysis revealed ample genetic divergence among diverse collections, which would be instrumental in devising sound conservation strategies.
- Pest and disease monitoring of solanaceous vegetables and Crucifers was done in South Andamans and damage was periodically assessed. The extent of damage suffered and peak time of occurrence of key pests was recorded.
- The maximum fruit and shoot borer, *L. orbonalis* damage in brinjal was found during rainy season. Healthy crop could be grown after October II week till March end. Incidence of Brinjal fruit and shoot borer, *Leucinodes orbonalis* was found significantly positive correlated to relative humidity ($r = 0.71^*$) and rainfall ($r = 0.91^*$).
- The intercrops, viz. Sowa, *Anethium sowa*, Kenaf, *Hibiscus subdariffa*, and Maize, *Zea mays* were found to be compatible with brinjal in fruit borer damage reduction and afforded protection almost equal to neem oil. The crop diversity led to 8 fold increase in natural enemies.
- Tomato with intercrop of Kenaf (4:1) rows , NPV application twice at 250 LE/ha at 15 Days interval from 45 DAT led to 78 % reduction in fruit damage over control. NPV along with 2 % jaggery as phagostimulant was effective in managing *S. litura* in Cauliflower leading to 66 % damage reduction to curds.
- Twenty nine strains of Pseudomonas were collected and chracterised. Local strains of Pseudomonas were found to inhibit growth of Pythium effectively to varying degrees.

NATURAL RESOURCES MANAGEMENT

- Comparative properties of soil and sediments were generated through repeated studies in the experimental farm to recognize the relationship between erosion and soil degradation. Both runoff loss and soil loss were less under forest canopy, which varied from 3.9 to 31.8 mm and 2.8 to 13.2 t ha^{-1} depending on the rainfall and followed by arecanut and other canopies except during September and October 2004.
- Consortium of five crop sequences, viz. Amaranthus-Bhendi-Ratoon bhendi, Cowpea-Brinjal-Ratoon brinjal, Babycorn-Cowpea-Snake gourd, Multicut fodder sorghum (COFS 29) and Brinjal-Cauliflower-Ridge gourd could be recommended for cultivation in the beds of BBF system. In the furrows, HYV's of rice-ratoon-pulses/sunflower and super rice-ratoon-ratoon could be recommended in order to achieve higher yield.
- In paddy, Quing Livan1 variety of paddy registered higher yield in main and ratoon crop compared to other varieties. Application of 50 % N through *Gliricidia* and 50 % N through inorganic sources is recommended for main crop and 40 kg N ha^{-1} is recommended for getting higher yield in the ratoon crop.
- *Sesbania aculeata* (Dhaincha) and *Sesbania rostrata* could be recommended for intercropping in wet seeded rice under island conditions. Combination of cultural (intercropping) and mechanical (cono weeder) weeding method was found effective for bringing down the weed density thereby registering higher yield, net income and energetics.
- Preliminary study on 'System of Rice Intensification (SRI)' using Taichung-sen-Yu variety revealed that this method produced higher grain yield (6222 kg ha^{-1}) than the conventional method of planting (4347 kg ha^{-1}).
- Field trials showed better performance of newly fabricated half and full cage wheels than the existing cage wheels.
- Among primary tillage implements, maximum time was required for ploughing in the *Deshi* plow (0.014 0.018ha/h), followed by Animal MB plow (0.040 ha/h), power tiller (0.08 ha/h) and tractor cultivator (0.42 ha/h).
- Puddling field capacity for one pass of tractor cultivator was maximum (0.1188 ha/h), followed by power tiller (0.1152 ha/h) and animal drawn puddlers (0.0144-0.120 ha/h). Power tiller was found the best for puddling of paddy field due to highest puddling index.
- Aerobic direct seeders required less time (8-20 h/ha) than anaerobic seeder (19.55 h/ha). The conoweeder required 50-60 man-h/ha in comparision to 120-150 man-h/ha required in the traditional method of weeding.
- A coconut dehusker was designed and fabricated for Nicobari tribals for dehusking of coconut in standing/ sitting posture by means of sharper dehusking tools.
- A solar dryer was designed and developed to trap solar energy and to improve the quality of copra. Within two days of bright sunshine hours, 110 nuts copra was dried with the temperature range of 28-52°C. The inside temperature of dryer was higher than the outside air temperature. The edible quality of the copra was obtained with MC between 6-10% (wb), which is suitable for storage.

- Study to find out the optimum season for the cultivation of *Andrographis paniculata* (Kalmegh) under shade (Intercropping) as well as open space (Sole cropping); to find out the optimum spacing; and to find out the nutrient requirement of kalmegh through organic source for getting maximum yield in Bay Islands was taken up.
- Soil samples were collected from surface (0-20cm depth) and sub surface (20-50 cm) and analyzed for physico-chemical properties to develop Fertility Capability Map by using GIS.

ANIMAL SCIENCE

- The performance of the progeny of the direct and reciprocal crosses of White Leghorn (ILI-80) with Brown and Black Nicobari such as feed consumption, production performance, feed efficiency, laying period mortality, egg and carcass quality traits and RAPD-PCR profile under both backyard farming and intensive system were studied and reported. The performance of the crosses of ILI-80 (as male parent) with Brown Nicobari (as female parent) was found to be better based on better survivability and production under backyard system.
- Studies on adaptability and productivity of turkey and guinea fowl revealed that these birds were well adapted to this climatic condition. The production and reproductive parameters were studied under deep litter system of rearing.
- Carcass quality of the different indigenous chicken breeds of these islands, viz. Nicobari fowl (Black, Brown and White) and Naked neck fowl was studied. Survey was conducted among the tribals of these islands to gather information on indigenous method of meat preparation and their storage. The meat quality parameters were also studied.
- Sera samples collected from cattle, goat, pig and poultry revealed the prevalence of Brucellosis (22.2%), IBR (22.82%), leprospirosis (16.67%) in cattle, Mycopalsmosis (15.7%), brucellosis (11.96%) and leptospirosis (24.14%) in goat and IBD (58.5%), salmonellosis (55.4%), IB (69.56%) and mycopalsmosis (13.12%) in poultry in these islands.
- The prevalent parasitic diseases in these islands were found to be humpsore (35%), Fascioliasis(10.5%), Strongyloides(23%), Taeniasis (2.6%), trichuris(0.86%) and Schistosomiasis (0.86%).
- Detailed study on outbreak of FMD was conducted and samples were examined for antibodies and it was found to be type 'O' FMDV.
- Efficacy of IBD vaccine was tested in poultry chicks @ 2 drops/bird through oral route and found to be safe and protective.
- The survey of dairy animals revealed the prevalence of infertility in different places like Indiranagar, New bimblitan , Namunagar, etc. of South Andaman and the cause of infertility was due to deficiency of mineral elements.
- Soil, grass and water from valleys, slopes and hilltops and blood samples from dairy animals were collected for studying minerals, pH and moisture in 3 seasons, viz. dry (October-January), pre-monsoon (February-May) and monsoon season (June-September).
- *Mycrosorim punctum* was screened for its nutrient composition and later on evaluated as a source of herbage in rabbit feeding.

- The initial survey of Nicobar group of Islands to collect information on herd size, litter size, managemental practice and other productive traits of Nicobari pig and Terresa goat was completed.

FISHERIES SCIENCE

- Comparative evaluation of different artificial diets on fattening of mud crab, *Scylla serrata* was carried out.
- Evaluation of different mixed wet feeds on growth of lobster, *P. versicolor* showed that the combination of 'green mussel +lam' gave the best growth (mean weight of 125.42 gm, total length 181.98 mm, carapace length 78.24 mm, abdomen length 73.69 mm and telson length 29.61mm).
- Evaluation of different mixed wet feeds on growth of grouper, *E. tauvina* showed that the combination 'sardine + stolephorus + common ingredients' gave the maximum growth (mean weight of 500.38 gm, total length 333.01 mm).
- Evaluation of different mixed wet feeds on growth of grouper, *C. argus argus* showed that the combination 'sardine + stolephorus + common ingredients' gave the maximum growth (mean weight of 386.02 gm, total length 298.98 mm).
- Through broodstock management, several breeding pairs of *A. percula* were developed and their breeding for mass scale production of juveniles was carried out. Influence of social structure on sex inversion in *A.percula* was studied. Captive breeding of *A. ocellaris* was successfully achieved under laboratory condition. Feeding habit of clown fishes was studied.
- Isolation and identification of unicellular algae and fresh water micro algae was carried and the stock culture experiments showed that Walnes media gave the highest population growth for *T. carteriformis, C. pyrenoidosa and P. tricornutum*.

SOCIAL SCIENCE

- The project on 'Development of Integrated Farming System model under different resource conditions in humid tropics of Bay Island' was started in farmers field in villages, viz. Calicut, Guptapara and Chouldari since October 2004.
- FFS programme on IPM in vegetable was conducted among 35 farmers in three villages, viz. Bharatpur, Sitapur and Laxmanpur in Neil Island. Technology intervention on biointensive pest management using *Trichoderma, Pseudomonas*, NPV, neem oil cake and neem oil was done in farmers' field. Post intervention impact survey revealed that application of chemicals in vegetables was reduced to 30-40%.
- Technologies like 'IPM in paddy', 'Insect pest and disease management in vegetables' were adopted by 100 farmers with minor refinement. They recorded significantly higher yield and net return and were found socio-economically viable and ecologically compatible in these islands.
- Socio-economic profile of the broiler farmers was recorded in these islands. Average age of the farmers ranged from 40-45 years. They were mostly illiterate and some had studied upto secondary level. As the size of the farm increased, the dependency of the farmers on broiler

farm for income reduced. As they get experience, they increased the size of the farm.

- Small and medium broiler farmers followed 'All in - All out system' of management, while large farmers maintained both 'All in - All out' and 'multiple brooding systems'. The major investment was made on feeder and waterer, compared to other equipment by all farmers in the study area.
- The labour utilization pattern for both broiler and layer farming was observed. As the farm size increased, the engagement of hired labour increased and that of family labour reduced.
- Common causes of mortality for broilers were found to be IBD, heat-stroke, curled toe paralysis, visceral gout and *E. coli*, while in case of layers fungal toxins, Mycoplanma, heat stroke, visceral gout, *E. coli*, IBD and curled toe paralysis resulted in mortality.

KRISHI VIGYAN KENDRA

- A total of 55 training programmes was conducted for the practicing farmers, farm women, rural youth and extension functionaries covering 1622 personnels, of which 960 were men and 662 women.
- Under Front line demonstration, 25 demonstrations on HYV of rice, 22 on vegetables and 67 on livestock were taken up in farmer's field followed by On farm trials on rice and vegetables both in problem and normal soil.
- To popularize the selected technologies assessed on agriculture and allied activities, numerous extension activities like field days, exhibition, campaign, meet and radio talk among the target groups were conducted.

INTRODUCTION

HISTORICAL PERSPECTIVE

Agriculture in the Bay islands is about 135 years old and obviously started at the expense of forest land with the help of contract labourers and later on the activity was carried on by the settlers from different parts of mainland, India. In 1927, the Department of agriculture was established; till 1901, 10198 ha were cleared of which 4198 ha were put under cultivation. In 1981, the area under cultivation went up to 40594 ha and in the year 2000, the total area reached 50410 ha. Soon after independence, these islands faced the influx of refugees from Bangladesh (erstwhile East Pakistan) and with abrupt influx of these new settlers, the socio-economic status of the existing population underwent a tremendous metamorphosis. To ensure food and economic security, the government allotted 2 ha of cultivable paddy land and 2 ha hilly land to the settlers.

In Nicobar, coconut and arecanut cultivation has a historical past. But unsystematic cultivation and over-crowding population have affected the yields of these plantations very badly. Inspite of government grant and input assistance, agricultural production has fallen short of demand necessitating shipment of food grains, vegetables and fruits from mainland. With the opening of better communication infrastructure, the Islands attract tourist population from mainland and abroad. The increasing influx of population is taxing the assimilative capacity of the Andaman and Nicobar Islands. The Government of India has therefore decided to develop these islands in a more comprehensive and integrated manner with minimum disturbance to the environmental quality.

As the available land for cultivation is minimal, harnessing of the resources in a sustainable manner has assumed paramount importance. A step towards this goal was the establishment of Central Agricultural Research Institute by amalgamation of the Regional Research Stations of different ICAR institutes, namely, the Indian Agricultural Research Institute, New Delhi, the Central Marine Fisheries Research Institute, Cochin, the Central Plantation Crops Research Institute, Kasaragod and the Indian Veterinary Research Institute, Izatnagar with the ICAR Regional Centre for NEH region. The Institute has been entrusted with the onerous task of catering to the needs of the population of these islands and conservation of ecosystem, as well, by forging a research base to enhance crop, livestock and aquatic productivity through the judicious use of the rich and diversified, though, fragile natural resource base of these islands.

Central Agricultural Research Institute (CARI) is playing a significant role in agricultural research in these islands. The Institute is catering to the need of the Islands' farming community. CARI is

evaluating and developing appropriate technologies in agriculture and allied fields and is transferring them to farmers through its Krishi Vigyan Kendra (KVK) and Agricultural Technology Information Centre (ATIC).

MANDATE

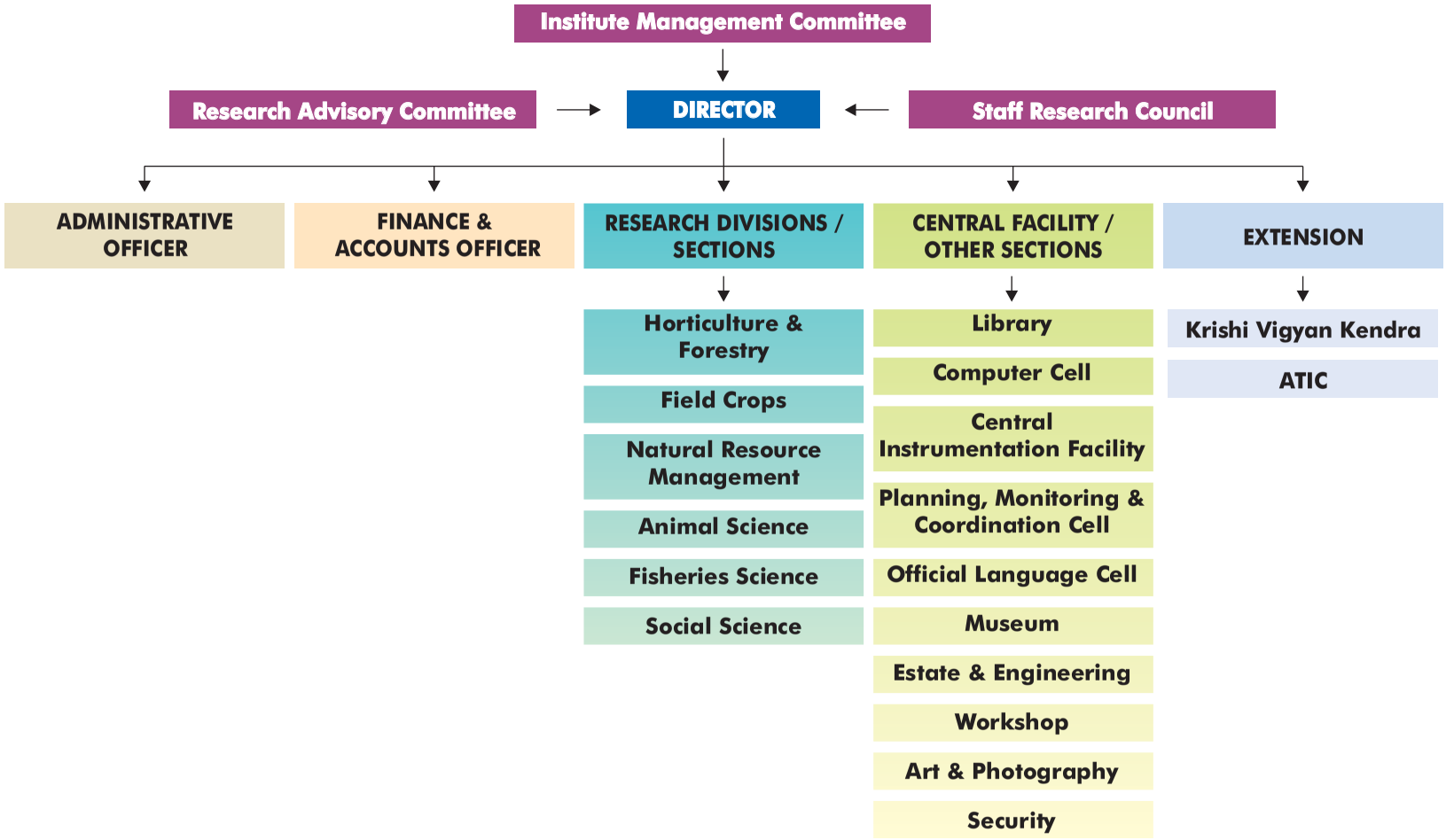
- To provide a research base to improve the productivity of important agri-horticulture, livestock and fisheries of A & N islands through adaptive and basic research for attaining economic self-sufficiency.
- To develop appropriate plans for conservation of natural resources and their sustainable use.
- To standardize technologies for animal health coverage and livestock production.
- To standardize techniques for capture and culture fisheries including coastal aquaculture.
- First line transfer of technology and training to the relevant state departments.

ORGANISATIONAL SET UP

The Central Agricultural Research Institute is located in the remote, backward and tribal territory of Andaman and Nicobar Islands. The main research and residential complex is located at Garacharma, 9 km away from Port Blair, the capital of the Union Territory. The Garacharma Complex houses the Director's Office within administrative block.

Division of Field Crops, Biotechnology Section, Division of Horticulture and Forestry, Entomology and Plant Pathology Section, Division of Animal Science, Division of Fisheries Science and Division of Natural Resource Management have their laboratories in Central Laboratory Block. A Central Instrumentation facility is existing in the Central Laboratory block for common access to all the Scientists for utilization of state of art equipments. The field research unit of horticulture, plantation crops, fisheries and the main Krishi Vigyan Kendra building are situated at the Sipighat farm which is 8 km away from the main campus. The Bloomsdale farm is situated 13 km away from the main campus, which is meant for the field experiment works of Natural Resource Management and Field Crops Division. The Institute has also established a fisheries laboratory at Marine Hill. World Coconut Germplasm Centre is located at the Sipighat farm campus.

ORGANOGRAM


Institute Management Committee
Research Advisory Committee
DIRECTOR
Staff Research Council
ADMINISTRATIVE OFFICER
FINANCE & ACCOUNTS OFFICER
RESEARCH DIVISIONS / SECTIONS
CENTRAL FACILITY / OTHER SECTIONS
EXTENSION
Horticulture & Forestry
Field Crops
Natural Resource Management
Animal Science
Fisheries Science
Social Science
Library
Computer Cell
Central Instrumentation Facility
Planning, Monitoring & Coordination Cell
Official Language Cell
Museum
Estate & Engineering
Workshop
Art & Photography
Security
Krishi Vigyan Kendra
ATIC

STAFF POSITION

Sl.No.	Category	Sanctioned	Filled
1.	Scientific	60	32
2.	Technical	45	42
3.	Administrative	30	28
4.	Supporting	85	84

FINANCIAL STATEMENT

The Annual Budget of the Institute for the year 2004-05 was Rs. 809 lakhs out of which Rs. 269.00 lakhs was under plan and Rs. 540.00 lakhs was under non-plan heads. Fund allocation and budget utilization under various heads are given below :

Budget Utilization During 2004-2005

(in lakhs)

Head of Account	Plan		Non-Plan	
	R.E.	Expenditure	R.E.	Expenditure
Establishment Charges	--	--	355.00	306.72
Wages	--	--	46.00	45.20
O.T.A.	--	--	00.05	0.05
Traveling Allowances	10.00	9.98	11.80	11.75
H.R.D.	5.00	5.00	--	--
Other Charges	170.00	162.88	75.00	74.94
O/C Information Technology	5.00	5.00	--	--
Works				
Special Repairs (a) Office	--	--	85.00	83.00
(b) Residential	--	--	10.00	10.00
Major Work	80.00	79.83	8.15	8.15
TOTAL	270.00	269.00	591.00	539.81

RESEARCH PROGRAMMES AND ACHIEVEMENTS

PROGRAMME - 1

CHARACTERIZATION AND MANAGEMENT OF NATURAL RESOURCES

TREE-SOIL-CROP INTERACTIONS IN AGROFORESTRY PRACTICES IN A & N ISLANDS

C.B. Pandey and A. Venkatesh

Experiment 1 : A study of physico-chemical changes under different homegarden trees

The study reports variations in soil texture, pool sizes of organic C, total N and P, mineral N and P, and exchangeable K, Ca and Mg, and pH in three soil depths, i.e. 0 to 10, 10 to 20 and 20 to 30 cm, at two canopy positions, viz. under canopy and between canopy of three homegarden trees namely coconut (*Cocos nucifera*), clove (*Eugenia cariophyllata*) and nutmeg (*Myristica fragrans*) in a coconut-tree spices plantation, adjacent to open plot and a moist evergreen forest in South Andaman.

Soil physical properties

The soils, not well weathered, were gravely- loamy in texture (Table1). The gravels were lower by 9 to 7 % in the under canopy and 3 to 9 % in the between canopy position of the homegarden trees than that in the adjacent open plot. Contrary to that of the gravels, fine sand particles were 4 to 7 % greater in the under canopy and 1 to 4% in the between canopy position compared to that in the open plot. The gravels tended to increase whereas fine sand particles declined with the depth in all the treatments. Compared to coconut palm, fine sand particles were 5% higher under the tree spices in the surface layer (0-10 cm). Gravels were 7 to 18 % lower whereas fine sand particles 4 to 7 % higher in the forest than that under the homegarden trees. Silt and clay soil particles did not differ among the treatments.

Soil chemical properties

Pool sizes of total nutrients

All the soils were slightly acidic in reaction (Table 2). Soil organic C was as much as 83 to 119 % higher in the under canopy and 18 to 75 % higher in the between canopy position of the homegarden trees than that in the open plot. Among the homegarden trees, it was 8-19 % higher under the tree spices than that under the palm. Soil organic C was invariably higher in the surface soil (0 to 10 cm) and declined with the depth in the both canopy positions of all the homegarden trees, open plot and the forest. However, the decline in the between canopy position was comparatively gradual. Pattern of total N was broadly similar to that of organic C. Like organic C, it was also 14 to 31% higher under the tree spices, than that under the palm. Organic C and total N as well were 27 to 52 % and 23 to 69 %, respectively higher in the forest than that under the homegarden trees. Total P also followed the pattern of organic C and total N but it's distribution was nearly uniform among the depths in almost all the treatments. Total P in the forest was nearly equal to that found under the tree spices but lower compared to that under the coconut palm. However, in general, P in the studied soil was excessively low.

Available nutrients

NH_4-N was as much as 37 to 100 % higher in the under canopy and 14 to 73 % higher in the between canopy position of the homegarden trees than that in the open plot. Among the homegarden trees, it was 12 to 46 % higher under the tree spices than that under the palm. NH_4-N was highest on the surface soil and declined with the depth in all the treatments. Pattern of NO_3-N was almost similar to that of NH_4-N but it's amount was always 2.2 to 2.8 times higher from the latter across the treatments. Pattern of NH_4 -N and NO_3 - N in the forest was similar to that found under the homegarden trees but these were 10 to 60 % and 14 to 50 %, respectively higher in the former. Available P, like other nutrients, was higher in the under canopy and between canopy positions of the homegarden trees than that in the open plot. However, among the homegarden trees it was 15 to 30 % higher under the tree spices than that under the palm.

Pattern of it's distribution among the depths was almost similar to that of mineral N.

Exchangeable, K was 4.5 to 5.7 times higher in the under canopy and 2.7 to 2.8 times higher in the between canopy position of the homegarden trees than that in the open plot. It was higher under the tree spices particularly the clove than that under the palm. Amount of the exchangeable K was highest in the surface soil and declined gradually with the depth. Highest amount of Ca was found under the tree spices particularly the nutmeg but lowest in the open plot. There was no marked pattern of variation in the exchangeable Ca between the tree positions and among the soil depths. Like Ca, Mg was 27 to 44 % higher under the homegarden trees and forest than that in the open plot. Pattern of variation in the Mg was broadly similar to that found in exchangeable Ca. It did not vary due to the tree canopy positions and the soil depths. Exchangeable Ca and Mg were nearly uniform across the soil depths in all the treatments. Unlike other nutrients, exchangeable K, Ca and Mg were lower in the forest than that under the homegarden trees.

Table 1. Gravel, fine sand, silt and clay soil particles of three homegarden trees in a coconut plantation, a moist evergreen forest and open field in South Andaman

Tree	Position	Gravel (%)	Fine sand (%)	Silt (%)	Clay (%)
Coconut	UC	^{A}25.49	^{A}71.28	^{A}2.17	^{A}1.05
	BC	^{A}26.11	^{B}69.67	^{A}2.18	^{A}1.04
Clove	UC	^{B}23.83	^{C}72.92	^{A}2.21	^{A}1.04
	BC	^{A}26.15	^{A}70.65	^{A}2.16	^{A}1.04
Nutmeg	UC	^{A}26.10	^{A}70.68	^{A}2.16	^{A}1.06
	BC	^{C}29.53	^{B}67.30	^{A}2.14	^{A}1.03
Forest		^{D}20.88	^{D}75.90	^{A}2.17	^{A}1.05
Open field		^{C}28.73	^{B}68.01	^{A}2.26	^{A}1.0

Note : UC - Under canopy; BC - Between canopy

Table 2. Soil pH,Organic C,Total N and Total of three homegarden trees in a coconut plantation, a moist evergreen forest and open field in South Andaman

Tree	Position	pH	Organic C (g/kg)	Total N (g/kg)	Total P (g/kg)
Coconut	UC	^{A}6.07	^{A}9.78	^{A}0.71	^{A}0.029
	BC	^{B}5.90	^{B}6.31	^{B}0.46	^{B}0.023
Clove	UC	^{C}6.20	^{C}10.60	^{C}0.81	^{BC}0.021
	BC	^{D}6.48	^{D}8.23	^{D}0.50	^{CDE}0.020
Nutmeg	UC	^{B}5.97	^{E}11.67	^{E}0.93	^{CDE}0.020
	BC	^{D}5.64	^{A}9.34	^{F}0.76	^{E}0.019
Forest		^{F}5.58	^{F}14.87	^{G}1.20	^{BC}0.021
Open field		^{B}5.93	^{G}5.33	^{H}0.36	^{F}0.014

Note : UC - Under canopy; BC - Between canopy

Experiment 2. Organic manuring to maize with *Gliricidia, Leucaena* and *Casuarina* leaves

Leaves of three nitrogen fixing trees namely Gliricidia (*Gliricidia sepium*), Subabool (*Leucaena leucocephala*) and Casuraina (*Casurina equisetifolia*) used for organic manuring to maize during wet rainy months contained nitrogen 3 %, 1.86 % and 1.42 % respectively. Effect of types of leaves (green vs surface dried) and mode of application (burried vs surface) on the peak biomass and grain yield of the maize was examined. Amount of the dried leaves equivalent to 120 kg N ha^{-1}, was applied @4 t ha^{-1} for *Gliricidia,* 6.5 t ha^{-1} for subabool and 8.5 t ha^{-1} for *Casuarina,* whereas fresh leaves @ 18.1 t ha^{-1}, 21.65 t ha^{-1} and 10.4t ha^{-1}, respectively.

Phosphorus and muriate of potash was applied to all the plots @ 100kg ha^{-1} and 80 kg ha^{-1}, respectively. Control plot was not applied with urea. Urea (120 kg ha^{-1}) was included as a treatment to compare the yield found in organic manuring treatments. Results indicated that peak shoot biomass as well as grain yield of maize were greater in the plot applied with the fresh leaves of both the *Gliricidia* as well as subabool in both buried and surface applied conditions (Table 3). Organic manure of both the species produced the yield at par. But, in *Casuarina* treated plot, it was lower than that in the former species. However, none of the species produced yield equal to that of urea. High yield in urea treated plot may be due to its application in two split doses.

Decomposition study revealed that decomposition rate of green leaves of *Gliricidia, Leucaena* and *Casuraina* in both buried as well as in surface applied condition decomposed at a faster rate compared to that of dried leaves (Figures 1, 2 and 3). Gliricidia as well as *Leucaena* green leaves decomposed quickly, 92 to 99 % within 24 days, however, Casuarina green leaves only 69 to 72 %. High decomposition in the former species may be attributed to high amount of moisture and parenchymatous tissues. Though, these species decomposed and released nitrogen quickly but grain yields in the organic treated plots were lower perhaps due to lack of synchronization in the release of nitrogen and its uptake by the crop.

Table 3. Peak shoot biomass and grain yield of maize in different organic manuring treatments

Treatment	Peak shoo biomass (kg ha^{-1})	Yield (t ha^{-1})
Gliricidia dry mixed	1244^{a}	2.41^{a}
Gliricidia dry surface	962^{b}	2.01^{b}
Gliricidia fresh mixed	1413^{c}	2.47^{ad}
Gliricidia fresh surface	1431^{c}	2.45^{ad}
Leucaena dry mixed	1338^{d}	2.42^{a}
Leucaena dry surface	1374^{d}	2.34^{c}
Leucaena fresh mixed	1434^{c}	2.51^{d}
Leucaena fresh surface	1426^{c}	2.57^{d}
Casuarina dry mixed	832^{f}	1.50^{e}
Casuarina dry surface	871^{f}	1.13^{f}
Casuarina fresh mixed	1042^{e}	1.65^{e}
Casuarina fresh surface	1026^{e}	1.44^{e}
Urea	1858^{g}	3.14^{g}
Control	658^{h}	0.83^{h}

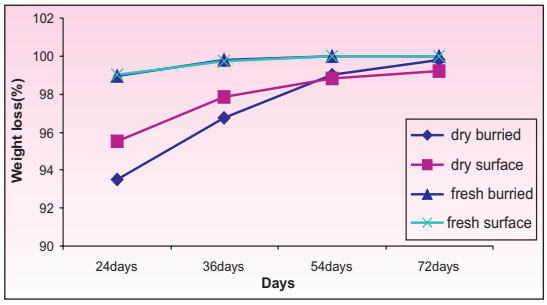


Figure 1. Decomposition of Gliricidia leaves in buried and surface conditions

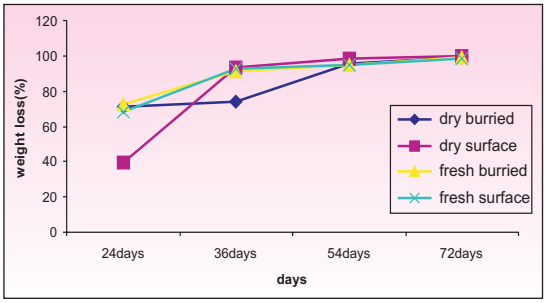


Figure 2. Decomposition of Leucaena leaves in buried and surface conditions

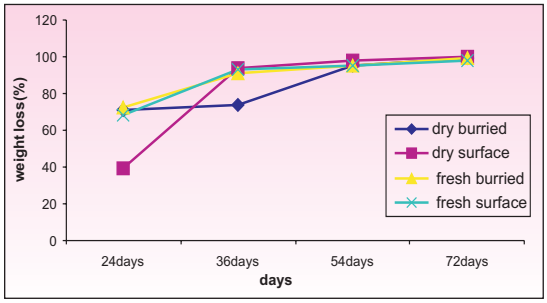


Figure 3. Decomposition of Casuarina leaves in buried and surface conditions.

Experiment 3. Soil erosion under different land uses in Andaman

Experimental treatments for measuring soil erosion is given in Table 4. Soil erosion ranged from 2.04 to 15.8 t ha^{-1} across the treatments. Soil erosion ranging from 4.3 to 7.2 t ha^{-1} in the alley- cropping system and was nearly equal to that in homegarden but 25 % lower than that under coconut tree. Moreover, among the homegarden trees soil erosion loss was greater under coconut than that under arecanut. High soil loss under coconut may be attributed to the higher spacing (7.5 x 7.5 m). Arecanut spacing was 2.7 x 2.7 m within the alley- cropping system greater soil loss was observed in till condition, suggesting that tilth preparation on sloppy land in the islands provokes the soil erosion. Lowest loss of soil was found under Napier grass. In semi- evergreen forest soil loss was greater than that in the napier grassland.

Loss of nutrients due to soil erosion under different treatments is also given in Table 4. The run off soil contained organic carbon 51 to 229 kg ha^{-1} ; total N, 5.6 to 30 kg ha^{-1}; total P 0.09 to 0.69 kg ha^{-1}; NH_4-N 0.07 to 0.30 kg ha^{-1}; NO_3-N, 0.5 to 2.56 kg ha^{-1}; available P 0.009 to 0.03 kg ha^{-1}; Na 0.68 to 5.47 kg ha^{-1}; Ca 0.06 to 1.05 kg ha^{-1}; and Mg 0.02 to 0.51 kg ha^{-1}.

Table 4. Soil erosion and loss of nutrient under different land uses in Andaman

Treatment	Soil loss (t ha^{-1})	Total P (kg ha^{-1})	Total C (kg ha^{-1})	Total N (kg ha^{-1})	NH_4-N (kg ha^{-1})	NO_3-N (kg ha^{-1})	Available Po_4 (kg ha^{-1})	Available Na (kg ha^{-1})	Available K (kg ha^{-1})	Ca (kg ha^{-1})	Mg (kg ha^{-1})
No Till + Maize	4.32[a]	45.09	1.49	0.13	47.38	173.16	1.49	304.67	291.5	77.63	10.73
Till + Maize	15.80[b]	43.49	1.45	0.19	19.02	161.93	1.61	346.33	142	66.68	6.02
Till + Maize + Hedgerow	5.97[c]	45.89	2.22	0.13	28.32	197.49	1.41	289.83	175.5	38.03	8.27
No Till + No Maize + Hedgerow	7.18[d]	43.65	1.41	0.18	29.06	181.27	1.51	325.67	148	38.15	8.13
Till + Mulch + Maize+ Hedgerow	5.29[c]	44.14	1.53	0.13	29.45	156.62	1.77	322.33	124.67	16.26	6.68
Coconut	7.58[d]	55.73	2.88	0.22	26.14	176.59	1.43	422.41	271.13	35.44	9.43
Arecanut	5.54[c]	43.73	3.53	0.18	20.2	188.76	1.52	472.25	458	34.19	9.14
Semi evergreen forest	3.45[e]	43.3	2.59	-	28.02	171.83	1.28	358.08	149.25	23.11	6.09
Napier grass	2.04[f]	42.69	2.49	-	32.56	245.85	1.36	332.67	182.33	28.63	9.52
Homegarden	5.54[c]	42.62	3.34	-	34.19	181.74	1.14	309.58	105.08	13.12	7.58

MACROPROPAGATION STUDIES ON SOME IMPORTANT TIMBER SPECIES OF BAY ISLANDS

A. Venkatesh and C.B. Pandey

An experiment was conducted to test the rooting ability of padauk from the stem cuttings. Stem cuttings were collected from young trees and grouped in to small (1.0-1.3 cm diameter) and medium (2.0-2.3 cm diameter) with the length of 25-30 cm. The cuttings were treated in IAA and IBA in the concentration of 100, 200 and 400 ppm for 24 hrs besides dipping in rooting mixture and water soaked control. The results revealed that the medium sized cuttings treated with IBA 100 ppm exhibited maximum rooting per cent (62.0), which is on par with IBA 200 ppm, IBA 400 ppm and IAA 400 ppm (Figure 4). The similar trend was observed in small sized cuttings but it was comparatively less. The longest root length (28.0 cm) and shoot length (38.3 cm) was observed in IBA 100 ppm treated cuttings.

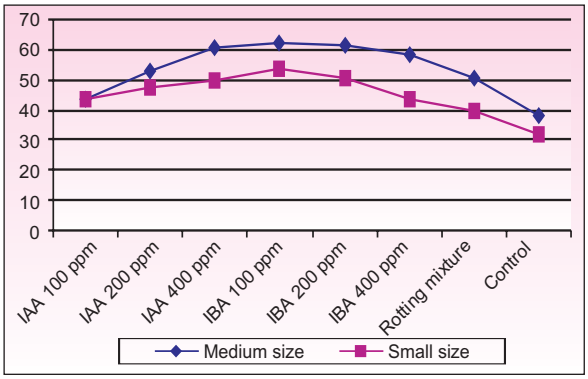


Figure 4. Rooting percent of Padauk

ASSESSMENT OF SOIL LOSS WITH BIOLOGICAL CONTROL MEASURES UNDER DIFFERENT CANOPIES IN HILL SLOPES OF ANDAMAN ISLANDS

S. Ghoshal Chaudhuri and S.C. Pramanik

In this study, comparing the properties of the plot soil and eroded sediment results are focused on changes in particle size distribution, organic matter content, nutrient and pH status. Soil erosion has been a threat to most of the agricultural areas on slopping land in Andaman & Nicobar Islands and it is becoming a grave problem on slopes more than 25%. Removal of ground cover under different crop canopies on steep slopes have resulted in rapid and excessesive soil erosion leading to soil degradation.

The runoff loss (mm) and soil loss (t/ha) in the demonstration plot under different crop canopies were studied (Table 5). The runoff estimation was done over a period of 6 months and results showed that runoff loss was less in undisturbed soil under forest canopy relatively to other disturbed soils irrespective of canopy and rainfall. It was also observed that the runoff loss were very much higher in case of aracanut and vegetable canopies except during the months of September 2004 & October 2004. But in case of forest canopy the runoff loses was relatively less and varied between 3.9 to 31.8 mm depending upon the rainfall. In case of soil loss under different canopies (Table 5), similar observations were recorded. This result has supported the pervious year's observations in the farmer's fields at New Bimblitan.

From May 2004 to October 2004 under different canopies reveled that there was a trend of increased soil loss with increased slope % (Table 6). The soil loss was higher in control, which has less organic matter content, and ultimately to the higher susceptibility to rill erosion and thus greater soil loss occurred, another two plots under different canopies at a higher organic matter content which contributed to the lower susceptibility to rill erosion and thus less soil loss occurred. The reason might be that the plot erosion rates were variable and possibly also influenced by the slope shape, tending to be higher on the convex slopes.

In plot soil (PE) and sediment (E) of the experiment plot the mean % of clay, silt, sand and coarse fraction were also determined (Table 7) and it was observed that erosion selectively removed sand. Sediment contained more sand than the soil and silt, clay and coarse fractions were less in case of sediment as judged against the plot soil (PE). This advocated that the silt, clay fractions and the soil

Table 5. Runoff loss (%) and Soil loss (t/ ha) over six months in experimental plots

Months	Rainfall (mm)	Control	Disturbed soil (Arecanut)	Disturbed soil (Vegetable)	Undisturbed soil (Forest)
Runoff loss (%)					
May 2004	792	62.3	44.6	51.4	31.8
June 2004	647	51.4	36.8	43.7	22.4
July 2004	393	39.0	24.3	39.5	14.3
August 2004	383	41.4	24.0	30.4	10.9
September 2004	331	19.4	16.7	14.2	8.6
October 2004	247	17.8	14.4	12.9	3.9
Soil loss (t/ ha)					
May 2004	792	30.7	16.2	22.1	13.2
June 2004	647	26.2	15.3	16.8	10.9
July 2004	393	16.1	9.4	11.8	6.7
August 2004	383	16.7	12.1	15.7	6.6
September 2004	331	13.8	7.6	6.3	4.3
October 2004	247	9.2	5.4	3.7	2.8

organic matter all possessed higher resistant to erosion than the sand fraction. Relationship between the organic matter content and texture were also evident in case of sediments (E). Like last year, this year also plot studies were conducted in the experimental plots. It was observed that coarse fraction was negatively correlated with slope % and the total weight and % of clays; and silt loss in the sediment was positively correlated between organic matter content and clay and silt, but negative correlation with sand content. The reason might be that sediments had a lower coarse fraction than the plot soil. The organic matter content of the sediment was significantly lower than that of the soil. These findings were attributed to the lower clay and silt content of the sediment and to the fact that organic matter was mainly bound to the mineral particles which supports the observation of Schulten *et al* (1993).

The pH values in water and 0.01(N) $CaCl_2$ were lower in the sediment than in the soil. A possible explanation that the base content is lower is due to the sandier texture of the sediments. Bases were also being partly dissolved and removed by leaching during their erosion from the plots and subsequent in the collection pits. This highlighted the need for studies to separate effects of erosion on the proportion of soil sediments from sediments, changes that occurs while in field storage (i.e. leaching and floatation effects).

Comparisons of mean organic carbon content and total nitrogen content of plot soil (PE) and sediment (E) in the experimental farm (Figure 5) reveled that both organic carbon and total nitrogen content are lower than that of the soil. Sediment were positively correlated with clay and negatively correlated with sand, which indicated organic matter was associated with soil fines and the depletion of both was deleterious to soil fertility.

Hence, in the farmer's land where there is existence of slopping area, conservation structures have to be made for different slope classes and different crop groups. At the same time, the necessary agronomic practices have to be carried out to arrest the soil erosion and uphold sustained soil fertility.

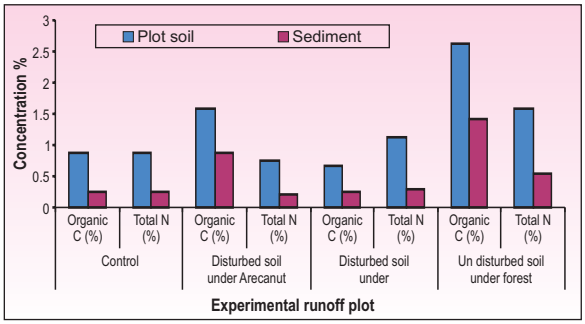


Figure 5. Comparision of mean organic carbon content (%) and total nitrogen content (%) of plot soil (PE) and sediment (E)

Table 6. Erosion rates from May 2004 to October 2004 in experimental plots

Plots	Slope (%)	Erosion (kg)	Erosion equivalent (t/ha)
Control	20.8	35.4	13.7
Disturbed soil (Arecanut)	20.4	49.6	19.8
Disturbed soil (Vegetables)	21.9	50.1	19.4
Undisturbed soil (Forest)	21.3	28.2	12.3

Table 7. Slope and total loss associated with particle classes and the coefficient between slope and particle class loss in experimental plots

Plots	Total loss (kg) for each size fraction			
	< 0.002 mm	0.002-0.06 mm	0.06- 2.0 mm	> 2.0 mm
Control	3.91	29.10	124.70	4.12
Disturbed soil (Arecanut)	2.02	11.06	50.73	0.43
Disturbed soil (Vegetables)	0.41	2.57	34.16	0.69
Undisturbed soil (Forest)	0.23	1.49	25.31	0.92

OPTIMIZING LAND USE BASED ON FERTILITY CAPABILITY CLASSIFICATION IN COASTAL PADDY SOILS OF SOUTH ANDAMAN

T. P. Swarnam, S. Ghoshal Chaudhuri, R. Raja and N. Ravisankar

The project was undertaken in order to identify the soil fertility constraints to crop growth; to group the soils into different FCC units and mapping them using GIS; to suggest management options to optimize land use; and to identify regions of similar constraints so as to facilitate the transfer of technology and or innovation. For this purpose, surface (0-20 cm depth) and sub surface (20-50 cm) soil samples were collected from rice growing areas of coastal South Andaman. The samples would be analyzed for texture, color, pH, CEC, exchangeable cations, EC, soluble salt percent, soluble chloride and sulfate, total acidity, available micronutrients and total Fe and Al content. The classification will be done as per FCC system (Sanchez et al . 2003) and Fertility Capability Map will be prepared by using GIS.

During the period, agricultural areas were identified and delineated using IRS-1C satellite data (Figure 6) and base map was prepared by digitizing the Toposheets of South Andaman.

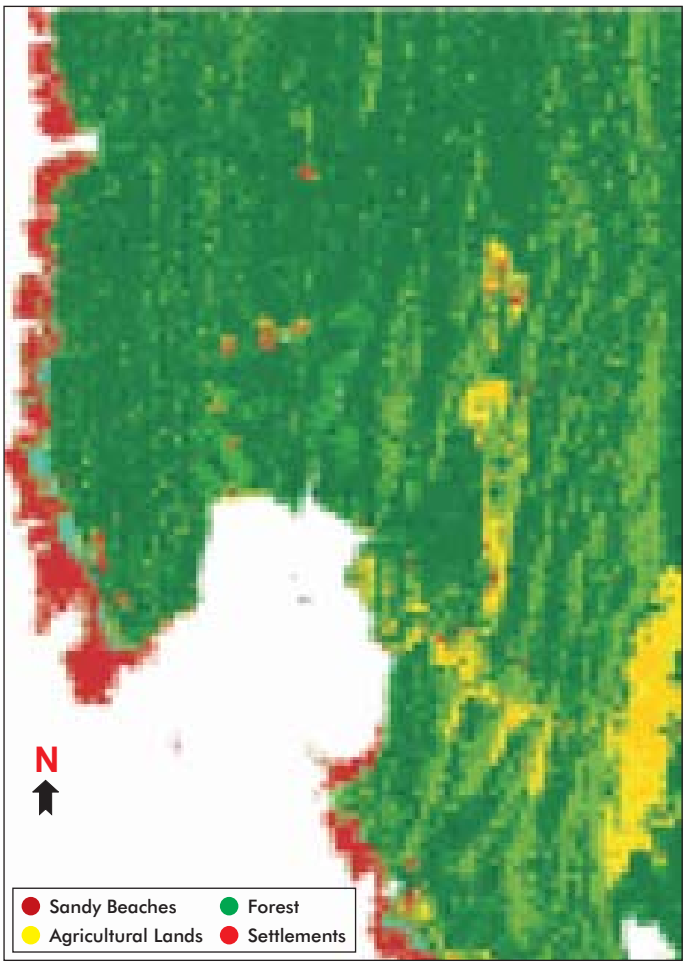


Figure 6. Cultivated areas of South Andaman

PROGRAMME - 2

IMPROVING THE PRODUCTIVITY OF RICE BASED CROPPING SYSTEM

GENETIC MANIPULATION FOR IMPROVED PRODUCTIVITY IN RICE WITH SPECIAL REFERENCE TO BIOTIC AND ABIOTIC STRESS TOLERANCES IN BAY ISLANDS

Asit B. Mandal and R. Elanchezhian

Identification of promising rice varieties

Quing Livan 1, BG 1639, Nanjing 57164 and Taichung Sen Yu showed promising performance under the rainfed low land condition. Maximum productivity of 5.72 tons/ha was observed in Quing Livan 1 in yield trial under experimental research farm condition followed by BG 1639, Nanjing 57164 and Taichung Sen Yu.

Evaluation of New Plant Type (NPT) rice

Seventeen NPT rice (super rice) varieties were evaluated during Kharif 2004. Among them, IR 67963-63-1-3, IR 71684-36-3-3-2 and IR 66738-118-1-2 were promising with grain yield of 5.70, 5.57 and 5.44 tons/ha, respectively, *albeit* their performance was found to be inferior in comparison to earlier years.

Evaluation of breeding lines

The breeding lines, developed earlier, were evaluated in advance generation yield trials, BM 1, BM 4 and BM 7 were found to be most promising and produced grain yield of about 5.5, 5.1 and 4.8 tons/ha, respectively.

Evaluation of somaclones at advanced generation

Among the somaclones derived from HYV Annada, Soma-1, Soma-7 and Soma-2 were found to be most promising and produced 15, 11.66 and 9.66 g of grain/ plant, respectively They have been forwarded to the succeeding cropping season for yield trial on large-scale.

Evaluation of Pokkali somaclones at advanced generation

Among the somaclones developed from Pokkali, BTS 18, 24 and 28 performed well during Kharif 2004. This year grain yield of those three somaclones were found to be 4.5, 4.0 and 3.5 tons/ha, respectively. They displayed appreciable field tolerance to prevailing insect and disease pests during the cropping season.

AICRP trials

Advanced Varietal Trial 2 - (Basmati) was conducted during Kharif 2004 under normal soil condition. Promising lines identified were UPR 2355-14-3-2, Pusa 2517-2-51-1 and P 1121-92-8-1-3-3 with grain yield of 3.3, 3.2 and 2.2 tons/ha, respectively.

To identify and breed biotic and abiotic stress tolerant rice varieties with special reference to sheath blight, yellow stem borer and excess salt through classical breeding and genetic engineering approaches to cultivate the saline soils of Andamans, requirement of promising salt tolerant variety was felt essential. Achievements are highlighted below:

Performance of Pokkali somaclones

Among the somaclones developed from a tall traditional salt tolerant cultivar Pokkali, BTS 24 and 28 and 18 performed excellent during last 9 years. This year too BTS 24 excelled producing 3.7 tons/ha under saline soil condition. The variety also displayed appreciable field tolerance to prevailing insect and disease pests during the cropping season both in South and Middle Andamans.

Development of lines tolerant to Al toxicity

Somaclones tolerant to Al toxicity in IR 72 background were developed from embryogenic callus derived from mature seeds. They were evaluated on medium containing toxic levels of Al in the form of $Al_2(SO_4)_3$, 18 H_2O. The R_o plants were grown in experimental net house initially. R_1 and R_2

plants were evaluated in fiberglass tanks filled with Al toxic soil. R_3 was evaluated under field condition. A few lines derived from IR72 with high yield, good plant type and profuse roots were selected. Selectants were evaluated at R_4 advance generation. A few lines blended with Al tolerance and good yield amounting to 2.5-3.0 tons/ha have been selected.

Development of lines tolerant to Fe toxicity

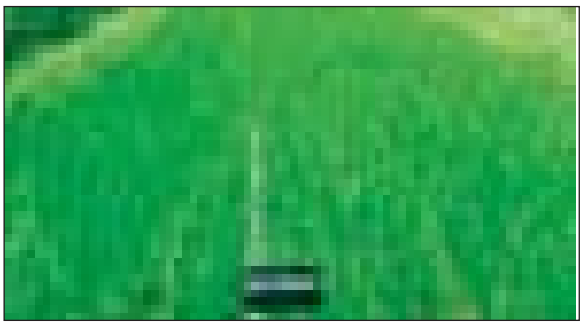
An early somaclone tolerant to Fe toxicity in C14 -8 background was developed earlier, which has been tested recurrently. Under Fe toxic condition 2.3 tons/ha yield with 140 cm plant height was observed. Days to 50% flowering was found to be 120 days.

EVALUATION OF BROAD BED AND FURROW SYSTEM FOR VEGETABLE PRODUCTION IN RICE FIELDS OF A&N ISLANDS

N. Ravisankar, R. Raja and S. Ghoshal chaudhuri

During 2004-05, flowers and medicinal plants were incorporated in to the cropping sequence and compared with the earlier identified sequences for the beds.

Bhendi and Brinjal on the beds



Super rice in furrows

Two super rice varieties and Taichung sen Yu variety were grown in the furrows to evaluate its performance for rice-ratoon sequence. The growth parameters recorded suggests that, super rice varieties are better than the Taichung sen Yu variety.

Recommendation arising from various experiments since 1999

Consortium of five crop sequences, viz. Amaranthus - Bhendi - Ratoon bhendi, Cowpea - Brinjal - Ratoon brinjal, Babycorn - Cowpea - Snake gourd, Multicut fodder sorghum (COFS 29) and Brinjal - Cauliflower - Ridge gourd could be recommended for cultivation. This sort of diversified cropping in the beds would reduce the risk of market price fluctuations and in turn result in higher net income and B: C ratio.

In the furrows, HYV's of rice-ratoon-pulses/sunflower and super rice-ratoon-ratoon could be recommended in order to achieve the higher yield.

Application of 50 % N through glyricidia and 50 % N through inorganics are recommended for main crop.

Quing Livan No.1 variety of paddy registered higher yield in main and ratoon crop compared to other varieties. Application of 40 kg N ha^{-1} is recommended for getting higher ratoon yield.

Table 8. Yield and economics of the cropping sequence involving flowers and medicinal plants on the beds and rice in the furrows of BBF system

S.No.	Cropping sequence	Yield (kg in 4000 m^2 area)	Gross Income (Rs.)	Net Income (Rs.)	B:C ratio
1	Amaranthus -	58.6	293	109	0.59
	bhendi -	224.8	2248	1907	5.59
	ratoon bhendi	120.6	1206	1058	7.15
	Total			3074	4.44
2	Cowpea-	128.4	642	401	1.66
	brinjal –	140	1400	920	1.92
	ratoon brinjal	62	620	410	1.95
	Total			1731	1.84
3	Babycorn –	70.6	353	73	0.26
	cowpea-	114	570	329	1.37
	snake gourd	720	3600	2752	3.24
	Total			3154	1.62
4	Brinjal-	142	1420	940	1.96
	Cauliflower-	342.6	3426	2076	1.54
	ridge gourd	606	3636	2788	3.29
	Total			5804	2.26
5	Multicut fodder sorghum (COFS 29)	1270	3.63	1620	1620
6	Bhendi-	186.4	1864	1523	4.46
	gerbera-	-	-	-	-
	brinjal	144	1440	960	2
	Total			2483	2.15
7	Radish-	812	2436	1596	1.9
	Amarillus-	-	-	-	-
	Chillies	21.2	530	274	1.07
	Total			1870	1.45
8	Amaranthus-	62.5	312	1285	0.7
	marigold-	-	-	-	-
	bitter gourd	564	2820	1972	2.33
	Total			2106	1.52
9	Cowpea-	112.6	563	322	1.34
	Kalmegh-	-	-	-	-
	babycorn	82.5	413	133	0.47
	Total			455	0.91
10	Bhendi-	182.4	1824	1483	4.35
	chillies -	11.2	280	24	0.09
	cucumber	400	2000	1550	3.44
	Total			3057	2.63
11	Brinjal-	128.4	1284	804	1.68
	ratoon	45.8	458	248	1.18
	Total			1052	1.43
	Total vegetables from 4000 m^2 area (Computed from 5 best sequences)	-	44952	32718	2.67
	Paddy from 6000 m^2 area (super rice-ratoon-ratoon)	5486 kg/ha	30432	19480	1.77
	Total (BBF of 1 ha area)	**-**	**75384**	**52198**	**2.25**
	Paddy alone (1 ha area) (Taichung Sen Yu ratoon)	**4470 kg/ha**	**25350**	**14899**	**1.43**

AGRO TECHNIQUES FOR DIRECT SEEDED RICE IN BAY ISLANDS

N. Ravisankar, R. Raja, M. Din, S.C. Pramanik, R. Elanchezhian and S. Ghoshal Chaudhuri

Experiment 1 : Evaluation of Intercropping of *S. aculeate* and *S. rostrata* in direct wet seeded rice

The experiment was laid out in randomized block design (RBD) with four replications. The treatments evaluated include Wet seeded sole rice (T_1), Wet seeded Rice + *S. aculeate* (*dhaincha*) (T_2), Wet seeded Rice + *S. rostrata* (T_3), Transplanted sole rice (T_4), Transplanted Rice + *S. aculeate* (*dhaincha*) (T_5) and Transplanted Rice + *S. rostrata* (T_6). Taichung-sen-Yu variety of paddy was sown in 24th standard week and harvested in 39th standard week. Only trace quantity of rainfall was received in the first three standard weeks of sowing.

Green manure intercropping of *S. aculaeta* and *S. rostrata* led to slight smothering effect on rice growth at 20 and 45 DAS which was evidenced through shorter rice plants in intercropping treatments compared to sole wet seeded rice which might be due to mutual shading of *dhaincha* on rice at initial stage. Both the green manures registered on an average of 8.1 t ha^{-1} of fresh biomass at the time of incorporation (37 DAS) under wet seeded condition. However, under transplanted condition, both green manures have registered lower fresh biomass due to lower population.

Wet seeded rice + *dhaincha* and wet seeded rice + *rostrata* registered yield attributes, viz. tillers m^{-2} and EBT m^{-2} on par with transplanted rice. In general intercropping of *S. aculaeta* and *S. rostrata* led to higher grain yield in wet seeded rice compared to sole wet seeded rice. It was also observed that transplanted and wet seeded rice registered comparable grain yield under green manure intercropping. Net returns and B:C ratio (Figure 7) also registered similar trend. Energy ratio was higher with wet seeded rice + *dhaincha* (Figure 8). The energy required to produce one kg of grain (Specific energy) was lower for wet seeded rice + *dhaincha* (T_2) compared to intercropping in transplanted conditions. Hence, *S. aculeate (dhaincha)* and *S. rostrata* could be recommended for intercropping in wet seeded rice under island conditions. Among the two green manures, *dhaincha* is best suited, because, *S. rostrata* needs acid treatment before sowing which may not be feasible under farmers field conditions.

Direct wet seeded rice with Dhaincha in the border

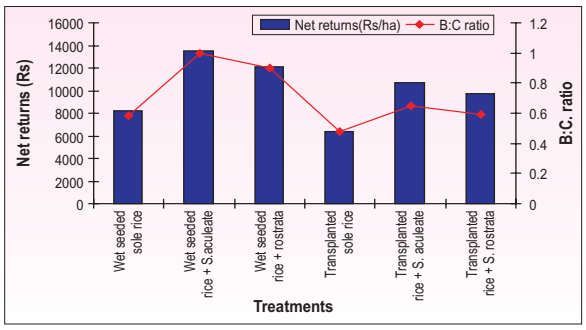


Figure 7. Net returns and B:C ratio of wet seeded rice influenced by green manure intercropping

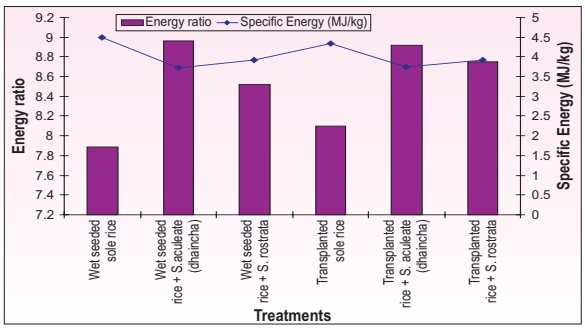


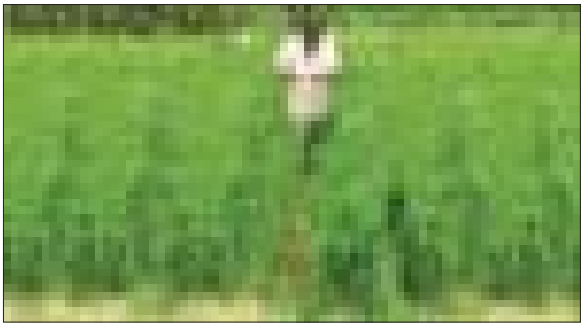
Figure 8. Energetics of wet seeded rice influenced by green manure Intercropping

Experiment 2 : Evaluation of cultural and mechanical weed management in direct wet seeded rice

The experiment was laid out in randomized block design (RBD) with seven treatments and three replications. Taichung-sen-Yu variety of paddy was sown on 18th June 2005 at Bloomsdale farm. Observations on total weed density, green manure characters, growth, yield parameters of rice and yield were taken and economics and energetics were computed using standard methods.

Intercropping *dhaincha* and *S. rostrata* led to reduced total weed density in wet seeded rice compared to sole rice at 20 DAS. Incorporation of green manures using cono weeder at 37 DAS led to lower total weed density at 45 DAS which was comparable with hand weeding. Weeding using cono weeder is effective as that of hand weeding. Unweeded check registered more total weed population.

Yield parameters, viz. EBT m^{-2}, grain and straw yield were higher in wet seeded rice + *dhaincha* or *S. rostrata* intercropping and incorporating it with conoweeder. Net returns and B: C ratio (Figure 9) also registered similer trend as that of yield. Specific energy (Figure 10) was lower under rice + *dhaincha* + cono weeder incorporation and was higher for unweeded check. Hence it could be concluded that combination of cultural (intercropping) and mechanical (cono weeder) weeding method is effective for bringing down the weed density there by registering higher yield, net income and energetics.



Dhincha incorporation using conoweeder

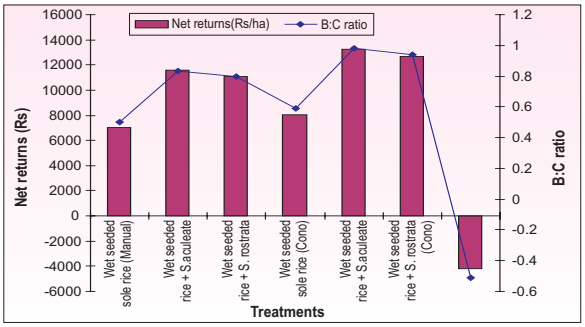


Figure 9. Net returns and B:C ratio of wet seeded rice influenced by cultural and mechanical weed management

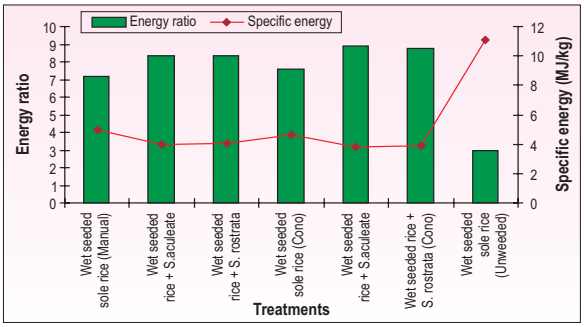
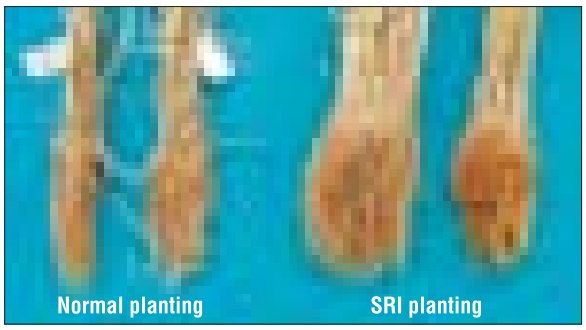


Figure 10. Energetics of wet seeded rice influenced by cultural and mechanical weed management

Experiment 3 : System of Rice Intensification - A preliminary study

Taichung Sen Yu variety was sown in August at blooms dale farm. The critical stage is the first 20 days of transplanting. In this experiment, rain fall of first 20 days amounts to 89.45 mm in 4 rainy days. At harvest, during last week it registered 368.3 mm of rainfall in 2 rainy days.

SRI (standing) & Normal (lodged) cultivation of rice



Root growth of Normal and SRI planting

This variety was compared for normal and SRI planting. The parameters studied along with grain yield and root characters are presented in Table 9. Even though there was heavy rainfall of 89.45 mm of rain fall in 4 rainy days, the seedlings withstood. The SRI method outperformed the normal planting in terms of yield attributes, yield and root growth. SRI registered 42 per cent higher yield than normal planting. Due to heavy rainfall of 368.3 mm at harvest stage, normal planting led to complete lodging and recorded only 2.2 t ha^{-1} compared to SRI planting where in no lodging was observed. This might be due to the compact hill with more tillers, deep root (25.2 cm) with increased root weight. Further studies are required to confirm the results.

Table 9. Growth and yield parameters of Normal and SRI method of Rice cultivation

Charecters	SRI	Normal
Variety	Taichung Sen Yu	Taichung Sen Yu
Spacing	25 X 25 cm	15 X 10 cm
Age of seedlings	14th DAS	23rd DAS
Number of seedlings/hill	1	3-4
Cono weeding	Yes	No
Plant height at harvest (cm)	122	110
Productive tillers / hill	29	8
Panicle length (cm)	29.2	23
Filled grains / panicle	166	42
Grain yield (kg /ha)	6222	2283 (lodged)
		4347 (without lodging)
Straw yield (kg / ha)	6741	3153
Root length (cm)	25.2	18.3
Root weight (g)	49.62	23.3

STATUS AND SCOPE OF FARM MECHANISATION IN A&N ISLANDS

M. Din, P. S. Deshmukh and N. Ravisankar

Mechanisation of paddy

Design and fabrication of half and full cage wheels

Tractors are mostly equipped with half cage wheel manufactured locally that does not conform to the BIS Standard No. 11081 for tractor half cage wheel. The half cage wheel was designed and fabricated according to BIS standard. However, the BIS has not laid any standard for the tractor full cage wheel. Therefore, new cage wheel was designed with modifications and fabricated. The modifications included: (i) 18 number of equally spaced lugs, (ii) The lug angle is 18^0, (iii) M.S. angle size 75x75x8 mm was used. Newly designed full cage wheel was tested at Bloomsdale farm. The working performance was better as compared to existing cage wheel.

Primary tillage by various tillage implements

Improved implements, viz. MB plough, tractor drawn-cultivator and power tiller were identified. Field preparation was done at Bloomsdale by animal drawn conventional plough, MB plough (size 10 cm) and tractor operated cultivator, power tiller. Among the primary tillage implements, Deshi plough required maximum time (0.014 0.018ha/h) followed by Animal drawn MB plough (0.04 ha/h), power tiller (0.08 ha/h), whereas tractor-operated cultivator has field capacity 0.42 ha/h.

Testing of the puddling implements

Modified Tractor full cage wheel

A puddling experiment was conducted at Bloomsdale farm by using traditional animal drawn deshi wooden plough, animal drawn improved puddlers like straight rib puddler and rectangular blade puddler, tractor drawn-cultivator, tractor with cage wheel and power tiller. Among the puddling implements, the field capacity was maximum in case of tractor cultivator, followed by power tiller and animal drawn puddlers (Table 10). In animal drawn puddlers, the time required was less in case of straight rib puddler, but the depth of puddling was less and hence the effectiveness was less. Rectangular blade puddler had less field capacity than that of the straight rib puddler. Puddling index varied from 0.223-0.426 in all puddling implements. For total puddling, the cumulative time required was less in case of power tiller (0.19 ha/h). Hence among all the implements the power tiller was the best for puddling of paddy field.

Testing of direct seeders

The Anaerobic (IRRI design) and Aerobic Direct Seeder (TNAU-design) were tested in well-puddled field at Bloomsdale farm to know the performance of seeders. Direct seeder requires less time (8-20 man-h/ha), whereas traditional method of transplanting requires more time and energy (250-400 man-h/ha). Aerobic Direct seeder was found better as it required less time than anaerobic seeder, because the furrow openers of IRRI direct seeder increases the time (19.55 man-h/ha) and thus reduced the field efficiency. In case of the TNAU paddy-cum-dhaincha seeder, seeding was done in aerobic conditions. The paddy yield of the dhaincha plot was more among all the direct seeded plots because dhaincha suppresses other weeds from growing as well as after 45 days it became green manure for the paddy.

Puddling by power tiller

Power tiller on terrace

Testing of cono weeder

The cono- weeder was tested at Bloomsdale farm in different paddy fields. It was observed that weeder incorporated the weeds in the soil and thereby made it green manure. It worked better if 2 cm surface water was in paddy field. The average field capacity of the weeder was 0.02 ha/h. If water level was more than 2 cm on surface it was difficult in operation, thus resulted less weeding. The conoweeder requires 50-60 man-h/ha, compared to 120 150 man-h/ha required in the traditional method with the help of *Khurpa*.

Testing of power tiller at slopes

Power tiller was tested on the sloppy plain field and terraces. The terraces were tilled with power tiller before planting. The small width of the terrace hindered the turning of the power tiller. Power tiller along with planter requires minimum 5 m for turning. Hence the terrace must have 5 m width.

Table 10. Performance parameters of different puddling implements

equipment	Capacity(ha/h)	Index
Deshi wooden plough	0.0144	32.5
Striaght rib puddler	0.1200	34.4
Rectangular blade puddler	0.1060	46.5
Power tiller	0.1152	53.0
Tractor full cage wheel	0.1188	50.0

PROGRAMME - 3

EVALUATION OF VEGETABLES FOR INCREASED PRODUCTIVITY

IMPROVEMENT AND AGRO TECHNIQUES OF VEGETABLE CROPS

R.P. Medhi, V. Damodaran and T. Damodaran

Varietal trial

Sponge Gourd

Evaluation of six varieties of sponge gourd revealed that the variety JSGL-55 (Junagadh) recorded the highest yield of 78.60 q/ha followed by NSG-1-11 (AVT-1) 67.22 q/ha.

Cowpea

Among seven varieties of cowpea evaluated, CHCP-1 recorded the highest number of fruits/plant (63.8) and highest yield of 88.22 q/ha followed by CHCP-2 (87.77 q/ha) (Table 11).

Tomato

Twenty-one varieties were evaluated for yield and bacterial wilt resistance. Among them, the varieties Co-3, Anand, DT-2, DVRT-2, Arka Vikas, BT-120, BT-136, Sel-7, DT-1, MDB No-2-3 recorded 100 percent survival against bacterial wilt. However the varieties VTG-87, BT-120, BT-136 were found promising.

French Bean

Evaluation of eight varieties of French beans revealed that the variety Contender recorded the highest yield of 89.64 q/ha followed by Sel-9 of 62.66 q/ha (Table 12).

Table 11. Performance of Cowpea varieties

Varieties	Plant height (cm)	No.of fruits/ plant	Weight of 10 fruits (gm)	Length of fruit (cm)	Yield (q/ha)
Arya Vaibhavlaxmi	170.33	45.46	36.56	13.56	60.55
HACP-3	199.33	58.66	113.00	32.60	81.10
CHCP-2	256.00	50.13	61.85	34.14	87.77
Ajeet-11 (IET)	63.03	45.86	45.00	17.43	73.88
IVRCP-3	63.20	38.60	45.17	16.40	66.11
IVRCP-4	63.06	46.73	65.05	31.40	67.77
CHCP-1	261.66	63.80	73.38	42.06	88.22

Table 12. Performance of French bean varieties

Varieties	Plant height (cm)	Weight of 10 fruits (gm)	Length of fruit (cm)	Girth of fruit (cm)	Yield (q/ha)
Sel-9	58.66	76.6	16.41	3.07	62.66
HAFB-1	61.46	61.6	15.06	2.98	36.88
Contender	58.70	80.0	16.76	3.30	89.64
HAFB-2	61.60	63.3	14.70	3.25	40.40
IHR –Sel-909	60.53	73.3	14.90	3.20	55.55
IVFB-1	58.53	60.0	15.17	3.15	50.00
IVFB-2	59.06	70.0	17.53	3.08	52.88
MFB-5	57.40	71.6	16.64	3.20	52.42

Table 13. Performance of Brinjal varieties

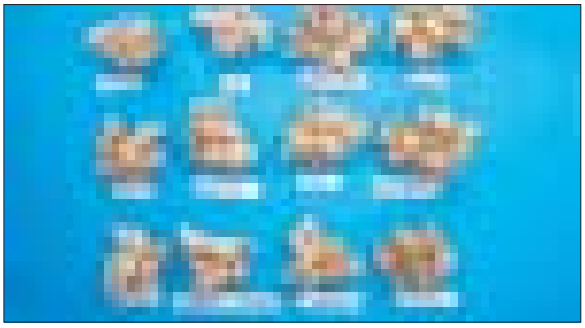
Varieties	Plant height (cm)	No.of fruits/plant	Single fruit weight (gm)	Length of fruit (cm)	Girth of fruit (cm)	Yield/ plant (gm)	Yield (q/ha)
IET round (JBR-02-11)	48.26	10.77	69.43	6.55	15.33	680.00	78.66
HABL-2	58.00	10.30	58.40	6.67	16.46	676.63	64.30
IET round (ABR-02-23)	44.70	9.43	70.66	7.96	15.76	722.00	73.30
IET round (ABR-02-16)	51.26	8.36	57.43	5.90	15.33	523.30	55.00
KS Long-331	44.43	9.33	119.43	20.1	10.63	869.96	89.40
HABL-1	47.80	7.70	376.60	6.87	23.00	623.30	85.50
Aruna	51.86	9.43	56.53	5.70	11.50	652.20	74.40
JBGR-99-5	52.26	7.00	126.10	8.16	20.56	745.53	72.20
KS-358	54.13	8.55	114.20	6.88	18.23	862.16	88.80
HBB-21 (long)	55.86	7.08	96.43	22.83	11.33	691.06	93.30
HE-12	57.06	7.66	92.20	9.82	12.76	627.66	84.40
DBR-8 (round)	56.13	8.43	110.50	7.09	14.10	797.63	95.50
Pb-66	58.06	8.88	73.53	16.46	15.73	720.00	110.00
IVBR-1	53.53	7.63	61.86	7.52	10.10	553.10	62.20
BB SR-52	51.33	7.40	64.43	7.40	12.10	655.00	68.80
IET long (JBRL-01-01)	55.26	8.96	56.73	20.60	10.90	661.73	78.80
KS-224	58.26	6.96	93.33	7.50	11.40	614.40	94.40
IVBR-3	47.13	7.43	67.76	7.43	13.73	515.43	92.20
IET long (JBR-03-04)	51.53	6.63	73.33	14.10	12.40	515.70	93.30
HABR-6	55.33	7.63	62.33	7.50	12.83	658.86	88.80
HABR-5	54.66	6.63	61.06	10.96	14.30	547.73	75.50
PB-60	62.70	10.54	64.46	9.30	14.50	895.43	107.70
IVBR-2	54.50	7.20	67.30	6.26	19.56	610.00	75.50
HABR-4	51.76	7.73	70.63	7.20	11.33	643.30	73.30
PB-64	57.66	9.76	63.53	11.26	13.50	829.06	120.0

Brinjal

Out of twenty-five varieties evaluated for yield and resistance to bacterial wilt, the variety PB-64 recorded the highest yield of 120 q/ha and 80.5 per cent survival against bacterial wilt, where as the variety IET round (JBR-03-16) recorded poor yield of 55 q/ha with lowest survival against bacterial wilt 41.6 percentage (Table 13).

Chilli

Sixteen varieties were evaluated for yield and resistance to bacterial wilt. Among them, the variety JCA-283 registered the highest survival percentage (100 percent) against the bacterial wilt. With regard to yield, the variety BC-40-2 was found to be promising with a yield of 229 q/ha followed by variety LCA-353 (RARS) 203q/ha (Table 14).



Ginger

Evaluation of thirteen varieties of ginger revealed that Acc.27 recorded the highest yield of 377.7 q/ha followed by Jorhat (374.9 q/ha) (Table 15).

Table 14. Performance of Chilli varieties

Varieties	Plant height (cm)	Days to 50 % flowering	No.of fruits/plant	Weight of 10 fruits (gm)	Length of fruit (cm)	Single plant yield (g)	Yield (q/ha)
LCA-353 (RARS)	92.66	81.33	200.33	31.66	8.60	488.28	203.00
BC-25	84.30	81.33	153.33	33.66	8.86	403.51	147.16
JCA-283	97.73	82.66	153.00	77.66	9.64	431.13	194.50
BC-40-2	99.20	79.33	153.00	38.33	5.04	501.20	229.00
AVT-II (ACS-97-2) Anand	99.93	83.00	94.33	100.0	15.65	626.30	190.80
Co-4	77.50	95.33	104.00	28.33	8.24	261.20	65.00
LCA-206 (RARS)	74.40	83.33	113.00	31.0	9.54	282.93	110.80
DCL-1	78.13	81.66	137.66	31.00	5.54	350.76	97.50
Arka Lohit	88.26	82.66	158.00	30.66	7.73	401.63	131.30
DSL-2	93.60	82.33	129.66	26.66	4.79	419.06	160.80
Ajeet-3	90.60	81.66	131.66	41.00	10.29	472.73	175.00
LCA-333 (RARS)	90.40	82.66	141.66	51.00	11.12	388.26	172.50
JCA-283	89.53	83.00	121.00	39.33	9.83	299.96	165.80
SKAU-C-101	81.40	83.33	102.66	38.33	10.40	413.96	147.50
KA-2	47.40	82.00	162.33	39.33	7.65	484.96	181.60
F-112-5-03	74.60	83.00	105.66	43.33	8.56	323.33	107.50

Table 15. Performance of Ginger varieties

Varieties	Plant height (cm)	No.of tillers/ clump	Single plant yield (g)	Yield (q/ha)
Mahima	43.8	6.33	488.3	216.6
Pune	55.9	8.4	398.6	347.2
Acc.3573	58.3	7.8	400.0	250.0
Basar	43.7	6.3	333.3	165.5
Acc.27	53.1	7.6	366.6	377.7
HP	53.7	9.2	419.2	211.0
Puri	53.6	9.3	433.3	252.7
Acc.179	48.5	8.3	446.6	292.12
Jorhat	55.0	9.2	486.6	374.9
Thing Laidon	52.4	7.2	413.3	250.0
Vardha	44.5	7.7	340.0	162.7
Acc.204	43.3	9.0	353.3	230.5
Acc.294	53.3	8.5	305.0	280.5

PROGRAMME - 4

IMPROVING THE PRODUCTIVITY OF PLANTATION AND FRUIT BASED CROPPING SYSTEMS

IMPROVEMENT OF COCONUT AND ARECANUT

R.P. Medhi, V. Damodaran and T. Damodaran

Coconut nursery has been raised from the selected elite palms, viz. I-187, I-94, I-95, N-236, N-240, N-295, N-219, N-118, N-119, M-190, M-113, M-130, M-97, M-208, M-43, M-105, M-89, M-59, M-374, M-35, M-6, M-74 etc. for establishment of separate elite block. The overall germination percentage of the elite seed nuts was 78.1.However maximum percent germination was noticed in M-89, I-94and M-35 whereas the least germination of 50 % was observed in M-208. (Table 16)

Mother Palm

Nursery

Inter-se-mating/selfing

Inter-se-mating/selfing in selected palms of 30 accessions (24 exotic and 6 indigenous) has been carried out and 1142 pollinated nuts obtained in the crossing work were sent to CPCRI, Kasaragod for establishment of seed garden.

Distribution of seedlings for rehabilitation of tsunami affected areas of A&N Islands

On priority basis nursery with 5000 coconut seedlings was established from elite palms for distribution to the tsunami-affected areas of A&N Islands.

Table 16. Growth parameters of elite coconut seedlings

Elite palm	Germination (%)	Plant height (cm)	Collar girth (cm)	No. of leaves	Length of leaf (cm)
M-59	87.50	169.3	13.6	5.0	108.6
M-105	91.70	111.3	12.6	5.0	98.0
I-187	61.50	177.6	19.0	7.0	112.3
M-89	100.0	134.0	16.0	5.6	91.6
M-419	75.00	189.0	17.3	6.6	117.3
I-95	80.00	111.6	10.3	4.6	88.0
M-97	90.00	111.0	9.6	5.0	98.3
M-74	84.00	93.0	9.0	5.0	102.0
I-94	100.0	67.2	10.3	6.3	87.0
M-208	50.00	87.2	13.3	5.6	111.1
M-43	77.70	83.5	10.6	5.0	83.7
M-35	100.0	96.8	11.4	5.6	101.9
M-67	75.00	42.2	11.3	4.3	93.7
M-374	57.20	86.4	11.6	5.0	97.67

VARIETAL EVALUATION AND STANDARDIZATION OF AGROTECHNIQUES IN TROPICAL FRUITS

R.P. Medhi, T. Damodaran, D.R. Singh and V. Jayakumar

Induction of flowering in mango

Application of *Psueodomonas fluorescens* @ 0.5 % at an interval of 20 days from the month of flower bud initiation (May-June) upto final harvest, resulted in profuse flowering simultaneously with control of anthracnose. This bacteria plays dual role in the mango trees. It serves as the external source for the maintenance of IAA and GA contents, apart from the role of acting as endophytes in controlling the anthracnose diseases. This resulted in reduction in the level of black spot incidence both on the flower and fruits.

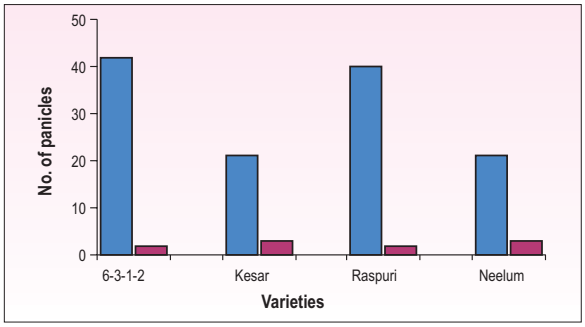


Figure 11. Effect of Psuedomonas on induction of flowering in mango varieties

To retain the flower formed and fruits set, cincturing of the floral branches with 10 ppm 2.4 D by 2,4-D twines was carried out. Among the three regulators 2,4-D, ascorbic acid and cytokinin, 2,4-D was found to be best and had significantly higher fruits to harvest than the others.

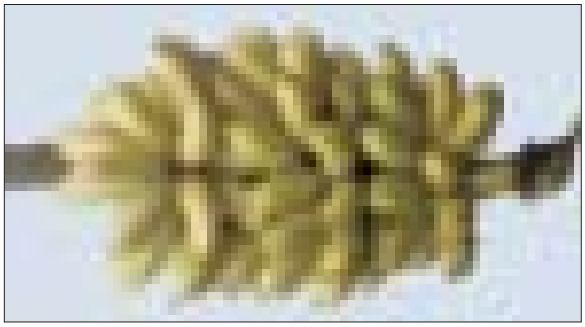
Table 17. Effect of growth regulators on cincturing for fruit retention

	6-3-1-2	Kesar Afus	Raspuri	Neelum
NAA	4	8	7	3
2,4-D	157	20	52	25
Alar	6	10	7	5
Control	1	1	2	2

COLLECTION, CHARACTERIZATION, EVALUATION AND STANDARDIZATION OF AGROTECHNIQUES OF BANANA (*MUSA SP.*) (Sub-Project)

T. Damodaran, R.P. Medhi, R. Elanchezhian and D.R. Singh

About 20 dessert varieties and two wild bananas were collected and is under evaluation. The yield



Rathalu variety

and quantitative estimates of seven cultivars suggested that the among the dessert type, the variety Cheena which is the synonym of Pisang Awak gave higher yield than the others. Among the culinary bananas, the variety Monthan collected from the farmers field of South Andaman gave the highest bunch weight of 19.66 kg. The genotypic correlation of the varieties suggested that the character plant height and girth was significantly and positively correlated with bunch weight.

Table 18. Phenological characters of the banana varieties

Variety	Plant ht. (cm)	Girth (cm)	No. of leaves	Leaf area	No. of hands	No. of fruits	Bunch wt.(kg)
Meeta champa	183.66	41.00	8.33	5.97	4.33	53.66	10.00
Katta champa	288.33	60.33	7.33	5.70	9.33	115.67	14.00
Cheena	321.66	61.66	9.33	6.04	12.66	146.67	16.00
Raje bale	183.66	41.00	8.33	5.97	4.33	53.66	5.60
Monthan	310.00	60.33	8.66	6.70	5.66	62.33	19.66
Red Banana	341.66	61.00	7.33	9.42	4.66	50.66	14.33
Rathalu	183.33	52.33	7.33	6.95	5.33	79.66	12.47

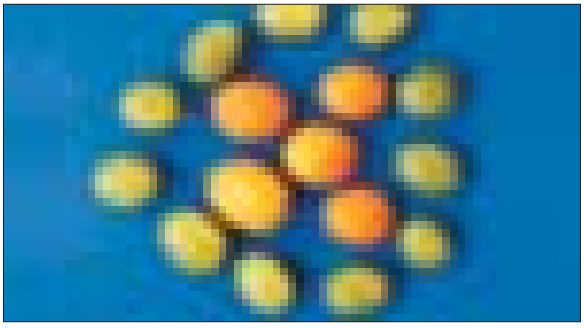
INTRODUCTION AND EVALUATION OF EXOTIC AND LESS KNOWN INDIGENOUS FRUITS

D.R. Singh and R.P. Medhi

In addition to previously existing underutilized fruits the following indigenous important fruits were collected from different parts of A&N Islands for detailed systematic study viz. Local Ber, Khariphal, Wild guava, Wild Badam and Poon. Their seedlings were being raised for conservation on the land in the Arboretum of underutilized fruits. Besides indigenous fruits, some of exotic fruits like Rambutan, Bael (NB-1), Aonla (NA-7,10, Krishna, Kanchan), Tamarindus (Thailand selection), Karonda (*Carissa carandus*) Passion fruit (Kaveri) from IIHR, Bangalore and Sikkim selection and Mizoram selection were also collected from mainland and planted them in the field for their evaluation under Andaman conditions.

Varietal evaluation of Passion fruit

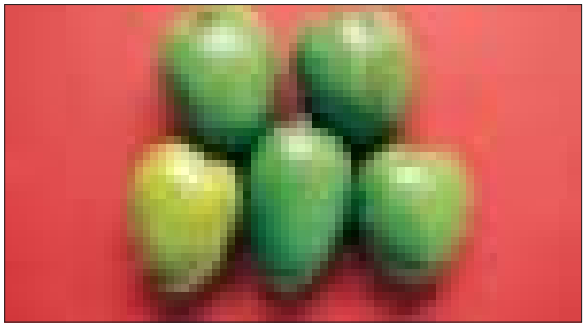
Four varieties of passion fruit viz. Kaveri, Sikkim selection, Mizoram selection and local (Andaman) along with a wild passion fruit (*Passiflora foetida*) were planted in September 2004 are performing well in vegetative growth but till date no fruit setting was noticed.



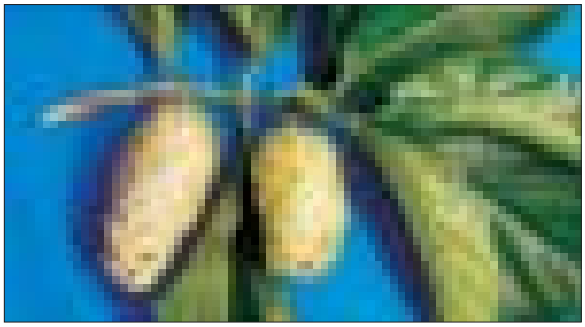
Passion fruit

Effect of pruning on the West Indian cherry

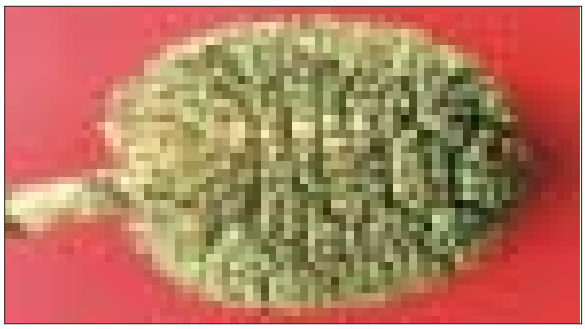
An experiment was carried out to study the effect of pruning on the bearing of fruits in the subsequent period. The study revealed that 25% level of pruning found to be significantly influenced in terms of flowering, fruiting and yield in comparison with other treatments.



Alligator apple



Morinda fruit



Pandanus fruit

Identification of saline resistant under utilized fruits

The following potential indigenous fruits have been identified for salinity resistant and been recommended for Tsunami affected land in Andaman and Nicobar Islands. The species are as follows:

1. Alligator apple (*Annona glabra* L.)
2. Pandanus species
3. *Morinda sp.*

Nutritional analysis of underutilized fruits

The underutilized fruits were analyzed for their macro and micronutrients. The study reveals that these fruits are having high content of Calcium, Phosphorous, and Potassium and Iron etc. in comparison with major fruits. The details are given in Table 19.

Burmaphal (*Morinda ctirifolia*)

The *Morinda citrifolia* which locally known as Burmaphal by then the Burmese people, Pongee by Nicobari tribals and by Burmese and Suraogi by some local people and Indian mulberry is its English name. The other species *Morinda trimera* were collected from South Andaman and their seedlings and rooted cuttings are being raised for distribution to farmers. The fruits, seeds and leaves of *Morinda citrifolia* were formed to be highly medicinal importance. The plants of these two species found to be saline resistant and recommended for tsunami affected land in Andaman and Nicobar Islands.

Multiplication of potential underutilized fruit

Out of 57 under utilized fruits conserved in arboratum, 18 potential species are being multiplied in larges scale for distribution to the farmers of Andaman and Nicobar Islands.

1. *Morinda citrifolia*
2. *Morinda trimera*
3. Pandanus species
4. *Passiflora edulis*
5. *Dillenia indica*
6. *Syzigium jambolana*
7. *Malpighia glabra*
8. *Averhoea carambola*
9. *Anona glabra*
10. *Aegle marmelos*
11. *Baccuarea ramiflora*
12. *Baccuarea sapida*
13. *Diospyros discolor*
14. *Anona squamosa*
15. *Artocarpus altilis*
16. *Syzygium aquem*
17. *Anona muricata*
18. *Spondias cytherea*

Table 19. Nutritional analysis of underutilized fruits

Name of the Fruits	Ca (%)	P (%)	K (ppm)	Fe (ppm)
Jungli Jamun	0.38	0.42	38.99	26.1
Karonda	2.0	1.06	33.11	5.0
Wild Guava	1.9	0.34	21.21	3.31
Wild Passion Fruit	1.2	0.32	28.36	2.5
Khattaphal	4.48	1.36	44.95	3.98
Wild Khattaphal	3.58	-	35.31	9.24
Velvet Apple	1.29	0.43	22.28	2.30
Wild Jackfruit	5.34	0.05	33.5	24.74
Wild Badam	3.48	0.34	33.97	0.05
Laseda	-	-	-	-
Poon	4.25	-	26.03	3.84
Ramphal	3.08	-	47.05	-
Jambose	3.82	-	36.52	8.01
Bethphal	2.86	-	16.88	1.37
Wild Fig	4.17	-	48.2	2.51
Cultivated Fig	3.89	-	59.3	10.16
Bael	0.32	0.76	52.1	0.2
Ber	0.57	0.96	-	-

Table 20. Nutrient content of *Morinda citrifolia*

Major nutrient (%)	
DM	38.52
Ash	3.34
Insoluble ash	0.3
Ca	0.5-3.49
P	1.56
EE	3.41
CP	6.25
Micronutrient (ppm)	
K	48.62
Zn	0.06
Cu	27.44
Mn	196.6-0.48
Fe	3.30-42.4

PROGRAMME - 5

IMPROVING THE PRODUCTIVITY OF LIVESTOCK AND POULTRY

DEVELOPMENT OF ECONOMIC RATION USING LOCALLY AVAILABLE ENERGY AND PROTEIN SOURCES

S. Senani

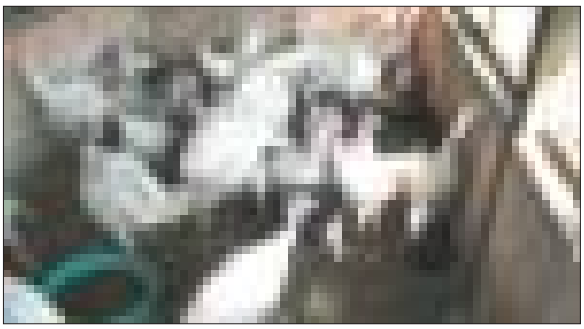
In an experiment *Mycrosorium punctum* was screened for its nutrient composition and later on evaluated as a source of herbage in rabbit feeding. In the study, 12 rabbits were divided in to groups of six each and given concentrate feed and hybrid Napier grass or edible as source of roughage. Initial body weight, daily intake of concentrate and roughage were recorded. Over a period of two months the intake of *Mycosorium punctum* decreased gradually.

In another study, *Lactobacillus* was used as a supplement to standard ration in the one day old Chara-chamballi ducklings of Kerala. Ducklings received Lactobacillus culture@ 3ml/100g of feed having $120x10^{-6}$ c.f.u/ml of NCDC-014 and in the control group there was no supplementation. No significant improvement in the growth and blood parameters were observed and the feed intake in the control and experimental groups were also similar.

ADAPTABILITY AND PRODUCTIVITY OF TURKEY AND GUINEA FOWL IN BAY ISLANDS

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

Turkey (*Meleagris gallopova*) and Guinea fowl (*Numida meleagris*) were introduced in these islands for the first time. Two varieties of Turkey, viz. Broad breasted white and Dwarf variety and four varieties of Guinea fowl, viz. Pearl, White, White breasted and Lavender variety are being maintained at the institute farm. Hatchability of Turkey and Guinea fowl were found to be 30.24 %



Turkey

Table 21. Production traits of Turkey and Guinea fowl

Traits	Turkey	Guinea fowl
Initial Hatchability (%)	30.24	32.52
Body wt. (gm)		
0 day	52.35	39.42
5th week	348.97 ± 12.22	151.33 ± 12.21
10th week	1085.6 ± 49.90	481.2 ± 37.40
24th week	4175.00 ± 281.74	1429 ± 39.39
Adult male wt. (kg)	5.00 to 9.2	1.1 to 1.56
Adult female wt. (kg)	3.00 to 4.2	—-
Age at sexual maturity (Days)	186	196
Annual egg production (No.)	100.81	158
Average egg wt. (gm)	70.63	39.62
Mortality (%)	22.32	24.46

Guinea fowl

& 32.52 % respectively. The mortality percentages during first two weeks were found to be 15.18 and 6.6 in Turkey and Guinea fowl, respectively. The body weight gain (gm) at 5th week and 10th week was found to be 348.97 ± 12.22 and 1085.6 ± 41.901 in Turkey and 151.33 ± 12.21 and 481.2 ± 37.403 in Guinea fowl, respectively (Table 21).

In Turkey, the semen evaluation studies showed that the average pH, motility (Scale 1-5), concentration (in millions), live and dead percentage and the colour were 7.80 ± 0.03, 4.45 ± 0.14, 5528.55 ± 0.39, 89.35 ± 1.51 and 10.83 ± 1.5 and Creamy white to milky white respectively (Table 22).

Differential staining of live & dead spermatozoa
(Pink - dead & White - live)

Table 22. Semen characteristics of Turkey

Colour	Milky to Creamy White
Volume (ml)	0.132 ± 0.001
Motility (1-5 Scale)	4.45 ± 0.14
Concentration (millions/ml)	5528.55 ± 39.00
Live (%)	89.35 ± 1.51
Dead (%)	10.83 ± 1.5
pH	7.80 ± 0.03

GENETIC UPGRADATION AND EVALUATION OF LOCAL CATTLE OF ANDAMAN

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

Evaluation of productive traits in indigenous and crossbred cattle of Andaman

The data on growth, production and reproductive traits of local and crossbreds (local with HF) cattle maintained at Institute's farm spread over 3 years (1999-2000, 2000-2001 and 2001-2002) were analyzed. Seasonal variation of daily milk yield of both the genetic groups over years were also studied. Crossbred calves had significantly ($P<0.05$) higher body weights than indigenous calves at all age groups. Male calves had higher body weight than females in most of the earlier ages in both the genetic groups. Lactation yield, lactation length and peak yield were significantly ($P<0.05$) higher among crossbred cows than local cows. Age at first heat, dry period and service per conception were all significantly ($P<0.05$) higher in local cows, while calving interval was significantly ($P<0.05$) higher among crossbreds. Average daily milk yield was higher (but not

Table 23. Comparative performance of local and genetically upgraded cattle of Andaman

Genetic groups	Traits							
	LY (litre)	LL (days)	PY (litre)	DP (days)	AFH (months)	SP (days)	SPC (no.)	CI (days)
Local	619.75[b] ±131.92	256.00[b] ±29.42	4.25[b] ±0.71	125.75[a] ±12.36	39.46 ± 6.92	114.67 ±16.23	2.20[a] ±0.65	381.72[b] ± 17.21
Crossbred	1735.04[a] ±301.95	318.86[a] ±22.30	7.06[a] ±0.64	108.00[b] ±11.42	19.14 ±1.58	107.6 ±17.23	1.93[b] ±0.23	426.86[a] ± 14.34

LY, LL, PY, DP, AFH, SP, SPC and CI are lactation yield, lactation length, peak yield, dry period, age at first heat, service period, service per conception and calving interval, respectively. Means with different superscripts differed significantly at P<0.05.

significant) during wet season in both the genetic groups. Both local and crossbred cows produced lowest daily milk yield during the quarter from January to March, while, highest daily milk yield was recorded in both the genetic groups during the quarter July to September over the years (Table 23).

SERO-SURVEILLANCE & ANTIGENIC CHARACTERIZATION OF ETIOLOGICAL AGENTS OF MAJOR LIVESTOCK & POULTRY DISEASES OF A&N ISLANDS

Jai Sunder, R.B. Rai, A. Kundu, S. Senani, R.N. Chatterjee and B. Ganesh Kumar

Seromonitoring and disease surveillance

Sero surveillance was conducted for major livestock and poultry diseases by employing diagnostic tests, viz. ELISA, SAT, AGPT, TAT etc.The sera samples were collected from the different islands of Diglipur, Rangat, Mayabunder, Car Nicobar and South Andaman and the following results were observed:

Cattle

Total of 364 sera samples were screened for major cattle diseases from the 5 tehsils of A&N Islands. Results revealed that the prevalence of IBR and Brucellosis was found to be highest in Mayabunder tehsil of A&N Islands. The highest prevalence of Leptospira was found in Ferrargunj Tehsil. The PPR was detected only in Rangat tehsil. The over all % of IBR was found to be 22.67% and of Brucellosis by ELISA 22.2% and by SAT 13.15% and Leptospira was found to be 16.81%, PPR 8.33% and Blue tongue was found nil. Different serovar of Leptospira was *L. grippotyphosa, L.jamanica, L. habdomalis, L. icterohaemorrhagica, L. atumnali, L. australis* and *L. hardjo.*

Goat

The result of goat sera showed the prevalence of *Brucella melitensis* 11.96%, *Mycoplasma Capri* 15.7%, Leptospira 24.14% in A&N Island. Highest prevelance of Mycoplasma was recorded in Port Blair tehsil, Leptospira in Rangat Tehsil and Brucella in Mayabunder tehsil.

Poultry

The sero screening of poultry sera showed the presence of *Salmonella pullorum* as 55.4% by SAT and 82.82% by ELISA, *Mycoplasma gallisepticum* 13.12%, C.A.V.91.3%, Reo virus 95.6%, IBD 58.5%, IB 69.56%, ND 0% & Avian encephalomyelitis 46.1%.

Swine

The results of swine sera showed the sero prevalence of swine fever (43.75%), of which Lapathy in Car Nicobar showed highest sero prevalence of 21.87% followed by Diglipur (18.75%) & Tamaloo (3.13%).

Post Tsunami survey

A wide survey was conducted in the tsunami affected area to assess the loss to the livestock sector and effect on health and productivity. Based on the survey and the information collected in collaboration with the AH&VS, A&N Administration the loss to the livestock sector have been assessed.

As an immediate relief measures, veterinary care were provided to the affected animals through health camps mainly in the southern Andaman.

As a part of the survey and assessment team for the tsunami affected area, impact on animal sector were assessed and based on the initial findings it was assessed that the animals mainly suffered from the saline toxicity and due to shortage of feed and fodder suffered digestive related problems. No outbreak was reported in poultry except few cases of saline toxicity with symptoms of diarrhoea.

Outbreak of FMD in cattle of South Andaman

After the episode of tsunami, FMD outbreak was reported in cattle, goat and pig mainly from the south Andaman. As an immediate action wide


Gum ulcers


Necrosis of hoof

survey were conducted in different areas of South Andaman and samples, viz tongue epithelium, blood samples, saliva etc were collected and processed for further confirmation of the disease. The clinical symptoms of FMD was observed from the cattle, mortality in the adult was negligible and in calf was reported to be 2-3%. The FMD was confirmed by c-ELISA as type 'O'. As an immediate action, vaccination of all the animals were advised and quarantine of the animals were strictly followed. Awareness among farmers was created though media and the disease could be controlled within 2-3 weeks.

Development of diagnostic test such as AGPT, SAT and ELISA from local isolates of Salmonella and IBD in poultry

The diagnostic tests, viz. SAT and ELISA were developed and standardized for diagnosis of *Salmonella pullorum* in poultry. The ELISA for *S. pullorum* has been standardized and compared with SAT. ELISA test was performed as per the method described by Engvall and Pearlman (1977). The test was assessed for its specificity and compared with standard slide agglutination test for diagnosis of *Salmonella pullorum* in poultry. Total of 163 samples were screened by both ELISA and SAT and the positive sera detected was135 and 115 respectively. The result showed that ELISA was superior to SAT as it detected 82.2% of positive as compared to 55.4% by SAT.

The AGPT for diagnosis of IBD has also been developed by local isolates and both the tests has been standardized and being used routinely for screening of the sera samples in farm and in field. Total of 106 sera was screened by AGPT and 52 samples were found positive.

Prevalence of parasitic diseases

As a part of the routine survey work, disease screening and on spot faecal examination was carried out in health camps conducted. The faecal examination revealed eggs of different parasites as shown in the table and figures. The examination revealed the presence of Humpsore (60%) and Strongylosis (29.16%) highest in Nancowry tehsil. Clinical cases of eyesore were also found. The incidence of Fascioliasis was found to be highest in ferrargungj tehsil (16.52%). The incidence of Taeniasis (2.6%), Schistosomiasis (0.86%) Trichuris (0. 86 %) were found to be sparsely scattered.

MEAT QUALITY ASSESSMENT OF DIFFERENT INDIGENOUS CHICKEN BREEDS OF BAY ISLANDS

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

A survey was conducted to know the preference and cooking pattern of poultry among Nicobari tribals. It was observed that they followed conventional method of preparation of chicken / quails, i.e. by smoking. The meat prepared by this method was subjected for sensory evaluation. It was observed that the meat was tougher which could be due to lack of optimal cooking. Proximate composition of cooked meat is shown in Table 24.

Carcass quality evaluation

Consumer awareness about the carcass quality improved considerably over recent years and the appearance of carcass or meat has become more important in determining consumer acceptability and retail price. In general, carcass and meat

quality problems could originate from various factors starting from on farm handling of live bird to the evisceration and storage process.

Meat cholesterol content

The meat cholesterol content of various indigenous poultry birds of Bay Islands, was also studied. 2 gm of tissue of different breeds/ strains were processed for cholesterol content (mg/100gm of meat) as per Liebermann Burchard Method and cholesterol content was estimated by Chemistry Analyser. The results revealed the lowest cholesterol content (mg/100gm of meat) in Black Nicobari (23 ± 3.25) and the highest in Duck (74.76 ± 1.54). The respective cholesterol content (in descending order) were 74.76 ± 1.54, 60.46 ± 0.23, 45.25 ± 0.92, 40.04 ± 0.91, 35.43 ± 0.89 and 23 ± 3.25 in ducks, japanese quails, White Nicobari, Brown Nicobari, Naked neck and Black Nicobari respectively (Figure 12).

Total Protein

Total protein in the meat of different poultry breeds was studied as per procedure described by Lowery *et al.* (1951) for protein estimation. From each group six numbers of samples were processed. The total protein was estimated using the following formula:

TP= OD sample / OD standard X Conc. Standard / Vol. sample

Table 24. Proximate composition of chicken and quail meat cooked by smoking method

Species	Moisture %	DM %	Ash %	EE %
Chicken Meat	62.98 ± 0.91	37.02 ± 0.91	4.06 ± 0.32	13.55 ± 0.80
Quail Meat	59.04 ± 0.36	40.96 ± 0.36	4.54 ± 0.16	10.00 ± 0.67

Table 25. Physical quality and proximate composition of meat of indigenous poultry birds (20th week)

Breed	Moisture %	DM %	E.E %	CP%	Ash %	pH	Water Holding Capacity (ml/100gm)
Black Nicobari	72.86±0.60	27.14±0.6	6.22±1.19	38.12±1.99	3.93±0.13	6.44±0.03	19.2±0.06
White Nicobari	71.36±0.72	28.64±0.72	3.97±1.14	38.08±1.88	3.74±0.21	6.46±0.01	17.6±0.49
Brown Nicobari	71.62±0.87	28.38±0.87	4.66±0.35	33.83±1.4	3.34±0.09	6.53±0.03	19.69±0.13
Naked Neck	71.91±1.14	28.09±1.14	6.38±1.41	36.61±1.34	3.29±0.21	6.51±0.02	19.14±0.66

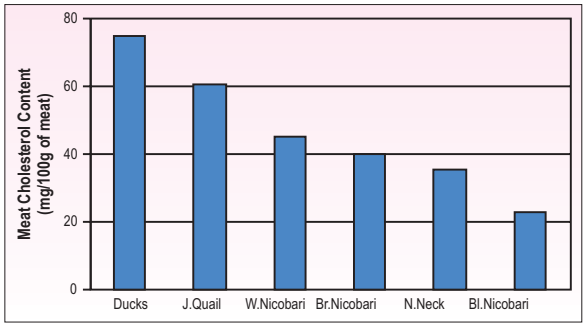


Figure 12. Meat cholesterol content of various species / breeds of poultry

STUDIES ON THE STATUS OF MINERAL PROFILE IN BOVINE OF A & N ISLANDS AND ITS CORRELATION TO MORBIDITY AND PRODUCTION

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

Collection of samples

A total of 171 soil samples, 171 grass samples and 57 water samples were collected for Monsoon (June-September), Dry (October-January), and Premonsoon (February-May) season from different sites of the selected villages of South Andaman and processed for further analysis in the lab. The initial processing of the samples, viz. drying, grinding, have been done for the monsoon season. Macro and micronutrients were analyzed by atomic absorption flame emission spectrophotometer (Shimadzu). The soil samples were collected approximately up to a minimum depth of 15 cm. Detailed results are given below:

Soil texture

Sandy clay loamy soil

Manglutan, Indranagar, Guptapara, Meethakhadi, Haathitapu, Ferrargunj, Manpur, Chouldari and Manjeri.

Clay loamy soil

Ograbranj, Calicut, Newbimblitan, Makkaphad, Garacharama and Sippighat.

Sandy clay soil

Burmanallah, Kodiyaghat, Chidiyatapu and Baetnabad.

Soil texture of 75% of the area is sandy clay to clay loamy. The coastal plains and beaches have sandy clay soil.

Organic Carbon Content (Walkley and Black (1934) method)

The result indicated that the organic carbon content of South Andaman was greater than 0.5% except in some areas like Newbimblitan hill top and Guptaphara slope where it was found very low, i.e. 0.42% This might be due to heavy soil erosion occurred during the heavy rainfall.

Moisture %

Moisture% of areas with clay loamy soil was higher ranging from 22.55% (Makkapahad slope) to 30.8% (Ograbranj slope). Areas with sandy clay soil was having lower moisture % ranging from 13.52% (Kodiyaghat slope) to 26.3% (Baetnabad valley).

pH

Commonly encountered pH range in soil was 5.5 to 8.5. However, pH lower than 4.5 and higher than 9.5 were also observed and was strongly acidic and alkaline soils respectively. Based on the degree of acidity, the soils were classified into various acidity and alkalinity classes. The result suggested that major soil types were moderately acidic to slightly acidic.

Micro and macro elements

Soil

Organic carbon content was greater than 0.5 %,pH ranged from 4.7 to 7.36. Among micronutrients the level of Zn was found to be normal except in some areas like Manjeri, Chidiyatapu and Haathitapu where it was found very high. Fe concentration was normal to very high. Cu and Mn was also found to be towards the higher range. Among macronutrients Ca, Mg and Na was almost normal and the level of K and P was lower than the normal range.

Fodder

The level of Zn and Mn was lower than the normal value, Fe and Cu level was found to be normal except Ograbranj where the concentration was found very high (290ppm), Cu and Mn was found to be very low in some places. Overall the level of macronutrients like P, K and Mg was found to be lower except Ca and Na which were found to be in normal range.

Water

The level of Fe and Cu was almost normal with high value of Fe in some places of Ograbranj, Calicut, Chidiyatapu, and Baetnabad. Concentration of Mn and Zn was very low. Overall all the macro elements were normal except the level of Ca which was found high in Haathitapu and Garacharama. Na level was slightly higher.

Serum

The concentration of all the macro elements in sera of cattle was found to be lower than the normal value except the level of Ca which is slightly higher. Further analysis of micro elements and other elements is in progress.

CHARACTERIZATION AND CONSERVATION OF NICOBARI PIGS

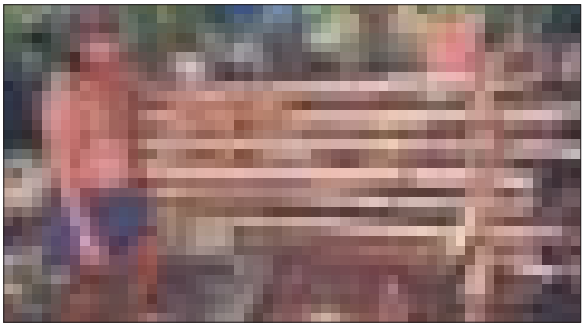
S. Jeyakumar, Jai Sunder, R.B. Rai and A. Kundu

Survey in Nancowrie group of Islands

The survey proforma was prepared with little modification based on the breed descriptor proforma developed by National Bureau of Animal Genetic Resources (NBAGR), Karnal. Initial survey has been conducted in Nancowrie group of Islands. In the selected three villages of Teressa Island, a total of 46 tribal families were interviewed about the population status and pig farming practices.

The herd size of Nicobari pig by individual tribal family was found as 15.56 ± 3.05. On an average, swine herd constituted with the number of sows 2.33 ± 0.33, boars 2.00 ± 0.48 and growers 2.70 ± 0.90. Majority of the pigs appeared short, black or brownish in colour and the pigs were generally healthy and alert. All the tribal farmers allowed their pigs for free range / open grazing in the arecanut, coconut plantation and inside the forest. The pigs were mostly fed on coconut and its water, ripe pandanus fruits, locally available tuber crops and roots. Pigs were also found to eat crabs, poor quality fish or fish waste. Further, regular feeding of copra (dried coconut) was practiced by all the farmers particularly late in the evening. Some Nicobari tribals additionally fed kitchen waste to their pigs.

The mean age at first farrowing (months), litter size and farrowing interval (months) was 10.91± 0.85, 6.44 ± 0.31 and 7.94 ± 0.33, respectively. The average age (months) at slaughter and live weight (kg) at slaughter was 12.76 ± 1.07 and 112.82 ± 14.26, respectively.



A Nicobari tribe with his indigenously made pig house

A Nicobari women caring her pregnant sow

PROGRAMME - 6

IMPROVING THE PRODUCTIVITY OF AQUACULTURE

STUDIES ON RECRUITMENT, CULTURE AND NUTRITIVE VALUE OF EDIBLE OYSTERS OF ANDAMAN WATERS

R. Soundararajan, S. Dam Roy, S. Senani, P. Krishnan and S. Murugesan

During the period under report, two species of edible oysters from two coastal locations were studied. While fortnightly sampling for *Crassostrea rivularis* and *Saccostrea cucullata* was done at Chidiyatapu, the same was done only for *Saccostrea cucullata* from Marine Hill, where it has predominant. The data of oyster length, weight, meat content, sex ratio, gonadal maturity stages, spat settlement, etc were recorded apart from environmental parameters from both locations.

Reproduction

C.rivularis (Chidiatapu) : The sex ratio of male:female ranged from 1 : 0.66 to 2.96. Except in September and December, the females outnumbered the males in all the months. The gonadal maturity in male occurred mostly in December and January and in female during July-August and February and April. However, the maturing and ripe gonads occurred in above all the months in both sexes.

S.cucullata (Chidiyatapu) : The male:female sex ratio varies between 1 : 0.22 to1.77. The males were predominant in most of the months. Comparatively higher number of males showed matured and ripe gonads in August and November to January. Similarly, comparatively more number of females showed matured and ripe gonads in June to September.

S . cucullata (Marine hill) : In Marine hill also the males dominated in most of the months. The male:female ratio in different months varied from 1: 0.66 to 1: 1.38. Comparatively higher number of males had matured and ripe gonads in July, September, October and December. The females had matured and ripe gonads almost in all the months. The active spawning period is between June to October and February to March.

A preliminary study was conducted on the sanitary significance of the edible oysters collected from different locations, viz. Chidiyatapu and Marine Hill. The oyster samples were analysed for total heterotrophic counts, total and faecal coliforms, human pathogens like *Staphyloccus aureus, Vibrio cholerae, Salmonella typhi, Listeria monocytogens* and *Clostridium botulinum*. The study suggested that the oysters being filter feeders have accumulated the pathogens from the waters, which are polluted by domestic discharges. Due to this, the faecal coliform counts were quite high. Further, the samples were positive for pathogens like *Vibrio cholerae* and *Salmonella typhi*. The sites need to be studied further, taking water and soil samples also along with the oysters to conclude the sanitary significance of the edible oysters of Andaman waters.

CULTURE OF MILKFISH, SEABASS AND PRAWN IN TIDEFED BRACKISHWATER CULTURE

S. Dam Roy, R. Soundararajan, N. Sarangi, K. Madhu and Rema Madhu

Altogether two experiments on fattening of milkfish were done. In one experiment at an average stocking size of 294 g, a gross production of 1142 kg/ha and a net production of 726 kg/ha was obtained within a period of 14 months. In another experiment the fattening of milk fish was done for a period of 1 year and 4 months. The average weight at stocking was 730 g and average weight at harvest 1207 g. The net production at harvest was 1030 kg/ha. The Length-weight relationship was worked out.

$$\text{Log } W = -2.8938 + 2.1707 \log L$$

Culture of tiger prawn

Tiger prawn produced from marine hill hatchery were cultured in the trenches of Sipighat and an average growth of 129 mm (20g) was obtained by the end of 4 months. In another experiment under monoculture of *P. monodon* at a stocking density of 50000 no./ha, it was found that the prawn had grown to a size range of 55 to 172 mm, with a average of 96 mm. The recovery was 11.62%.

On 26th December 2004, earthquake and tsunami hit Port Blair, causing damage to the farm building and pond embankment. Consequent to the flooding of the pond embankment, the entire stock of about 1670 kg escaped out of the pond.

DOCUMENTATION AND ANALYSIS OF FISHERIES INFORMATION AND FORECASTING OF FISHERIES IN BAY ISLANDS

S. Dam Roy, M. Balakrishnan, R. Soundararajan, B. Ganesh Kumar, Benny Varghese and Nagesh Ram

Molluscan Fishery resources and shell craft industry of Andaman & Nicobar Islands

The taxonomic composition of the malacofauna were analysed. The two dominant classess of Mollusca, viz. Bivalvia and Gastropoda have successfully adopted and colonized the different habitat available in these islands. Bivalvia forms 34.87 % and Gastropoda forms 60.62 % of the population. The significance of the malacofauna has been delineated. It has been observed that in Andaman and Nicobar islands, the endemism is only 10 % of the marine molluscan fauna. A total of 16 species, mostly gastropoda are presently used in trade, the two important species being *Trochus niloticus* and *Turbo murmoratus* which are commercially exploited due to their mother pearl cunture. Although these two species are widely distributed in the Indo pacific, Andaman and Nicobar islands contribute to shell fish production and serve as the western fringe for both the species.

The molluscan fishery resources of trochus, turbo, giant clam, cephalopods were described in detail. The prospect and problem of shell craft in dustry were also documented. Culture of mollusks as a sustainable livelihood, detail pertaining to sea shell fishing license were also documented.

Fin fish exploitation

The fish landing in A&N Islands went up with increase in population from 44 tonnes during 1950 to 27,000 tonnes during 1998, the 39 years landing profile manifest 8 % to 17 % of annual demersal stock contribution, the demersal stock exploitation is mainly through hook and line. This also includes non-reef dwellers caught through bottom trawl and shore seine. The exploited coral reef fishes belongs to families (1) Lutjanidae (Snappers) (2) Serranidae (Groupers) (3) Pomadasyidae (Grunts) (4) Scaridae (Parrot fishes) (5) Holocentridae (Squirrel fishes) (6) Mullidae (Goat fishes) (7) Chaetodontidae (Butterfly and Angel fishes) (8) Acanthuridae (Surgeon fishes) and (9) Balistidae (Trigger fishes). Presently there are 2196 licenced fishermen with a fleet strength of 1762.

Shell fish exploitation

Lobster

With the establishment of export oriented industries lobsters attracted the attention of the industry and they too got a place in the export list. They are hand picked or caught through spear. The exploited varieties are *Panulirus* spp. and *Thenus* sp., inhabiting coral and rocky reefs.

Sea shells

These islands are traditionally known for shell wealth. Systematic exploitation seems to have started during 1929 when a Japanese company was licenced to exploit *Turbo* sp. and *Trochus* sp. at

the rate of 500 tonnes in a season of 3 months. Later the shell fishing was regulated through A&N Islands Fishing Regulation, 1938 and Fishing Rules, 1939 upto 1954, thereafter A&N Islands Shell Fishing Rules, 1955 was enacted wherein 9 geographically demarcated shell fishing zones were identified and right of fishing was through auction, subsequently it got repealed and A&N Shell Fishing Rule, 1978 was enacted limiting the harvestable limit to 15 tonnes per zone per season of 6 ½ months. The last amendment was promulgated during 1994 through which the right of shell fishing is now granted only to registered shell craft industries by the Director of Fisheries by issue of licence, the quantity of shell to be exploited is kept reserved as a discretory decision of the licencing Officer.

CULTURE POSSIBILITY OF MARINE ORNAMENTAL FISHES *(AMPHIPRION SPECIES)* IN ANDAMAN AND NICOBAR ISLANDS

K. Madhu, Rema Madhu and R. Soundrarajan

Mass production of *A.percula* seeds

Through broodstock management, several breeding pairs of *A. percula* were developed and its breeding and mass scale production of juveniles were carried out and a complete package of practices for its captive breeding, larval rearing and juvenile production was developed. Standardization of suitable feeds, its quantity to be supplied and enhancement of feed quality during the larval stages of between 10 and 20 days were carried out.

Social structure

In the course of field studies of anemone fish *A. percula* in Andaman Islands, it was found that this species usually appeared around the host anemone in social groupings that included an adult pair (brooders) and one to three juveniles (non-breeders) and the largest fish is usually the female and the next largest individual is the functional male and noticed a hierarchy or 'peck order' existing in which the female is the dominant individual. *A. percula* changes sex as they mature and normally, all juvenile clownfish start out as males and subsequently change into females when they reach larger sizes in the wild.

Hatchery produced juveniles of *A. percula*

To study the influence of social structure on sex inversion four types of experiments were carried out under laboratory condition : (i) Protandric Sex Inversion from active male to female in the absence of active female; (ii) Juveniles in the presence of a functional male that was changing sex from male to female; (iii)Juvenile in the presence of a functional female and (iv) Juvenile fishes without the presence of adults. In all the cases, six replicates were maintained for each treatment and the gonadal development of fishes were histologically analyzed after 1 week to 6 months of its association.

The present study concluded that in the absence or disappearance of a partner or adult female, an active male changes sex from male to female within a period of 20 weeks and confirmed the unusual aspects of sex reversal in clown fish *A. percula*. Thus a protandrous (male first) sequential hermaphrodites has been established in *A.percula* and found that social structure plays and important role on its sex changing mechanism.

Captive breeding of *Amphiprion ocellaris*

Amphiprion ocellaris commonly known as false clown is a close relative of A. *percula* and it is easily confused with A. *percula*. The distinct differences are in the number of dorsal-fin spines. A. *percula* usually has 10 dorsal-fin spines, while A. *ocellaris* usually has 11 and black margins outlining the fins are very thin. As this species are very rare and the population is almost vanished in Andaman and Nicobar islands, attempt was made to breed the fishes under laboratory condition.

Through experiment a pair of false clown anemone fish A. *ocellaris* having size 89.2 mm (presumptive female) and 69.1 mm (presumptive male) was developed. It was then reared in the broodstock tank (100 lit Perspex tank) along with host anemone. The brood stock were fed with meat of green mussel, prawn, fish egg mass twice daily and artemia twice per week. After a period of three months rearing, the pairs spawned 200-300 capsule shaped eggs and attached to the side of the filter bucket.

The newly spawned eggs were bright yellow in colour for initial two days and third day onwards the colour changed to black. The incubation period of eggs were 6-7 days. Just prior to hatching the embryo which has undergone rapid development is clearly visible through the transparent egg membrane. The most noticeable features are the large eyes with their silvery pupils and the red-orange yolk sac which is responsible for the general colour of the entire egg mass when viewed form a short distance.

Parental care

During the incubation period both parents were allowed to remain in the parental tank itself till the hatching. Both the parents carefully looked after the eggs during day time and it involved two basic activities fanning and mouthing. Male assumed nearly all responsibility of caring for the eggs and spent a higher percentage of time at the nest than the females did which increased gradually up to 70% of time as the day of hatching approached. On the final evening, males spent most of their time for fanning and mouthing whereas female spent a low but relatively constant percentage of time at the nest throughout the incubation period. The hatching took place immediately after sunset under complete darkness which accelerated hatching. After hatching, the larvae sink to the bottom of the aquarium for few seconds and then gradually make their way toward the surface of the water. The planktonic larval stage lasted for 8 to 12 days. After this time period, the juvenile fishes begin to develop the coloration typical of their species. During the rearing period, the larval were fed with rotifer *Brachionus plicatilis* at the rate of 100/ml for the initial 12 days and after that the larvae were weaned to newly hatched artemia nauplii along with rotifer.

MICRO ALGAL CULTURE FOR LARVAE OF SELECTED MARINE SHELL FISHES OF ANDAMANS

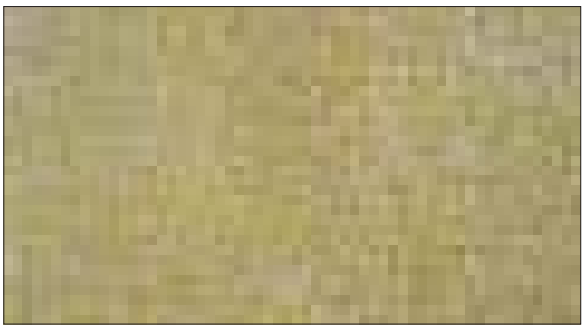
Rema Madhu, K. Madhu and R. Soundrarajan

Isolation and identification of unicellular algae

The species such as *Phaeodactylum tricornutum, Chlorella pyrenoidosa C. ellipsoidea, Chlorella miniata, Dunaliella parva, and Dicroteria sp. Tertraselmis carteriformis*, and fresh water micro algae *Chlorella vulgaris* were isolated and identified from the water samples collected from Neil island, Dundus point, Havelock, Maybunder, Diglipur, North bay, Bombooflat, and Coriyaghat and Chidiyattappu.

Stock culture

In order to find out suitable Stock culture media for maximum multiplication of microalgae in



Micro algae, *C. ellipsoidea*

Andaman waters, nine culture media have been used to record the cell density of *Tertraselmis carteriformis* C. *ellipsoidea* C. *pyrenoidosa* P. *tricornutum* during the culture period. The algal cell density was assed as lakhs cells /ml from all stock culture flask as well as mass culture tanks.

Tertraselmis carteriformis

The results of the stock culture of *T. carteriformis* showed that Walnes media gave the highest population growth and attained peak cell density (15.85) on 9th day of culture.

Chlorella ellipsoidea

The results of the culture of C. *ellipsoidea* showed that Guillard f media gave the highest population growth and attained peak on 8th day of culture (14.9 Lakhs cells /ml).

Chlorella pyrenoidosa

The results of this study divulged that Walnes media gave the highest population growth and a attained peak (13.8 lakhs cells /ml) on 9th day of culture.

Phaeodactylum tricornutum

The stock culture experiment of *P. tricornutum* showed that Walnes media gave the highest population growth 12.9 lakhs cells/ml on 6th day of culture.

Determination of suitable salinity range for isolated micro algae

Different salinities such as 10,15, 20,25, 30,31,32,33, 34, 35, 37, 38, 40, 45, 50, 55 ppt were tried for the culture of isolated micro algae in 2 liter sea water in a haufkins flask and in a temperature controlled lab at 23°C and 12 hours illumination at 2000 lux were provided to find out the suitable salinity for their stock culture maintenance in the respective media wherein maximum multiplication was obtained.

Mass culture of micro algae

Mass culture of 12 micro algae were carried out in 9 different culture media such as Walnes, Guillard f, GF/2, GF/4, Miquels, TMRL, PM, Suto and SEAFDEC where transparent roof is provided and the light intensity during day time ranged between 2000 to 3000 lux. Peak cell density, day and suitable media are given in Table 26.

Table 26. Peak cell density of different isolated microalgae from mass culture

Species	Peak cell density (Lakhs cells /ml)	Day	Media
C. calcitrans	8.925	5th	Walnes
C. ellipsoidea	11.5	5th	Guillard f
C.marina	12.85	7th	Walnes
C.plethora	10.475	6th	Guillard f
C. pyrenoidosa	11.35	6th	Walnes
C. pleiodes	12.35	6th	Walnes
D. inornata	2.16	6th	Walnes
P. tricornutum	10.4	4th	Walnes
N. occulata	16.25	5th	Walnes
N. vitrea	8.225	5th	Walnes
T. caeca	9.025	6th	Walnes
T. carteriformis	2.1875	5th	Walnes

Shelf life period of different isolated micro algae

One of the important aspects of algal culture is the maintenance of isolated species as an inoculum for the use at required time. In the usual practice, each culture need to be inoculated frequently to keep the cultures in good condition. Since it is a time consuming and also involved the requirement of chemicals, experiments have been carried out to find out

the shelf life of these species so as to know upto what period a species can be kept under laboratory condition without re inoculation with manipulating the light intensity. For this purpose cultures of *C. calcitrans, C. ellipsoidea, C. pyrenoidosa, Chromulina pleoides, Dicroteria inornata, P.tricornutum, Monochrysis lutheri, Tetraselmis chuii, Tetraselmis carteriformis, Thalassomonas caeca, Chlorella miniata, Scenedesmus quadricauda* were kept under different light intensities (100, 200 lux, 300 lux) and also under darkness after attaining exponential phase. Promising shelf life period was obtained for all culture at 200 lux. Shelf life of isolated microalgal species from Andaman waters are presented in Table 27.

Table 27. Shelf life of micro algae under laboratory condition

Species	Shelf life Period
C. calcitrans	2 weeks
C. ellipsoidea	1 months
C. pyrenoidosa	2 months
Chromulina pleoides	20 days
Dicroteria inornata	5 months
P. tricornutum	1 weeks
Monochrysis lutheri,	2-3 months
Tetraselmis chuii	4 months
Tetraselmis carteriformis	3 months
Thalassomonas caeca	3-4 months
Chlorella miniata	3-4 months
Scenedesmus quadricauda	1-2 months

ARTIFICIAL FEED FORMULATION FOR SELECTED CULTIVABLE MARINE SHELL AND FIN FISHES OF ANDAMANS

Rema Madhu and K. Madhu

Comparative evaluation of different artificial diet (semi moist diet) feeds on fattening of mud crab, *Scylla serrata*

Semi moist artificial diets were fed to the crab, *Scylla serrata* (initial mean weight 288.15 gm, carapace length 105.24 mm, carapace width 78.5 mm) for fattening of the crab. Four diets were tested using different combinations of locally available feed ingredients (clam + sardine), (sardine + green mussel), (clam + green mussel) in 1: 1 proportion keeping Clam alone as control (mangrove clam). In all the four tested feeds, rice bran (100 gm/kg feed), GOC (100 gm/kg feed),Vitamin mix (20 gm/kg feed), mineral mix (20 gm/kg feed), cod liver oil (10 gm/kg feed) and binder gelatin at the rate of 20 gm/kg were used as common ingredients. For feed preparation, all the ingredients were cooked and made to a paste. On cooling the dough, the vitamins, minerals and oil were added and mixed thoroughly and dried in oven at 40° C for overnight. The semi moist diet obtained is separately packed in poly ethylene bags and stored in deep freezer for daily feeding.

The experiment for a period of 90 days showed that the crabs fed with mixed feed having combination of (clam + sardine + common ingredients) has gained a mean total weight of 550.25 gm, carapace length 119.8 mm, carapace width 84.32 mm, chelar propodus length 90.51 mm, chelar propodus width 39.36; chelar propodus depth 33.50 mm and that of feed (clam + green mussel + common ingredients) fed crabs attained a mean total weight of 600.68 gm, carapace length 130.5 mm, carapace width 89.42 mm, chelar propodus length 94.52 mm, chelar propodus width 45.43; chelar propodus depth 34.33 mm. The feed combination of (sardine + green mussel + common ingredients) fed crabs attained a growth of 500.72 gm, carapace length 115.23 mm; carapace width 82.39 mm, chelar propodus length 88.12 mm, chelar propodus width 35.28; chelar propodus depth 30.19 mm.

Evaluation of different mixed wet feeds on growth of lobster, *P. versicolor*

In the feed formulation for lobster, *P. versicolor* (initial mean weight 80.25 gm total length 133.57, carapace length 57.41 mm, Abdominal length

50.82 mm), six combinations of mixed semi moist feeds were tested. For this, major feed ingredients such as (green mussel + clam) (green mussel + squid); (green mussel + sardine); (clam + squid); (clam + sardine) and (sardine + squid) were taken in 1:1 proportion along with common ingredients of rice bran (100 gm/kg feed), GOC (100 gm/kg feed), Vitamin mix (20 gm/kg feed), mineral mix (20 gm/kg feed), codliver oil (10 gm/kg feed) and binder gelatin at the rate of 20 gm/kg.

The experiment showed that out of the six combinations of mixed semi moist feeds were tested, the combination of (green mussel + clam) gave best growth followed by (green mussel + squid + common ingredients); (green mussel + sardine + common ingredients); (clam + squid + common ingredients); (clam + sardine + common ingredients) and (sardine + squid + common ingredients).

Evaluation of different mixed wet feeds on growth of groupers, *E. tauvina* and *C. argus*

In the feed formulation for groupers, *E. tauvina* and *C. argus,* six combinations of mixed semi moist feeds were tested. For this, major feed ingredients such as (sardine + stolephorus) (sardine + green mussel); (sardine + clam); (stolephorus + green mussel); (stolephorus + clam); (green mussel + clam) were taken in 1:1 proportion along with common ingredients rice bran (100 gm/kg feed), GOC (100 gm/kg feed), Vitamin mix (20 gm/kg feed), mineral mix (20 gm/kg feed), codliver oil (10 gm/kg feed) and binder gelatin at the rate of 20 gm/kg. It is divulged that that out of the six combination of mixed feed tested, (sardine + stolephorus + common ingredients) gave maximum growth in both the groupers followed by other combinations.

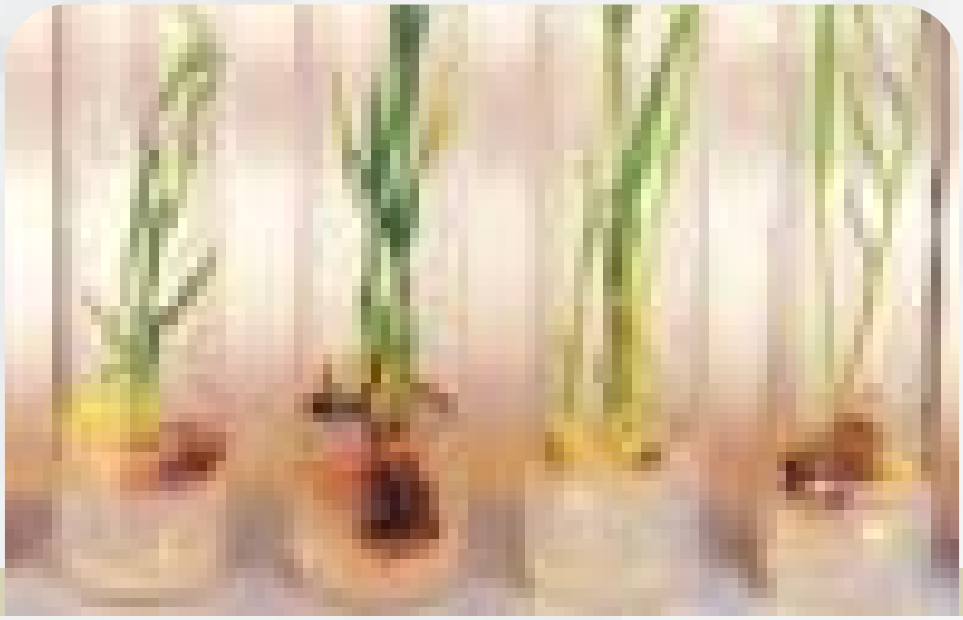
Fattening of mud crab, *Scylla serrata*

Table 28. Biochemical analysis of the different feed ingredients

Feed ingredients	Moisture (%)	Protein (%)	Fat (%)	Fiber	Ash
Clam meat	9.98	54.25	8.76	Nil	7.45
Green Mussel	87.5	71.1	7.49	Nil	12.8
Squid	8.3	64.5	4.38	3.79	10.61
Stolephorus	5.5	47	3.1	3.0	22.5
Sardine	74.35	35.2	5.30	1.68	13.8
Leognathus	54.0	40	2.1	2.9	20.3

PROGRAMME - 7

FRONTIER RESEARCH FOR KNOWLEDGE AND INCREASED PRODUCTIVITY



GENETIC MANIPULATION FOR IMPROVED PRODUCTIVITY IN RICE WITH SPECIAL REFERENCE TO BIOTIC AND ABIOTIC STRESS TOLERANCES IN BAY ISLANDS

Asit B. Mandal and R. Elanchezhian

Optimization of microprojectile bambardment for efficient transgene delivery and expression

Microprojectile bombardment involving PDS 1000 He system was optimized involving two *in vitro* culture responsive varieties viz. Basmati 370 and Taraori Basmati with a view to develop an efficient protocol for efficient transgene delivery and expression. Considering the combined results 1100 (psi) helium pressure, 1ml microcarrier size, 10 ml particle volume, 8 h pretreatment of the calli.,9.0cm flight distance, 30cm of Hg pressure of the internal chamber, top position of the stopping screen were found to be optimum.

Transgenic plants developed via particle bombardment

In Basmati 370, twenty nine putative transgenic plants harbouring cryI A(b), cryI A(c) and hpt genes were developed following bombardment in co-transformation mode with hpt localized in a separate binary vector. Out of those 29 plants, 11 showed PCR positive result. They were found to be slot blot positive too. Southern blot is in progress. Similarly out of 21 plants developed and tested for the presence of cry 1A (c) only 3 (14.28%) showed PCR positive result. Inheritance studies showed Mendelian ingheritance of the transgene in a few plants, while distorted ratio was observed in many plants progenies. Two new vectors in pCAMBIA 1301 background viz. pCAMBB and pCAMBC were developed by cloning cry 1A(b) and cry 1A(c) at Hind III site to exploit the advantage of hygromycin selection marker in monocot system were mobilized into LBA 4404 and are being used for Swarna, Samba Mashuri and C 14 - 8 transformation.

Development of transgenic plants harbouring AmSod

Sixteen plants were developed for Amsod in Taraori Basmati. At T_0 generation majority of them showed PCR positive result. At SOD isoenzyme level discernible variations in the transgenic lines in comparison to the control wild plant was observed To assess oxidative stress tolerance of the putative transgenics of Taraori Basmati harbouring AmSod gene were used for MV test to assess oxidative stress tolerance. Seventeen putative transgenic plants were incubated for 16 h involving 50, 75 and 100mM of MV. Variation in terms of leaf rolling, leaf colour change and survival was discernible and a few lines showed more tolerance in comparison to non-transgenic control plant. Similarly excised

A few putative transgenic plants harbouring Amsod

PCR profile showing presence of transgene through display of amplicons

tillers and leaf discs were assesed for tolerance towards 150 and 300mM NaCl. In a few lines enhanced tolerance was observed. Those were reared under transgenic rearing facility and seeds were collected from plants at maturity. Transgene showed Mendelian ingheritance in the progenies of maximum plants while distorted ratio was observed in a few plants progenies.

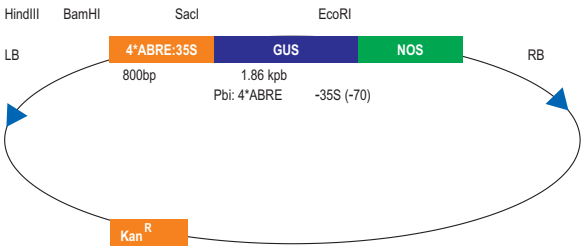


Figure 13. Physical map showing the location od ABRE in upregulating gus gene

Development of putative transgenic plants involving ABRE for manipulating abiotic stress tolerance

Agrobacterium-mediated genetic transformation was conducted to introgress ABRE into embryogenic callus of IR 72. After selection, survivors were transferred onto MS basal with hygromycin (50mg/l) for root induction. Selected microtillers from IR 72 were transferred to rooting medium where they put forth roots successfully. Those plants are currently progressing under molecular analyses.

MOLECULAR TAGGING OF GENE(S) FOR EXCESS SALT TOLERANCE IN RICE AND ITS SIGNIFICANCE IN MARKER AIDED SELECTION

Asit B. Mandal and R. Elanchezhian

The F_3 mapping population was evaluated under excess salt stress condition ($12dS^{-1}$) for agronomic and chlorophyll fluorescence parameters.

Parents of F3 population (Left - Pokkali; Right - IR28)

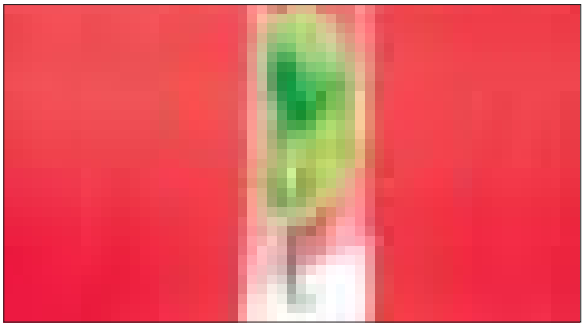
Polymorphism survey involving 20 random decamer primers from Operon technologies, USA have been completed for IR28, Pokkali and the 150 F_3 mapping population.

PHYSIOLOGICAL APPROACHES FOR IMPROVED ABIOTIC STRESS TOLERANCES IN SOLANACEOUS VEGETABLE CROPS

R. Elanchezhian, Asit B. Mandal and T.E. Sheeja

Evolving putative brinjal transgenics for tolerance towards abiotic stress harbouring Amsod gene

Putative transgenics of brinjal var. Pusa Bindu, harbouring Amsod gene were developed for improving tolerance towards abiotic stress. The co-cultivation medium comprised of MS basal with 2 mgl^{-1} BAP + 0.5 mgl^{-1} Kinetin + 250 mgl^{-1} Cefotoxime and co-cultivation was done for 48 hours. Selection for transformants was done under same medium with kanamycin (50 mgl^{-1}). A transformation efficiency of 33.33% was observed. Roots were induced on MS containing 0.1 mgl^{-1} IAA, Cefotoxime 250 mgl^{-1} and 50 mgl^{-1} kanamycin. About 60% rooting was observed. However, only 33.33% of regenerated plantlets survived when hardened in plastic cups. The



Putative transformant of brinjal var. Pusa Bindu harbouring Amsod gene

Putative transformant of chilli var. KA2 with Amsod gene

hardened plants were planted in pots and evaluated at T_0 generation. The seeds were harvested for further evaluation.

Evolving putative tomato transgenics for tolerance towards abiotic stress with Amsod gene

Putative transgenics of tomato var. Pusa 120 transformed with Amsod gene were developed to improve tolerance towards abiotic stress. The co-cultivation medium had MS basal with 2 mgl^{-1} BAP + 0.5 mgl^{-1} Kinetin + 250 mgl^{-1} Cefotoxime. Co-cultivation was done for 48 hours. Selection for transformants was done under same medium with kanamycin (50 mgl^{-1}). Total number of explants transformed was found to be 57.69%. Roots were induced on MS + 0.1 mgl^{-1} IAA + Cefotoxime 250 mgl^{-1} + 50 mgl^{-1} kanamycin and 83.33% rooting was observed. However, 40% of them survived when hardened in plastic cups. The hardened plants were planted in pots and evaluated at T_0 generation. The seeds were harvested for further evaluation.

Evolving putative chilli transgenics for tolerance towards abiotic stress with Amsod gene

Putative transgenics of chilli var. KA2 involving Amsod gene were developed to improve tolerance towards abiotic stress. The co-cultivation medium was comprised of MS basal with 2 mgl^{-1} BAP + 0.5 mgl^{-1} Kinetin + 250 mgl^{-1} Cefotoxime and co-cultivation was done for 48 hours. Selection for transformants was done under same medium with kanamycin (50 mgl^{-1}). Total number of explants transformed was found to be 50%. Roots from regenerants were induced on MS + 0.1 mgl^{-1} IAA + Cefotoxime 250 mgl^{-1} + 50 mgl^{-1} kanamycin and 50% rooting was observed. The hardened plants were planted in pots and evaluated at T_0 generation. The seeds were harvested for further evaluation.

Evolving putative transformants of chilli var. KA2 with cry 1A(b) gene

Putative transgenics of chilli var. KA2 involving cry 1A(b) gene was generated for improved tolerance towards biotic stress through *Agrobacterium*-mediated genetic transformation. The co-cultivation medium was MS basal containing 2 mgl^{-1} BAP + 0.5 mgl^{-1} Kinetin + 250 mgl^{-1} Cefotoxime. Co-cultivation was done for 48 hours. Selection for transformants was done under same medium with kanamycin (50 mgl^{-1}). Total number of explants transformed was found to be 66.67%. Roots were induced in the regenerated plantlets on MS + 0.1 mgl^{-1} IAA + Cefotoxime 250 mgl^{-1} + 50 mgl^{-1} kanamycin and 75% rooting was observed. However, 33.33% of them survived when hardened in plastic cups. The hardened plants were planted in pots and evaluated at T_0 generation. The seeds were harvested for further evaluation.

Evolving putative transformants of chilli var. KA2 with cry 1A(c) gene

Putative transgenics of chilli var. KA2 involving cry 1A(c) gene was developed for improved tolerance towards biotic stress through *Agrobacterium*-mediated transformation. The co-cultivation medium was comprised of MS basal with 2 mgl^{-1} BAP + 0.5 mgl^{-1} Kinetin + 250 mgl^{-1} Cefotoxime. Co-cultivation was done for 48 hours. Selection for transformants was done under same medium with kanamycin (50 mgl^{-1}). Total number of explants transformed was 55.55%. The regenerated plantlets were rooted on MS + 0.1 mgl^{-1} IAA + Cefotoxime 250 mgl^{-1} + 50 mgl^{-1} kanamycin. About 80% rooting was observed. However, 50% of them survived when hardened in plastic cups. The hardened plants were planted in pots and evaluated at T_0 generation. The seeds were harvested for further evaluation.

COLLECTION, CHARACTERIZATION, CONSERVATION AND ENHANCEMENT OF ECOLOGICALLY AND ECONOMICALLY IMPORTANT PLANT SPECIES IN BAY ISLANDS

Asit B. Mandal and R. Elanchezhian

Molecular characterization of *Costus speciosus*

Costus speciosus, a medicinal plant species endemic to Andaman and Nicobar group of islands, was collected from 14 diverse locations of the islands through recurrent survey to determine the extent of genetic variability using RAPD-PCR analysis. Twelve Operon primers were used for amplification and only four showed discernible bands. All the accessions were identified with the presence of markers. The primers OPD8 and OPZ16 amplified DNA from all the 14 accessions. Number of accessions showing amplification were 13 and 11 with primers OPZ1 and OPZ13, respectively. RAPD profiles displayed intra species variation or molecular polymorphism at amplicon level, which was pre-existing in different collections. In spite of their morphological identity, a great deal of polymorphism was observed in the accessions. The UPGMA analysis revealed up to 35% variation among these accessions (Figure 14). Such variation is expected to be useful while formulating conservation strategies for this species.

Costus speciosus

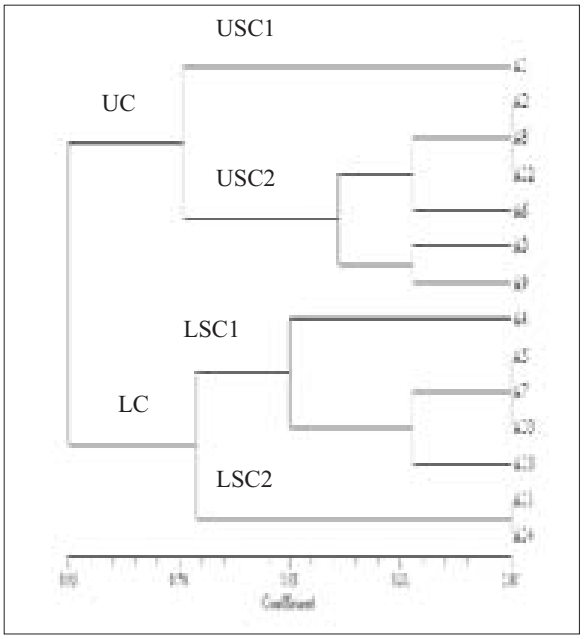


Figure 14. Dendrogram showing plylogenetic relationships among 4 different collections of *Costus specious*

Molecular characterization of *Alstonia macrophylla*

Six accessions of a medicinal plant species endemic to Bay Islands, viz. *Alstonia macrophylla* were

collected and characterized by RAPD-PCR using random primers from Operon technologies. Attempt was made to distinguish these accessions at genetic level otherwise impossible due to identical morphological characters. Twelve Operon primers were used for amplification, 11 showed discernible bands. Twenty nine out of 124 amplicons generated from 11 primers were found to be polymorphic. All the accessions could be identified with presence of markers. Maximum bands were generated using primer OPX13 (15) followed by OPX2 (12).A great deal of polymorphism was observed in different accessions of *Alstonia macrophylla* under study in spite of their morphological resemblance (Figure 15). Despite the extent of genome covered by this set of primers remain very limited, the polymorphism was high. Thus, relatively uncharacterized accessions of an endemic species of medicinal value could be classified using this technique. This information can be used as bench mark information for more extensive fingerprinting of different accessions of this invaluable medicinal species of Bay Islands.

Alstonia macrophylla

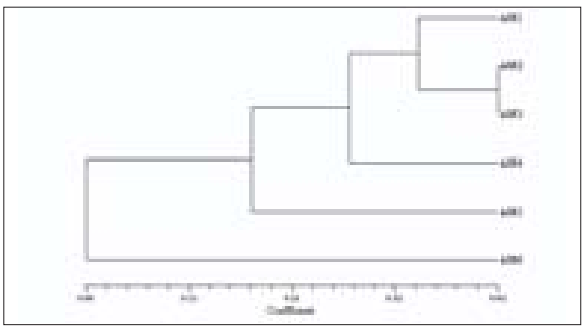
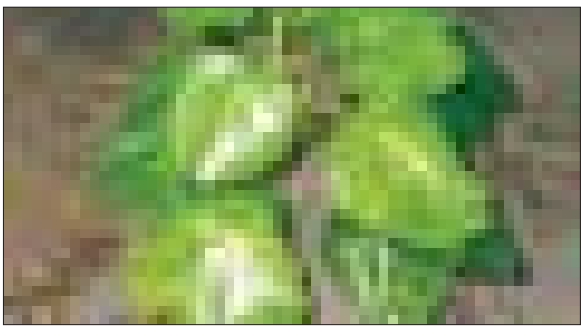


Figure 15. Dendrogram showing genetic divergence in *Alstonia macrophylla*

BIODIVERSITY CHARACTERIZATION, CONSERVATION AND BIOPROSPECTING OF FOUR ECONOMICALLY IMPORTANT MEDICINAL PLANT SPECIES OF BAY ISLANDS

Asit B. Mandal, T.E. Sheeja and G. Shyam Prasad

Hernandia peltata, an endemic medicinal plant species was molecularly profiled through RAPD analysis to assess the genetic divergence among five collections made from diverse locations of Bay Islands. Altogether 32 primers were used for amplification. Twenty-two primers (68.75%) showed a total of 431 discernible bands. All accessions were identified with the presence of specific amplicons. About 98 bands (22.7%) were found to be polymorphic in nature. Number of polymorphic bands were 333. The maximum numbers of polymorphic bands were observed in case of OPX-11 (12). All primers showed amplification in all the samples except OPX-01, OPX-05, OPQ-02 and OPZ-14. Finally four unique bands were observed, 3 bands in OPX-07 and 1 in OPX-04, which may be used in development of molecular ID cards for diagnosing specific accessions.



Hernandia peltata

PROGRAMME - 8

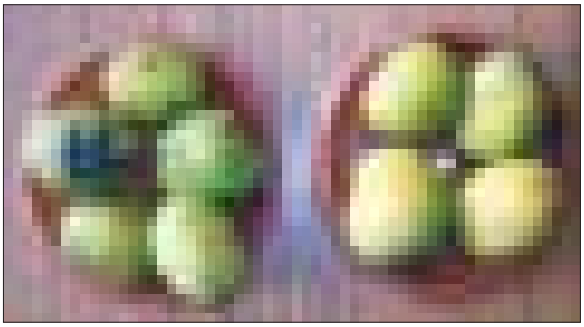
POST HARVEST TECHNOLOGIES AND HIGH VALUE AGRICULTURE

VARIETAL EVALUATION AND STANDARDIZATION OF AGROTECHNIQUES IN TROPICAL FRUITS

R.P. Medhi, T. Damodaran, D.R. Singh and V. Jayakumar

Studies on post harvest shelf life on mango var.6-3-2-1

The mango fruits are subjected to various post harvest treatments as mentioned the table 3 and studied for their shelf life quality. It was observed that the fruits treated with Psuedomonads (0.5%) had the highest shelf life with the lowest physiological weight loss and sugar contents followed by treatment with GA3 (100 ppm). The PO and PPO content was also lower than the control and IAA (100 ppm) treatment (Table 29).



Mango

Table 29. Physiological weight loss of the mango fruits subjected to post harvest study.

Treatment	2 DAS	4 DAS	6 DAS	8 DAS
Control	20.00	35.00	35.00	45.00
Hot Water	13.33	18.33	25.00	30.00
GA_3 (100 ppm)	15.00	22.50	22.50	35.00
IAA (100 ppm)	6.66	21.66	28.33	38.33
Ascorbic acid (500 ppm)	10.00	20.00	23.33	35.00
Pseudomonas (0.5%)	6.66	18.33	21.66	25.00
Hot Water + Pseudomonas	11.60	18.33	25.00	32.50

Table 30. Effect of post harvest treatments on qualitative characters of mango var.6-3-2-1

Treatments	TSS	Acidity	Total Sugars (%)	PO	PAL
Control	12	0.32	11.5	18.5	10.4
Hot Water	16	0.28	12	17.58	11.46
GA3 (100 ppm)	17	0.24	13.65	17.73	18
IAA (100 ppm)	16.25	0.3	12.5	18.28	12.06
Ascorbic acid (500 ppm)	16.52	0.23	12.8	14.08	11.01
Pseudomonas (0.5%)	19	0. 20	14.2	10.94	14.18
Hot Water + Pseudomonas	17.55	0.2	12.65	3.96	10.28

COLLECTION, CATALOGUING, EVALUATION AND STANDARDIZATION OF AGRO TECHNIQUES OF NATIVE AND EXOTIC ORCHIDS AND OTHER SHADE LOVING PLANTS

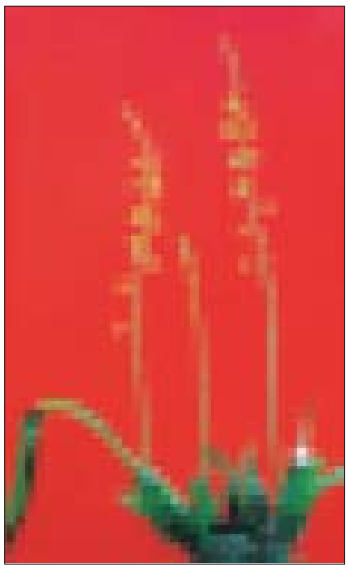
D.R. Singh and R.P. Medhi

Collection of indigenous orchids

In addition to the existing indigenous species, following indigenous orchids were collected and conserved in orchidarium.

- *Dendrobium macrostachyum*
- *Dendrobium sp.*
- *Bulbophyllum sp.*
- *Nerviella sp.*

Effect of growth regulators on production of suckers of *Eulophia andamanensis*



Eulophia andamanensis

Application of growth regulators significantly influenced number of suckers and spike length and duration of spike emergence. Among the different concentration of growth regulators, IBA 200 ppm produced more number of suckers (5.0) and maximum spike length (135.5 cm). However, number of florets/spike and duration of flowering did not respond significantly to the growth.

Effect of different concentrations of urea on pre-blooming period of *Eulophia andamanensis*

Investigations were carried out to study the influence of foliar application of urea on pre-blooming period of *Eulophia andamanensis*. The result showed that spraying of urea at 1.5 % concentration improved the spike length (142.1 cm) and prolonged the duration of flowering in comparison with other treatments.

Cut foliage

Cut foliage sector is the recent one is A & N Islands. Also known as cut greens, they are used as fillers in bouquets, flower arrangement, etc. in combination with cut flowers. Unlike with cut flowers, there is year round demand for cut foliage. Production in A & N Islands will be practically year-round because of humid tropical conditions. The investment cost is also low, compared to cut flowers. The risk of damage during transport is also minimum. These Islands consists about 120 species of Ferns, many of them could be used for cut foliage as they are having high vase life. Of these, 3 indigenous species, viz. *Microsorium punctatum, Asplenium nidus, Huperzia phelgmera* fern were tried for their vase life in different chemicals along with tender coconut as it is abundantly available in these Islands and as the tender nut water has high sugar concentration and is acidic.

Vase life studies

Trials indicated that when 30 ppm $AgNo_3$ + 4 % Sucrose was used as the holding solution, the vase life of *Huperzia phelgmera* was 144 days against 93.5 days in control (distilled water).

In *Microsorium punctatum*, 30 ppm $AgNo_3$ + 4 % sucrose as holding solutions kept the cut leaf fresh for 182 days followed by 144 days with 20 ppm $AgNo_3$ + 4 % sucrose, while in control it was recorded 124 days.

Microsorium punctatum

Asplenium nidus

Huperzia phelgmera

In *Asplenium nidus* also, 30 ppm $AgNo_3$ + 4 % sucrose produced best results with 130 days while in control (distilled water) it was 60.5 days.

COLLECTION AND EVALUATION OF TUBEROSE, GLADIOLUS, CHRYSANTHEMUM, GERBERA, MARIGOLD, BALSAM, CROSSANDRA AND AMARYLLIS

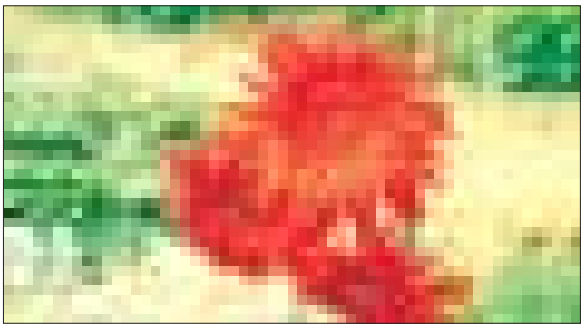
D.R. Singh and R.P. Medhi

Introduction of ornamental plant

During the year following ornamental plants were introduced from mainland, viz. Pilea (ground covering plant) from NBRI, Lucknow, Coriopsis from NBRI, Lucknow, Crossandra hybrid from Tamil Nadu and Jasmine species such as *Jasminum sambac* (Co-1,2), *J. grandiflorum* (Co-1,2,3) and *J. auriculiformis* from TNAU, Coimbatore.

Gerbera spacing trial (Naturally ventilated poly house)

There are few flowers to surpass the beauty of gerbera cut flower in the floriculture industry. In India, it has become a commercial venture in most of the cities. However, in Andaman and Nicobar Islands it has not gained due importance as yet, although there is congenial climatic conditions for quality flower production of gerbera under protected house. Spacing had significant effect on flower production in gerbera and it has striking effect on its vase life. An experiment was conducted to assess the effect of spacing on flowering; flower quality and vase life. Among the spacing the plants planted at 30 x 20 cm significantly increased number of flowers / plant / month.

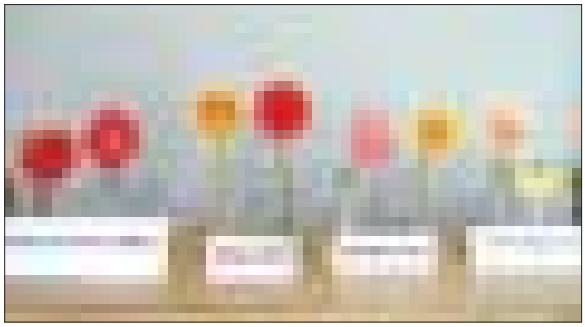


Gerbera

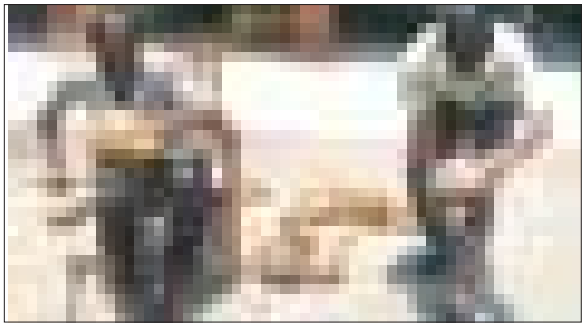
Vase life studies

Trials indicated that when 100ppm $AgNo_3$ + 5 % Sucrose was used as the holding solution, the vase life of Gladiolus was 12.8 days followed by 50 ppm

Gladiolus



Gerbera



Modified coconut dehusker

$AgNo_3$ + 5 % Sucrose by 12 days against 7.8 days in control (distilled water).

In Gerbera, 20 ppm $AgNo_3$ + 4 % sucrose as holding solutions kept the flowers for 16 days followed by 10 days with 30 ppm $AgNo_3$ + 4 % sucrose, while in control it was recorded 8 days.

STATUS AND SCOPE OF FARM MECHANISATION IN ANDAMAN AND NICOBAR ISLANDS

M. Din, P. S. Deshmukh and N. Ravisankar

Prototype design and fabrication of Coconut dehusker

The KAU dehusker was tested in Garacharma and Sippighat farms in the previous year. Taking into consideration the shortcomings of the KAU dehusker, a new coconut dehusker was designed and fabricated. Some modifications are: (i) The height adjustment for operation by male /female, including Nicobari tribal, (ii) dehusking in sitting or in standing posture, (iii) the sharper dehusking tool for less impact force, (iv) Anti clogging clearance at the bottom of shearing/cutting blades, (v) ergonomic design of handle, and (vi) the stand fixing provision with four hooks. The dehusker was tested with the unskilled operator who was operating it for the first time. Comparative evaluation was done with the KAU dehusker. The new dehusker was giving good results with respect to the easiness in operation both in standing and sitting postures. The time required for dehusking 20 nuts was in the range of 14-17 min. in both dehuskers.

Prototype design and development of solar tunnel dryer

To trap solar energy and to improve the quality of copra, a solar dryer was designed and developed in Engineering complex. The performance of the dryer was evaluated by conducting tests at no load and with load of coconuts in following manner. In the first trial, 110 nuts were kept on the Aluminium sheet. The temperature in solar dryer varied from 28 - 52° C. It was higher than the outside air temperature. Copra was dried within two days, i.e. within 24 hours of the bright sunshine hours. The quality of the copra obtained was of edible quality. Moisture content of copra ranges between 6-10% (wb).

Solar copra dryer

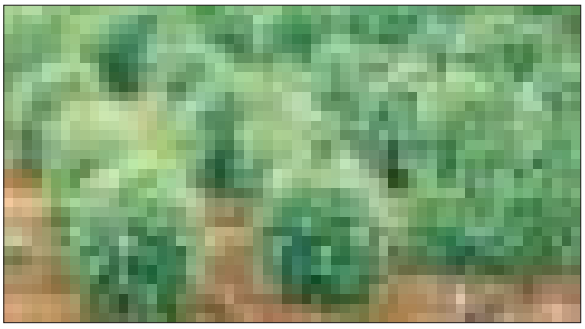
Testing of mechanical copra dryer

The designed capacity of the CDB mechanical copra dryer is 500 nuts. But 400 nuts were loaded for drying. It was observed that the copra on the lower side of the drying chamber was over dried (MC 4 % wb), which is not desirable. Some Modifications are required in the dryer such as increase in the thermal efficiency, uniform drying of the copra as the existing dryer has uneven heat distribution and perforated fire chamber, which will carry the hot air upwards to the drying zone easily.

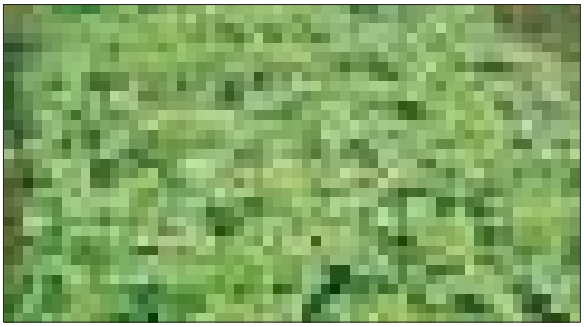
AGRO-TECHNIQUES FOR *ANDROGRAPHIS PANICULATA* (KALMEGH) IN BAY ISLANDS

R. Raja, N. Ravisankar, T. P. Swarnam, S. Ghoshal Chaudhuri and R. P. Medhi

Andrographis paniculata (Kalmegh), which is known as "King of bitters" is one among the 32 medicinal plants prioritized by The National Medicinal Plants Board. Lack of reliable and standardized agro technology like optimum spacing, season and nutrient requirement is a bottleneck in popularization of kalmegh for commercial cultivation in Bay Islands. Hence, this project was taken up in order to find out the optimum season for the cultivation of kalmegh under shade (Intercropping) as well as open space (Sole cropping), to find out the optimum spacing for cultivation of kalmegh and to find out the nutrient requirement of kalmegh.



Maximum vegetative growth stage



Kalmegh seedlings in nursery bed

During this year, kalmegh seeds were collected from NRCMAP and seedlings were raised in the nursery beds for the summer crop during second fortnight of February 2005. The seedlings were transplanted in the main field on 24th March 2005. The crop was provided with mulching in order to cope up with the hot sun and high temperature prevailed at that time. The crop was irrigated frequently once in three days, as the soil was of highly porous in nature. Once, the crop got established, the mulching materials were removed. The crop attained the maximum vegetative growth stage at the end of May 2005.

For the *kharif* crop nursery beds were prepared and sowing of kalmegh seeds was done. The main field was well prepared and kept ready for transplanting the kalmegh seedlings.

PROGRAMME - 9

MANAGEMENT OF EMERGING PESTS AND DISEASES

DEVELOPMENT OF IPM & IDM PRACTICES FOR KEY PESTS AND DISEASES OF BRINJAL, TOMATO, COLE CROPS (CAULIFLOWER, CABBAGE)

G. Shyam Prasad, S. Bhagat, V. Jayakumar and T.V.R.S. Sharma

Monitoring of insect pests and diseases of Brinjal, tomato and Cole crops

Pest monitoring was done in South Andamans and damage was periodically assessed. The extent of damage suffered and peak time of occurrence of key pests was recorded (Table 31).

Study of the population fluctuation of *L. orbonalis*, key pest of Brinjal

The seasonal population fluctuation of Brinjal fruit and shoot borer L. orbonalis was studied by sequential cropping in such a way that throughout the study period fruits were available for damage assessment. The damage assessment was done and per cent shoot and fruit infestation was recorded weekly during May 03 - March 05. The weather data corresponding to previous week was correlated with present week damage data. It was found that the maximum borer damage was during rainy season. The crop grown during May II week to October I week suffered maximum damage which ranged from 9.80 - 64.25 %, with maximum incidence during Aug II week. If this period is avoided the damage ranges from 9.85 - 29.56 %, peak incidence was during third week of December. Hence, it is inferred that brinjal can be grown successfully after October II week till March end (Figure 16).

From the figure it can be inferred that the damage caused to shoot was 5.25 26.45 % and it was most of the time less than shoot damage. The shoot and fruit damage was inversely correlated and this trend prevailed throughout the cropping period (Figure 16).

The damage suffered by brinjal fruits by *L. orbonalis* was correlated with weather parameters of preceding week. The damage can be predicted by

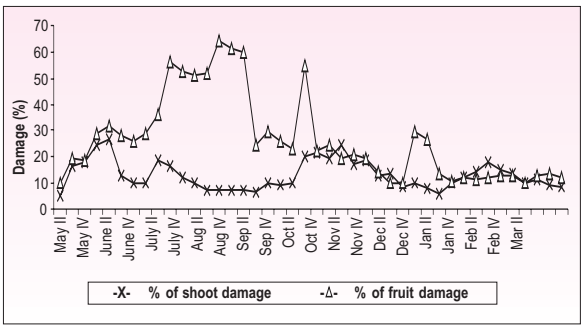


Figure 16. Seasonal population fluctuation of L. orbonalis on brinjal in South Andamans (2003-05)

Table 31. Surveillance of pests of brinjal, tomato, cole crops in South Andaman

Crop	Pest	Extent of damage	Peak incidence
Brinjal	Fruit & shoot borer, *Leucinodes orbonalis*	12.0 – 64.25 %	Rainy season May- September
Brinjal	Jassid, *Amrasca biguttula biguttula*	0.5 nymphs/leaf	45 - 60 DAP
Brinjal	Cotton aphid, *Aphis gossypii*	25 / sq. cm	130 – 150DAP
Brinjal	Spiralling White fly, *Aleurodicus dispersus*	45 pupae/leaf	130-150 DAP
Tomato	Fruit borer	5 - 24 %	45 DAP onwards
Tomato	Serpentine leaf miner, *Liriomyza trifolii*	6.5 mines/leaf	Throughout
Cauliflower, Cabbage	Cut worm, *Spodoptera litura*	5 – 62 %, 34 larvae/sq.m	Throughout
Cauliflower, Cabbage	Diamond back moth, *Plutella xylostella*	4 – 25 % foliar damage	30 DAP onwards

the following equation derived by multiple regression analysis:

$Y = 87.84 - 2.19X_1 - 0.29X_2 + 0.0012X_3 + 0.223X_4$

Where,

X_1 = Maximum temperature

X_2 = Minimum temperature

X_3 = Relative Humidity

X_4 = Rainfall

Effect of intercropping on incidence of *Leucinodes orbonalis* in Brinjal

BB 93 - C a tolerant variety was selected for this trial. The intercrops selected were Sowa, *Anethium sowa,* Kenaf, *Hibiscus subdariffa,* and Maize, *Zea mays*. These were planted in 5 : 1 proportion. The intercrops were planted 30 days prior to transplant of brinjal.

The incidence of borer on weight basis was minimum in T6 (10.98%) followed by T1 (14.23%), T2, T3, T5 and it was maximum in sole crop. The intercrop had profound influence in reducing damage caused by borer and afforded protection almost equal to neem oil. Statistically the brinjal with intercrops was on par to treatment of monocrotophos implying that, growing of intercrops like Kenaf, Sowa and Maize with brinjal could help in pest reduction. Highest marketable yield was recorded in T6 (40.50t/ha) as crop was highly protected by pesticides. Lowest yield was recorded in T4. The intercrops encouraged the prevalence of natural enemies as compared to sole crop and pesticides treated crops. All the intercrops encouraged the natural enemies, viz. Spiders and Trichogramma as revealed by trap card method (Table 32).

Integration of shoot clipping and pheromone lure on incidence of *L. orbonalis* in brinjal

The IPM practices, viz.

- Planting of brinjal alongwith intercrops kenaf,, *H. subdariffa* in 5 :1 ratio
- Weekly removal of borer infested shoots and fruits and disposal by deep burial
- Deployment of Pheromone to attract male moth at crop canopy level @ 1 trap/100 m^2

individually and in integrated way were tested for the management of *L. orbonalis* in brinjal. All the control measures gave response by way of reduction of borer damage and increase in marketable yield of brinjal. It was noticeable that integration of T1, T2 and T3 realised decrease in damage by 74 % and increase in marketable yield by 60 % as compared to control (Table 33). However, it was on par with T5. Hence the IPM can be successfully adapted in brinjal so as to do away use of pesticides.

Table 32. Effect of intercropping brinjal with other crops on incidence of *L. orbonalis*

	Treatment	Fruit borer incidence (%)	Marketable yield (T/ha)	Per cent eggs parasitised by Trichogramma	Spiders /2 m^2
T_1	Brinjal + Kenaf (5:1)	15.23 ^{b}	37.02 ^{ab}	94.75 ^{a}	42.75^{a}
T_2	Brinjal + Sowa (5:1)	17.36 ^{c}	36.24^{ab}	95.5 ^{a}	42.25^{a}
T_3	Brinjal + Maize (5:1)	20.24 ^{d}	35.45 ^{c}	90.5 ^{a}	40.25^{a}
T_4	Brinjal (Sole crop)	52.52 ^{e}	25.72 ^{d}	81.00 ^{a}	37.25^{b}
T_5	Brinjal (Sole) + weekly neem 2 % spray	19.45 ^{d}	34.65 ^{c}	79.0 ^{a}	28.45 ^{c}
T_6	Brinjal (Sole) + monocrotophos (0.07%) spray at 15 days interval	11.98 ^{a}	40.50 ^{a}	0 ^{b}	5.24 $_{d}$

Means followed by the same letter are not significantly different (p = 0.05) by LSD

Table 33. Effect of integration of IPM components for management of *L. orbonalis*

	Management practice	Fruit borer incidence (%)	Marketable yield
T1	Brinjal intercrop with *Hibiscus subdariffa* (5 : 1)	18.23[b]	36.02[c]
T2	Brinjal crop deployed with Pheromone @ 1/100m^2	21.25[b]	28.50[c]
T3	Removal of brinjal infested shoot and fruits and deep burial weekly	19.45[b]	23.65[d]
T4	Combination of T1, T2, T3	13.56[a]	39.75[a]
T5	Monocrotophos (0.07%) fortnightly spray	11.98[a]	36.50[a]
T6	Brinjal sole crop (Control)	50.52[c]	23.23[e]

Means followed by the same letter are not significantly different (p = 0.05) by LSD

Effect of inter crop on incidence of fruit borer in Tomato

An experiment was laid by intercropping tomato with *Hibiscus subdariffa*. The results of the experiment indicated that there was significant effect of intercropping on the reduction of *Helicoverpa armigera* incidence. Tomato with intercrop of *H. subdariffa* (4:1) rows + NPV application twice at 250 LE/ha at 15 Days interval from 45 DAT was best treatment recording least fruit damage (6.24 %) followed by Tomato sole crop + NPV application twice at 250 LE/ha. at 15 Days interval from 45 DAT (9.35 %), as compared to tomato sole crop and tomato with intercrop of *H. subdariffa*.

Using trap card of Corcyra eggs it was found that that the population of native *Trichogramma sp.* was more in intercropped plots as compared to tomato sole crop, implying that the intercrop serves as an excellent reservoir of natural enemy providing pollen and nectar. The egg parasitoid *Trichogramma sp.* is responsible for damage reduction as they colonize in intercropped plots and parasitize eggs of *Helicoverpa armigera* thereby exercising control.

Efficacy of trap crop and NPV for the management of *Spodoptera litura* in cauliflower

The pest *Spodoptera litura* is major pest attacking cole crops like cauliflower, Cabbage etc. It was observed that mustard planted as trap crop was on par to control. The application of NPV @ 250 LE/acre significantly reduced the mean egg mass in sole cauliflower crop (5.5) and mustard border with cauliflower (4.85), and they both were on par. It is inferred that NPV alone along with 2 % jaggery as phagostimulant was effective in managing *S. litura* in Cauliflower.

Evaluation of botanicals for molluscicidal properties

It was found that the Giant African snail avoided some of the plants. Hence, some of the plant cuttings were evaluated for their molluscicidal properties which included *Annona glabra, A muricata, A Squamosa, Avverhoea carambola, Avverhoea bilimbi* and *Moringa pterigosperma* as control.

The results of the choice test indicated that *M. pterigosperma* was the most preferable among the cuttings put to test, recording the maximum area fed (47.14 sq cm). The cuttings of *A. glabra* were significantly protected from snail, being totally untouched.To some extent the other members of Annonaceae were not readily preferable. The two members of oxalidaceae family, *A. carambola* and *A. bilimbi* were fed to the extent of 34.28 and 31.64 sq cm.

To confirm the repellent and antifeedant activity of *A. glabra* against *A. fulica,* all the cuttings were planted closely as a fence around Tagetes erecta

nursery bed. It was noticed that *A. glabra* totally kept the nursery free from snail followed by *A. muricata, A. reticulate* and *A. squamosa*. Thus these plants possess antifeedant properties.

Efficacy of antagonistic rhizobacteria against *Pythium sp*

Eight mm actively growing culture disc of *Pythium* was placed onto sterilized Petri dish containing previously plated nutrient agar medium inoculated at the place 1.5 cm away from edge of the plate. Actively growing 48 h old cultures of the respective bacteria were separately streaked onto the medium at the opposite side of *Pythium sp*. The medium inoculated with pathogen alone served as control. The radial growth of pathogen was measured after the pathogen attains full growth in control plate and inhibition zone was graded.

UTILIZATION OF NATIVE BIOAGENTS FOR THE MANAGEMENT OF MAJOR DISEASES OF VEGETABLES AND CATALOGUING OF CROP DISEASES OF ANDAMAN & NICOBAR ISLANDS

Someshwar Bhagat, G. Shyam Prasad, V. Jayakumar and T.V.R.S. Sharma

Monitoring of diseases of Tomato, brinjal, chillies and crucifers in South Andamans

During the year extensive survey was conducted in vegetable cultivated area of South andamans and eight diseases of Tomato, four diseases of Brinjal, Two diseases of chillies and five diseases each of crucifers and cucurbits were recorded along with damage caused (Table 34).

Table 34. Diseases of tomato, brinjal, chillies, crucifers and cucurbits in South Andamans

Crops	Major diseases	Pathogens	Disease incidence (%)
Tomato	Damping off of seedling	*Pythium sp., Phytopthora sp., Fusarium sp.*	25 - 45
	Early blight	*Alternaria solani*	15 - 20
	Septoria Leaf blight	*Septoria lycopersici*	15 - 20
	Fusarium Wilt	*Fusarium oxysporum f.sp. lycopersici*	30 - 45
	Verticillium Wilt	*Verticillium albo-atrum*	20 - 25
	Root and Collar rot	*Sclerotium rolfsii, Rhizoctonia solani*	15 - 20
	Bacterial Wilt	*Ralstonia solanacearum*	35 - 50
	Leaf Curl	Virus	20 - 25
Brinjal	Phomopsis Blight	*Phomopsis vexans*	45 - 50
	Stem rot	*Sclerotinia sclerotiorum*	15 - 30
	Collar rot	*Sclerotium rolfsii*	15 - 20
	Bacterial Wilt	*Ralsonia solanacearum*	35 – 65
Chilli	Anthracnose and fruit rot	*Colletotrichum capsici*	30 – 50
	Leaf curl	Virus	15 – 20

Crops	Major diseases	Pathogens	Disease incidence (%)
Crucifers	Damping off	*Rhizoctonia solani*	25 - 35
	White blister	*Albugo candida*	15 - 20
	Downy mildew	*Peronospora parasitica*	20 - 30
	Alternaria leaf spot	*Alternaria alternata*	30 - 35
	Black rot	*Xanthomanas campestris pv.campestris*	10-15
Cucurbits	Downy Mildew	*Pseudoperonospora cubensis*	25 - 30
	Powdery Mildew	*Erysiphe cichoracearum*	15 - 20
	Cucumber mosaic	*Cucumo virus*	20 - 25
	Collar Rot	*Pythium aphanidermatum, Fusarium sp, Sclerotium rolfsii*	20 - 25
	Fruit rot	*Pythium aphanidermatum, Fusarium sp., Rhizoctonia sp, Sclerotium rolfsii*	10-15

Distribution of *Trichoderma sp.* in soils

The distribution of the soil antagonistic fungi, *Trichoderma sp.* was analyzed in soils of Andaman and Nicobar Islands. A total of 315 soil samples were screened for the presence of *Trichoderma sp.* representing different agroecosystem. Thirty five samples were found to harbor *Trichoderma sp.* (Table 35). The prevalence was 11.11 %. Maximum prevalence (15.17 %) was found in cultivated soils, followed by Tropical forest. The coastal sandy soils did not yield *Trichoderma sp.*

Out of 35 isolates of *Trichoderma sp.* collected, 17 sp. were *T. harzianum,* 7 sp. of *T. viride*, 11 sp. of *T. hamatum* (Table 36). The presence of *Trichoderma* was associated with soil pH ranging from 5.8-7.7 and with high organic carbon.

The different strains of *Trichoderma viride, T. hamatum* and *T. harzianum* were tested against *Pythium sp., Rhizoctonia solani, Sclerotinia sclerotiorum, Sclerotium rolfsii, Fusarium oxysporum f.sp. lycopersici, Colletotrichum capsici.* The superior strains of *Trichoderma sp.* are being identified.

Table 35. Distribution of *Trichoderma sp.*

Source of samples	% Prevalence
Cultivated soil	15.17
Tropical forest	13.25
Garden soil	10.63
Fallow soil	5.26
Coastal areas	0
Total	11.11

Table 36. Prevalence of *Trichoderma sp.* in soils of various islands

Location	Samples	pH	Isolates of *Trichoderma sp.*		
			T. harzianum	*T. viride*	*T. hamatum*
South Andaman	144	5.8-7.7	7	3	4
Middle Andaman	68	6.0-6.8	4	2	3
North Andaman	37	6.1-8.0	3	2	1
Little Andaman	29	5.6-7.0	1	-	1
Great Nicobar	37	5.6-6.4	2	-	2
Total	315		17	7	11

PROGRAMME - 10

IMPROVEMENT AND AGROTECHNIQUES OF VEGETABLE CROPS

R.P. Medhi, V. Damodaran and T. Damodaran

Organic farming of Bhendi

In organic cultivation of bhindi, the fully organic treatment (Navadhayam + crop debris layer + FYM) was found to be promising with a yield of 40.46 q/ha followed by (organics + 50 % NPK) with a yield of 39.36 q/ha (Table 37).

STUDIES ON CROPPING SYSTEMS AND EFFICIENT UTILIZATION OF ORGANIC WASTES IN COCONUT GARDENS

T. Damodaran, R.P. Medhi, V. Damodaran, N. Ravisankar and A. Venkatesh

Cropping system models involving black pepper, clove and nutmeg among spices and pineapple, banana among fruits were developed in Garacharma farm, Sippighat farm and farmers field at Macapahar. The components of soil and water erosion were considered by forming trenches and catch pits across the slope at Sippighat farm. Half moon terraces were also made at the basins of the coconut. These terraces were filled with coconut husks and above them pineapple was planted.

Technology of composting the coir pith and dried leaves was also developed using *Pleurotus* and urea.

Coir pith decomposition

Table 37. Organic cultivation of bhendi

Treatment	Plant height at flowering	Survival (%)	No. of fruits/plt	Fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	Yield/plt (g)	Yield (q/ha)
T_1 = Control	58.60	66.60	10.96	13.20	18.80	4.86	129.80	26.46
T_2 = Neem cake + FYM	60.80	52.40	10.86	12.50	19.10	5.10	131.70	29.76
T_3 = FYM + NPK (Full)	68.40	69.60	11.50	12.90	19.90	5.10	143.20	31.66
T_4 = Fully inorganic	68.90	74.20	11.40	16.20	21.20	5.30	149.30	40.46
T_5 = Fully organic	71.60	71.60	12.06	14.20	19.80	5.10	152.60	33.40
T_6 = 50 % organic + 50 % inorganic	81.30	66.10	13.30	17.30	19.30	4.96	163.30	39.36

DEVELOPMENT OF INTEGRATED FARMING SYSTEM MODEL UNDER HUMID TROPICS OF BAY ISLAND

S.C. Pramanik, R.B. Rai, B. Ganesh Kumar, A. Kundu, S. Ghoshal Choudhuri, R. Raja, N. Ravisankar, R.P. Medhi and D.R. Singh

Quick-Composting

Through this method, the crop by products, crop wastes and several other biomass

Quick-Composting

available in the farm was converted into organic manure. Quick composting contain a mixture of various microbes which enhanced the decomposition process. The composting pits were prepared in the farmers field with the dimension of 3 m long, 2 m width and 1m depth. The pit was filled with layer of dry leaves (jackfruit, sugarcane, arecanut, coconut and cashew nut leaves), layer of green leaves (glyricidia), quick compost, dry leaves (arecanut, coconut, jackfruit, cashew nut), 30 cm green leaves (jatropha, glyricidia, bhuti leaves) The heap was covered with cowdung slurry. The pit was covered with temporary shed to prevent rainwater from entering the pit to prevent anaerobic decomposition. The mixture was turned at 20 days interval for proper mixing of the waste materials.

Vermicomposting

Vermi-composting was started in the farmers' field for efficient recycling of farm by products. The pit was filled with layers of gravel, dry leaves, cowdung, earthworms and glyricidia leaves following standard procedures. Earthworm species, *E. foetida* was introduced in the pit. The pit was filled with fresh glyricidia leaves and dry crop leaves in different batches. Altogether about 120 kg farm waste was recycled into nutrient rich organic manure in the farmers field. Then it was moistened and covered with a wet sack.

Vermicomposting

Bio-intensive farming

Bio-intensive farming

Improving sustainability of the farming system was one of the objective of the IFS project. Thus, the use of chemicals were replaced by introduction of bio-fertilizers, organic manures, bio-pesticides, pheromone traps. Accordingly two experiment was conducted in the farmers field on the use of bio-pesticides in controlling insects pests in paddy and vegetables. The bio-pesticides used were *Ttrichoderma viridae*, *Pseudomonas fluorescens*, NPV and also pheromone traps and lures were used. Also mechanical methods like dragging ropes, lightening fires were practiced by the farmer for control of various insect pest in the crops. The Insect pest was controlled to the significant extent without much addition to the cost of production. More significantly the use of chemicals were reduced by 35-40% through such methods and the sustainability of the production system was improved (Table 38).

Poultry cum fish integration

The purpose of such enterprise integration was to make efficient utilization of poultry manure as feed supplement for the fish in the pond so that the fish productivity is enhanced without addition to the cost of fish production.

Five such poultry sheds were constructed by the farmers in the villages. 25-30 poultry birds were supplied to each farmer. The data on quantity and

Poultry shed in a corner of fish pond

Fodder crops as intercrops in plantation

quality (nutrient content) of poultry droppings were collected. Meanwhile, all the ponds were dried after Tsunami. Hence, the ponds have been freshly prepared for fish culture and fingerlings.

Crop - Dairy Integration

As a sole crop, sufficient interspaces are left unutilized under coconut and arecanut in these islands. Thus the unutilized interspaces under coconut plantations were profitably utilized through planting fodder grass Hybrid Napier 21. The crops have been established and first cut are yet to be taken. The fodder obtained would enhance the milk production as the availability of fodder is one of the main constraints for higher milk production in the farmers field.

Table 38. Performance of IPM practices on yield, economics and pesticide use of crop in farmers field

Parameter	Paddy		Tomato	
	Without IPM	With IPM	Without IPM	With IPM
Incidences of insects pests (%)	35	25.5	30	35
Incidence of disease (%)	20.4	7.5	38	20
Percent control of insects and diseases	45	65	40	75
Reduction in chemical pesticide use (%)	Nil	65	Nil	40
Yield (q/ha)	36.5	40.6	180	203
Cost of cultivation (Rs/ha)	13,500	15,200	91,115	80,846
Gross return (Rs/ha)	21,900	24,360	1,44,000	1,62,400
Net return (Rs/ha)	8,400	9,160	52,885	81,554
B: C ratio	1.60:1	1.60:1	3.5:1	4.7:1

Table 39. Quantity and quality of excreta from animal component in IFS model

Species	Monthly Yield of excreta (Kg)	Carrying Capacity /ha	Moisture (%)	Chemical % of DM with nutrient Composition		
				Nitrogen (N)	Phosphate (P_2O_5)	Potassium (K)
Poultry	3.45	500	18	2.89	1.80	0.5-0.9
Cattle	510.0	275	81	3.86	0.5	1.62

PROGRAMME - 11

TRANSFER OF TECHNOLOGY AND SOCIO-ECONOMIC IMPACT ANALYSIS

FARMERS FIELD SCHOOL (FFS) ON IPM IN VEGETABLES IN NEIL ISLAND

S.C. Pramanik

FFS was started with an objective to reduce the use of chemical pesticide and to increase the use of biointensive pest management methods for control of insect pest and diseases in tomato. This was required for environmental safety and sustainability of vegetable production system in Islands.

The programme was conducted among 35 farmers in three villages Bharatpur, Sitapur and Laxmanpur in Neil Island. 14 week long programme on various aspects of identification and management of various insects pests diseases in tomato were conducted in the village. Also technology intervention on biointensive pest management using *Trichoderma, Pseudomonas,* NPV, neem oil cake, neem oil were done in farmers field in the village. During the FFS programme, farmers were taken to the field every week, provided knowledge and training on insect pest identification. ETL of pest population, disease identification and their various physical, cultural, mechanical and biological control methods in tomato.

15 farmers from village Sitapur and 20 farmers from village Bharatpur in Neil Island were selected for the study based on the contiguity of tomato fields at a stretch in these two locations. Recommended IPM practices for controlling prevalent insect pest and diseases were intervened in farmers field. The adoption of IPM practices created more impact on environment. Post intervention impact survey revealed that application of chemicals in vegetables were reduced to 30-40% in the farmers field. Adoption of IPM specially bio-intensive pest management practices could significantly reduced the pest population and increased the yield and economics in tomato in farmers field in Andaman Island.

TECHNOLOGY ASSESSMENT AND REFINEMENT THOUGH INSTITUTION VILLAGE LINKAGE PROGRAMME

S.C. Pramanik, R.B. Rai and R. Soundararajan

Technology 1 : Assessment of Integrated Pest Management in paddy

Yellow stem borer, case worm and leaf roller, Gundhi bug and bacterial blight were noticed as the major insect pest diseases in paddy in the farmers field. Farmers were reluctant to apply pesticides as it was less effective during rainy season. Therefore, effectiveness of Integrated Pest Management practices were assessed in paddy in farmers field. The IPM practices adopted were use of potash (MOP) @ 60 kg k/ha neem cake @ 40 kg/ha as basal before final land preparation, roping at 30 DAT, use of Tricho-card, spraying of neem oil @ 15ml/lit, to control these insect pests in paddy. Results revealed that the damage due to YSB was reduced to 7.5% only as compared to 20.4% in case of control. Case worm and leaf folder were fully controlled by dragging rope across the paddy field that dislodged the insect larva and eggs. Application of neem cake and neem oil and basal application of higher dose of potash and other non-chemical pest management techniques significantly reduced use of chemical pesticide by 95% in paddy in the farmers' field. The test variety IET 11771 (short duration 110 days) recorded an average yield of 40.6 q/ha which was 11.2% higher than the yield under control. The gross and net return were also higher (Rs 9160/-) than IPM techniques (Table 40).

Table 40. Performance indicators of paddy (cv. Heera) under IPM practices in farmers' field

Performance indicator	With Chemical	With IPM
Damage due to YSB infestation (%)	20.4	7.5
Damage due to leaf folder (%)	10.6	Nil
Damage due to Gundhi bug (%)	35.0	25.5
Reduction in pesticide use (%)	Nil	95.0
Yield (q/ha)	36.5	40.6
Gross return (Rs./ha)	21,900	24,360
Net Return (Rs./ha)	8,400	9,160
Benefit Cost ratio	1.60:1	1.60:1

Technology 2 : Evaluation of Integrated Pest Management in Brinjal

Fruit and shoot borer was found to be the major problem in brinjal in the farmers field. The frequent applications of pesticides in the field resulted in less profitability with higher environmental pollution. Therefore IPM practices in brinjal were evaluated in the farmers field. The practices includes application of MOP @ 60 kg K/ha and neem oil cake @ 40 kg/ha as basal, use of 5 gm carbofuran per pit along with neem cake and cowdung in each pit, growing of maize as border crop and marigold as inter crop, use of pheromone trap and spraying of neem oil @ 15ml/lit and herbal pesticides. The results revealed significant reduction in fruit and shoot borer damage in brinjal due to IPM practices. Though there was marginal increase in yield (11.5 q/ha) but net return and benefit cost ratio was increased significantly with the adoption of IPM practices (Table 41). The technology was accepted and adopted by the farmers.

Technology 3 : Assessment of high yielding cut flowers variety

Technology was assessed in farmers field in Calicut village of South Andaman. Three cut flowers variety, viz. Crossendra var. Aboli, Tuberose var. single, double and Marigold var. African dwarf and local were evaluated in the farmers field for cultivation in commercial scale in improving household economy of the rural women folk. Crossendra, tuberose and marigold recorded an average yield of 29.5 q/ha, 24.5 q/ha and 62.4 q/ha under field condition. Consequently the average net return of the family was increased by Rs 30,000/- over the years (Table 42). The farmer's wife and children were also engaged in value addition of flowers through making of garlands and thereby more employment was generated along with more empowerment of the farm women. Commercial cultivation of cut flower became very popular in the village.

Table 41. Performance indicators of brinjal under IPM practices in farmers' field

Performance indicator	With Chemical	With IPM
Plant affected by fruit and shoot borer/25m^2	30	2
Jassid infestation (n0o. of affected leaf/plant)	2	2
Average fruit weight (g)	155	150
Yield (q/ha)	450.0	461.5
Gross return (Rs./ha)	2,85,320	3,70,250
Net return (Rs./ha)	1,80,450	2,76,750
Benefit : Cost ratio	2.0:1	3.5:1

Table 42. Performance of local Vs. HYV's of cut flower species in farmers' field

Performance indicator	Marigold		Tube rose		Crossendra	
	Local	African dwarf	Local	Double	Local	Aboli
Yield (q/ha)	54.5	62.4	16.5	24.5	12.6	29.5
Cost of cultivation (Rs/ha)	64,540	70,700	82,440	1,46,050	96,540	1,24,500
Gross return (Rs/ha)	1,63,500	1,87,200	1,26,275	2,47,500	3,78,000	8,87,500
Net return (Rs/ha)	98,960	1,16,500	43,835	1,01,450	2,81,460	7,63,000
B:C ratio	2.53:1	2.65:1	1.53:1	1.69:1	3.9:1	7.12:1

ECONOMIC ANALYSIS OF POULTRY FARMING ENTERPRISE IN ANDAMAN & NICOBAR ISLANDS

B. Ganesh Kumar, M. Balakrishnan and S.K. Zamir Ahmed

About 50 broiler farms having different sizes, viz. small (300 birds), medium (301-900 birds) and large (901 birds) were surveyed in South Andaman villages by random sampling to study the socio-economic profile of the farmers, managemental practices followed, investment pattern on fixed assets, labour utilization pattern and causes of mortality in field conditions etc. Similar information was collected for one layer farm located in South Andaman Island.

Broiler farming

Socio-economic profile of the farmers

It was found that the average age of the broiler farmer was around 40-45 years. Small and medium farmers were illiterate to secondary level educated, while large farmers were from primary to collegiate level. As the size of the farms increased, the dependency on broiler farm for income reduced. It could be very well seen from Table 43 that for 78% of the small farmers, it was the main source of income for the family, while for 63% of the large farmers, it was found be as subsidiary income source. Broiler farmers were found increasing their farm size as their experience in broiler farming increased. They get their source of knowledge to start broiler farming from the UT Animal Husbandry Department, friends, relatives, market trend/demand and also from CARI.

Size of the unit

The average capacity of different sizes of broiler farms in the study area was given in Table 44. Small and medium farmers followed All in All out system, while large farmers maintained both All in-All out and multiple brooding systems as the latter had more farm area and other needed resources than the former.

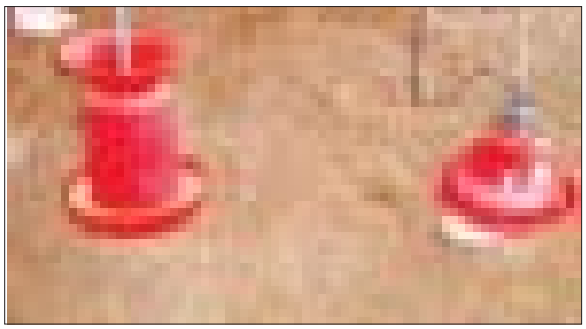
Multiple brooding system

Table 43. Socio-economic profile of broiler farmers

Category	Age (Year)	Education	Source of income		Experience	Source of knowledge
			Main	Subsidiary		
Small (< 300 birds)	45.4	Illiterate-Secondary	78%	22%	5-7	AH Dept.
Medium (301-900 birds)	40.8	Illiterate-Secondary	62%	38%	5-8	AH Dept., Friends, Relatives
Large (>901 birds)	41.7	Primary-Collegiate	37%	63%	5-17	AH Dept., Friends, Market, CARI

Table 44. Size of the unit of broiler farm

Category	Average size	Type of system	No. of farms
Small	323	All in - All out system	17
Medium	674	All in - All out system	22
Large	1620	All in - All out system & Multiple brooding system	11
Total			50



Feeder and waterer

Farm labour giving feed

Investment pattern

The total investment in equipment for small farms was found to be Rs. 1907, of which 57.58 per cent was made on feeder, 28.79 per cent on waterer, 8.39 per cent on buckets and 5.24 per cent on electrical bulbs. The investment for medium farms was found to be Rs. 3858, of which 59.41 per cent was on feeder, 29.70 per cent on waterer, 6.22 per cent on buckets and 4.67 per cent on electrical bulbs. Similarly for large farm, the total investment on equipment was Rs. 9202, of which 59.86 per cent as feeder, 29.93 per cent as waterer, 3.91 per cent as buckets and 6.30 per cent as electrical bulbs. Thus, the major investment was made on feeder and waterer in all farms followed by on buckets and electrical bulbs in case of small and medium farms, while large farm invested little higher on purchase of electrical bulbs than on buckets (Table 45).

Labour utilization pattern

Broiler farmers of these islands employed both family and hired labour in routine management of their farms. Category-wise analysis revealed that small and medium farmers had both the kind of labours in their farm, while large farmers employed only hired labours as the family members are engaged in other agriculture and allied activities. The number of labours, their working hours and the wage rate of hired labours are given in Table 46.

Table 45. Investment for equipment in broiler farming

Item	Category		
	Small	Medium	Large
Feeder	1098 -57.58	2292 -59.41	5508 -59.86
Waterer	549 -28.79	1146 -29.7	2754 -29.93
Bucket	160 -8.39	240 -6.22	360 -3.91
Electrical Bulbs	100 -524	180 -4.67	580 -6.3
Total	1907	3858	9202

Figures in the parentheses indicate percentages to total

Table 46. Labour utilization pattern in broiler farming

Category	Hired		Family		Wage rate
	No.	Hours	No.	Hours	
Small	1	4	1	4	Rs. 1500
Medium	1	8	1	3	Rs. 1500
Large	2	8	-	-	Rs. 2300

Common causes of mortality

In the study area, commercial broilers were found affected due to IBD, heat stroke, curled toe paralysis, visceral gout and *E. coli*. They get mainly IBD & RD vaccination.

Layer farming

Socio-economic profile of the farmers

Only one farm at Tylerabad was surveyed in the study. The socio-economic profile is given in Table 47.

Labour utilization pattern

The daily routine operations, number of labours and their wage rate are depicted in Table 48.

Common causes of mortality

The major causes of mortality in layers in these islands were found to be fungal toxin, *Mycoplasma*, heat stroke, visceral gout, *E. Coli*, IBD and curled toe paralysis. Layers were vaccinated against IBD, RD, fowl pox and coryza.

Farm labour collecting eggs

Affected chicks

Table 47. Socio-economic profile of a layer farm

Type of farm	Partnership (2 owners)	
	Partner 1	Partner 2
Age of the farmer	53 years	50 years
Educational status	Secondary	B.A.
Occupational status	Subsidiary	Man
Experience	6 years	
Source of inducement	Market demand	

Table 48. Labour utilization pattern in layer farming

Operation	No. of labours	Wage rate
All kinds of operation, (cleaning, feeding, watering, medication etc.)	20	Rs. 3,250.00
Watchman	2	Rs. 3,500.00
Cook	1	Rs. 4, 000.00
Helper	1	Rs. 3,250.00
Electrician & Plumber	1	Rs. 5,000.00
Farm Manager	1	Rs. 6, 000.00
Veterinary doctor	1	Rs. 8,000.00

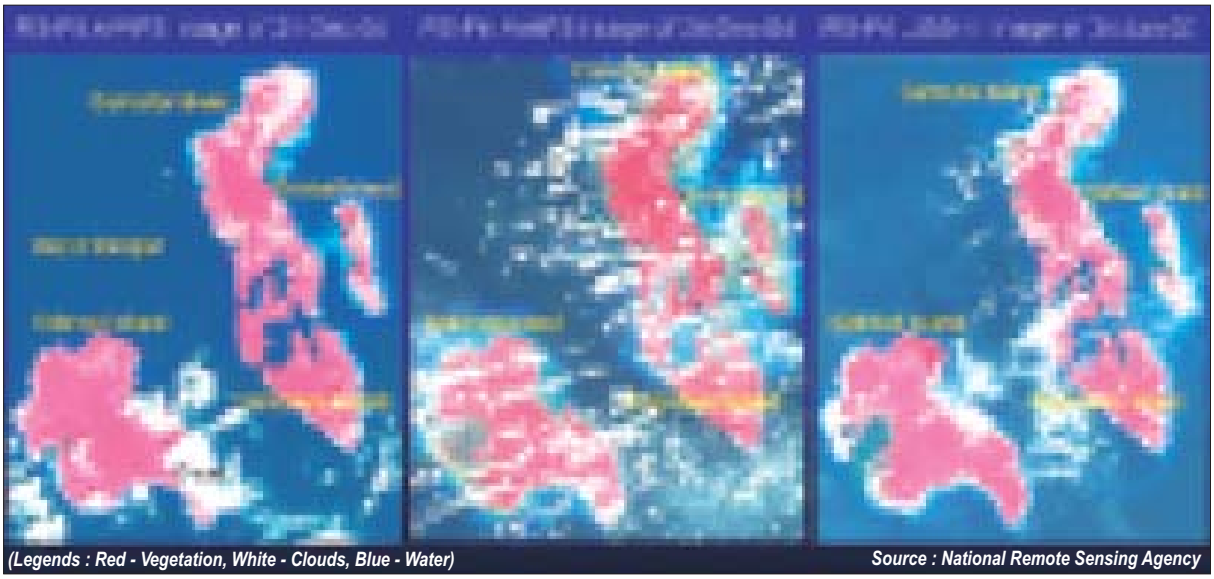
PROGRAMME - 12

ECONOMIC REHABILITATION OF TSUNAMI AFFECTED FARMING COMMUNITY

Dr. Mangala Rai, Secretary, DARE and Director General, ICAR distributing agricultural inputs to tsunami affected farmers

TSUNAMI DISASTER

In the deep blue sea of Bay of Bengal, Andaman and Nicobar Islands glitter like emeralds. These islands of paradise had been the favorite destination of the nature loving eco-tourists across years. On the fateful day of 26th December, 2004 at 6.26 a.m., a severe earth quake measuring 9.0 Richter scale in magnitude shook the entire Southeast Asian Region including Andaman and Nicobar Islands. The consequent giant waves called tsunami ravaged the complete topography of low lying coastal and agricultural lands considerably. These unprecedented developments have collapsed the normalcy in the daily life of the islanders. Particularly, the southern group of islands witnessed near complete devastation. People lost everything and had been undergoing extreme physical, mental and psychological trauma. The life supporting systems, viz. agriculture, livestock and fisheries were enormously damaged in this archipelago.



Satellite Images pertaining to Pre-Event (21 December, 2004) and Post-Event (26 December, 2004 and 4 January, 2005) taken from IRS-P4 and IRS-P6

The changed scenario warrants immediate action plan for revival of the system for the very sustenance and perpetuation of the survivors. Instant assessment of the extent of damage has been made by various Government agencies, particularly CARI and efforts were made to chalk out action plan which was approved by the Ministry of Agriculture, Government of India to overcome this crisis and to convert this hardship into opportunity.

As per the request made by Andaman and Nicobar Island Administration and on the instruction of Ministry of Agriculture, Government of India CARI, Port Blair constituted expert committees to assess the impact of tsunami on agricultural lands and suggest suitable technologies for rehabilitation of affected farmers in various groups of islands such as Campbell Bay, Nancowrie, Car Nicobar, Little Andaman and South Andaman separately. The experts for various islands are listed below.

Campbell Bay

Dr. R. Raja, Shri S.L. Paik and Shri V. Damodharan

Nancowrie

Dr. S. Ghoshal Choudhuri, Dr. T. Damodaran, Dr. S.K. Zamir Ahmed and Dr. S. Jeyakumar

Car Nicobar

Dr. T.V.R.S. Sharma, Dr. N. Ravisankar, Dr. C.B. Pandey and Shri B. Singh

Little Andaman

Dr. R.P. Medhi, Dr. Asit B. Mandal, Dr. S.C. Pramanik, Dr. V. Jayakumar, Shri B. Singh and Shri P.S. Deshmukh

South Andaman

Dr. R.P. Medhi, Dr. Asit B. Mandal, Dr. S.C. Pramanik, Dr. R. Elanchezhian, Dr. N. Ravisankar, Dr. Ghoshal Choudhuri, Dr. M. Din and Shri P.S. Deshmukh

All the team visited their respective islands and made survey with the help of Agricultural department officials and local people and tribals. The brief findings and suitable technological recommendations are presented below.

Kamorta jetty after tsunami

FINDINGS

After *Tsunami*, three different situations, viz. (I) Area where sea water intruded to the cultivated land during *Tsunami* and receded completely thereafter, (II) Area where sea water intrudes during high tide and recedes during low tide and (III) Area which are under permanent inundation of sea water were emerged in all groups of islands.

Sea water ingression due to Tsunami waves has lead to the complete submergence of paddy fields and adjoining plantations and resulted in complete crop loss. Uprooting and breaking of coconut trees was observed in most parts. Arecanut palms were found wilted due to salt injury and coconut palms under continuous submergence were also exhibiting wilting symptoms. There was complete dry and loss of banana noticed in South Andaman Island. Slow wilting of spices like cinnamon, black pepper, clove in coconut plantations was also noticed. There was also loss of tuber crops which are the major food of tribals. Dry season vegetables already grown were destroyed totally and the soil became unsuitable to grow vegetables in the ensuing days.

Uprooted coconut plant in Car Nicobar

Affected paddy field in South Andaman

Surviving chilli plant in Car Nicobar

Loss of livestock was assessed in the aftermath of tsunami in A & N Islands totally. They were : Cattle-3386, Buffalo-89, Goat-6521, Pig-25862 and Poultry-42700 (Source : AH&VS Dept., A & N Administration). There was also a considerable loss of fodder and grazing land due to sea water ingression.

Escaped pig population in Nancowrie

Most of the fresh water and brackish water ponds in South Andaman and in some parts of Middle Andaman were submerged due to high tides. In the whole A & N Islands 413 locally made dinghies and 421 motorised dinghies were completely destroyed while 201 locally made dinghies and 410 motorised dinghies were partially damaged. About 1783 gill net, 4919 hook and lone, 283 cast net, 3 shore seine were lost due to tsunami (Source : Fisheries Dept., A & N Administration).

In order to ascertain technological requirements, soil samples were collected from different locations under different situations and analysed for pH, Electrical Conductivity (EC), Sodium Absorption Ration (SAR) and Exchangeable Sodium Percentage (ESP). The results were given in Table 49.

Table 49. Analytical results of soil samples collected from different locations of Tsunami affected areas

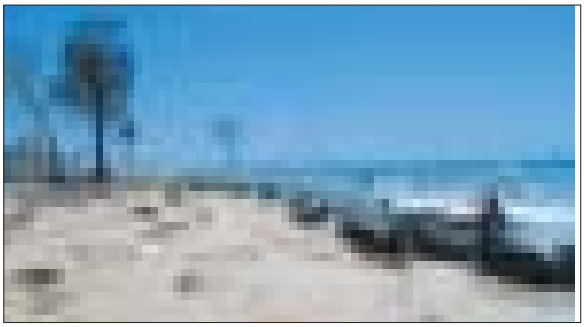
Location	pH	EC (dS/m)	ESP
Campbell Bay			
Situation I	4.9	7.20	5.56
Situation II	7.1	8.84	10.19
Situation III	5.5	13.66	11.60
Nancowrie			
Situation I	6.9	7.25	7.66
Situation II	5.2	10.04	11.06
Car Nicobar			
Situation I	8.97	0.51	6.9

The results clearly indicated that in Car Nicobar slight alkalinity/sodicity towards the coast was observed. The heavy rainfall could leach away the salts since soils are very porous (sandy). Hence, salinity may not be an issue in Car Nicobar. However in other islands, soluble salt concentration in the soil was increased manifold and the soil became saline.

In the light of above findings, the following recomendations were made by the expert teams for rehabilitation of agricultural and allied activities.

RECOMMENDATIONS

- Provision of adequate surface and sub surface drainage
- Impounding and leaching of affected fields with rain water



Tsunami ravaged coastal area in Katchal

Soil texture after tsunami in Nancowrie

Expert team interacting with Deputy Commissioner, Car Nicobar

- Construction of raised embankments along with one way sluice gates
- Biofencing through conservation of the existing mangroves and planting new seedlings
- Planting of alternative trees like *Casurina,* Sea mahua, *Pongamia, Pandanus*, *Thespesia*, *Ipomea pes-caprae* etc. in the sea shore, if the site is not compatible for mangroves
- Planting of trees/ shrubs with higher evapotranspiration requirement viz., *Eucalyptus sp.* and *Acacia auriculiformis* to act as a Bio-Pump in waterlogged areas
- Selection and raising of salt tolerant crops like rice, sugarcane, sorghum, watermelon, castor and forage crops like karnal grass (*Diplachne fusca*) and para grass (*Brachiaria mutica*) and green manure crop like Sesbania
- Selection of suitable crop rotation like Rice-watermelon, Rice- maize, Rice-Sorghum, Rice- vegetables, Rice-sugar beet and Rice-forage crops
- Adoption of Broad Bed and Furrow system of land manipulation in the affected areas to cope up with the problem of salinity and for increased profit
- Application of higher dose of Farm Yard Manure and its incorporation in the field to improve the drainage
- Incorporation of blue green algae and azolla in rice fields
- Adoption of 25% higher seed rate than the recommended seed rate
- Sowing the seeds in the furrows or 2/3rd from the top of the ridge
- Cultivation of rice followed by dhaincha, sunhemp followed by safflower, castor, sugarbeet, watermelons during dry season. Replanting of coconut and other fruits like Aligator apple and tuber crops like sweet potato in the lowlying submerged areas in the next rainy season
- For wide spaced crops like vegetables, adoption of pit system of planting by replacing the salt affected soil with mixture of normal soil and farm yard manure
- Adoption of drip irrigation or pitcher irrigation for high value crops
- Application of higher dose of NPK than the recommended dose
- Promotion of Jatropha and *Morinda citrifolia,* which are saline tolerant crops even after tsunami
- Adoption of Rice-cum-brackish water-prawn and fish culture
- Adoption of Auger hole technique for planting tree species in salt affected areas
- Distribution of poultry birds (Nicobari Fowl, Vanaraja, Turkey, Guinea Fowl and Ducks), goat and piglets to the affected farmers
- Culture of shrimps, mud crab, milkfish, mullet and sea bass
- Tambak system of aquaculture by planting mangroves and culturing shrimp / fishes in trenches

Expert team with Tribal Captain in Nancowrie

KRISHI VIGYAN KENDRA

TRAINING ACHEIVEMENT

A total of 55 training programme were conducted / facilitated for the practicing farmers, farm women, rural youths and extension functionaries by the faculty members wherein 960 men, 662 women, totaling to 1622 got trained in agriculture and allied fields. (Table 50).

Table 50. Training programmes

Discipline	No. of participants		
	Men	Women	Total
	Practising Farmers		
Crop Science	332	83	415
Horticulture	96	18	114
Animal Science	57	130	187
Fishery Sciences	31	11	42
Home Science	34	176	210
Total	550	418	968
	Rural Youth		
Crop Science	71	21	92
Horticulture	114	20	134
Animal Science	57	28	85
Fishery Sciences	17	9	26
Home Science	9	76	85
Total	268	154	422
	Extension Functionaries		
Crop Science	21	4	25
Horticulture	9	14	23
Animal Science	8	3	11
Home Science	37	36	73
Total	75	57	132
Grand Total	**893**	**629**	**1522**

FRONT LINE DEMONSTRATION

Rice

Under Kharif 2004-05, 25 demonstrations of HYV of rice with selected variety Quing Livan No.1 were taken up in Muccapahar and Chouldari cluster of villages of South Andaman in an area of 0.40 ha each covering a total area of 10.0 ha. The result showed that Quin Livan No. 1 gave an average yield of 5.65 t/ha compared to local check var. Bhavani (3.5 t/ha) exhibiting 61.42 percent increase in the yield.

FLD on HYV of paddy

Vegetables

Three crops, viz. cowpea, amaranthus and chilli were selected for taking up 22 demonstrations in farmers' field. The result showed that in cowpea, var. Laffa gave an average yield of 85.60 q/ha followed by BCP (58.50 q/ha). In amaranthus, var. CO 2 gave an average yield of 194.70q/ha followed by Arka Saguna (178.05 q/ha) and Pusa Kirti (176.50 q/ha). In chillies, var. LCA 334 gave an average yield of 84.0 q/ha followed by LCA 235 (75.23 q/ha) and BC 30 (73.70 q/ha).

Livestock

Sixty seven demonstrations covering Nicobari Crosses (34), Khaki Campbell duck (20), quail (10) and broiler (3) were undertaken. From the result, the percentage increase in the yield were found as 125 (Nicobari Crosses), 77 (Khaki Campbell duck) and 12.50 (Quail).

FLD on broiler farming

COMPATIBLE TECHNOLOGIES IDENTIFIED THROUGH ON-FARM TESTING

Subject	Micro-environment	Crop	Problem area	Technology	Yield
Varietal evaluation	Saline sulphate with iron toxicity	Paddy	Low yield of local cultivars	BTS-24	35.0 q/ha
Weed management	High rainfall	Paddy	Non-availability of labour during peak season	Pre-emergence selective herbicide Butachlor	51.2 q/ha
Production of off season fruits	One time fruiting	Pineapple	Low price during the season	Ethrel	34,000 No.

TECHNOLOGIES ASSESSED AND TRANSFERRED

- Control of sedges (Cyprus) and grasses like, *Echinoclova colona* in paddy by applying pre-emergent selective herbicide, 'Butachlor' between three and five days in transplanted crop.
- Destruction of egg mass of yellow stem borer in rice crop by clipping of leaf tip of the seedling in nursery before transplanting.
- Quail farming for better returns among unemployed youths.
- Biological control of Rhinoceros beetle in coconut garden through release of Baculo virus.

LIST OF PUBLICATIONS

Popular Articles

Singh, L.B., S.K. Zamir Ahmed, D.R. Singh, R.P. Medhi and R.B.Rai (2004). Burma Dhania – a much utilized little understood herb. Udayanki jeevan, October, 2004.

Bhaskara Rao, D. (2004) Swayam sahayak samooh kein liye fabric painting prasikshan. Samachar darshan (CARI Hindi Newsletter), 2004.

Folders

Aao mushroom ugay (Authors : Kanaklata, Archana Sharma and S.C. Pramanik) Published in 2004.

Coconut Cultivation (Authors : L.B. Singh, D.R. Singh, R.P. Medhi, R.B.Rai and S.C. Pramanik) Published in February, 2005.

Arecanut Cultivation (Authors : L.B. Singh, D.R. Singh, R.P. Medhi, R.B.Rai and S.C. Pramanik) Published in February, 2005.

Backyard Poultry Farming (Authors : N.C. Choudhuri, S.C. Pramanik, R.N. Chatterjee and R.B. Rai) Published in February, 2005.

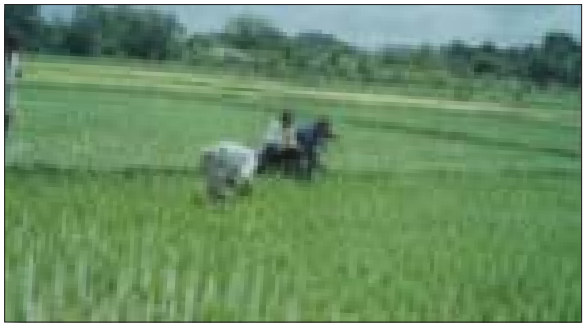
Broiler Farming (Authors : R.N. Chatterjee, R.B. Rai, S.C. Pramanik and N.C. Choudhuri) Published in February, 2005.

TRAINING / WORKSHOP ATTENDED BY THE STAFF

Name and designation	Title of the programme	Organising Institute	Period
Smt Kanak Lata	De-addiction of drug abusers	SWAB, Port Blair	25 June, 2004
Dr. S.K. Zamir Ahmed and Shri Nagesh Ram	Revitalisation of weak and Non-viable PACs	NCUI, Port Blair	21 August, 2004
Shri L. Brojendra Singh	Cultivation of medicinal and aromatic plants	JNKVV, Jabalpur	15-30 September, 2004

EXTENSION ACTIVITIES

Activities	Date
A. FIELD DAY(S)	
Broiler farming practices	19 May, 2004
Mango and minor fruits cultivation	26 June, 2004
Scientific cultivation of HYV paddy	7 July, 2004
IPM practices in paddy	16 July, 2004
Backyard poultry farming	21 July, 2004
Tissue culture Banana and Betel vine cultivation methods	7, August, 2004
Goat farming	12 August, 2004
Quail farming	17 August, 2004
Intercropping of spices	18 August, 2004
Fish-cum-duck farming	6 September, 2004
Quail farming	22 September, 2004
Backyard poultry farming	24 September, 2004
Vanilla cultivation	30 September, 2004
Intercropping of spices	8 February, 2005
Top working of nutmeg	10 February, 2005
Broiler farming for tsunami affected tribal youths	17 February, 2005
Piggery farming for tsunami affected tribal youths	18 February, 2005
B. EXHIBITION	
Fabric painting	6 October, 2004
Fabric painting	8 October, 2004
C. CAMPAIGN / MEET	
Farmers Scientist Interaction	7 June, 2004
Spices campaign	16 June, 2004
Workshop on water harvesting	27 July, 2004
Camp on agri. & allied fields	23 August, 2004
Animal health camp	1-10 January, 2005



IPM demonstration in paddy field

Field day - Backyard poultry farming

Fish cum duck farming

Inter cropping (Pine apple)

Training for tsunami affected tribal youth
on intensive poultry

Income generation activities on fabric painting
for self help group members

RADIO TALK

Topic	Date of broadcast	Speaker
Mahilayen kal aaj aur kal	11 May, 2004	Smt Kanak Lata
Handicrafts training for rural youth	10 June, 2004	Smt Kanak Lata
Nai aashayan nai dishayan	14 July, 2004	Smt Kanak Lata
Mahila jagat	8 August, 2004	Smt Kanak Lata
Plant propagation technique on citrus, guava and sapota	8 August, 2004	Shri L. Brojendra Singh
IWM in rice and watershed development	16 August, 2004	Dr. S.K. Zamir Ahmed
Bakri palan	19 August, 2004	Smt Kanak Lata
Round the year pineapple cultivation in Andaman	4 September, 2004	Shri L. Brojendra Singh

TECHNOLOGIES ASSESSED AND TRANSFERRED

HORTICULTURE & FORESTRY

- Technology of cultivation of pineapple, banana and spices in coconut gardens has been successfully demonstrated.
- Production technology for mango under Island eco-system.
- Production technology for solanaceous vegetables transferred to the farmers.
- Production technology of West Indian Cherry and custard apple.
- Production technology of marigold, crossandra and tuberose.
- Production technology of Eulophia andamanensis and indigenous orchids in coconut shell.

FIELD CROPS

- High yielding varieties of rice for both normal and saline soils

ANIMAL SCIENCE

- Backyard farming of Nicobari fowl
- Backyard farming of dual-purpose poultry (Nishibari & Nicorock)
- Poultry (Japanese quail, Khaki campbell duck, Turkey, Guinea fowl) farming
- Livestock (Dairy, Piggery, Goatery) farming
- Formulation of least cost feed
- Disease forecasting System
- Propagation of fodder germplasms
- Hump sore treatment
- Preparatation of post harvest products (Quail egg & Gizzard pickles, Chicken Samosa, Patties, etc.)

SOCIAL SCIENCE

- Integrated pest management practices in paddy
- Integrated Pest Management practices in vegetables (brinjal and tomato)
- High yielding cut flower varieties for improving household economy of the farmers
- High yielding varieties in sesame on paddy fallow
- Disease and insect pest tolerant high yielding varieties in brinjal
- Composite fish culture in household farm pond for higher productivity and income
- Backyard rearing of improved Nicobari fowls for increased income (through Video film)

EDUCATION AND TRAINING

HORTICULTURE & FORESTRY

Title / Topic	Date / Period	Participants
Cultivation of spices	29 April, 2004	Unemployed youths of Maccapahad, South Andaman
Cultivation of orchids under coconut plantations and different aspects of flower cultivation	16 June, 2004	Farmers from Wimberlygunj, South Andaman
Integration of spices in homegarden	4 August, 2004	Farmers from Manjeri, South Andaman
Use of bio control agents	14 August, 2004	Farmers from Neil Island
Promoting spices cultivation in Bay Islands	18 August, 2004	Farmers and field Staffs of Agriculture Departments in Rangat, Middle Andaman
Spices cultivation techniques and its post harvest management	9 February, 2005	Farmers from different villages of South Andaman

FIELD CROPS

Title / Topic	Date / Period	Participants
IPM in kharif paddy	27 May, 2004	15 farmers from Maccapahad, South Andaman
IPM in spices	14 June, 2004	20 farmers from Guptapara, South Andaman
Use of baculovirus for management of Rhinoceros beetle	10 July, 2004	20 farmers from Neil Island
IPM in spices	4 August, 2004	50 farmers from Manjeri, South Andaman
Integrated pest and disease management vegetable crops	7 & 8 August, 2004	10 agril. dept. officials and 20 farmers from South Andaman
Utilization of bio control agents for management of vegetable pest and diseases	14 August, 2004	1 agril. dept. official and 44 farmers from Neil Island
Use of bio control agents	18 August, 2004	2 agril. dept. officials and 40 farmers from Neil Island
IPM of Rhinoceros beetle	2 September, 2004	10 officials and 75 farmers from Guptapara, South Andaman
Apiculture	2 & 3 November, 2004	20 farmers and farm women from South Andaman

ANIMAL SCIENCE

Title / Topic	Date / Period	Participants
Broiler farming	17-19 May, 2004	21 farmers from South Andaman
Backyard poultry farming	19-21 July, 2004	42 farmers from South Andaman
Goat farming	11-13 August, 2004	23 farmers from South Andaman
Quail farming	17 August, 2004	27 farmers from South Andaman
Modern livestock production technology	24-30 August, 2004	11 farmers from South Andaman
Backyard poultry and duck farming	22-24 September, 2004	34 farmers from South Andaman
Scientific management of dairy cattle	9-11 November, 2004	41 farmers from South Andaman
Scientific poultry management practices	22-24 November, 2004	20 farmers from South Andaman
Semi-intensive poultry and pig farming	14-18 February, 2005	34 farmers from South Andaman

FISHERIES SCIENCE

Title / Topic	Date / Period	Participants
Marine ornamental fish culture	9-15 September, 2004	Rural unemployed youth from South Andaman
Culture of green mussel	27-29 November, 2004	10 farmers including 4 females from South Andaman
Culture of pearl oysters and nucleus implantation	27-29 November, 2004	10 farmers including 6 females from South Andaman
Brackishwater aquaculture	6-9 December, 2004	15 farmers hailing from North, Middle and South Andaman

Training on intercropping of spices

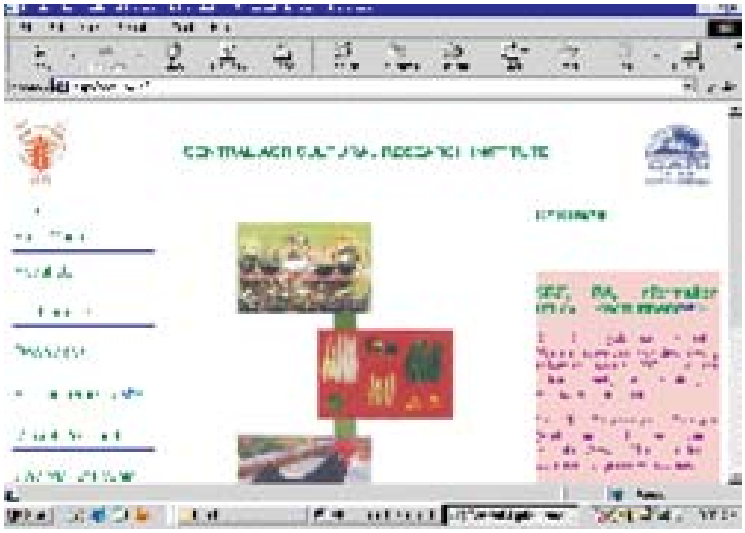
Training on artificial marine pearl culture

INFORMATION ON OTHER SECTIONS

LIBRARY

Central Agricultural Research Institute shares a well-organized library and plays an important role in this island as a center for literature and information related to the institute's mandate. The library serves and fulfills the need of the scientists of this institute as well as research workers and students from local research and educational institutes. The library has been enriched during the year with journal through subscription gifts and on exchange basis. It has 4502 books, 4310 gratis publications and 2455 bound journals. The existing collection of books was further enriched by adding more current, important scientific and technical books. The library has an extensive collection of resource materials in the fields of Animal Sciences, Horticulture, Field crops, Biotechnology, Social Science and many other related areas. The library has a user-friendly reference collection system under the NATO Scheme like CD-ROM Discs of AGRIS databases (1975-2000), which can be accessed through LAN in all Divisions/Sections. The CARI library has a precious special collection of island related books and publications alongwith reprographic facility. Besides, efforts have been made to acquire non-conventional literatures such as technical reports, reports on socio-economic study and annual reports from various sources.

COMPUTER CELL



Website

Website of CARI was developed as per the guidelines received from ICAR by Computer Cell and it was launched through the Mail/Web server of CARI. The website can be browsed at http://cari.res.in and http://cari.and.nic.in. The website is being updated regularly.

Mail/Web server

Mail/Web server was installed in the Computer Cell.

Training

Two training programmes on "MSOFFICE 2000" and "Internet based information system" were organized in the Computer Cell from 5-17th May 2004 and 8-18th June 2004 for school going children. 48 students participated in the training.

Database

- Database on ATIC billing.
- Database on Library Information System
- Database on Central Store
- Database on Farm Section Invoice

All the databases were prepared using Microsoft Access 2000.

CD-ROM

- CD-ROM on 'Medicinal Plants of Bay Islands'
- CD-ROM on 'Orchids of Bay Islands'
- CD-ROM on 'Floriculture of Bay Islands'

Above CD-ROMs are available for sale @ Rs. 50/- each.

PLANNING, MONITORING AND COORDINATION CELL

The Planning, Monitoring and Coordination cell serves as a coordinating link between the Institute and Council (ICAR), Government, Semi-Government and other R&D organizations in addition to providing information on various research, training and extension activities of the institute to these agencies. The section reviews and scrutinizes the research projects/proposals and coordinates the activities within and outside the institute. During the period under report, the section had :

I. Prepared the following reports

- CARI Annual Report 2003-2004.
- Material for DARE's Report 2004-2005.
- Monthly Reports to Cabinet Secretariat for the year 2004-2005.
- Half yearly Scientists Progress Monitoring Reports to DG, ICAR for the year 2004-2005.
- Monthly Institute Progress Monitoring Reports to DG, ICAR for the year 2004-2005.
- Revised Perspective Plan (Vision 2020).
- Draft State Development Report of A & N islands.

II. Processed and sent the following documents

- Research articles, Abstracts and Popular articles of the scientists for publication in Indian as well as foreign journals.
- Research project proposals from all the divisions for submission to external funded agencies like ICAR, DST, DBT, MoEF etc.
- Papers pertaining to various ICAR and other organizational awards applied from the Institute.
- Material for updating the Directory of Agricultural Institutions in India
- Questionnaire on the 'Impact of NAARM training' to assess the training needs of the scientists.
- Status of QRT, RAC, SRC & IMC to the Council.
- Information on Success stories of institute, List of technologies for commercialization in horticulture, Crop profile and New initiative with a focus on crop yields to Council.

III. Performed the following activities

- Monitored and Coordinated the institute research projects and maintained the project files of the Institute.
- Assisted in research project auditing.
- Circulated all the correspondence received from ICAR, DARE, other R&D organizations, A&N Administration, etc. among the research divisions.
- Circulated the notification about Summer school / Winter school, Short course, Training, Seminar, Symposium, Conference, etc. among the research divisions/sections through intranet.
- Provided the reply to all the parliamentary questions in time.

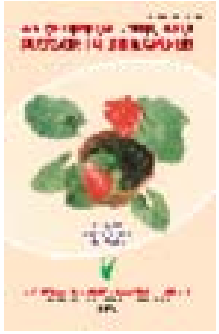
IV. Published the following items

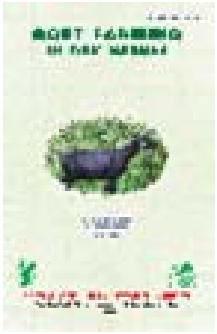
Technical bulletins - 3

- Goat farming in Bay Islands.
- Anthurium The Tail flower in Andamans
- Breed descriptor of Nicobari fowl.

Report - 1

- On farm trials By Biotechnology Section, Division of Field Crops.





Books - 2

- Genetic management for increased productivity of rice in Andaman & Nicobar Islands.
- Livestock management in Island Ecosystem.

Folders - 20

- Turning 'Grey to Green' - Participatory management of water stress in vegetables through low cost check dam in Ograbraj village, South Andaman (IVLP-Success Story 1).
- Improving household economic and nutrition security through popularization of Nicobari fowl under backyard farming (IVLP-Success Story 2).
- Dasrathpur The Low lying coastal village rehabilitated through cultivation of salt tolerant paddy variety BTS 24 (IVLP-Success Story 3).
- Improving sustainability production through integrated pest management in vegetables (tomato, brinjal and chilli) (IVLP-Success Story 4).
- Floriculture - A successful venture for improving household economy in South Andaman (IVLP-Success Story 5).

- Production technology of Custard apple for Andaman.
- Commercial cultivation of Banana.
- The Alligator apple.
- Bilimbi in Andamans.
- Chulta An unexploited fruit.
- Carambola in Andamans.
- Production technology to grow orchids in coconut shell.
- Coir pith composition A value added organic manure.
- Captive breeding of marine ornamental clown anemone fish, Amphiprion percula (Lacepede, 1802) (Pomacentridae) in Andaman Islands.
- High yielding rice varieties for large scale cultivation in Bay Islands.
- Promising high yielding Brinjal varieties suitable for cultivation in Andaman and Nicobar Islands.
- Low cost cultivation of Brahmi through in vitro culture.
- Broiler management practices.
- *Hari mirchi ki vaigyanik kheti* (Hindi).
- *Aoo mushrom ugayein* (Hindi).

V. Produced the following film

Video documentary film

- "Backyard rearing of improved Nicobari fowls for increased income" in three languages (Hindi, English & Tamil) with the financial support of NATP and submitted Beta cam, DVC Pro, Audio DAT Tape, VHS cassettes, DVD and VCD to the Council.

OFFICIAL LANGUAGE CELL

For the successful implementation of the official language policy and the target fixed in the Annual Programme, efforts were made for doing maximum work in official language.

- Achieved the targets of using Hindi fully in the field of transfer of technology and extension. All the training materials used are bilingual. The effort has thus helped the transfer of technology.
- With a view to accelerating the pace of implementation, bilingual scientific bulletins/pamphlets for farmers and half yearly newsletter ***"SAMACHAR DARSHAN"*** and home magazine ***"Krishika"*** in Hindi were published.
- Article 3(3) is being followed in toto in institute. All administrative meeting are being conducted in Hindi.
- Institute library has purchased scientific and literature books, magazines for staff/children. Beside this, reference books for office like dictionary and help and reference literature were distributed among all sections, officers and staff.
- For the extension of new technologies developed by the institute, All India Radio, Port Blair is broadcasting agricultural article daily for the island farmers. Doordarshan is also telecasting agricultural programmes related to Institute activities.
- During 'Hindi Week' in September, various programmes like quiz, extempore, dictation and essay competition for scientists/staff and farm ladies were organized to bring awareness about the importance of increasing use of Hindi in official language.
- During the year, Smt. Ashima Saha, Senior Clerk got special prize for her contribution and co-operation in implementation of the official language programme.
- Under Incentive Scheme, Smt. Shibani Sengupta, Asstt., Smt. Ashima Saha, Senior Clerk, Dr. S.C.Pramanik, Senior Scientist and Shri M.C.R.C. Murthy, S.S.Gr.III got cash award for writing original noting and drafting in Hindi in their official work.
- Hindi workshop was launched for Administrative and technical staff to increase the strength of the staff for implementation of official language to bring awareness about the importance of increasing use of Hindi in official dealings.
- During the year, 14 technical bulletins and 2 scientific/technical books were prepared, in which 8 bulletins and 2 books are under printing. List of Hindi Books & Magazine (Technical/Scientific)/Technical Bulletin & Pamphlets of Central Agricultural Research Institute, Port Blair.

List of Hindi Books and Magazine (Technical / Scientific) Technocal Bulletin and Pamphlets

प्रकाशन

संस्थान द्वारा निम्नलिखित पुस्तक/बुलेटिन/प्रसार प्रपत्र/पत्रिकाएँ प्रकाशित की गई:

पुस्तक एवं पत्रिका

- मुर्गी पालन
- कृषि संदेश भाग 1
- कृषि संदेश भाग 2

- कृषि संदेश भाग 3
- समाचार दर्शन {अर्धवार्षिक पत्रिका} अंक-1 से 5, अंक-6 और 7
- कृषिका - अंक-2 वार्षिक गृह पत्रिका {पुस्तक प्रकाशनाधीन}
- अर्धवार्षिक पत्रिका ''समाचार दर्शन'' का आठवां अंक {प्रकाशनाधीन}
- अप्रचलित फल
- अ.नि. द्वीप समूह में पशु और पक्षी पालन {पुस्तक}
- वार्षिक प्रतिवेदन - सारांश एवं प्रस्तावना

प्रसार प्रपत्र

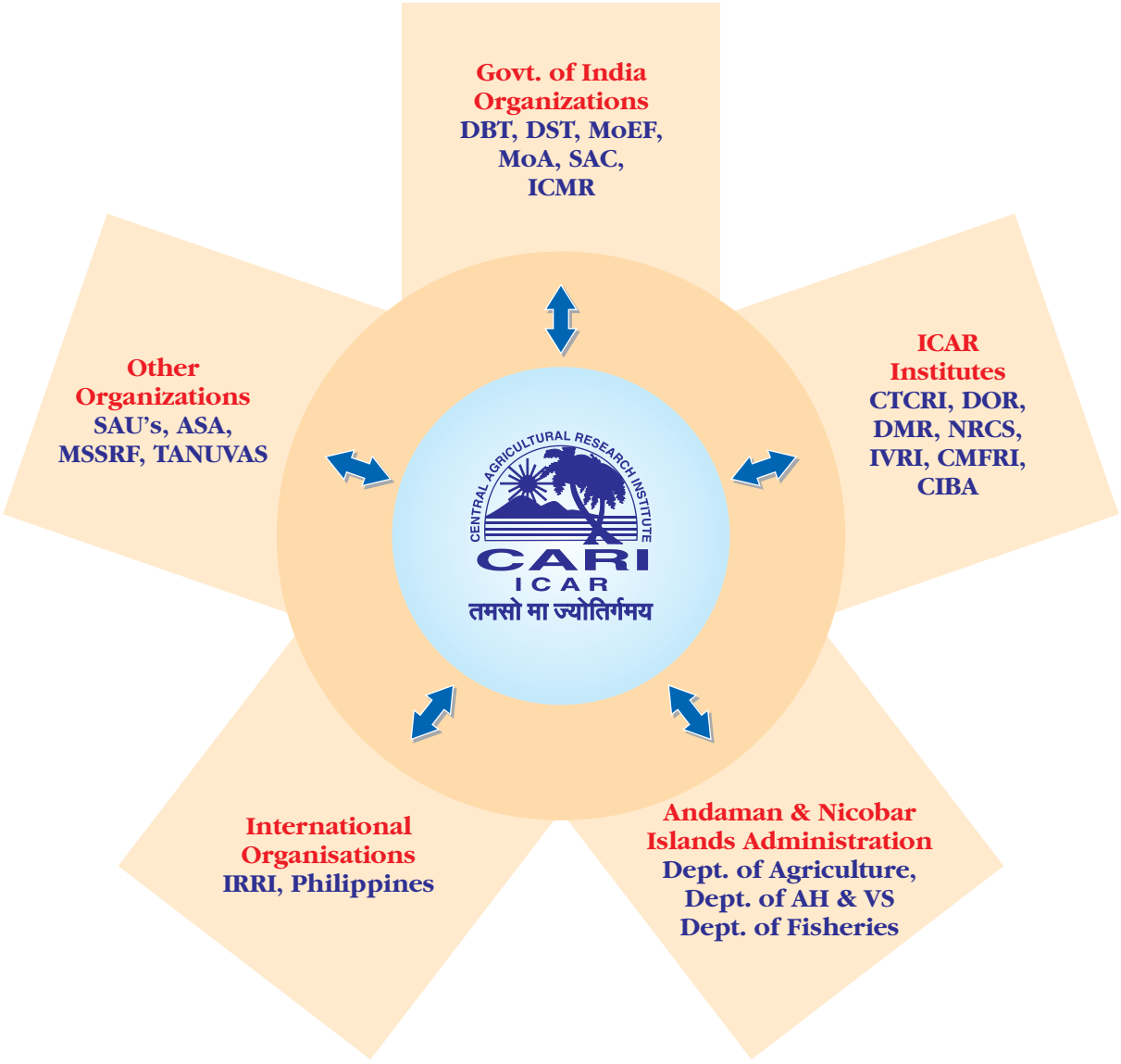
- शुष्क मौसम की क्षेत्रीय फसलों के लिए उत्पादन तकनीक
- द्वीपों की प्रमुख फसलों की कीट व्याधियाँ एवं नियंत्रण
- अंडमान निकोबार द्वीपों की स्थानीय कुक्कुट प्रजातियाँ
- एटिक द्वीपों के किसानों के लिए आशा की नई किरण
- जंगली बकरी - बैरन द्वीप का अनोखा जर्मप्लाजम
- समृद्धि-अंडमान से सुपारी की नई प्रजाति
- सुधरी विधि से बैंगन की खेती
- द्वीपों में टमाटर की उन्नत खेती
- द्वीपों में ग्लैडियोलस की व्यवसायिक खेती
- द्वीपों में गेंदे की व्यावसायिक खेती
- मुर्गियों के महत्वपूर्ण रोग, कारण, लक्षण, उपचार एवं प्रतिबंधक उपाय
- कुक्कुट रोगों के रोकथाम के लिए नियंत्रण उपाय
- थनैला - रोकथाम तथा नियंत्रण
- द्वीपों में बत्तख पालन
- द्वीपों में सब्जियों की खेती
- द्वीपों में गृह वाटिका द्वारा आय बढ़ाने हेतु जिन्दा बल्ली रेलिंग पर काली मिर्च की खेती
- खारा पानी में मत्स्य पालन संक्षिप्त विवरण
- हरी मिर्च की वैज्ञानिक खेती
- मशरूम की खेती
- सब्जियों में सिंचाई जल प्रबन्ध
- कोनोवीडर चलाओ, पैदावार बढ़ाओ, ऊर्जा बचाओ
- बिना रोपाई धान की उन्नत खेती
- टमाटर में समेकित कीटनाशी जीव प्रबंध
- वैज्ञानिक आलेखों का संकलन
- तिल की खेती
- मूंग की खेती

AWARDS AND RECOGNITION

Scientists	Award / Recognition	Awarding Agency	Date / Period
Dr. S.C. Pramanik Senior Scientist (Agronomy) and Principal Investigator TAR-IVLP and his Co-team members	Commendation Certificate	NATP, AED (Coastal), Thiruvananthapuram	9-11 June, 2004
Dr. R.B. Rai Principal Scientist & Head (Veterinary Pathology) and Acting Director **Dr. A. Kundu** Senior Scientist (Livestock Production & Management) **Dr. S. Senani** Senior Scientist (Animal Nutrition) **Dr. R.N. Chjatterjee** Senior Scientist (Animal Genetics & Breeding) **Dr. Jai Sunder** Scientist (Veterinary Microbiology) **Dr. B. Ganesh Kumar** Scientist (Agricultural Economics) **Dr. S.C. Pramanik** Senior Scientist (Agronomy)	ICAR Award for Out- standing Multidisciplinary Team Research for the biennium 2001-02 for their research on 'Integrated approach for improvement and sustenance of Livestock Production System in A & N Islands'	ICAR, New Delhi	16 October, 2004
Dr. R.N. Chatterjee Senior Scientist (Animal Genetics & Breeding) **Dr. R.B. Rai** Principal Scientist & Head (Veterinary Pathology) and Acting Director	Fakruddin Ali Ahmed Award for the biennium 2001-02 for their work on tribal development through backyard livestock & poultry farming	ICAR, New Delhi	16 October, 2004

Scientists	Award / Recognition	Awarding Agency	Date / Period
Dr. S.C. Pramanik Senior Scientist (Agronomy) and Principal Investigator TAR-IVLP	Best Poster Award for the poster 'Participatory management of water stress in vegetables through the low cost checkdam in Andaman'	Indian Society of Agronomy in the National symposium on 'Resource conservation and Agricultural productivity' held at PAU, Ludhiana	22-25 November, 2004
Shri P. Krishnan Scientist (Fish & Fishery Sciences)	Merit Certificate for the outstanding overall performance by securing 1st Rank in the 78th FOCARS	NAARM, Hyderabad	10 August - 7 December, 2004
Dr. R. Raja Scientist (Agronomy)	Merit Certificate for the outstanding overall performance by securing 2nd Rank in the 78th FOCARS	NAARM, Hyderabad	10 August - 7 December, 2004
Dr. V. Jayakumar Scientist (Plant Pathology)	'A' Grade based on the overall performance in the 78th FOCARS	NAARM, Hyderabad	10 August - 7 December, 2004
Shri Deshmukh P.S. Scientist (Farm Machinery & Power)	'A' Grade based on the overall performance in the 78th FOCARS	NAARM, Hyderabad	10 August - 7 December, 2004
Dr. S. Jeyakumar Scientist (Animal Reproduction)	Young Scientist Award	Indian Society for Study of Animal Reproduction for his work on 'Ultrasound guided Transvaginal Ovum Pick-Up in cows' at College of Veterinary Science, Durg, Chhatisgarh	14-16 December, 2004
Dr. T. Damodaran Scientist (Horticulture)	Young Scientist Award	Indian Science Congress Association at its 92nd Congress held at Nirma University, Ahmedabad	3-7 January, 2005

LINKAGES AND COLLABORATIONS



ON GOING RESEARCH PROJECTS

EXTERNALLY FUNDED

Project Title	Principal Investigator	Budget Outlay	Date of Start	Date of Completion
AP CESS FUND, ICAR				
Protected cultivation of cut and traditional flowers in A & N Islands	Dr. D.R. Singh	Rs.17,75,500	02.09.2004	01.09.2007
Agroforestry for sustainable biomass production in A & N Islands	Dr. C.B. Pandey	Rs. 22,86,880	01.04.2002	30.03.2007
Molecular tagging of gene/s for excess salt tolerance in rice and its significance in marker aided selection	Dr. Asit B. Mandal	Rs. 12,82,640	01.04.2002	30.9.2005
Meat quality assessment of different indigenous chicken breeds of Bay Islands	Dr. A. Kundu	Rs. 15,69,688	01.11.2002	31.10.2005
Studies on the status of mineral profile in Bovine of A & N Islands and its correlation to morbidity and production	Dr. R.B. Rai	Rs. 19,21,420	05.07.2004	04.07.2007
Characterization and conservation of Nicobari pigs	Dr. S. Jeyakumar	Rs. 13,50,000	01.11.2004	31.10.2007
Characterization, conservation, evaluation and improvement of native Teressa goat - An unreported indigenous germplasm	Dr. R.B. Rai	Rs. 9,99,000	01.02.2005	31.01.2007
Breeding, seed production and backyard hatchery development of freshwater prawn, *Macrobrachium rosenbergii* in Andamans	Dr. R. Soundararajan	Rs. 21,83,500	29.02.2004	28.07.2007
Development of Integrated Farming System model under different resource conditions in humid tropics of Bay island	Dr. S.C. Pramanik	Rs 21,27,055	22.04.2004	21.03.2007

Project Title	Principal Investigator	Budget Outlay	Date of Start	Date of Completion
NATP				
Mussel Mariculture	Dr. R. Soundararajan	Rs. 11,75,000	01.08.2000	30.11.2004
Pearl Mariculture	Dr. R. Soundararajan	Rs. 12,34,00	01.08.2000	30.11.2004
MINSTRY OF ENVIRONMENT & FORESTS				
Seed germination and natural regenaration in tropical rain forest of Andaman islands	Dr. C.B. Pandey	Rs.10,60,800	28.01.2004	27.01.2007
CENTRAL SECTOR SCHEME				
Integrated programme for development of spices	Dr. R.P. Medhi	Rs. 6,73,000	01.04.2004	31.03.2005
DEPARTMENT OF BIOTECHNOLOGY				
Collection, characterization, conservation and enhancement of ecologically and economically important plant species in Bay Islands	Dr. Asit B. Mandal	Rs. 10,40,000	01.07.2003	30.06.2006
NATIONAL MEDICINAL PLANTS BOARD (Ministry of Health & Family Welfare)				
Biodiversity characterization, conservation and bioprospecting of four economically important medicinal plants of Bay Islands	Dr. Asit B. Mandal	Rs. 16,00,000	22.04.2002	21.03.2005
SPACE APPLICATION CENTRE, AHMEDABAD				
Assessment of coral reef health using satellite data	Dr. R. Soundararajan	Rs. 10,40,000	01.04.2004	31.03.2007

INSTITUTE FUNDED

Project Title	Principal Investigator
HORTICULTURE & FORESTRY	
Varietal evaluation and standardization of agro techniques for tropical fruits	Dr. R.P. Medhi
Improvement and agrotechniques of vegetable crops	Dr. R.P. Medhi
Improvement of coconut and arecanut	Dr. R.P. Medhi
Studies on plantation based spices crops for tropical region	Dr. R.P. Medhi
Introduction and evaluation of exotic and less known indigenous fruit crops	Dr. D.R. Singh
Collection, cataloguing and standardization of agro techniques of native and exotic orchids and other shade loving plants	Dr. D.R. Singh
Collection and evaluation of tuberose, gladiolus, chrysanthemum, gerbera, marigold, balsam and amaryllis	Dr. D.R. Singh
Tree-soil-crop interactions in agro forestry practices in A&N Islands	Dr. C.B. Pandey
Macro propagation studies on some important timber species of Bay islands	Dr. A. Venkatesh
Studies on cropping systems and efficient utilization of organic wastes in coconut gardens	Dr. T. Damodaran
FIELD CROPS	
Genetic modulation for increased productivity in rice with special reference to biotic and abiotic stress tolerance in Bay Islands	Dr. Asit B. Mandal
Development of IPM practices for key pests and diseases of brinjal, tomato, cole crops (Cauliflower & cabbage)	Dr. G. Shyam Prasad
Physiological approaches for improved abiotic stress tolerance in solanaceous vegetable crops	Dr. R. Elanchezhian
Utilization of native bio-agents for the management of vegetable diseases and cataloguing of crop diseases in A & N Islands	Shri. Someshwar Bhagat
Improving the productivity and quality of rice and other crops in rice based cropping system in A & N Islands	Dr. T.V.R.S. Sharma

Project Title	Principal Investigator
NATURAL RESOURCES MANAGEMENT	
Assessment of soil loss with biological control measures under different crop canopies in hill slopes of Andaman islands	Dr. S. Ghoshal Chaudhuri
Status and scope of farm mechanization in Andaman and Nicobar Islands	Dr. M. Din
Evaluation of broad bed and furrow system for vegetable production in rice fields of Andaman and Nicobar Islands	Dr. N. Ravisankar
Agro techniques for direct seeded rice in Bay Islands	Dr. N. Ravisankar
Agro techniques for *Andrographis paniculata* (Kalmegh) in Bay Islands	Dr. R. Raja
Optimizing land use based on Fertility capability classification in coastal paddy soils of South Andaman	Dr. T.P. Swarnam
ANIMAL SCIENCE	
Sero-surveillance and antigenic characterization of etiological agents of major livestock and poultry diseases of Andaman and Nicobar Islands	Dr. Jai Sunder
Adaptability and productivity of Turkey and Guinea fowl in Bay Islands	Dr. A. Kundu
FISHERIES SCIENCE	
Studies on recruitment, culture and nutritive value of edible oyster of Andaman waters	Dr. R. Soundararajan
Culture of milkfish, sea bass and prawn in tide fed brackish ponds in Andamans	Dr. S. Dam Roy
Documentation and analysis of fisheries information and forecasting of fisheries in Bay Islands	Dr. S. Dam Roy
Micro-algal culture for larvae of selected marine shellfishes of Andamans	Mrs. Rema Madhu
Culture of marine ornamental fishes in Andaman Islands	Dr. K. Madhu
SOCIAL SCIENCE	
Economic analysis of poultry farming enterprise in A&N Islands	Dr. B. Ganesh Kumar

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Production Technology of Custard Apple for Andaman (Authors : D.R. Singh, R.P. Medhi, S. Senani, R. Senthil Kumar and V.B. Pandey) Published by Director, CARI, Port Blair in 2004.

Production Technology to Grow Orchids in Coconut Shell (Authors : D.R. Singh, R.P. Medhi, R.B. Rai and S.C. Pramanik) Published by Director, CARI, Port Blair in 2004.

The Alligator Apple (Authors : D.R. Singh, R.P. Medhi, S. Senani, R. Senthil Kumar and R.B. Rai) Published by Director, CARI, Port Blair in 2004.

Turning Grey to Green Participatory management of water stress in vegetables through low cost check dam in Ograbraj village, South Andaman (IVLP Success story-1) (Authors : S.C. Pramanik, S. Ghoshal Chaudhuri, P. Sanyal, R. Dinesh, R.B. Rai, B. Ganesh Kumar and Shakila Nawaz) Published by Director, CARI, Port Blair in 2004.

TECHNICAL BULLETINS

Anthurium The Tail Flower In Andamans (Authors : D.R. Singh, Sujatha A.Nair and R.P. Medhi) Published by Director, CARI, Port Blair in 2005.

Breed descriptor of Nicobari fowl (Authors : R.N. Chatterjee, S.P. Yadav and R.B. Rai) Published by Director, CARI, Port Blair in 2005.

Goat farming in Bay islands (Authors : B. Ganesh Kumar, S. Jeyakumar and R.B. Rai) Published by Director, CARI, Port Blair in 2004.

BOOKS / CHAPTERS

Farming Systems : Theory and Practice - I Edition (ISBN: 8170893062) (Authors : A. Solaimalai, N. Ravisankar and B. Chandrasekaran) Published by International Book Distributors, Dehra Dun in 2005.

Free range grazing in coconut and arecanut based Silvo-pastural system in Andaman: A Review. In: Agroforestry in 21st Century (Authors : C.B. Pandey, A.Venkatesh and R.P. Medhi and Edtors : S.K. Chauhan, S.S. Gill, S.C. Sharma and R. Chauhan) Published by Agrotech Publishing Academy, Udaipur in 2004.

Livestock production in island ecosystem (Authors : R.N. Chatterjee, B. Ganesh Kumar, R.B. Rai and A. Kundu) Published by Director, CARI, Port Blair in 2005.

Putting the last first Participatory Assessment and Transfer of Agricultural Technology in Bay Islands (Authors : S.C. Pramanik and R.B. Rai) Published by CARI, Port Blair in 2004.

VIDEO FILM

'Backyard Rearing of Improved Nicobari Fowls for Increased Income' in 3 languages (Hindi, English & Tamil) with NATP financial aid on the instruction of DDG (Extension).

Production Coordinator :

Dr. B. Ganesh Kumar

Subject matter specialists :

Dr. R.B. Rai and **Dr. A. Kundu**

PATENTS FILED

Five patents were submitted in revised version through ICAR to Indian Patent Office, New Delhi.

Product / Process	Scientist
Herbal antimicrobial, anti-inflammatory and anti-histaminic formulation (Topical/oral)	Dr. Asit B. Mandal
Polyherbal mouthwash	Dr. Asit B. Mandal
Herbal preparation for curing oral submucus fibrosis (OSF) – A pre-cancerous condition in oral cavity	Dr. Asit B. Mandal
Herbal vaginal contraceptive – an effective birth control measure (topical)	Dr. Asit B. Mandal
Protocol for producing large number of viable plantlets of *Bacopa monnieri in vitro* in gro-tek system under liquid culture	Dr. Asit B. Mandal

RESEARCH CO-ORDINATION AND MANAGEMENT

RESEARCH ADVISORY COMMITTEE (RAC) MEETING

The first meeting of the Fourth RAC was held under the Chairmanship of Dr. K. Pradhan, Ex-Vice Chancellor for OUAT, Bhubaneshwar and RAU, Bikaner during 25th to 26th February, 2005 at CARI, Port Blair. Other members present were Dr. R.C. Tiwari, Emeritus Professor, BHU, Varanasi, Dr. M. Thyagarajan, Former Professor and Head, TANUVAS, Chennai and Dr. U.B. Singh, Dean, College of Fisheries Science, GBPUA & T, Pant Nagar, Dr. R.B. Rai, Director, CARI, Port Blair, Smt. Uma Bharati, Member, Institute Management Committee, CARI, Port Blair and Dr. R.P. Medhi, Member Secretary. Directors of Agriculture, Fisheries and Animal Husbandry & Veterinary Services of A & N Group of Islands were also invited. All the scientists of the institute participated in the meeting. The research committee gave the detailed guideline for formulating new research project for next year and division wise recommendations.

STAFF RESEARCH COUNCIL (SRC) MEETING

The Staff Research Council for the year 2004 was held during 5-6 April, 2004 at the Institute's Conference Hall. Dr. R.B. Rai, Acting Director, CARI was the Chairman for the SRC 2004. Dr. R. C. Tiwari, Professor Emeritus was the SRC Expert and Dr. Sailesh Nayak, Group Director, Space Application Centre, Ahmedabad was the special Guest for the occasion. Dr. B. Ganesh Kumar, Scientist (Agricultural Economics) & In-Charge, Planning, Monitoring & Coordination Cell was the Member Secretary, SRC 2004, who coordinated the whole proceedings. Dr. R.B. Rai in his presidential address, pointed out that the islands needed innovative plans related to Agriculture and allied areas in order to tide over the problem of unemployment and CARI had to focus its efforts only on these areas where it has significant advantage over the mainland institutions. The Chairman requested the scientists to explore the best advantage of the multi-disciplinary expertise available in the institute by conceiving projects on agriculture, animal science, fisheries, forestry, biotechnology etc. It was also suggested that scientists have to take up strategic and adaptive research, in addition to basic research. Finally he requested all the scientists to participate in the discussion after each of the presentation and concluded his introductory speech. Dr. Sailesh Nayak in his special address highlighted the need for focusing on the environmental issues confronting in presently. He pointed out that most of the research data are not available at the time of need and suggested the adoption of modern technologies like GIS and Remote Sensing, as appropriate to the ongoing research projects for easy retrieval of the data. All the 36 on-going projects were presented by the concerned PIs in the house highlighting the progress made in the last year. 8 new projects were also approved.

PARTICIPATION OF DIRECTOR IN DIFFERENT COMMITTEES AND PANELS

The Acting Director, CARI, Port Blair served as

Member, Medicinal Plants Board, A&N Administration, Port Blair

Member, State Level Committee for Identification of beneficiaries for supply of tractor on Loan-cum-subsidy basis, A&N Administration, Port Blair

Member, Rural Programme Advisory Committee, A&N Administration, Port Blair

President, Andaman Science Association, Port Blair

Member, Pollution Control Board, A&N Administration, Port Blair

Member, UT level Coordination Committee on watershed management, A&N Administration, Port Blair

Member, UT Coordination Committee, A&N Administration, Port Blair

Member, IX State Level Environment Council, A&N Islands, Port Blair

Member, Committee for Health care and Treatment of Animals in Zoo, Haddo & Biological Park, A&N Islands, Port Blair

Member, Society for Science Centre, A&N Islands, Port Blair

Member, Conference for discussion of draft State Development Report of A&N Islands, Port Blair

Member, Executive Committee of SOC, Andaman Nature Club, Port Blair

Member, Central Advisory Committee for the Development of Sheep, Goats & Rabbits, A&N Islands

Member, State Level Advisory Committee for Narrowcasting Project under the scheme "Mass Media Support for Agril. Extension" A&N Islands

Member, Island Development & Training Institute, A&N Islands

Member, State Seed Sub-Committee for Agricultural & Horticultural Crops, A&N Islands

Member, State Level Monitoring Committee to monitor and oversee the functioning of "KISAN CALL CENTRE" of A&N Islands

UT level Monitoring Committee to monitor the implementation of programmes relating to rehabilitation of Animal Husbandry

CONFERENCES / SEMINARS / SYMPOSIA / TRAININGS ATTENDED BY SCIENTISTS

Scientists	Programme	Venue	Date / Duration
Dr. R. Raja Scientist (Agronomy)	Training on 'Precision Farming'	Centre of Advanced Studies in Agronomy, TNAU, Coimbatore	25 March - 14 April, 2004
Dr. Asit B. Mandal Senior Scientist (Plant Breeding)	9th National Rice Biotechnology Network Meeting	NAAS Complex Pusa, New Delhi	15 - 17 April, 2004
Shri P. Krishnan Scientist (Fish & Fishery Sciences)	Indo-Singapore Workshop on Aquaculture and Marine Biotechnology	Centre for Fish Disease Diagnosis & Management, CUSAT and CMFRI, Cochin	22 - 24 April, 2004
Shri P. Krishnan Scientist (Fish & Fishery Sciences)	Network Meeting for Fish health and Disease management	ICAR, New Delhi	29 - 30 April, 2004
Dr. T.P. Swarnam Scientist (Soil Physics & Water Conservation)	Training on 'Remote sensing in agriculture with special emphasis on agro ecosystem management'	IARI, New Delhi	28 April - 22 May, 2004
Dr. M. Din Senior Scientist (Farm Machinery & Power)	Summer school on Prospects and Constraints to mechanization of Hill Agriculture	GBPUA&T Pant Nagar	4 - 24 June, 2004
Dr. S. Ghoshal Chaudhuri Senior Scientist (Soil Physics & Soil Water Conservation)	National workshop on Forests and Water Conservation: Myths & Realities	Forest Research Institute, Dehradun	8 - 10 June, 2004
Dr. R. Soundararajan Principal Scientist (Fish & Fishery Sciences)	Technical Workshop on Remote sensing and GIS applications for coastal / mangroves / coral reef studies	Space Aplication Centre Ahmedabad	2 July, 2004
Dr. Asit B. Mandal Senior Scientist (Plant Breeding)	Meeting on 'Removal of exotics from A & N Islands of unworked reserve forest as protected areas'	Office of the PCCF Vansadan, Port Blair	29 July, 2004

Scientists	Programme	Venue	Date / Duration
Shri P. Krishnan Scientist (Fish & Fishery Sciences) **Dr. R. Raja** Scientist (Agronomy) **Shri Someshwar Bhagat** Scientist (Plant Pathology) **Dr. V. Jayakumar** Scientist (Plant Pathology) **Shri Deshmukh, P.S.** Scientist (Farm Machinery & Power)	78th FOCARS	NAARM, Hyderabad	10 August - 7 December, 2004
Dr. N. Ravisankar Scientist (Agronomy)	Training on 'Personnel Management Information System Network (PERMISnet) of ICAR'	IASRI, New Delhi	1 - 3 September, 2004
Dr. S.C. Pramanik Senior Scientist (Agronomy)	National Symposium on Alternative farming systems Enhanced income and employment options for small and marginal farmers	PDCSR, Modipuram Meerut	16 - 18 September, 2004
Dr. N. Ravisankar Scientist (Agronomy) **Dr. B. Ganesh Kumar** Scientist (Agricultural Economics)	Training on 'Introduction on LAN/WAN Technologies'	CRIJAF, Barrackpore	20 - 24 September, 2004
Dr. R. Soundararajan Principal Scientist (Fish & Fishery Sciences)	Colloquium on South Asian Artisanal Fishing and exhibition	India International Centre, New Delhi	8 - 9 October, 2004
Dr. R Elanchezhian Scientist (Plant Physiology)	National workshop on Biodiversity Resource Management and Sustainable Use	Madurai Kamraj University, Madurai	11 - 16 October, 2004
Dr. B. Ganesh Kumar Scientist (Agricultural Economics)	Training Workshop on 'Developing Winning Research Proposals'	NAARM, Hyderabad	26 - 30 October, 2004

Scientists	Programme	Venue	Date / Duration
Dr. S. Dam Roy Senior Scientist (Fish & Fishery Sciences)	Third Indian Fisheries Science Congress	IARI, New Delhi	4 - 6 November, 2004
Dr. R.P. Medhi Principal Scientist (Horticulture) **Dr. D.R. Singh** Senior Scientist (Horticulture)	First Indian Horticulture Congress	IARI, New Delhi	6 -9 November, 2004
Dr. M. Din Senior Scientist (Farm Machinery & Power)	Seminar on Conservation and utilization of water in A & N Islands	JNRM College Port Blair	22 November, 2004
Dr. S.C. Pramanik Senior Scientist (Agronomy)	National Symposium on Resource conservation and agricultural productivity	PAU, Ludhiana	22 - 25 November, 2004
Dr. R.B. Rai Acting Director	XVII ICAR Regional Committee Meeting No. III	Gangtok	25 - 26 November, 2004
Dr. Asit B. Mandal Senior Scientist (Plant Breeding)	ICAR Project Net Working meeting	Krishi Bhawan New Delhi	6 December, 2004
Dr. M. Din Senior Scientist (Farm Machinery & Power)	SAARC RICE EXPO-2004	Mumbai	8 - 10 December, 2004
Dr. S. Jeyakumar Scientist (Animal Reproduction)	XX Annual Convention and National Symposium on Advanced Reproductive Technologies for Management of Fertility in Livestock	College of Veterinary Science, Durg	14 - 16 December, 2004
Dr. T. Damodaran Scientist (Horticulture)	92nd session of Indian Science Congress	Nirma university Ahmedabad	3 - 7 January, 2005
Dr. M. Din Senior Scientist (Farm Machinery & Power)	Winter school on Remote Sensing and GIS Applications in Fisheries Research and Management	CIFE, Mumbai	5 - 25 January, 2005

Scientists	Programme	Venue	Date / Duration
Dr. K. Madhu Scientist (Fish & Fishery Sciences) **Mrs. Rema Madhu** Scientist (Fish & Fishery Sciences)	Winter school on 'Recent advances in mussel and edible oyster farming and marine pearl production'	CMFRI, Cochin	11 - 31 January, 2005
Dr. R.B. Rai Acting Director **Dr. A. Kundu** Senior Scientist (Livestock Production & Management)	XXIII Annual Conference and National Symposium of Indian Poultry Science Association IPSACON 2005	PDP, Hyderabad	2 - 4 February, 2005
Dr. R Elanchezhian Scientist (Plant Physiology)	16th Annual Biotechnology Information System Network Coordinators Meet	Birla Institute of Scientific Research Jaipur	3 - 4 February, 2005
Dr. S.C. Pramanik Senior Scientist (Agronomy)	International Conference on Sustainable crop production in stress environments: Management and genetic options	JNKVV, Jabalpur	9 - 12 February, 2005
All the Scientists and Director	Lecture delivered by Dr. Arun Bapat, Seismologist on Earthquake / Tsunami	CARI, Port Blair	23 February, 2005
Dr. N. Ravisankar Scientist (Agronomy)	Workshop on 'Personnel Management Information System Network (PERMISnet) of ICAR'	IASRI, New Delhi	9 March, 2005
Dr. C.B. Pandey Senior Scientist (Forestry)	National Seminar on Exotics in Indian forestry	PAU, Ludhiana	15 - 18 March, 2005
Dr. S. Dam Roy Senior Scientist (Fish & Fishery Sciences)	International Symposium on Improved Sustainability of Fish Production systems and appropriate technologies for utilization	CUSAT, Cochin	16 - 18 March, 2005
Dr. B. Ganesh Kumar Scientist (Agricultural Economics)	Sensitization-cum-Training Workshop for the 'PME Cells in the ICAR institutes'	NCAP, New Delhi	17 - 18 March, 2005
Dr. Asit B. Mandal Senior Scientist (Plant Breeding)	Project Presentation Meeting on Molecular Taxonomy	Department of Biotechnology New Delhi	29 March, 2005

RADIO TALK

Title	Date of Broadcast	Expert
Phaloon ki kheti ki sambavnaye	21.10.2004	Dr. D.R. Singh
Agricultural development strategies after tsunami disaster in Bay Islands	05.01.2005	Dr. Asit B. Mandal
Power tiller maintenance [in Hindi]	16.02.2005	Er. Deshmukh P.S.

DOORDHARSHAN INTERVIEW

Title	Date of Telecast	Expert
Dweepon mein sabjiyoon ki khashat	30.11.2004	Dr. D.R. Singh
Improved cultivation practices in banana (Unnath kela kethi)	16.02.2005	Dr. T. Damodaran
Kitchen gardening	23.02.2005	Dr. D.R. Singh
Flower cultivation in Bay Islands	05.03.2005	Dr. D.R. Singh

DISTINGUISHED VISITORS

Name & Designation	Date
Dr. O.P. Sehgal, Professor of Floriculture (Retd.), Delhi.	12.04.2004
His Holiness Jagadguru Shri Shivarathri Desikendva Mahaswamiji, Suttur Math, Mysore.	17.04.2004
His Holiness Rev. Shri Siddheshuaar Swamiji, Bijapur	17.04.2004
Capt. K. Suresh Babu, M. V. Swaraj Dweep, The SCI Ltd., Port Blair.	19.04.2004
Dr. N.G. Hegde, President, BAIF Development Research Foundation, Pune.	06.05.2004
Dr. R. Kadirvel, Vice-Chancellor, TANUVAS, Chennai.	15.05.2004
Dr. K. Gajendran, Director, Centre for Animal Production Studies, TANUVAS, Chennai	15.05.2004
Dr. A. Koteeswaran, Director, Centre for Animal Health Studies, TANUVAS, Chennai	15.05.2004
Dr. K. Ameerjan, Director, Directorate of Clinics, TANUVAS, Chennai	15.05.2004
Dr. R. Kumararaj, Professor & Head, Dept. of LPM, Madras Veterinary College, Chennai	15.05.2004
Dr. P. Gopalakrishnan, Professor, Fisheries College & Research Institute, TANUVAS, Tuticorin.	25.05.2004
Dr. G.S.R. Murti, Head, Division of Plant Physiology & Biochemistry, IIHR, Bangalore.	29.05.2004
Dr. V. Venkatasubramanian, Managing Director & CEO, KMV, Vijayawada.	05.06.2004
Shri Mandava Janaki Ramaiah, Chairman, Dairy Development Federation Ltd. & KMU, Ltd., AP	05.06.2004
Dr. S.D. Deshpande, Principal Scientist, CIAE, Bhopal.	09.07.2004
Dr. B.S. Hansra, ADG (AE), ICAR, New Delhi.	04.10.2004
Dr. D.C. Shukla, Professor cum Director, CAS (Veterinary Physiology), IVRI, Izatnagar.	07.10.2004
Shri V.V. Bhat, Chief Secretary, A & N Administration.	28.10.2004
Dr. H.S. Nainawata, ADG, Education Division, ICAR, New Delhi.	30.10.2004
Dr. M.L. Lodha, Head, Division of Biochemistry, IARI, New Delhi.	30.10.2004
Dr. B.R. Yadav, Professor, IARI, New Delhi	09.11.2004
Dr. C.K. Peethambana, Director of Research, KAU, Trichur.	18.11.2004
Dr. Mangala Rai, Secretary, DARE & Director General, ICAR, New Delhi.	14.01.2005
Shri V.P. Kothiyal, Director (Works), ICAR, New Delhi.	19.01.2005
Ms. Shashi Misra, Addl. Secretary, DARE & Secretary, ICAR, New Delhi.	20.01.2005
Dr. G. Kallo, DDG (Horticulture & Crop Science), ICAR, New Delhi.	21.01.2005
Shri Sharad Pawar, Union Minister of Agriculture, Food & Civil Supplies and Consumer Affairs & President of ICAR, New Delhi.	21.01.2005
Dr. Virendra Kumar, Tsunami Medical Relief Team from New Delhi.	15.02.2005
Dr. Arya, Tsunami Medical Relief Team from New Delhi.	15.02.2005
Dr. Malhotra, Tsunami Medical Relief Team from New Delhi.	15.02.2005
Dr. Biswas, Tsunami Medical Relief Team from New Delhi.	15.02.2005
Dr. K. Pradhan, Ex-Vice-Chancellor, OUAT & RAU, New Delhi.	25.02.2005
Dr. R.C. Tiwari, Emeritus Professor, BHU, Varanasi.	25.02.2005
Dr. M. Thyagrajan, Former Professor & Head, TANUVAS, Chennai.	25.02.2005
Dr. U.B. Singh, Dean, College of Fisheries Science, GBPUA & T, Pant Nagar	25.02.2005
Smt. Uma Bharati, Member, Institute Management Committee, CARI, Port Blair.	25.02.2005
Dr. J. C. Katyal, DDG (Education) & National Director, NATP.	01.03.2005

Shri Sharad Pawar, Hon'ble Union Minister for Agriculture, Food & Civil Supplies and Consumer Affairs and President, ICAR addressing tsunami affected farmers and media personnels in Andaman

IMPRESSION OF THE VISITORS

Dr. R. Kadirvel, Vice-Chancellor, TANUVAS, Chennai

Excellent. Compliments to the Director and his team of scientists for the good scientific work done in the institute. The centre is bound to grow to greater heights.

Dr. J. C. Katyal, DDG (Education) & National Director, NATP

Difficult and challenging situation and environment, but equally high level of scientific output and impact.

Dr. Virendra Kumar, Dr. Arya, Dr. Malhotra and Dr. Biswas, Tsunami Medical Relief Team from New Delhi

It is great experience to visit this place. The knowledge displayed is valuable to farming community.

Dr. R.B. Jain, Jain Irrigation, Jalgaon

Very happy to be here and learn about the excellent work CARI has been doing.

Visit of Zonal Co-ordinatior to tsunami affected fields

PERSONNEL

ACTING DIRECTOR — **Dr. R.B. RAI**

Head / In-Charge, Divisions / Sections

Head, Division of Animal Science	Dr. R.B. Rai
Head, Division of Field Crops	Dr. T.V.R.S. Sharma
Head i/c, Division of Fish & Fishery Sciences	Dr. R. Soundararajan
Head i/c, Division of Horticulture & Forestry	Dr. R.P. Medhi
Head i/c, Division of Natural Resource Management	Dr. S. Ghoshal Chaudhuri
In-Charge, Social Science Section	Dr. S.C. Pramanik
In-Charge, Planning, Monitoring & Coordination Cell	Dr. B. Ganesh Kumar
In-Charge, Computer Cell	Dr. N. Ravisankar
In-Charge, Library	Shri. Gangopadhyay
In-Charge, Central Instrumentation Facility	Dr. Jai Sunder
In-Charge, Garacharma Farm	Shri. Gopal Nair
In-Charge, Sipighat Farm	Dr. C.B. Pandey
In-Charge, Bloomsdale farm	Dr. Asit B. Mandal
In-Charge, Desk Officer Estate	Dr. M. Din
In-Charge, Workshop	Dr. M. Din
In-Charge, Guest House	Dr. V.B. Pandey
Administrative Officer	Shri. Vivek Purwar
Finance & Accounts Officer	Shri. Rajesh Sahay
Assistant Director, Official language	Smt. Sulochana
Security Officer	Shri. N.K. Pushp
In-Charge, Krishi Vigyan Kendra	Dr. S.C. Pramanik

LIST OF SCIENTIFIC STAFF

ACTING DIRECTOR

Dr. R.B. Rai, Principal Scientist (Veterinary Pathology) & Head, Division of Animal Science

DIVISION OF HORTICULTURE & FORESTRY

Dr. R.P. Medhi, Principal Scientist (Horticulture) and Head i/c
Dr. C.B. Pandey, Senior Scientist (Forestry)
Dr. D.R. Singh, Senior Scientist (Horticulture)
Dr.T. Damodaran, Scientist (Horticulture)
Dr. A. Venkatesh, Scientist (Forestry)

DIVISION OF FIELD CROPS

Dr. T.V.R.S. Sharma, Principal Scientist (Plant Breeding) & Head
Dr. Asit B. Mandal, Senior Scientist (Plant Breeding)
Dr. G. Shyam Prasad, Scientist (Entomology)
Dr. R. Elanchezhian, Scientist (Plant Physiology)
Shri. Someshwar Bhagat, Scientist (Plant Pathology)
Dr. V. Jayakumar, Scientist (Plant Pathology)

DIVISION OF NATURAL RESOURCE MANAGEMENT

Dr. S. Ghoshal Chaudhuri, Senior Scientist (Soil Physics & Water Conservation) and Head i/c
Dr. M. Din, Senior Scientist (Farm Machinery & Power)
Dr. N. Ravisankar, Scientist (Agronomy)
Dr. R. Raja, Scientist (Agronomy)
Shri. Deshmukh Prasanth, Scientist (Farm Machinery & Power)
Dr. T.P. Swarnam, Scientist (Soil Physics & Water Conservation)

DIVISION OF ANIMAL SCIENCE

Dr. A. Kundu, Senior Scientist (Livestock Production & Management) and Head i/c
Dr. S. Senani, Senior Scientist (Animal Nutrition)
Dr. R.N. Chatterjee, Senior Scientist (Animal Genetics & Breeding)
Ms. Deepa Bhagat, Scientist (Organic Chemistry)
Shri. Satyapal Yadav, Scientist (Animal Biotechnology) *on Study Leave*
Dr. S. Jeyakumar, Scientist (Animal Reproduction)
Dr. Jaisunder, Scientist (Veterinary Microbiology)

DIVISION OF FISH & FISHERY SCIENCES

Dr. R. Soundararajan, Principal Scientist (Fish & Fishery Sciences) and Head i/c
Dr. S. Dam Roy, Senior Scientist (Fish & Fishery Sciences)
Mrs. Rema Madhu, Scientist (Fish & Fishery Sciences)
Dr. K. Madhu, Scientist (Fish & Fishery Sciences)
Shri. P. Krishnan, Scientist (Fish & Fishery Sciences)

SOCIAL SCIENCE SECTION

Dr. S.C. Pramanik, Senior Scientist (Agronomy) and In-charge
Shri. M. Balakrishnan, Scientist (Computer Applications) *on Study Leave*
Dr. B. Ganesh Kumar, Scientist (Agricultural Economics)

KRISHI VIGYAN KENDRA

Dr. S.C. Pramanik, Senior Scientist (Agronomy) & In-Charge
Shri. Nagesh Ram, STA (Fisheries)
Dr. S.K. Zamir Ahmed, STA (Agronomy / Extension)
Smt. Kanak Lata, STA (Home Science)
Shri. L.B. Singh, STA (Horticulture)
Shri. N.C. Choudhury, Training Assistant (Animal Science)
Shri. D. Bhaskar Rao, Training Assistant (Art cum Audio visual aids)

VARIOUS COMMITTEES OF THE INSTITUTE

OFFICIAL LANGUAGES IMPLEMENTATION COMMITTEE

Dr. R.B. Rai	Chairman
Dr. S. Senani	Member
Dr. S.C. Pramanik	Member
Dr. Jai Sunder	Member
Smt. Kanaklatha	Member
Shri. Phalguni Gangopadhyay	Member
Finance & Accounts Officer	Member
Administrative Officer	Member
Shri. A.K. Tripathi	Member
Smt. Sulochana	Member Secretary

INSTITUTE JOINT STAFF COUNCIL

(Staff Side)

Technical Staff

Shri Norman David	Secretary IJSC (Staff side)
Shri K. Babu Rao	Member CJSC

Administrative Staff

Shri Sridham Kr. Biswas	Member
Shri Prasanta Kr. Das	Member

Supporting Staff

Shri B. Mahadevaiah	Member
Shri A. Dorairaj	Member

(Official Side) Nominated by Director

Administrative Officer	Member
Finance & Accounts Officer	Member
Dr. N. Ravisankar	Member Secretary
Shri Deshmukh P. S.	Member
Dr. B. Ganesh Kumar	Member

CONSTRUCTION COMMITTEE

Dr. S. Senani	Chairman
Dr. C. B. Pandey	Member
Dest Officer (Estate)	Member
Finance & Accounts officer	Member
Administrative Officer	Member
Shri M. A. Selvam, T-4	Member

PURCHASE COMMITTEE

Dr. R. P. Medhi	Chairman
Dr. Jai Sunder	Member
Shri. P. Krishnan	Member
Administrative Officer	Member
Finance & Accounts Officer	Member

PRICE FIXATION COMMITTEE

Dr. S. Senani	Chairman
Farm Superindent, CARI	Member
Farm Manager, Garacharma Farm	Member
Farm Manager, Sippighat Farm	Member
Farm Manager, Bloomsdale Farm	Member
Secretary, IJSC	Member
Administrative Officer	Member
Finance & Accounts Officer	Member

GRIEVANCE COMMITTEE

Dr. R. P. Medhi	Chairman
Dr. S. Senani	Member
Administrative Officer	Member Secretary
Finance & Accounts Officer	Member
Dr. S. Dam Roy	Member (Scientific Category)
Shri Abdul Majeed, Driver	Member (Technical Category)
Shri S. K. Biswas, Jr. Clerk	Member (Administrative Category)
Shri B. Mahadevaiah, S.S.Gr.IV	Member (Supporting Category)

ARS SCIENTISTS' FORUM

Dr. R.B. Rai	Patron
Dr. R. Soundararajan	President
Dr. B. Ganesh Kumar	Secretary
Dr. A. Venkatesh	Joint Secretary
Dr. R. Raja	Treasurer

CARIEWA

Dr. R. B. Rai	Patron
Dr. R.P. Medhi	Chairman
Dr. R.N. Chatterjee / Dr. R. Elanchezhian	Secretary
Sri Prasanth Deshmukh	Joint secretary
Shri Phalguni Gangopadhyay	Cultural Secretary
Shri S.K. Biswas	Canteen Secretary
Shri Prakash Mondal	Treasurer
Smt. Archana Sharma	Member
Shri B. Mahadeviah	Member
Shri Dorairaj	Member
Shri Ali Akbar	Member
Shri Bikas Mondal	Member

NEW ENTRANTS / TRANSFER / PROMOTION

New Entrants

Shri Rajesh Sahay
Finance & Accounts Officer
w.e.f. 19.08.2004

Transfer

Name	Designation	Date
Dr. N. Sarangi	Principal Scientist	12.04.2004
Dr. R. Dinesh	Senior Scientist	26.06.2004
Dr. (Mrs.) T.E. Sheeja	Scientist	26.06.2004
Shri P. Sanyal	T-4	26.06.2004
Shri Mayank Bhshan	T-4	31.12.2004
Shri H. D. Parashuram	T-3	18.06.2004
Shri Mithlesh Kumar	Finance & Accounts Officer	21.05.2004

Promotion

Name	Designation		Date
	From	To	
Smt. P. Thulasi Devi	T-4	T-5	04.09.2003
Shri S. Murugesan	T-4	T-5	04.09.2003
Shri A. K. Tripathi	T-3	T-4	01.05.2003
Shri Nanak Singh	T-3	T-4	01.01.2003

CARIEWA

The executive committee of Central Agricultural Research Institute Employees Welfare Association of previous year was continued during the year 2004-2005.

However, Secretary, CARIEWA, Dr. R.N. Chatterjee has handed over his resignation consequent upon his transfer from CARI, Port Blair. The Executive committee members of CARIEWA have nominated Dr. R. Elanchezhian as new secretary for CARIEWA and he is continuing in that position.

During the year reported upon, CARIEWA organized and performed various activities, viz. distribution of loan, lectures, welcome function, farewell function and sports, which are as follows.

- A sum of Rs. 38000/- as short-term loan was distributed to 22 members.
- A cricket tournament for children of employees was arranged on 9-11 April, 2004.
- Career guidance for children of CARI employees was held on 22 April, 2004.
- A lecture on 'Art of living' was arranged on 13 October, 2004 at CARI, Conference hall.
- Yoga programme 'Self management of excessive tension' by Swami Vivekanda Yoga Anusandhan Sansthan was held at CARI during 17-18 February, 2005. The programme consisted of both theory and practical classes.
- Welcome function to one newly joined staff and farewell function to seven outgoing staff was organized.
- A canteen is being run to provide refreshments and meals at reasonable prices on all working days and holidays.
- An ex-gratis amount of Rs. 2000/- was paid to the family of Shri Gangadharan Nair on his sad demise.
- CARIEWA has collected Rs. 12001/- from the members for the medical treatment of Premanand Halder's son at Chennai.

CARIWA organising farewell function for the outgoing scientists and staff of the Institute

INFRASTRUCTURE DEVELOPMENT

- Construction of Circular (Ring) Road at Garacharma Farm.
- Construction of Library at Garacharma Campus.
- Construction of Field laboratory cum Seed processing unit at Garacharma Farm.
- Construction of Vermiculture shed at Garachama Farm.
- Construction of Slaughterhouse at Garacharma Farm.
- Construction of Transgenic house at Garacharma Farm.
- Construction of water reservoir at Garacharma Farm.
- Construction of Vehicle service center at Garacharma Farm.
- Construction of a Marine laboratory shed at Marine Hill Campus.
- Renovation of one block of old type-II quarters (2 Nos.) at Garacharma Farm.
- Construction of an Irrigation pond at Garacharma Farm.
- Construction of approach road for Guesthouse Lawn/Garden.
- Renovation of Fisheries Science laboratory in Central Lab.
- Construction of Ring well at Garacharma Farm.
- Construction of Nicobari Hut in the Guest House Lawn at Garacharma Farm.
- Construction of Circular Watchman shed for Director's Bungalow at Haddo.

Field laboratory cum Seed processing unit

Slaughterhouse

Transgenic house

Fisheries Science laboratory

Irrigation pond

Marine laboratory

INDEPENDENCE AND REPUBLIC DAY CELEBRATIONS

Independence Day and Republic Day were celebrated in the Institute with gaiety and fervor. On 15th August, 2004 and 26th January, 2005, Dr. R.B. Rai, Acting Director hoisted the National Flag and all the staff of the institute attended the ceremony with patriotism. He lauded the effort of the scientists, technical and administrative staffs of the institute in general. He particularly commended the dedication and involvement shown by the scientific community in the quick assessment of the agricultural scenario in the aftermath of the unprecedented earthquake of 9.0 magnitude on the Richter scale in these Islands and the consequent Tsunami triggered devastation on the livelihood options of the farming community. He further stressed upon to explore and utilise the opportunities generated out of this adversity to cater to the needs of the farmers and tribals of Andaman and Nicobar Islands.

Dr. R.B. Rai, Acting Director hoisting the National Flag on the eve of Republic day in 2005 and offering floral tributes to the Father of the Nation