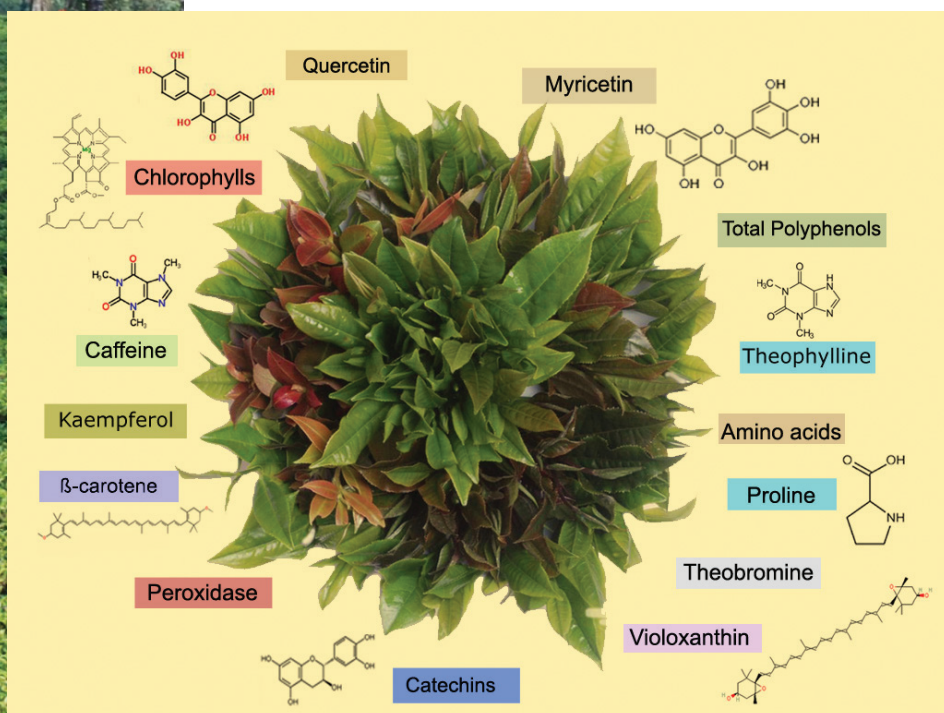


ANNUAL REPORT

2011



Tea Research Institute of Sri Lanka
Talawakelle

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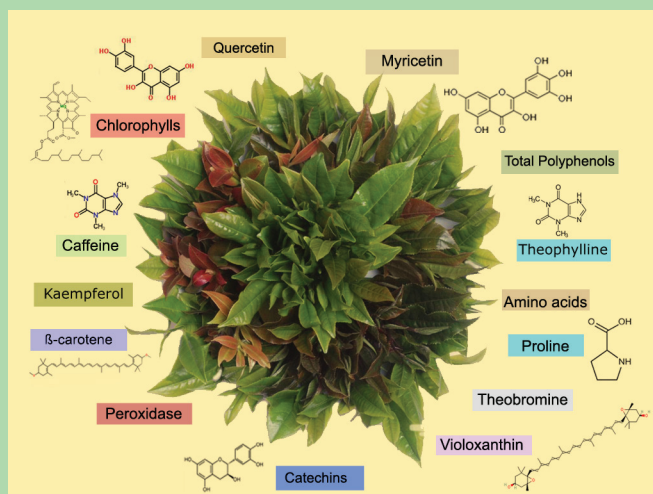
Annual Report 2011

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Cover



Metabolite Profiling of Tea Germplasm

Investigation has been initiated to explore the metabolite diversity of the morphologically diverse tea germplasm of Sri Lanka.

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TEA RESEARCH INSTITUTE OF SRI LANKA

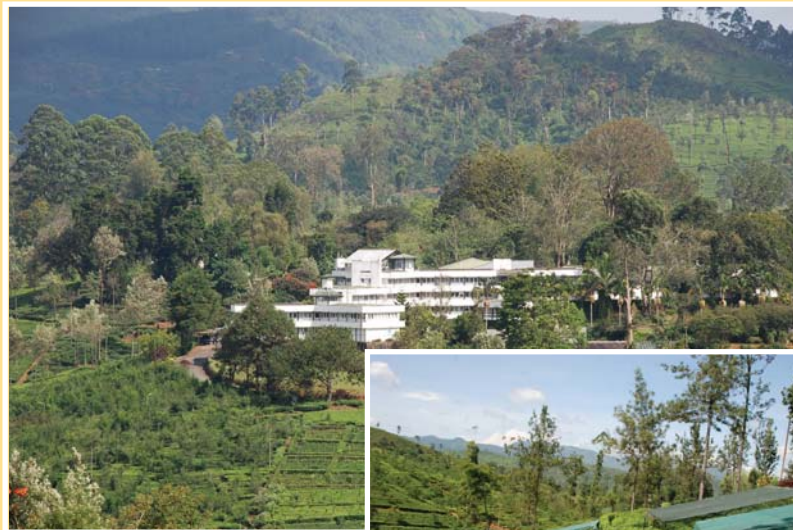
The Tea Research Institute of Sri Lanka (TRI) was founded in 1925 in accordance with the provisions of an Ordinance passed in the Legislative Council of Ceylon to enrich the tea industry through professional tea research. The TRI established as an arm of the Planters' Association of Ceylon, is presently governed by the Tea Research Board of Sri Lanka subsequent to gradual transformation.

VISION

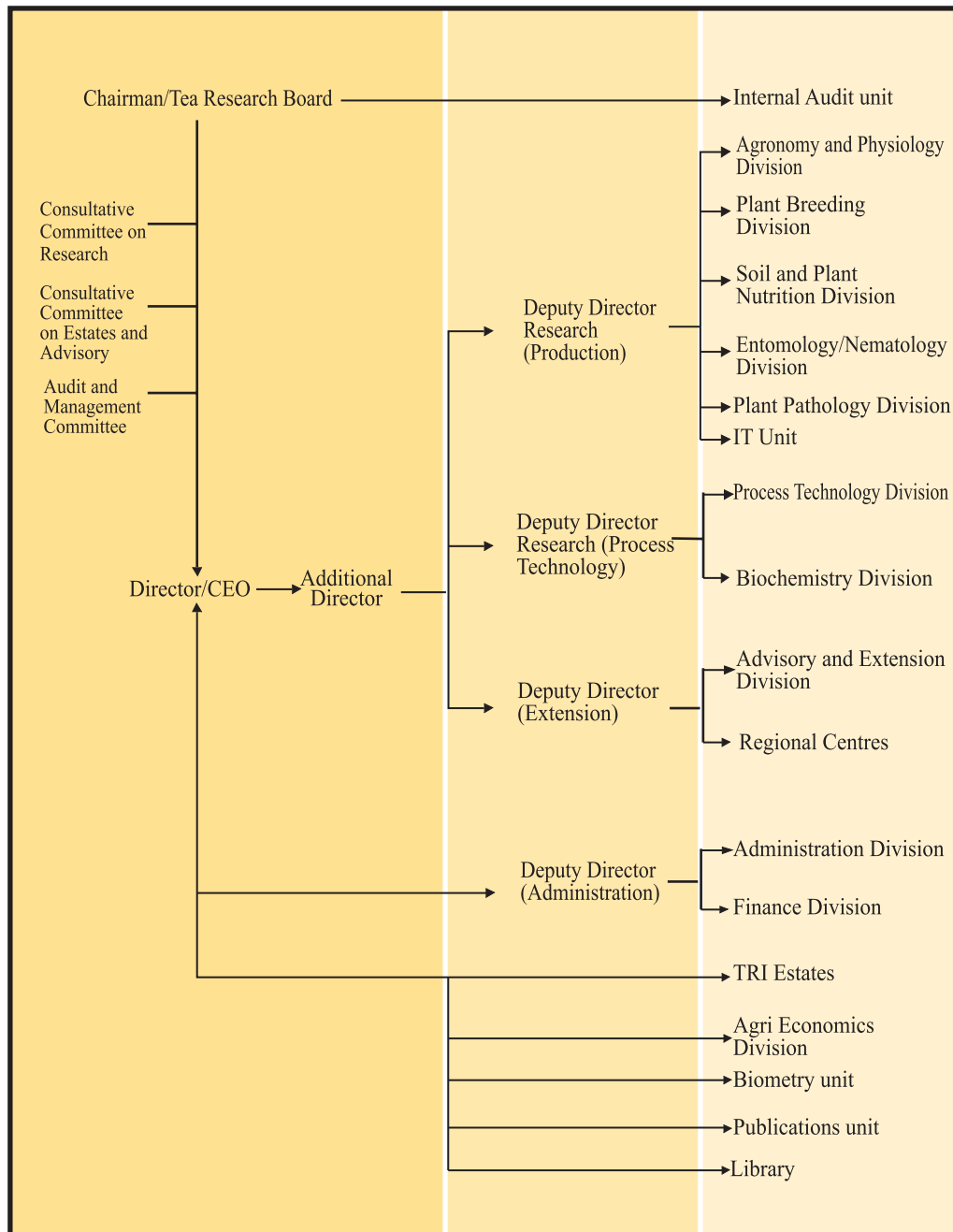
To achieve excellence in tea research and to provide technological guidance to the tea industry, in order to make Sri Lankan tea the most preferred tea in the world, at a competitive price

MISSION

To generate and transfer scientific knowledge and technologies appropriate for the stakeholders to improve productivity and quality of Sri Lankan tea in a most profitable manner



Organizational Structure of the TRI



BOARD OF MANAGEMENT

TEA RESEARCH BOARD OF SRI LANKA

The TRI is presently governed by the Tea Research Board of Sri Lanka that was established on 12th November 1993 under the provisions of the Tea Research Board Act No. 52 of 1993. In 2007, Tea Research Board act was amended, and a Supplementary Act No. 43 of 2006 was approved by the Cabinet.

The functions of the Tea Research Board shall be to engage in, and to encourage, foster and facilitate, research leading to cultivation and processing of tea.

Specific functions of the Tea Research Board

- To conduct, assist and encourage scientific and technological research and investigations into all problems and matters affecting the production and processing of tea including the prevention and control of pests and diseases, improvement of quality of processed tea, as well as diversification of products of tea and to disseminate and publish results of such research
- To conduct, assist and encourage research into the economic viability of the tea industry in Sri Lanka, including future economic trends of the industry
- To establish and maintain relations with research institutions in Sri Lanka and abroad
- To conduct joint study programmes, seminars or symposia, with foreign and local research institutions



Seated: Mr. N. Padmasiri Kariyawasam, Dr. I. S. B. Abeysinghe, (Director/TRI), Dr. S.S.B.D.G. Jayawardena (Chairman/TRB), Mr. P.L.U. Dissanayake, Mr. J.M.B.J. Bandara.

Standing : Dr. M.T.K. Gunasekare (Convenor/Secretary), Dr. D.S.A. Samaraweera, Mr. Ajith Abeyssekera, Mr. Prasanna Fernando, Dr. D.V. Seevaratnam, Mr. Leonard Jayasinghe.

Members of the Tea Research Board

- Dr. S S B D G Jayawardena
Chairman, Tea Research Board
- Dr. I S B Abeysinghe
Director, Tea Research Institute of Sri Lanka
- Mr. Prasanna Fernando
Head of Institutional Sales
Pan Asia Banking Corporation PLC
- Mr. P L U Dissanayake
Additional Secretary,
Ministry of Plantation Industries
- Dr. D V Seevaratnam
Chief Executive Officer,
Watawala Plantations Ltd
- Mr. L P Jayasinghe
Representative - Sri Lanka Private Tea Factory Owners Association
- Mr. Ajith Abeysekara
Director, Department of National Budget
- Mr. N Padmasiri Kariyawasam
Chairman, Tea Holdings Development Authority
- Dr. D S A Samaraweera
Head of Operations, Tea Smallholders Factories PLC
- Mr. J M B J Bandara
President,
Sri Lanka Federation of Tea Small Holdings Development Authority
(Re-appointed on 03.11.10)
- Convenor/ Secretary to the TRB
Dr. (Ms) M T K Gunasekara, Tea Research Institute of Sri Lanka

CONSULTATIVE COMMITTEES

Members of the Consultative Committee on Research

- Dr. D S A Samaraweera (Chairman of the Committee)
Head of Operations, Tea Smallholders Factories PLC
- Dr. S S B D G Jayawardena
Chairman, Tea Research Board
- Dr. I S B Abeysinghe
Director, Tea Research Institute of Sri Lanka, Talawakelle
- Dr. D V Seevaratnam
Chief Executive Officer, Watawala Plantations Ltd
- Dr. P Sivapalan
Ex-Director, Tea Research Institute of Sri Lanka
- Prof. W A J M de Costa
Faculty of Agriculture, University of Peradeniya
- Prof. H P M Gunasena
Chairman, Coconut Research Board
- Mr. N B H Pilapitiya
Proprietor, New Vithanakanda Tea Factory,
Kalawana.
- Mr. M B Cyril
Deputy General Manager (Development),
Tea Small Holding Authority
- Mr. S K L Obeysekare
Director/ Chief Executive Officer,
Balangoda Plantation Ltd and Madulsima Plantation Ltd
- Mr. L P Jayasinghe
Representative, Sri Lanka Private Tea Factory Owners Association
- Mr. P M Samarasinghe
General Manager (Production),
Agro Technica Ltd
- Mr. Fred R Amarasinghe (From June 2011)
Forbes & Walker Tea Brokers (Pvt) Ltd
- Mr. G D V Perera
Director, Lankem Tea & Rubber Plantations (PVT) Ltd
- Mr. L J Pieris
Managing Director, Helix Engineering (PVT) Ltd
- Convenor/Secretary
Dr. L S K Hettiarachchi, Deputy Director Research (Production)

Members of the Consultative Committee on Estates and Advisory Services

- Dr. D V Seevaratnam (Chairman of the Committee)
Chief Executive Officer, Watawala Plantations Ltd
- Dr. S S B D G Jayawardena
Chairman, Tea Research Board
- Dr. I S B Abeysinghe
Director, Tea Research Institute of Sri Lanka
- Dr. L S K Hettiarachchi
Deputy Director Research (Production), Tea Research Institute of Sri Lanka
- Dr. D S A Samaraweera
Head of Operations, Tea Smallholder Factories PLC
- Prof. W A D P Wanigasundara
Head, Department of Agricultural Extension
University of Peradeniya
- Mr. K G B Obeysekare
General Manager
Tea Small Holdings Development Authority
- Mr. R K Nathaniel
Ex-Head, Advisory & Extension Division, Tea Research Institute of Sri Lanka
- Mr. Dhayan Madawala
Chief Executive Officer, Hapugastenna Plantation Ltd
- Mr. S Wirasinghe
Ex-Director (Extension), Department of Agriculture
- Mr. T A G de Mel
General Manager, Balangoda Plantations PLC
- Convenor/Secretary
Dr. V S Sidhakaran, Senior Advisory Officer, Advisory and Extension Division,
Tea Research Institute of Sri Lanka

Members of the Audit and Management Committee

- Mr. Ajith Abeysekare (Chairman of the Committee)
Director Department of National Budget
- Mr. J M B J Bandara
President, Sri Lanka Federation of Tea Small Holdings Development Societies
- Mr. P L U Dissanayake
Additional Secretary, Ministry of Plantation Industries
- Convenor/Secretary (Up to August 2011)
Mr. R Kariyawasam, Internal Auditor, Tea Research Institute of Sri Lanka
- Convenor/Secretary (From August 2011)
Mr. K J C J Rodrigo, Deputy Director (Administration), Tea Research Institute of Sri Lanka

REPORT OF THE CHAIRMAN, TRB

On behalf of the Tea Research Board, I have great pleasure in presenting the Annual Report, Audited Financial Statement of the Sri Lanka Tea Research Institute for the year 2011.

During the year 2011, National tea production recorded a 328.37 million kg, a marginal decline from 2010 which recorded a production of 329 million kg which was the highest ever recorded. Of the total production, tea small holding sector recorded a 230 million kg production which was 70% of the total production while twenty Regional Plantation Companies (RPCs) managing about 307 estates and other estates managed by Janatha Estates Development Board (JEDB), Sri Lanka State Plantations Corporation (SLSPC) and Elkaduwa Plantations together produced the balance 98.47 million kg. The estimated average tea yield (productivity) of corporate sector and small holding sector during 2011 was about 1280 kg/ha/yr and 1970 kg/ha/yr of made tea respectively. This clearly indicates that our tea productivity levels are comparatively less than that of our major competitors like Kenya and India. Low productivity of our tea lands remain the biggest challenge for the industry as well as for the TRI Scientists as other cost components such as labour, energy and fertilizer have become beyond the control of industry managers due to their dependence on local and global socio-economic dimensions. The year 2011 became the most challenging year for the tea industry with significant increase in cost of production mainly due to very high wage increase and also high cost of other inputs.

Tea Research Board through its interactive mechanisms with the industry stakeholders mainly tea small holder sector, plantation sector through Planters' Association, Private Tea Factory Owners, promptly responded to various challenges by organizing seminars, meetings and discussions on various industry issues such as reducing cost of production, increasing fertilizer use efficiency and reduction of energy consumption in tea processing. Tea Research Board directed the Tea Research Institute to focus on the importance of mechanization of tea harvesting through appropriate

machinery development with the involvement of private sector and universities.

Recognizing the importance of small holder sector contribution to national tea production and importance of government fertilizer subsidy, TRI continued to focus an adaptive research program to evaluate suitable fertilizer mixtures and use of healthy planting material of recommended cultivars.

The Tea Research Board closely monitored the progress of the Institute's external review of Divisional Research Programs with the involvement of external scientists. In order to ensure that need based research is undertaken by the Institute and research outputs are relevant to the industry needs, Tea Research Board (TRB) regularly evaluated the divisional research programs. Consultative Committee meetings on Research held quarterly continued to serve as an effective mechanism to evaluate stakeholder acceptance of TRI technologies developed and recommended for adoption. Similarly Consultative Committee on Estate and Advisory Services which met quarterly monitored the Advisory and Extension programs to ensure that the stakeholder needs are addressed through the activities of the division. This Committee regularly monitored the performance of St. Coombs Estate and St Joachim Estate to ensure that these two properties of TRI are managed efficiently and profitably.

TRI and TSHDA linkage meeting was held to discuss and review the technology transfer procedures and identification of training needs and skill development programs to better serve the small holder. Regional Scientific Committees held regularly in different regions continued to focus on emerging region specific industry issues. Regional Scientific Committee meetings provided an opportunity for Plantation Managers to interact with scientists effectively in a participatory manner.



*Dr. S S B D G Jayawardena
B Sc Agric. (Ceylon),
M Sc (Kyoto, Japan)
Ph D (Kyoto, Japan)*

Newly opened Advisory and Extension Centre at Matugama to cater to extension needs of 38,184 small holders and 69 proprietary estates organized a Crop Clinic focusing mainly on Plant Propagation and Nursery Management. It was encouraging to note that the District Secretary, Kalutara and Divisional Secretaries of the area played a leading role in organizing the event as tea small holder sector in this District drives the rural and economy livelihood of large number of villagers.

The Themes of the Experiments & Extension (E&E) forums held at TRI, Talawakelle during 2011 were “The Challenges for Sri Lankan Tea – Satisfying Current Global Market Requirements” and “Addressing Productivity Decline Through Proper Land Management”. Experiments and Extension Forum conducted by the TRI continue to remain the most popular event among stakeholders, viz. Chief Executive Officers, Senior Managers of Plantation sector, officials from Sri Lanka Private Tea Factory Owners (SLPTFO), Tea Small Holdings Development Authority (TSHDA), Sri Lanka Tea Board (SLTB) and Tea Small Holder Federation (TSHF). E&E forum conducted in Sinhala medium held twice a year in 2011 at Ratnapura aimed to cater the technological needs of the Tea Small Holder sector on timely issues such as small holder profitability, understanding soil buffering capacity and importance of crop diversification to enhance smallholder income.

E&E forum, Regional Technical and Extension Forum (RTEF) and crop clinics regularly conducted at regional level continued to serve the small holders technological information needs effectively, providing opportunities for farmers and extension workers to interact with Institute’s scientists in a friendly environment.

The Low Country Regional Centre at Ratnapura continued to play a prominent role in serving the tea small holder technological information needs through various interactive mechanisms with TSHDA while providing estate sector advisory needs. Tea small holder sector extension needs in Deniyaya, Galle and Uva regions were effectively provided by Advisory and Extension Centres at Deniyaya, Kottawa and Passara respectively through very effective interactive field activities. The Mid Country Regional Centre at Hantana continued to play a vital role in research and development activities in Plant Breeding, Plant Protection while catering to the technological information needs of the RPCs, SLSPC and JEDB plantation sector and Mid Country small holding sector. Mid-Country Regional Centre continued to coordinate the TRI mother bush program and nursery certification program contributing immensely to the spread of new tea cultivars developed by the Plant Breeders.

In 2011 Advisory and Extension Division of the Institute has taken a new initiative by providing an opportunity for the Plantation Managers to share their experience at seminars organized by TRI for senior managers of Plantation sector in partnership with

TRI scientists. This strategy has proved to be very effective in conveying their success stories to enhance acceptability of the technology while giving a feed back to scientists.

Advisory and Extension Division continued to perform advisory visits mainly to estates in plantation sector to look into specific issues and also attending to tea small holder sector needs in the field. In 2011, this division conducted 516 training programs, seminars, field days, in collaboration with other Divisions demonstrating interdisciplinary interaction at field level in solving tea growers problems.

Advisory and Extension Division has taken a leading role in organizing and strengthening public-private partnership in promoting the technology for the production of healthy planting materials through proper nursery management.

During April 2011, TRB appeared before COPE to examine the Auditor General's Report for the financial years 2005 to 2008 and proved good governance and sound financial management strategies adopted in the Institute.

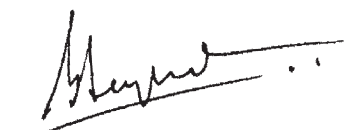
The Tea Research Board continued to monitor the administrative and financial management of the Institute to ensure highest degree of compliance of government instructions and circulars.

Governing Board closely monitored the audit committee reports regularly and scrutinized the Auditor General's reports and directed the institute to implement the recommendations of the committee.

Ministry of Plantation Industries through regular consultations, review meetings, ministerial directives guided the TRB and TRI in achieving the goals and objectives of the Corporate Plan while achieving the set targets of the government in economic development.

I take this opportunity to appreciate and acknowledge the dedicated services of the Institute scientific, supporting and administrative staff towards achieving the targets. Directions, guidance and facilitating role played by the Honorable Minister, Secretary and Ministry Staff are highly commendable.

On behalf of the Tea Research Institute, I wish to acknowledge with great appreciation the commitment, contribution and guidance given to the Chairman by the members of the Tea Research Board.



Dr. S S B D G Jayawardena
Chairman
Tea Research Board of Sri Lanka

REVIEW OF THE DIRECTOR, TRI

General:

The updated TRI website was launched by the Honorable Minister of Plantation Industries in July 2011.

A tree planting program was carried out under the national tree planting program “Deyata Sevana” launched by the Ministry of Environment to plant 1.1 million trees in the country on 15th November to commemorate 65th birthday of His Excellency the President of Democratic Socialist Republic of Sri Lanka and the commencement of second term in the office.

TRI organized a programme on pirith and alms giving on 11th and 12th May 2011 respectively, to commemorate “Sammudhathwa Jayanthi”.

The technical operation of the Sri Lanka Tea Board laboratory was handed over to TRI as per the MOU signed between the two organizations in November.

National Technical Committee on Tea appointed by Sri Lanka Standards Institution recommended a financial assistance scheme to Export Development Board to promote SLSI-SLTB product certification and to introduce system certification and capacity building/training and awareness programs.

Research, Advisory and Extension Activities:

A comprehensive review of the progress of the existing Corporate plan (2008-2012) was completed to facilitate the formulation of Corporate plan for 2013-2017.

Research Highlights:

“TRI 5000 series” – Cultivars in pipeline/ next series of tea cultivars

Evaluation of TRI 5000 series potential cultivars on nineteen adaptive trials with the partnership of growers has been continued. Four new trials were established in the corporate sector estates in different agro-climatic regions. Results revealed that five cultivars tested in WU2a region were yielding more than the popular existing cultivars/ controls, TRI 2025 and DT 1. Of those high yielding cultivars, one cultivar was found to have comparable made tea quality with DT 1.

Grower perception on TRI 3000 and TRI 4000 series cultivars

An island wide survey was initiated with the collaboration of Advisory & Extension division & TSHDA to assess grower perception on performances of recently released new series tea cultivars. Tea growers in Deniyaya and Uva (Bandarawella, Badulla and Passara) regions were surveyed and results revealed that growers have a good perception (77% in Deniyaya and 100% in the Uva) on performances of TRI 3000 and 4000 series cultivars and growers are willing to continue with new series cultivars. Survey is being continued in Kandy region.

Biochemical characterization and metabolite profiling of tea germplasm

Biochemical parameters of green leaf and black tea of 35 accessions revealed possible grouping of accessions based on the biochemical diversity. Wide variation was observed in Caffeine content among different accessions thus, suggesting its usefulness in future tea breeding programmes. A new project on metabolite profiling of tea germplasm in



*Dr. I S B Abeysinghe
B Sc (Peradeniya, Sri Lanka)
Ph D (Sheffield, UK)*

Sri Lanka funded by National Research Council was initiated aiming rational utilization of tea germplasm in tea breeding and crop improvement programme.

Improved seeds as alternative planting materials for marginal tea growing areas

Owing to revived interest among tea growers for alternative planting materials suitable for marginal growing conditions, there has been an increasing demand for improved seeds. Work has been initiated to link growers with commercial seed gardens to facilitate seed collection during peak fruiting periods.

Screening tea shoot characteristics amenable for mechanical harvesting

Shoot characteristics were studied to identify the amenability of different tea cultivars for mechanical harvesting. The shorter inter-nodal length and wider angle of leaf positively correlated with the yield reduction while shoot density correlated negatively. Leaf length was positively correlated with both damaged shoot content and stalk content in the mechanically harvested crop while coarse leaf content in the harvested crop was negatively correlated with the leaf curviness.

Screening of tea accessions, cultivars and seed stocks against major tea pests

The potential accessions, cultivars and seed stocks identified for low, mid and high elevation areas by the Plant Breeder were screened for major tea pests. During the period under review, 82 tea accessions, cultivars and seedlings were evaluated against *Pratylenchus loosi*, *Radopholus similis*, shot hole borer and low country live wood termite for resistance and or tolerance at various localities following standard protocols.

Development of water management techniques

Field experiments on drip/sprinkler irrigation were completed in 2011 and significant findings are given below:

Drip Irrigation

Responses of two contrasting tea cultivars TRI 2023 and TRI 3025 to drip irrigation were evaluated. Drip irrigation increased tea yield by 2.6-2.8 times during dry spell and annual yield by 20% when compared with rain fed tea. The yield response of TRI 2023 for irrigation is greater than that of TRI 3025 indicating differential cultivar responses for drip irrigation. Further, the incidence of stem canker was reduced by more than 80% with drip irrigation. Results suggest that Drip irrigation is feasible for high yielding cultivars.

Drip and Sprinkler Irrigation

Tea cultivar TRI 2023, when sprinkler irrigated produced 6% higher yield than drip irrigated plants. Sprinkler irrigated plants maintained a lower leaf temperature than drip irrigated plants, facilitating higher physiological activities during dry months.

Evaluation of chemical properties and quality during a pruning cycle

Studies conducted to examine the variations of biochemical parameters using two cultivars, DT 1 and TRI 2025, in the different stages of a pruning cycle revealed that quality characteristics of the harvested shoots and processed tea were highest in the third year of the pruning cycle and inordinate delays in pruning affects the quality of made tea.

Use of grafting techniques to increase productivity and quality and to mitigate biotic and abiotic stresses

The scion and stock combination for incorporating high yield, quality, drought tolerance and pests and diseases resistance into a composite plant were identified. Graft combinations where TRI 777 and TRI 4079 were used as the scion, recorded the highest yield. Quality of made tea of the combinations was similar to the control TRI 777 and TRI 4079. Graft combinations TRI 4046 on TRI 4006, TRI 3072 on TRI 4006, TRI 3072 on 4053, TRI 4046 on TRI 3072 and TRI 4006 on TRI 3072 gave higher yields than their controls.

Development of site specific fertilizer recommendations

Twenty bench-marked soil series representing all tea growing regions in Sri Lanka were analyzed for Nutrient Buffering Capacity. The results showed a variation of magnesium dynamics in these soils. This information is useful when refining the existing magnesium fertilizer recommendations for tea.

Soil series from different tea growing regions were evaluated for pH buffering capacities. The soils in the tea growing regions were characterized into three main groups according to their pH buffering capacities which could be used to refine the lime requirements of the soils in tea growing areas.

Development of bio-organic fertilizers for tea

In order to promote Plant Growth Promoting Rhizobacteria (PGPR), Nitrogen fixing bacteria from tea root samples and phosphate solubilizing bacteria from rhizosphere soil samples were isolated. Screening of the isolates for their beneficial traits under nursery condition commenced to confirm practical applicability.

Molecular diagnosis of canker causing fungi in tea

Stem and branch canker caused by *Macrophoma theicola* is a serious problem in tea. Molecular diagnostic studies revealed *Fusarium* species also associated with this disease and the results indicated that the isolates are similar to *Fusarium solani*.

A key for Blister Blight severity assessment

A quantitative percentage scale was developed and validated for Blister Blight disease in order to estimate disease severity efficiently, accurately and reproducibly. The key developed would be useful for studying disease epidemiology, screening cultivars for resistance in breeding programs and evaluating the economic impact of a disease and the benefit of particular control strategies.

Assessment of the impact of global climate change on the productivity and profitability of the tea industry

A new model was developed by modifying Sheffield Dynamic Global Vegetation Model, to predict the impacts of climate change on the productivity of different tea growing regions representing different elevational zones in Sri Lanka.

Assessing the impact of climate change on the growth and productivity of tea

Analysis of monthly data for a thirty year period and recognition of long term trends, patterns and variations in tea growing regions completed. A study was initiated to find out drought occurrence patterns over the last forty year period using daily rainfall data at different agro-meteorological stations maintained by TRI.

Improvement of price and premium grade percentage by interchanging roll breaker meshes in processing low grown black tea

A study conducted to find out suitable combinations of No 3 and 4 mesh combination during rolling stage to increase premium grades percentages and net sale average of teas revealed that introducing No 4 mesh to separate tea particles just after 1st rolling and combination of No 3 & 4 meshes to separate tea particles in subsequent rolling stages could increase main grade percentages and prices of main grades.

Determinants of Cost of Production (COP) of tea small holders in low country wet zone (Ratnapura district)

A survey was conducted to estimate the Cost of Production (COP) and to identify determinants of COP and constraints faced by tea smallholders. Results revealed that COP/kg for different holding category differ. The lowest COP was obtained for the holding category of 0.75 – 1.5Ac which was significantly different from other land category. The highest share of COP is labour which was 72% of the total COP. Poor knowledge on new technology, lack of awareness about finance and training institutions, high price fluctuation and low price of green leaf were recorded as main constraints faced by the small holders.

Development of a model for out grower system in tea estates

The out grower concept was introduced to Selagama estate under Elkaduwa Plantation Company to develop a model. Results of the preliminary analysis showed that average productivity of out grower land has improved in the year 2011 in comparison to year 2010.

Issues related to Maximum Residue Limits (MRLs) of pesticides in made tea

Ministry of Industry and Commerce granted Rs. 7.3 million for pesticide residue analysis related to revision of MRLs set by EU and Japan.

A multi-residue method was developed to analyze selected pesticides. Diazinon was incorporated into the multi residue method developed for conazole fungicides (Bitertanol, Hexaconazole, Propiconazole and Tebuconazole). A new set of pesticides are being incorporated for the recovery study in order to increase the number of constituents in the multi-residue method developed for four types of conazoles and diazinon. Oxyfluorfen, Fipronil (MRL – 0.005 mg/kg) and Pyraclostrobin (0.05 mg/kg) have been tested along with the four types of conazoles and diazinon.

An analytical method for quantification of multiple residues of fungicides such as Bitertanol, Propiconazole, Hexaconazole and Tebuconazole was developed using Gel Permeation Chromatography (GPC) and Gas Chromatography Electron Ionization Mass Spectrometry (GC-EIMS).

A declining trial conducted with alternative, new generation fungicide, Pyraclostrobin, during wet season revealed that the residue level achievable after 07 days exceed the MRL stipulated by the EU, indicating the need for submitting an application for revision.

Inter-laboratory Testing Programmes

Inter-laboratory testing programmes are essential to maintain the proficiency of the analytical parameters. TRI continue to participate in these programmes conducted by both international and national agencies and participated in the following proficiency testing programmes:

International Standards Organisation (ISO): Second round of the quantification of L-theanine using HPLC was carried out as per the ISO guidelines. The data were submitted to ISO.

Sri Lanka Association for Testing Laboratories (SLATL): Inter laboratory testing programme for the ISO 3720 parameters were conducted by the SLATL.

Training and Technology Dissemination

Stakeholder Forums:

As a new participatory approach with the aim of enhancing the interaction between TRI scientists and the stakeholders, two seminars were conducted in April and October for Chief Executive Officers and all the senior management of Regional Plantation Companies and other tea related organizations. The document on “Agronomic Profile of the Corporate Sector Tea Plantations”, the outcome of diagnostic survey, was released at the first seminar held in April.

Crop Clinics:

A Crop Clinic was held at TRI Matugama Regional Center in December 2011 under the theme of “A healthy tea plant for a sustainable tea field”. Main objective of the event was to disseminate the technology know-how on producing healthy and quality nursery plants.

Fertilizer Adaptive Trials:

Adaptive trials on TRI recommended fertilizers mixtures and the fertilizer mixtures preferred by the smallholders were established to elicit the smallholders views on TRI fertilizer recommendation. Regular monitoring and data collection were done jointly by the staff of advisory division and the TSHDA.

Para Extension Approach (PEA) for the Corporate Tea Sector:

In order to assess the agricultural knowledge and adoption gaps at supervisory and worker level employees of corporate sector tea estates, the pilot scale collaborative project on *Para Extension Approach (PEA)* with Watawala Plantations was continued in the year 2011. The training covered not only technical subjects but also subjects related to improving communication skills of para trainers, health, nutrition, related to worker productivity. Six programs were completed during the year and 30 para trainers were trained.

Cyber Extension Activities:

Cyber extension, using all possible information and communication technologies, was initiated as an appropriate and timely information delivery mechanism affordable to tea growers both in corporate sector and smallholding sectors. The main objective of this initiative was to fill the technology adoption gap of tea growers by reducing time taken for information delivery between technology generation system and the technology user systems.

Commercial Nursery Inspection:

On the request of TSHDA, 137 commercial tea nurseries were inspected. It was found that about 55-60% of nursery plants inspected were suitable for recommending, in terms of the size of bag, number of leaves and the height of nursery plants.

Uncultivated Land Survey:

Staff of the advisory division and the staff of some research divisions were actively participated for the data collection of the land use survey in all tea growing regions organized by the Ministry of Plantation Industries

ADB Mother Bush Project:

7.8 million cuttings of TRI 3000 & TRI 4000 series cultivars have been issued to Small holders and the corporate sector estates. In the Uva region, there was a preferred demand for cultivars such as TRI 4053, TRI 4052, TRI 4042 and TRI 3019. In the low country, the most demanding cultivar was TRI 4049 while in the mid country demand was for TRI 4006 and TRI 4046. In the up country region, the demand was more for TRI 4071, TRI 4052 and TRI 3019.

Publications, Patents, Awards and Recognition:

There were seven publications in refereed journals during 2011. In addition to the regular TRI publications such as SLJTS, TRI Update and '*Thei Thathu*', three advisory circulars (PA2, PM4 and PM5) and two new guidelines on "Measures to be Adopted on Tea Lands Following Drought" and "Burying of Pruning to Improve Soil Fertility and Productivity of Tea Lands" were published.

On 25 August 2011 at the BMICH Dr. I. S. B Abeysinghe and Dr. Nimal Punyasiri were awarded First Prize in the National Awards for Excellence in Agricultural Research.

Dr. K M Mewan was awarded the 'Hiran Tillekeratne Research Award' for outstanding postgraduate research carried out during 2007 to 2009, in the field of Natural Science, by University Grants Commission, Colombo, Sri Lanka on 21 February 2011.

Mr. J D Kottawa Arachchi received two awards, Best PGIA student presentation and best presentation in the session on Biochemistry & Food Science, at the 23rd Annual Congress of Post Graduate Institute of Agriculture for the research paper presented on "Analysis of selected biochemical constituents in black tea for predicting the quality of tea germplasm in Sri Lanka".

Dr. P A N Punyasiri received a research grant worth of Rs. 9.3 million from the National Research Council of Sri Lanka to carry out research on “Metabolite profiling of Sri Lankan Tea Germplasm” for a collaborative project between Biochemistry and Plant Breeding division of TRI and University of Peradeniya.

The following three research proposals submitted were selected to be included in the National Agricultural Research Plan by the Sri Lanka Council for Agricultural Research Policy:

- “Morphometric and molecular characterization of tea nematode populations in Sri Lanka with reference to climate change scenario in tea plantations”
- “Development of early selection criteria for screening tea germplasm for high black tea quality using a combination of biochemical and molecular markers”
- “Development of disease resistant tea varieties through inter-specific hybridization and embryo rescue”

New Publications and Patents:

- Sri Lanka Journal of Tea Science – Volume 74 Part 2
- Advisory Circular No: P A 2 – Drought Mitigation in Tea Plantations
- Advisory Circular No: P M 4 – Protection of Young Tea from Nematodes
- Advisory Circular No: P M 5 – Sampling for Nematode Analysis (PM 5)
Guideline No: 01/11 – Measures to be Adopted on Tea Lands Following Drought (Sinhala / English)
- Guideline No: 02/11 – Guideline on Burying of Pruning to Improve Soil Fertility and Productivity of Tea Lands
- TRI update : Volume 13; No. 2
- “*Thei Thathu*” Volume 7; Part 1
- “*Thei Thathu*” Volume 8; Part 1
- Annual Report 2010 - (English)
- Annual Report 2010 - (Sinhala)
- Annual Report 2010 - (Tamil)

Collaborative work/links with other organizations:

Head, R&D of Nestle South Asia Region, visited the TRI in March 2011 to discuss the possibility for research collaborations between two organizations.

A collaborative project on “Soil fertility improvements using slow releasing fertilizer” was continued with Sri Lanka Institute of Nanotechnology (SLINTEC).

Scientists at TRI continued to serve as resource persons for the degree programme on Tea Technology and Value Addition at Uva Wellasa University.

Collaborative project on the use of Bio-film bio fertilizer (BFBF) in tea with Institute of Fundamental Studies was continued. Adaptive trials on the use of BFBF in the nursery as well as in immature tea fields was initiated.

A meeting was held on 8th July 2011 with the officials from Natural Resources Management Center (NRMC) to discuss collaborative research proposals on climate change and weather forecasting. Three projects were identified: (1) Establishment of trends of climate changes over the past few decades in all tea growing AERs and projections for the year 2025 – 2050; (2) Identification and mapping of vulnerable areas for climate change impact and (3) Seasonal weather forecasting. It was decided to focus on Projects (1) and (3) in the first phase of the project.

A Chinese delegation headed by Mr. He Guanxin, Vice Mayor of the Hangzhou Municipal Government visited TRI on 20th April 2011 to discuss possible research collaborations.

Director's forum which comprises Chairmen and Directors of all crop research institutes was held with the main objective of organizing the 4th Symposium on Plantation Crop Research.

Important Meetings/conferences attended:

- Dr. S S B D G Jayawardena, Chairman, TRB joined the official delegation led by the Honorable Minister of Plantation Industries to Indonesia to sign the MOU with the Ministry of Agriculture for the development of oil palm sector in Sri Lanka, from 02nd- 04th January.
- Dr. S S B D G Jayawardena, Chairman, TRB participated as a Member of the delegation with the Honorable Minister of Plantation Industries to Japan to discuss and identify development projects and strengthen tea promotion activities with the Japanese government and trade organizations, from 11th - 21st February.
- Dr. I S B Abeysinghe, Director, TRI attended the National Conference on Tea held in Silguri, India as an “Invited Speaker” from 09th - 15th March.

- Dr. S S B D G Jayawardena, Chairman, TRB participated as a Member of the delegation with the Honorable Minister of Plantation Industries to Germany to discuss and identify development projects related to strengthening tea promotion activities and maximum residue limits (MRLs) in processed tea with the German Tea Association and Council from 21st - 27th June.
- Dr. S S B D G Jayawardena, Chairman, TRB and Dr. K M Mohotti, Head, Entomology Division participated at the 19th FAO/IGG meeting on Tea and 1st Africa Tea Convention held in Kenya from 18th - 22nd July.
- Dr. I S B Abeysinghe, Director, TRI participated at the World Tea Congress, Tocklai Experimental Station from 21st - 25th November in Assam, India.
- Dr. (Ms) M T K Gunasekera, Head, Plant Breeding Division participated as an invited scientist at the meeting of Expert Consultation on Agricultural Biotechnology, Biosafety, and Bio security held in Chinese Taipei, from 25th - 29th October.
- Dr. (Ms) M T K Gunasekera, Head, Plant Breeding Division; Dr. G P Gunaratne, Head, Soils & Plant Nutrition Division, Mr. B A D Samansiri, Head, Advisory & Extension Division; and Dr. M A Wijeratne, Senior Research Officer, Agronomy Division visited the United Planters Association in Southern India (UPASI) and some tea plantations in South India followed by participating at the World Tea Congress organized by Tocklai Experimental Station in Jorhat, Assam during 16th - 25th November.
- Dr. K M Mohotti, Head, Entomology Division participated at the Conference of Parties of Montreal Protocol held in Bali, Indonesia organized in parallel with the Tea Ceremony from 21th - 25th November.
- Dr. K G Prematillake, Head, Agronomy Division participated at the 6th World Congress on Allelopathy held in Guangzhou, China from 14th - 21st December.
- M/s L R M C Liyanage, D M G S Thanayamwatta, W M S Wijayatunga, Dr. G P Gunaratne, Prof. A N Jayakody, presented a research paper on “Categorization of tea growing soils based on pH buffering capacity” at the 10th International Conference of the East and Southeast Asia Federation of Soil science Societies held at Cinnamon Lake Hotel Colombo from 10th – 13th October .
- Dr. G P Gunaratne, and M/s L R M C Liyanage, Prof. A N Jayakody, W M S Wijayatunga, S M Dissanayake, presented a research paper on “Impact of locality conditions on potassium availability in tea plantations of Sri Lanka” at the

International Symposium on Role of Potassium in sustaining the yield and its quality, organized by the International Potash Institute at the Hotel Topaz, Kandy from 27th – 28th October .

Administrative and Financial Matters:

The Institute's Scheme of Recruitment (SOR) prepared as per the guidelines of Management Services Division (MSD) Circular Nos. 30 and 30 (1) of the General Treasury was approved on 16th September, 2011.

The performance of the TRI from 2005- 2008 and audit queries were discussed at the COPE on 8th April 2011.

Human Resources:

After rendering more than 30 years of valuable service, Ms. Jayanthi Jayasundara, Senior Research Officer, Mr. K D Dahanayake, Senior Advisory Officer/OIC, TRI Kottawa Station and Mr. K G Piyasena, Public Relations Officer retired from TRI services in 2011. Two Research Officers and four Experimental Officers resigned from TRI services in 2011.

Mr. K J C Rodrigo assumed duties as the Deputy Director (Administration) with effect from 1.2. 2011. Dr. W S Botheju and Dr. G P Gunaratne were appointed as Head, Process Technology and Head, Soils & Plant Nutrition respectively with effect from 1.08.2011.

Mr. R M R R L Ranaraja assumed duties as Resident Engineer with effect from 2.05.2011.

Mr. T M S K Tennakoon was recruited as Superintendent, St Coombs estate with effect from 15.08.2011. Mr. D L A L A Dasanayake and Ms. H R M P Abeyratna were recruited as Research Officers with effect from 01.08.2011.

17 Technical Officers, four clerks, six drivers, and 26 general workers were also recruited in 2011.

Dr. K M Mewan, Research Officer, Biochemistry division completed his postgraduate degree program leading to a PhD on 'Molecular Biology and Gene Technology' in October at the University of Colombo.

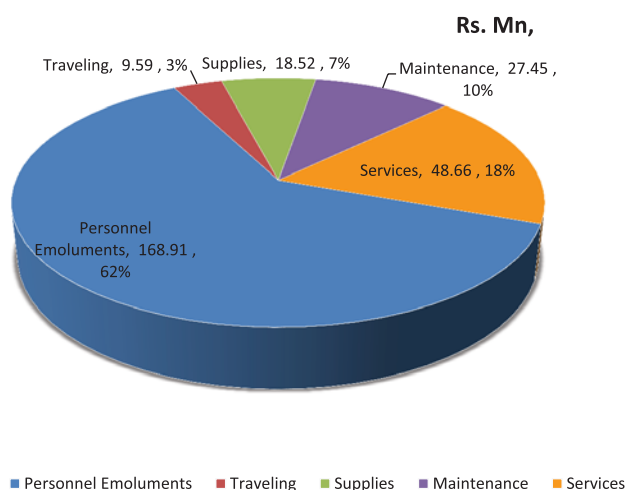
Mr. K K Ranaweera, Experimental Officer, Plant Breeding division completed his postgraduate degree leading to a M Phil degree in Crop Science from the Postgraduate Institute of Agriculture, University of Peradeniya.

Mr. K G J P Mahindapala, Advisory Officer, completed his post graduate diploma in Applied Statistics at the Post Graduate Institute of Agriculture, Peradeniya.

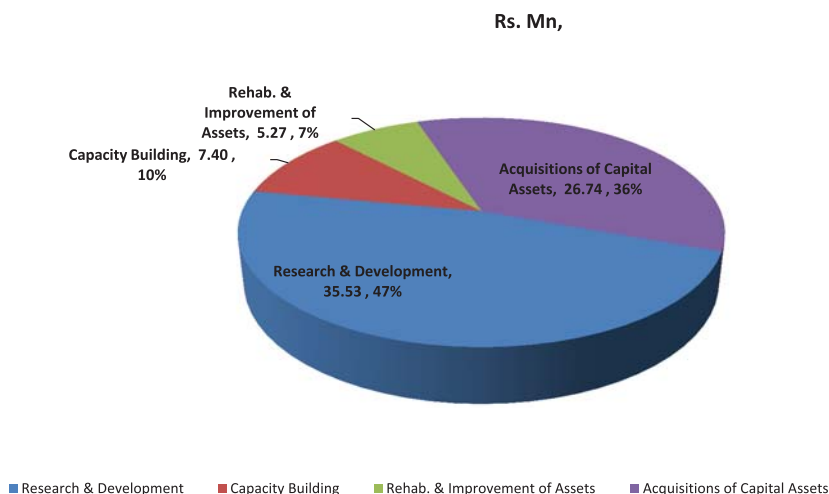
Due to non-competitive remuneration, limited opportunities for quality post graduate training and inadequate promotional prospects attracting and retaining qualified staff at the TRI has become difficult. In order to achieve the objectives set in the corporate plan and to serve the industry in a more efficient manner these constraints have to be addressed on a priority basis.

In 2011 the Treasury released Rs. Mn 233.91 and Mn 82.20 respectively for Recurrent and Capital expenditure. This was an increase compared to last year. The expenditure pattern for capital and recurrent is given below.

Recurrent Expenditure 2011



Capital Expenditure 2011



Performance of TRI Estates

St. Coombs Estate:

The Hon. Minister of Plantations Industries Mr. Mahinda Samarasinghe visited the tea factory on 22 April 2011. St. Coombs estate made a profit of approximately Rs. 2.2 Million.

Replanting

Two hectares of rehabilitated land was planted with new TRI cultivars and another two hectares of old seedling tea was uprooted and rehabilitated.

ADB Mother Bush Project

798,278 VP Shoots from TRI 3000 & 4000 Series cultivars were issued to Tea Small Holders and the Corporate Sector. The profit from the ADB Project was Rs. 901,852.63.

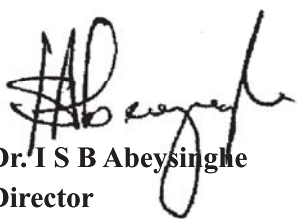
St. Joachim Estate:

The St. Joachim Factory qualified to obtain the SLSI-SLTB Product Certification for year 2011 to 2014.

ADB Mother Bush Project

A total of 287,445 shoots of TRI 3000 and TRI 4000 series cultivars were issued to small holders and the Corporate Sector.

I take this opportunity to thank the Chairman, the Board of Management, the Consultative Committees on Research, Estate and Advisory and Audit and Management for their constant support, advice and guidance extended to me during the year to carry out my duties. I wish to extend my great appreciation to all staff of the Tea Research Institute for their fullest cooperation to achieve the goals set out in the corporate plan.



Dr. I S B Abeysinghe
Director

Tea Research Institute of Sri Lanka

STAFF MEMBERS

DIRECTORATE

Director

I S B Abeysinghe B Sc (Peradeniya, Sri Lanka) Ph D (Sheffield, UK)

Director/ CEO

Deputy Directors

L S K Hettiarachchi B Sc (Peradeniya, Sri Lanka) Ph D (Aberdeen, UK)

Deputy Director Research (Production)

K J C J Rodrigo

Deputy Director (Administration)

Office Staff

S Jeyasingham, Secretary to the Director

Devika Ratnayake, Stenographer (English)

R J Rayappan, Clerk

P Selvaraj, General Worker (from 1.10.2011)

AGRICULTURE ECONOMICS DIVISION

Actg Head

H W Shyamalie B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka) Ph D (CSKHPKV, India) Research Officer

Research Officer

H R M P Abeyrathne B Sc Agric (Peradeniya, Sri Lanka), (from 1.8.2011)

Technical Officers

K W N Nadeeshani B Sc (Peradeniya, Sri Lanka)

A V K S Perera HNDT (Naiwala) Technical Assistant, (from 1.8.2011)

AGRONOMY DIVISION

Head

K G Prematilake B Sc Agric (Ruhuna, Sri Lanka) M Phil (Peradeniya, Sri Lanka) Ph D (Reading, UK) Senior Research Officer

Senior Research Officers

M A Wijeratne B Sc Agric (Ruhuna, Sri Lanka) Ph D (London, UK)

Senior Research Officer & Officer-in-Charge, Low country Regional Centre

M S D L De Silva B Sc Agric (Peradeniya, Sri Lanka) M Phil (Peradeniya, Sri Lanka) Ph D (James Cook University, Queensland)

Research Assistants

N P S N Bandara B Sc Agric (Peradeniya, Sri Lanka) (on study leave until Nov. 2011)

S R W Pathiranage B Sc Agric (Ruhuna, Sri Lanka) (Low country Regional Centre)

T L Wijeratne B Sc Agric M Sc Crop Sc (Peradeniya, Sri Lanka)

D M S Nawaratne B Sc M Phil Crop Sc (Peradeniya, Sri Lanka))

Experimental Officers

H S N Peiris B Sc Agric (Peradeniya, Sri Lanka) M Phil (Peradeniya, Sri Lanka)
(Low country Regional Centre)

A J Gamage B Sc Agric (Peradeniya, Sri Lanka)

M G S Liyanage B Sc Agric (Peradeniya, Sri Lanka) (Low country Regional Centre)

L A S P Jayasinghe B Sc Agric (Wayamba, Sri Lanka) M Sc Crop Sci (Peradeniya, Sri Lanka)

M M N Damayanthi B Sc Agric (Peradeniya, Sri Lanka) M Phil Crop Sci (Peradeniya, Sri Lanka)

D W Viithana Diploma in Agriculture (Low country Regional Centre)

U P Abeysekara Diploma in Agriculture

A P D A Jayasekara (Mid country Regional Centre)

S N Wijesekara (Mid country Regional Centre)

V Sidhakaran

E W T P Premathunga (Low country Regional Centre)

Technical Officer

W A A Hashitha Shamaka (from 1.8.2011)

General Worker

N Sivasubramaniam (from 1.10.2011)

BIOCHEMISTRY DIVISION

Acting Officer-in-Charge

J Jayasundera Senior Research Officer (up to June 2011)

K M Mewan B Sc Agric (Ruhuna, Sri Lanka) Ph D (Colombo, Sri Lanka)

Research officer, Actg. Officer-in-Charge (from July 2011)

Senior Research Officer (contractual)

P A N Punyasiri Grad. Chem Ph D (Peradeniya, Sri Lanka)

Research Officer

G A A R Perera B Sc Agric (Peradeniya, Sri Lanka) M Sc (Sri Jayawardhenapura)

Experimental Officers

Ms. G H Thotawattage B Sc Agric (Peradeniya, Sri Lanka)

M Sc (Peradeniya, Sri Lanka)

P K P Muthukumarana B Sc Agric (Ruhuna, Sri Lanka) (up to 14.09.2011)

P G C Priyantha (up to 01.07.2011)

Technical Assistant

H M S B Heenkenda

Technical Officers

R M E M K Randeiya Diploma in Agriculture (from 1.8.2011)

E N U Edirisinghe Diploma in Agriculture (from 1.8.2011)

Skilled Mechanic

M W Silva

General Worker

G Periyasamy (from 1.10.2011)

ENTOMOLOGY AND NEMATOLOGY DIVISION

Head

K M Mohotti B Sc Agric (Peradeniya, Sri Lanka) Ph D (Reading, UK)

Research Officer

R M D T Pallemulla B Sc Agric (Peradeniya, Sri Lanka) M Sc (PGIA, Sri Lanka)
(up to 7 January 2011)

Experimental Officers

D D Liyanage B Sc (Kelaniya, Sri Lanka)

N Navaratne

R D P D Senanayake B Sc Agric (Peradeniya, Sri Lanka) M Sc (PGIS, Sri Lanka)

P G D S Amarasena B Sc Agric (Peradeniya, Sri Lanka) M Sc (PGIA, Sri Lanka)

A R Abeysekera

R Perera

B S Vitana

A K Prematunga

P K Jayawickrema

U B Herath

M M Jayathilake (up to 30. 6. 2011)

C De Seram

Technical Officers

E P Wijewardana (from 1.8. 2011)

B M N J Basnayake (from 1.8.2011)

General Workers

S Hettiarachchi (from 1. 10. 2011)

V Sabaratam (from 1. 10. 2011)

PLANT BREEDING DIVISION

Head

M T K Gunasekare B Sc Agric (Ruhuna, Sri Lanka) Ph D (Southampton, UK)

Senior Research Officer

Senior Research Officer

M A B Ranatunga B Sc Agric (Peradeniya, Sri Lanka) M Sc (TNAU, India)

Research Assistants

H A C K Ariyaratna B Sc (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

M Phil (Colombo, Sri Lanka) (up to 07th March 2011)

J H N Piyasundara B Sc (OUSL, Sri Lanka) M Phil (Peradeniya, Sri Lanka) (Low country Regional Centre)

R Paskarathevan B Sc (Madras, India) M Sc (Colombo, Sri Lanka)

Experimental Officers

P D Upali (Low country Regional Centre)

T M Sarathchandra B Sc (Canterbury, UK) (Mid country Regional Centre)

J D Kottawa Arachchi B Sc (OUSL, Sri Lanka)

K K Ranaweera B Sc Agric (Ruhuna, Sri Lanka) MPhil (Peradeniya, Sri Lanka)

A K Mudalige Diploma in Agriculture (Low country Regional Centre)

Technical Officers

M G M Kumara HNDT (Agric) (from 1. 8. 2011)

D V R Deniyapahala Diploma in Agriculture (from 1. 8.2011)

PLANT PATHOLOGY DIVISION**Senior Research Officers**

K L Wasantha Kumara B Sc Agric (Ruhuna, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Ph D (Bangalore) On contract basis (up to January, 2011)

Ms N H L Pradeepa B Sc (Ruhuna, Sri Lanka) M Sc (GBPUAT, India) (study leave)

G D Sinniah B Sc (EUSL) Ph D (Peradeniya, Sri Lanka) On contract basis

(from 1.4. 2011)

Research Officers

J W K K Jayasundara B Sc Agric (Peradeniya, Sri Lanka) M Sc (Punjab, India)

(up to February, 2011)

D L A L A Dassanayake B Sc Agric (Peradeniya, Sri Lanka) (from August, 2011)

Technical Officers

Ms D G N P Karunajeewa National Diploma in Agriculture

C D Jayasinghe Higher National Diploma in Agriculture (from August, 2011)

SOILS & PLANT NUTRITION DIVISION

Head

G P Gunaratne B Sc Agric (Peradeniya, Sri Lanka) M Phil (Peradeniya, Sri Lanka)
Ph D (Peradeniya, Sri Lanka)

Senior Research Officers

Prof. A N Jayakody B Sc Agric (Leipzig, Germany) M Sc (Leipzig, Germany)
Ph D (West Berlin, Germany) (on contract basis)

Research Assistant

L R M C Liyanage B Sc Agric (Peradeniya, Sri Lanka)

Research Officer

W M S Wijetunga B Sc (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Experimental Officers

P L K Tennakoon B Sc (Peradeniya, Sri Lanka) M Sc (Dharwad, India)
W T B D Priyantha B Sc (Sri Jayawardanapura, Sri Lanka)
S M Dissanayake B Sc (Wayamba, Sri Lanka)
J R Y Abeywardane
O G K A Gunaratne Diploma in Agriculture ACLT (OUSL, Sri Lanka)
W M J C Bandara B Sc (OUSL, Sri Lanka)

Technical officers

R A I W K Ranathunge Diploma in Agriculture (from 1.8.2011)
K A S A Rupasinghe Diploma in Agriculture (from 1.8.2011)
K S Thilakasiri Diploma in Agriculture (from 1.8.2011)

General Worker

D Silvester (from 1.10.2011)
V Rathakrisnan (from 1.10.2011)

PROCESS TECHNOLOGY DIVISION

Head

W S Botheju B Sc (Colombo, Sri Lanka) M Phil (Peradeniya, Sri Lanka)
Ph D (Peradeniya, Sri Lanka)

Chemical Engineer

K Raveendran B Sc Engineering (Mratuwa, Sri Lanka) M Eng (AIT, Thailand)

Mechanical Engineer

S Koneswaramoorthy B Sc Engineering (Peradeniya, Sri Lanka)

Senior Research Officer

G L C Galahitiyawa B Sc (Kelaniya, Sri Lanka)

Experimental Officers

S H Priyanthie N D T (Moratuwa, Sri Lanka)

L Jayasinghe

W M U A B Marapana B Sc (Sri Jayawardenepura, Sri Lanka)

A Chamindra

S P Dayananda B Sc Engineering (Peradeniya, Sri Lanka)

M S Weerawardena B Sc Engineering (Peradeniya, Sri Lanka)

K B M Sripalika B Sc Engineering (Peradeniya, Sri Lanka)

Mechanical workshop

A Nandasiri, Chief Mechanic

L Weerasooriya, Mechanic

M Gabrial, Mechanic

General Worker

R Illangovan (from 1.10.2011)

S Selvadurai (from 1.10.2011)

ADVISORY AND EXTENSION DIVISION

Acting Head (up to 14.3.2011)

V S Sidhakaran B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka),
Ph D (TNAU, India)

Head (from 15.3.2011)

B A D Samansiri B Sc Agric (Peradeniya, Sri Lanka) M Phil (Los Banos, Philippines)
Senior Advisory Officer

Senior Advisory Officers

J C K Rajasinghe B Sc Agric (Peradeniya, Sri Lanka) M Sc (PGIA, Sri Lanka)

Officer-in-Charge (Mid country Regional Centre)

V S Sidhakaran B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Ph D (TNAU, India)

Advisory Officers

K G J P Mahindapala B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Officer-in-Charge (Galle Extension Centre)

S P Rathnayake B Sc Agric (Ruhuna, Sri Lanka) M BA (WHUT, China)

Officer-in-Charge (Deniyaya Extension Centre)

T G N Mahinda B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Actg. Officer-in-Charge (Matugama Extension Centre)

Extension Officers

H J M De Silva B Sc Agric (Ruhuna, Sri Lanka) (Mid country Regional Centre)

H Jayaweera Actg. Officer-in-Charge (Matugama Extension Centre)

K R W B Kahandawa B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Officer-in-Charge (Uva Extension Centre)

M A H Nishanthi B Sc Agric (Peradeniya, Sri Lanka)

A L R U Kumara B Sc Agric (Peradeniya, Sri Lanka)

C J Liyanaarachchi B Sc Agric (Wayamba, Sri Lanka) M Sc (Peradeniya, Sri Lanka)
(Low country Regional Centre)

P K R C E Munasinghe B Sc Agric (Wayamba, Sri Lanka) (Deniyaya Extension Centre)

Technical Officers

D K D Dissanayake (Uva Extension Centre)

I P S D Wickramasooriya (From 1.11.2011)

N S Ekanayake

BIOMETRY UNIT

Senior Research Officer

T Ursula S Peiris B Sc Agric (Peradeniya, Sri Lanka) M Phil (Peradeniya, Sri Lanka)

Technical Officer

H K K Deshapriya AMBSC Diploma in C#. NET

PUBLICATIONS AND PUBLICITY UNIT

Publications/Publicity Officer

K P H Liyanage B Sc (OUSL, Sri Lanka)

G W M S N Gunasekara Diploma in Agriculture, Technical Officer (from 1.8. 2011)

A P V Kalyani, Stenographer (English) (up to Feb 2011)

I W M Nihal Kumara, Typist/Clerk (from Feb 2011)

K G R Niroshan, Photographer

J T Thevadasan, Photographer

A Krishnamenan, General Worker (from 1.10.2011)

LIBRARY

R W M S K Amunugama Diploma in Library Science, Library Assistant

S Parameswari, General Worker (from 1.10.2011)

INFORMATION TECHNOLOGY UNIT

Udeni D Alagiyawadu, Experimental Officer

ADMINISTRATION DIVISION

W P A N Jayasinghe, Chief Clerk

S Shanmuganathan, Stenographer/ Typist (English)

K R M Priyantha, Clerk/Typist

A W M G R Jayasinghe, Clerk/Typist

W M S R Wanasinghe, Clerk/Typist

R M D K Rathnayake, Clerk/Typist

C Jeyaram, Clerk/Typist

I W N Kumara, Clerk/Typist

S Dharmalingam, Clerk/Typist

R M B D Rathnayake, Guest House Keeper (Colombo)

R Mahendren, Guest House Keeper (Talawakelle)

V Chandrasekaran, General Worker (from 1.10.2011)

N Pushparaj, General Worker (from 1.10.2011)

Purchasing Unit

B Tillakaratna, Purchasing Officer

P D S L De Silva, Clerk/Typist

Internal Audit Unit

R Kariyawasam, Internal Auditor

P S Wickramasinghe, Internal Audit Officer

W N K I Ariyaratne, Internal Audit Clerk

Engineering Unit

R M R R Lalith Ranaraja, Resident Engineer (from 2. 5.2011)

C J B Abeykoon, Clerk of Works

J G Gamage, Filter Plant Assistant

W C K Fernando, Chief Plumber Mechanic

W R P De Silva, Clerk/Typist

P T Perera, Clerk/Typist

U D W Rathnasiri, Filter Plant Assistant

K A F Dharmadasa, Assistant Plumber Mechanic

J M Jothipala, Mason

R Jeyaraj, Carpenter (from 1.10.2011)

A Loganathan, General Worker (from 1.10.2011)

H M Wijesekera, General Worker (from 1.10.2011)

S Balakrishnan, General Worker (from 1.10.2011)

C Paul, General Worker (from 1.10.2011)

Telephone Exchange

K M Seneviratne Banda, Telephone Operator

P K N Damayanthi, Telephone Operator/Receptionist

P Vythilingam Pillai, General Worker (from 1.10.2011)

Electrical Unit

U A Wickramasinghe, Electrical Foreman
R W Rengasamy, Electrician
J M R K Bandara, Electrician
K Jayaratnam, General Worker (from 1.10.2011)
L R Rajalingam, General Worker (from 1.10.2011)
J Anthony, General Worker (from 1.10.2011)

Transport Unit

M L H Perera, Transport Officer
S H Chandrasena, Clerk/Typist
S Bastian, Driver Class I
K B V Piyasena, Driver Class I
P A S L Luxman, Driver Class I
P Sengamalai, Driver Class I
L Murugesu, Driver Class I
M Kaliyaperumal, Driver Class I
W G Seneviratna, Driver Class I
R M N Prematillake, Driver Class I
R Gunasekara, Driver Class I
K M G de Silva, Driver Class I
W S G W Perera, Driver Class I
M Marudamuttu, Driver Class I
K B V U N Gunasena, Driver Class I
G G M Ranasinghe, Driver Class II
M B S Priyashantha, Driver Class II
W M S J Weerasinghe, General Worker (from 1.10.2011)

Motor Garage

G G E H Gamage, Chief Motor Mechanic
W G Wijeratne, General Mechanic
K Rajaratnam, General Worker (from 1.10.2011)

FINANCE DIVISION

D M R Dissanayake AAT (Sri Lanka)-Associate, Acting Senior Accountant

M V Mohan CIMA (London)-Intre, AAT (Sri Lanka)- Associate, Accountant

S G Punchibanda, Senior Accounting Officer

Ms. V Pahalage, Accounts Clerk

M G Weeratileke, Cashier

Mrs. B K S Herath, Accounts Clerk

Ms. A A A P Amaratunge, Accounts Clerk

H B Thalagahagoda, Accounts Clerk cum Cashier

Saman Hewasiliyan, Accounts Clerk

W A Nishantha AAT (Sri Lanka) Part I & II, Data Entry Operator cum Accounts Clerk

I G N C Jayaweera AAT Member (Sri Lanka), Internal Audit Clerk

Mrs. I Jayawickrama, Clerk/Typist

H N Dharmapala, Clerk/Typist

K A D Sudath Pradeep, Accounts Clerk

T S S Kumara, Accounts Clerk (from May 2011)

V E Kumara ICASL-Intermediate, Accounts clerk (from May 2011)

G S Raju, General Worker (from 1.10.2011)

Stores

K T U Kulatunga, Assistant Store Keeper

H P W Gunasekara, Stores Assistant

K M S K Kodithuwakku, General Worker (from 1.10.2011)

RESEARCH HIGHLIGHTS

CROP IMPROVEMENT

Development of low-cost tissue culture protocol for micropropagation

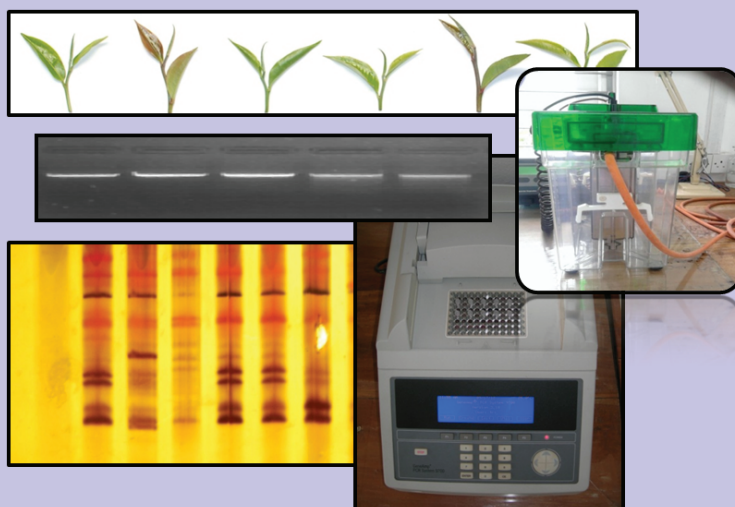
A study carried out to investigate the effect of alternative tissue culture medium components as a substitute for agar revealed that out of the ten sources tested in compariso with solidified agar (8 g/L) medium, significantly higher multiplication rate of microshoots was possible in medium containing sago as compared to agar containing medium.

This low cost tissue culture protocol enhances the practical feasibility of tea micropropagation method that has already been deployed to accelerate the conventional tea breeding programme.



Use of DNA markers for molecular characterization of tea

As tea plant is predominantly an out breeding perennial, conservation and utilization of genetic resources and genetic improvement of tea using conventional approaches has its limitations. To increase the efficiency and precision, TRISL has integrated DNA marker technologies into the existing conventional breeding program under two major areas; i. e. Genetic diversity and conservation studies (exploitation of genetic diversity of tea genetic resources for conservation and utilization in cultivar improvement) and genetic mapping and marker assisted tea breeding (identification and use of linked DNA markers for early selection (Marker Assisted Selection-MAS) of economically important characters. To achieve above objectives highly informative microsatellite (Simple Sequence Repeat-SSR) markers have been being used to characterize improved tea cultivars. In order to widen the tea gene pool, individuals selected from old seedling tea (OST) populations were also assessed and few diverse OST accessions, which could be used in cultivar improvement program, were identified.



Development of new tea cultivars

Hybridization is the main method of obtaining genetic variation and developing new tea cultivars. Two multi location trials to evaluate 50 accessions selected from controlled hybridization programmes during 2003-2005 were established at Talawakelle and Ratnapura simultaneously. These crosses were made using diverse parental materials which were not recurrently used in the previous breeding programmes. Plants are being raised to replicate same accessions at Hantana and Passara in 2012.

Estate cultivar selection programme was conducted during 2001-2004 covering Pedro, Labukelle, Liddesdale and Fairlawn estates to select promising land races to develop new tea cultivars. A new phase 1 trial was established at Talawakelle to evaluate 20 accessions selected from the above programme.

“TRI 5000 series” – Cultivars in the pipeline: The next series of tea cultivars

Evaluation of TRI 5000 series potential cultivars on nineteen adaptive trials with the partnership of growers has been continued. Four new trials were established in corporate sector estates in different agro-climatic regions. First cycle evaluations of two trials were completed in WU2a and IU3c agro-climatic regions. Results revealed that five cultivars tested in WU2a region were yielding more than the popular existing cultivars/controls, TRI 2025 and DT 1. Of those high yielding cultivars, one cultivar was found to have comparable made tea quality with DT 1 confirming the added advantage of high yield incorporated with high quality attribute in the new series of cultivars. Evaluations on yield, made tea quality and resistance to shot hole borer of nine tested accessions in IU3c agro-climatic region are being carried out.

Integrating molecular biological approaches into conventional tea breeding program

Laboratory facility for molecular assays has been established, aiming to integrate molecular approaches to supplement the conventional breeding program. Using the facility, some selected hybrids of 2004, 2005 and 2006 controlled hybridization programmes were used in progeny analysis using molecular markers. This is the first attempt of evaluating hybrid tea progenies in Sri Lanka using a molecular marker approach and preliminary results revealed that Random Amplified Polymorphic DNA (RAPD) markers are useful to exploit genetic variability of putative hybrids and to identify recombinants at the early stages of tea breeding programme.

Biochemical characterization and metabolite profiling of tea germplasm

Project on germplasm characterization using biochemical markers have been progressed well. Biochemical parameters of green leaf and black tea of 35 accessions were analyzed and accessions were grouped based on the biochemical diversity. Wide variation was observed in Caffeine content among different accessions revealing that those would be useful in future tea breeding programmes. A new project on metabolite profiling of tea germplasm in Sri Lanka funded by National Research Council, was initiated aiming rational utilization of tea germplasm in tea breeding and crop improvement programme. Analytical capability of TRI has been improved with modern high throughput equipment. Freeze drying or lyophilization procedure for sampling was successfully standardized for highly unstable biochemical compounds and high throughput metabolite profiling is being carried out. Post-graduate training (1 M Phil and 1 Ph D) offered as a component in this study will build up the human resource capacity with expertise in multidisciplinary areas (both Biochemistry and Plant Breeding) that would foster and harmonize the Institute's research program.

Improved seeds as alternative planting materials for marginal tea growing areas

Owing to the revived interest among tea growers for alternative planting materials suitable for marginal growing conditions, there has been an increasing demand for improved seeds. Work has been initiated to link growers with commercial seed gardens to facilitate seed collection during peak fruiting periods. Six adaptive trials established have been monitored for evaluating performances of improved seedlings.

Grower perception on TRI 3000 and TRI 4000 series cultivars

An island wide survey was initiated in collaboration with the Advisory & Extension division & TSHDA to assess grower perception on performances of recently released new series of tea cultivars. Tea growers in Deniyaya and Uva (Bandarawella, Badulla and Passara) regions were surveyed and results revealed that growers have a good perception (77% and 100% in above regions respectively) on performances of TRI 3000 and 4000 series cultivars and growers are willing to continue with new series cultivars. Survey is being continued in Kandy region.

Establishment of parameters in green leaf to predict made black tea quality

Early prediction of black tea quality using parameters in green leaf would help breeders to enhance efficiency of selection of cultivars harboring quality characters. At present, green leaf has to be processed to made tea and evaluated organoleptically for quality. To find the correlation between quality of the made tea and morphological/chemical

characters (both fresh leaf and made tea) studies were carried out using 12 selected cultivars. Analysis was completed for the wet season and data collected on green leaf and black tea and organoleptic parameters are ready for statistical analysis. The same is being continued during the dry season.

Evaluation of cultivars suitable for processing of White tea/ Silver tips

In general, only buds of the cultivar TRI 2043, which possess high level of anthocyanin as well as pubescence at the lower surface of the leaf, were used to produce Silver tips. Therefore, it would be important to evaluate and identify other cultivars suitable for White tea/ Silver tips. Furthermore, ISO is in the process of setting up a standard for White tea and TRI had been working on developing Sri Lankan White tea for the first time. Sri Lankan tea industry are of the view that silver tips should be considered as a unique tea category. To facilitate the above and to explore the other cultivars having potential to produce White tea/ Silver tips, biochemical characterization of White tea/Silver tips has been commenced. Results revealed that in addition to TRI 2043, TRI 777 could also be used to produce White tea. Other cultivars tested were TRI 2025 and DT1.

Screening tea shoot characteristics amenable for mechanical harvesting

Identification of shoot characteristics is important to select tea cultivars amenable for mechanical harvesting. Hence, eight shoot related characteristics (yield, inter-nodal length, leaf apex habit, leaf size, leaf angle, shoot density, hardness and banyiness/dormant shoot) in eight tea cultivars (TRI 2023, TRI 2027, TRI 3025, TRI 3055, TRI 4014, TRI 4042, TRI 4049 and TRI 4061) were evaluated. Shoots of selected tea cultivars were harvested manually and mechanically using motorized harvester. The percentage reduction of yield with time was found significantly lower in TRI 4061 and TRI 3025 than TRI 2023 and TRI 2027, respectively. The shorter inter-nodal length and wider angle of leaf were found to be positively correlated with the yield reduction while shoot density correlated negatively. Leaf length was positively correlated with both damaged shoot content and stalk content in the mechanically harvested crop while coarse leaf content was negatively correlated with the leaf curviness (difference between the angle from stem to mid rib and stem to leaf tip).

Identifying criteria for screening tea cultivars for drought tolerance

Aiming to validate the method developed in glass house experiments for drought screening, field trials were established at St. Joachim estate, Ratnapura and TRI, Hantana.

Five cultivars, TRI 2025, DG 39, TRI 4049, TRI 2023 and TRI 4046 with different drought tolerance ability were tested at St. Joachim, Ratnapura while cultivars, TRI 2023, TRI 2027, DG 7, CY 9 and TRI 2025 were tested at TRI, Hantana. Field trial results confirmed the findings of glass house experiments. Hence, the method developed could be successfully used in future breeding programmes for screening drought tolerant cultivars.

Screening of tea accessions, cultivars and seed stocks for major tea pests

Selection of tea cultivars resistant or tolerant to economically important tea pests is a key aspect in the integrated pest management. This would facilitate both economical and environmental crop management through minimizing use of other pest control measures, including use of pesticides. 82 tea accessions, cultivars and seedlings were evaluated against *Pratylenchus loosi*, *Radopholus similis*, Shot hole borer and low country live wood termite for resistance/ tolerance at various localities following standard protocols.

LAND PRODUCTIVITY IMPROVEMENT

Development of an economically viable system to eliminate /reduce soil rehabilitation period prior to replanting.

Although soil rehabilitation prior to replanting of tea is compulsory, some estates of RPC and tea small holders follow direct planting of tea, as they are of the view that time duration left for rehabilitation is unproductive or there is no income generation for a period of 18-24 months. Hence, it is timely to introduce alternative strategies to eliminate/reduce the time period of rehabilitation. With the above objective, following three experiments were commenced in mid 2011 at different locations

a. Establishment of grasses and leguminous species simultaneously prior to uprooting of tea.

(T1) *Gliricidia sepium* and Mana and (T2) *Flemingia congesta* and Mana were planted *in-situ* in mid 2011 for soil rehabilitation while old tea is in the field aimed at uprooting of old tea followed by replanting of tea in mid 2013, (T3) Direct replanting of tea following uprooting of old tea in mid 2013, (T4) Replanting of tea in mid 2013 following uprooting of tea and soil rehabilitation with Mana grass in 2011 and (T5) Direct planting of tea in mid 2011 following uprooting of tea as the Control at New Peacock estate to evaluate different systems to minimize the time period of rehabilitation.

Tea flush was harvested from old tea in plots assigned for Treatments 1, 2 and 3 where old tea is to be retained until mid 2013. Soil sampling was done to assess the Soil Quality Index (SQI) prior to commencing the trial and it was 5.72. Soil C was 1.68%. Bulk density was 1.4 and 1.32 g/cm³ at 0-30 cm depth. Mana was lopped twice and mulched the ground with loppings. Experiment is in progress.



b. Establishment of new grass species having high biomass production ability to reduce the time period of rehabilitation at St. Joachim Estate, Ratnapura, Houpe Estate, Kahawatte and TRI Regional Center, Kottawa.

Two grass species, Hybrid Napier (Variety CO-3) and East Indian Lemongrass (*Cymbopogon flexuosus*), which are known to be higher biomass producers were established in order to compare with Guatemala (*Tripsacum laxmum*) and “Mana” (*Cymbopogon confertiflorus*) to evaluate the growth performances of two new grass species. Pre soil testing was done before planting of grasses. With three loppings at Ratnapura trial, the highest lopping dry weight was obtained from Hybrid Napier- Variety CO -3 (30.6 m t/ha) as compared to Lemmon grass (12.1 m t/ha), Mana (5.5 m.t/ha) and Gautemala (16.6 m t/ha). Total nitrogen (N%) was increased by 0.17% and 0.02% with CO-3 and Lemmon grass and K was increased by 57 and 70.9 ppm after first lopping when compared to those of pre soil testing. However, C% was increased by only 0.1% in both Mana and Gautemala treated plots at 0-15 cm depth. Experiments are in progress.

Meanwhile, with two loppings from Haupe estate the highest lopping dry weight (24.55 m t/ha) was also obtained from Hybrid Napier- Variety CO-3 when compared with Lemmon grass (6.91 m t/ha), Mana (4.76 m t/ha) and Gautemala (8.63 m t/ha).

c. Reducing the period of rehabilitation through enhancement of soil quality with application of Bio film bio fertilizer (BFBF) at New Peacock estate, Gampola and Houpe estate, Kahawatta

Two experiments using BFBF were commenced in June. (T1) Direct planting of tea without rehabilitation and treating with BFBF + half of the recommended dose of T200 fertilizer mixture in mid 2011 and (T2) Rehabilitation with Mana grass for 24 month period followed by replanting in 2013, for comparison. (T3) Rehabilitation with Mana grass for one year (2012-13) + BFBF+ half dose of T 200 and U 625 for Mana, (T4) Rehabilitation with Mana grass for one year (2012-13) + BFBF alone and U 625 for Mana, (T5) Direct replanting of tea in 2013 with BFBF alone (T6) Direct replanting of tea in 2013 with full recommended dose of T200fertilizer mixture alone. Pre soil sampling was done. Soil pH was 3.39 and soil C was 1.04%. Total N was 0.17%, K was 194 ppm at New Peacock estate. Soil Quality Index was 5.5, Soil pH was 5.04, soil C was 2.5%. Total N was 0.22%, K was 181 ppm at Haupe estate. Mana was lopped once. Experiment is in progress.

Validation of Soil Quality Index (SQI)

Validation of the SQI which was developed for the first time to assess soil chemical physical and biological properties of tea lands is important to make recommendations for soil improvement in future for its precise application. Soil sampling from lands ear-marked for replantin were commenced in May in New Peacock and Stelenberg estates in Gampola, TRI Passara regional extension center, Doloswala and Watapotha estates in Ratnapura, Analysis of soil is in progress.

Development of water management techniques

Developing strategies/techniques for soil moisture replenishment by rain water harvesting and micro irrigation applications are important aspects in soil moisture management in tea plantations. Field experiments on drip and sprinkler irrigation were conducted for more than 3 pruning cycles and completed in 2011, under the low country conditions and significant achievements are given below:

Cultivar response to Drip Irrigation

Responses of two contrasting tea cultivars TRI 2023 and TRI 3025 to drip irrigation were investigated at St. Joachim estate, Ratnapura. Drip irrigation increased the tea yield by 2.6-2.8 times during dry spell and it was 20% increase of annual yield compared to rainfed tea. The yield response of TRI 2023 for

irrigation was greater than that of TRI 3025. Further, the incidence of stem canker was reduced by more than 80% with drip irrigation. Differential cultivar responses were clearly evident and drip irrigation seemed to be feasible only for drought susceptible cultivars such as TRI 2023.

Comparison of Drip and Sprinkler Irrigation

Tea cultivar, TRI 2023 under sprinkler irrigation system produced 6% higher yield than drip irrigated plants. Sprinkler irrigated plants maintained a lower leaf temperature than drip irrigated plants, facilitating higher physiological activities during dry months.

Development of shade management strategies:

Evaluation of growth performances of various tree species amenable for shade.

In order to study the suitability of tree species as alternative shade trees in tea fields 8 tree species were identified after a survey. Of those eight species, seeds of *Derris microphylla* and *Cassia nodosa* were collected and nurseries were established at St. Joachim estate, Ratnapura.

Integrated approach on soil fertility management

Development of Site specific fertilizer recommendations

The objective of Site Specific Fertilizer Recommendations (SSFR) is to provide fertilizer in required amounts more precisely by soil testing, while taking into consideration potential yield of the field and the corresponding nitrogen fertilizer requirement. This will not only provide balanced nutrition to the plant but also save cost of fertilizer. In the SSFR protocol, testing soil for certain nutrients is a prerequisite for proper nutrient management of tea lands. SSFR was first introduced by TRI in 2006 and a guide-line was issued on the use of SSFR.

In this study, twenty bench-marked soil series representing all tea growing regions in Sri Lanka were collected and analyzed for Nutrient Buffering Capacity (resistance to nutrient concentration change) and was used as the characterization tool for magnesium nutrient. Results showed a variation in magnesium dynamics in soil series subjected for analysis. It would be beneficial to use this categorization when fine tuning the existing magnesium fertilizer recommendations for tea growing soils in Sri Lanka.

Response of tea to nitrogen and potassium fertilizer

This experiment was carried out to investigate the effects of different rates of N (120, 360 and 600 kg ha⁻¹ yr⁻¹ N), K (0, 80 and 120 kg ha⁻¹ yr⁻¹ K₂O) on soil/plant nutrient status

and yield of tea. The yield increased significantly with the increasing rates of nitrogen. The nitrogen concentration in the mother leaf of the cultivars significantly increased with increasing rates of nitrogen. In general, application of increasing rates of nitrogen significantly decreased soil pH (acidity, neutrality or alkalinity of soil) in both potassium concentration in the mother leaf significantly increased with increasing rates of potassium, but without any corresponding yield increase. However, application of increasing rates of potassium significantly increased soil potassium levels.

Application of inorganic nitrogen with compost manure

This experiment was carried out to investigate the effects of three different levels of N (200, 400 and 600 kg ha⁻¹ yr⁻¹) with different levels of compost manure (at 0, 10, 20 and 30 t ha⁻¹ yr⁻¹) on soil/plant nutrient status and yield of tea. Increasing rates of nitrogen in the form of urea significantly increased the yields. No significant effect on yield was observed due to application of increasing rates of compost, but the average yield over nitrogen rates with compost application, was higher compared to the treatment without compost. Soil organic carbon level, soil nutrient retention capacity, plant available magnesium and calcium increased significantly with increasing rate of compost.

Application of different rates and proportions of urea & sulphate of ammonia in combination

This experiment was carried out to investigate the effects of application of different rates of N as urea and sulphate of ammonia (240 and 360 kg ha⁻¹ yr⁻¹) and their proportions (Urea: SA = 100-0, 75-25, 50-50, 25-75 and 0-100) on growth, soil/plant nutrient status and yield of tea. Majority of the trials did not show significant yield increases with increasing rates of nitrogen as well as different proportions of urea: sulphate of ammonia. Increasing the proportion of sulphate of ammonia component in the urea/sulphate ammonia combination, and increasing the rate of nitrogen significantly increased available soil sulphur concentration in the top and sub soils. Soil pH in plots receiving 100% nitrogen as sulphate of ammonia, was significantly lower compared to plots receiving nitrogen as 100% urea.

Assessment of micro nutrient status in tea growing soils in Sri Lanka

The main objective of this study is to introduce a useful & economical micro nutrient formulations based on micro nutrient status in tea growing soils. Soil samples were collected after identification of soil series from Mid Country (Kandy, Matale, Kurunegala and Kegalle districts), Low country (Galle, Matara, Hambantota, Ratnapura districts), Up country (Nuwara Eliya district) and Uva (Badulla and Bandarawella districts) regions for evaluating micro nutrient status. These samples were used for evaluating boron status in different tea growing regions. Soils were analyzed for available boron contents. The results showed a variation of boron status in different soil series in tea growing regions.

Development of methods for formulation of bio-organic and mineral or compound fertilizers suitable for tea

Plant Growth Promoting Rhizobacteria (PGPR) is beneficial, free living, associative or symbiotic soil bacteria isolated from the rhizosphere of plants and is known to improve plant growth and yield. Collection of rhizosphere (immediate root space) soil samples from tea plants grown in tea estates in all the Agro Ecological Regions (AER) of the Mid country was completed. Isolation of nitrogen fixing bacteria from collected tea root samples was done. Phosphate solubilizing bacteria were also isolated from rhizosphere soil samples. Screenings of the isolates for their beneficial traits under nursery condition have been commenced.

Assessing pH buffering characteristics of tea growing soils in Sri Lanka

Soil samples were collected after identification of soil series from different tea growing regions and were evaluated on pH buffering capacities (Resistance to pH change). The soils in the tea growing regions were characterized into three main groups according to their pH buffering capacities which may help in deciding the lime requirements of the soils in tea growing areas. Studies were also commenced to derive formulae to arrive at dolomite recommendations by giving attention to efficiency and purity of dolomite, duration of effective neutralization, climatic factors, and acidity development by plant uptake and leaching of alkaline cations and N-fertilizers.

Application of different rate of dolomite

This experiment was carried out to investigate the effect of application of different rate of dolomite (0, 1000, 2000, 3000 and 4000 kg ha⁻¹ cycle⁻¹) on yield and soil plant nutrient status. The yield did not vary significantly with the application of increasing rates of dolomite. However, application of increasing levels of dolomite significantly influenced the soil pH and soil available magnesium and calcium as well.

Application of Geographical Information System (GIS) in tea plantation

The main objective of this study is to identify spatial and temporal variability in soil fertility properties in variable landscapes of the tea growing regions. Spatial variability in soil chemical properties in the Kottawa Extension Centre were evaluated and mapped by using GIS technique. It was observed that soil pH, Organic carbon and available nutrients differ spatially.

Evaluating bio film technology for tea nurseries

To study application of biofilm technology for nursery plants, suitable inocular were prepared using bacteria isolated from *Gliricidia*, *Arachis pintoii*, tea rhizosphere and fungi isolated from tea rhizosphere. After conducting a series of experiments, it was found that there is a potential to reduce T65 fertilizer mixture by half. This was further

confirmed with series of experiments conducted using 5000 nursery plants at each TRI regional station. Sub soil was found to be the best media for BFBB trials. BFBB trials at Uva nurseries were more successful with bacteria isolated from Gonekelle estate.

Improvement of soil fertility and tea yield through application of Biofilmed biofertilizers (BFBB)

BFBB with selected inocular were tested with half dose of recommended tea fertilizer mixtures in the field.

BFBB with selected inocular were tested with half dose of recommended tea fertilizer in field conditions in 1st and 2nd year stage of tea in Kottawa and Ratnapura TRI regional stations and Elkaduwa Estate, Matale.

In the field trials, yield and soil parameters in BFBB with half rate of recommended fertilizer treated plots and full recommended fertilizer treated plots were comparable. The BFBB treatments tested were F3B (combination of Bacteria isolated from *Arachis pintoii* + *Bacillus megatherium* + bacteria isolated from tea rhizosphere + fungi isolated from tea rhizosphere), F3A (combination of bacteria isolated from *Gliricidia* + bacteria isolated from refuse tea + *Bacillus megatherium* + fungi isolated from tea rhizosphere) and FR (combination of Bacteria isolated from refuse tea + Bacteria isolated from Mana roots + *Bacillus megatherium*).

The yield recorded from plots treated with T200 alone and half the rate of T200 fertilizer with BFBB was comparable in the low country (Ratnapura and Kottawa) field trials.

The yield recorded from plots treated with T200 fertilizer mixture alone was significantly lower when compared to that of BFBB with half rate of T200 in the mid country (Elkaduwa) field trial.

Soil properties such as organic carbon, available phosphorus, potassium, soil microbial activity were also improved in BFBB treated plots compared to those of recommended fertilizer treatment alone. Therefore, it can be concluded that BFBB treatments with half rate of recommended fertilizer treatments have caused to improve the nutrient use efficiency thereby the yield and soil properties.

In mature tea, there was a trend to lower the transpiration rate as well as SHB infection in F3A BFBB treatment. Further, investigations are needed to study the low severity of SHB infestation in BFBB treated plots.

Evaluating soil fertility improvement in organically grown tea through Biofilm technology at Haldummulla estate.

The performances of tea treated with BFBF were compared with recommended compost treatment in an organically grown tea field. It was found that soil microbial biomass carbon (MBC) (from 115 to 227 $\mu\text{g/g}$), soil carbon (from 1.64 to 1.67%) and soil potassium (from 165 to 170 ppm) were improved. Yield of tea was 1120 made tea kg/ha in BFBF treatment compared to the compost treatment (953 made tea kg/ha).

Evaluating the use of organic amendments for tea with reduced fertilizer

It was found that there was an improvement in soil properties when artificial fertilizer U 709 was applied at $3/4^{\text{th}}$ of recommended dose together with organic amendments such as Mana, Tithonia, Dadaps, refuse tea (surface and incorporation) and pruned litter buried on trenches, separately compared to the application of recommended dose of fertilizer alone. Therefore, it can be concluded that organic amendments such as Tithonia, Dadap, refuse tea (surface application), burying of pruning together with $3/4^{\text{th}}$ rate of recommended fertilizer could be used for tea in place of recommended fertilizer alone.

Partitioning of assimilates in relation to aging of clonal tea in a pruning cycle - Evaluation of chemical properties, quality and yield

Variations in chemical properties, quality and yield of tea during different years of the pruning cycle of two cultivars (DT 1 and TRI 2025) under dry and wet weather conditions was evaluated in a trial at St. Coombs estate. Chemical parameters in tea flush such as total amino acids were reduced but chlorophyll and fiber contents were increased with year after pruning. Total polyphenol (PP) content and PP oxydase activities were increased up to 3rd year and decreased thereafter. Quality (color, brightness and TF/TR ratio) was different under wet and dry seasons, in DT 1 and TRI 2025 and also during pruning years. TF/TR ratio and colour were increased but brightness was reduced with increasing age in the pruning cycle from 1st-5th year. TF/TR ratio was greater in TRI 2025 than in DT1 and it was significantly lower during wet season than dry season in both cultivars. Both colour and brightness were significantly greater in DT 1 than in TRI 2025 and were also greater during wet season than in dry season. Thearubigine (TR) was increased with age of the pruning cycle and it was reduced in TRI 2025 but increased in DT1 during wet season compared with that of dry season. Overall quality of mature tea was increased from 1st to 3rd year and diminished thereafter.

Identification of physiological basis of yield decline during the latter part of the pruning cycle in mature VP tea at high elevation

The tea yield in general, declines towards latter part of the pruning cycle. Tea yield decline during 4th year of the pruning cycle was not caused by specific shifts in biomass partitioning to either shoot or root. A decline in harvest index (HI) was directly responsible for such decline. A reduction of assimilates capacity was observed during the 2nd half of the pruning cycle. An overall down-regulation of physiological activities was observed, as evidenced by increased root starch, occurred during 4th year of the cycle.

Investigating the stock and scion compatibility of grafting

The objectives of these studies were to identify better tea scion and stock combination for grafting with special reference to high yield, high quality, drought tolerance and pests and diseases resistance.

Grafting for combining high quality and high yield in tea.

Cultivar with high quality as a scions with drought tolerance cultivar as a stock were selected for graft combinations and single nodal cutting from selected scion cultivar has been planted as control in a field trial at St. Coombs estate. Plants were in 1st year of the 2nd cycle.

Graft combinations where TRI 777 and TRI 4079 were used as the scion, recorded a higher yield. Of the combinations tested, TRI 4079 on TRI 2025 showed a higher yield. Analysis of quality parameter such as TF, TR, brightness and total colour showed that the quality of the combinations was similar to the control i.e. TRI 777 and TRI 4079.

Grafting for combining high yield with pest and disease resistance at St. Coombs estate, Talawakelle.

In grafting, different scions with individual characters such as Blister blight and Shot hole borer resistance and high yielding were selected. Stock characters were high rooting, drought tolerance and resistance to Nematode (*Pratylenchus loosi*). Plants of different combinations are in 5th year of the first cycle.

Only the graft combination, TRI 4046 on TRI 4006 showed a significantly higher yield than its control (TRI 4046) but the other combinations such as TRI 3072 on TRI 4006, TRI 3072 on 4053, TRI 4046 on TRI 3072 and TRI 4006 on TRI 3072 were not, though each of them recorded relatively a higher yield compared to each respective control.

Grafting for combining drought resistance with high yield for Uva region

Objective of this study was to overcome yield declining due to drought in Uva region by grafting high yielding cultivars with drought tolerance cultivars. Graft combinations such as TRI 3018 on DN, TRI 3019 on DN, TRI 4042 on DN, TRI 4046 on DN and TRI 4052 on DN were tested. Cultivars selected for scion were also planted separately as control. Growth and physiological assessments were made from plants in the field and centering was done after one year.

Rejuvenation of old seedlings through grafting in the nursery

Different scion and stock combinations were tested for rejuvenating over-grown seedling nursery plants. Over-grown seedling raised from seeds of different seed gardens, Raigama 4006, Peen 2023 and Reucstle S/06 were used as stocks and combined with TRI 2043, TRI 4006, TRI 4055 and TRI 3015 as scions. After the nursery period, grafted plants were transferred to the field and maintain as demonstration plot at the TRI regional station, Ratnapura.

CROP MANAGEMENT

Weed Management in tea

Investigation on possible causative factors on poor control of problem weeds, Tandam pillu (*Crassacephelum crepidiodes*) and Alawangu Pillu (*Erigeron sumatrensis*) using Glyphosate.

Field and glass house experiments were continued at St. Coombs estate, Talawakelle to elucidate the factors that attribute for poor control of the weeds such as maturity of weeds, dosage of glyphosate and possible development of resistance in weeds for glyphosate. Thandam pillu found at St. Coombs estate, was totally controlled by glyphosate @ 5ml/L (0.99 kg a.i/ha) at very tender phase (1-5 cm height) but fairly controlled at young phase (6-12 cm height) and no control at all at mature phase (12-18 cm height). Alawangu pillu was totally controlled at 8-10 leaf stage (10-12 cm height) and a partial control at 2-4 leaf phases. Higher dosage (5ml/L) always resulted in a better control than lower dosage (3 ml/L). The average rank of visual injury scores attained by 'susceptible type' Thandam pullu weed of Haldumulla, where glyphosate had not been used for more than 15 years under organic tea cultivation, was significantly higher than that of 'resistant type' of St. Coombs estate, where glyphosate has been used for more than 25 years, ($P=0.05$) with application of Roundup @ 0.99 Kg a.i/ha but it was not so in the case of Allawangu pillu. Hence, there is some tendency to develop resistance in Thandam pullu for glyphosate. Both weeds are still possible to control at their tender phase with a higher dose of Glyphosate (0.99 kg a.i/ha).



Development and evaluation of sustainable farming systems

Evaluating growth, yield, pest and disease management under organic tea cultivation

Pest, disease and weed incidences in tea under organic and biodynamic cultivation systems varied as compared to conventional system owing to differences in pest control approaches. Additionally, tea cultivation under organic, biodynamic and Rainforest Certification needs exposure to scientific validations for the benefit of the end users.

The responses of growth, yield, soil, pest, disease and weed incidences and levels of natural biological control mechanisms in the long term TRI Organic & Conventional Comparative Trial (TRIORCON) and Biodynamic Organic & Conventional Comparative Trial (BIDORCON) field trials established at Talawakelle and Geragama were compared with tea grown conventionally and in accordance with norms of Rainforest Certification.

CROP PROTECTION

Prophylactic measures for pest control

Protection of vulnerable stages of tea from Shot hole borer

Prophylactic treatments are important in protecting vulnerable stages of tea from perennial pests as a means of integrated management of pests. After pruning, it is crucial to protect pencil thickness tea stems from the attacks of shot hole borer and rotted wood from live wood termites, in mitigating the pest introduction, invasion and further aggravation leading to cause economic damages. Experiments and surveys conducted to study those aspects revealed the following information:

1. Results of survey carried out to assess damage caused by shot hole borer warranted that prophylactic measures is critical in tea nurseries, in addition to managing their damage in immature and mature tea.
2. Confirmation trials on evaluating the efficacy and persistency of Fipronil and a few local adhesive materials such as oil palm affluent from Nakiyadeniya oil palm factory, natural rubber based Shot Guard and Lime Sulphur formulated in collaboration with the Rubber Research Institute were completed in SHB active locations in different agro ecological regions. Pest assessments and plant responses were monitored for analytical purpose.

In-vitro culturing of SHB on artificial diets was furthered in order to facilitate protocols for laboratory bio-assays for screening tea cultivars and chemicals.

Field efficacy of soil treatments against Shot hole borer

Frequent incidences of significant shot hole borer damage in nurseries and new clearings warranted SHB control measures. Trials on field efficacy of using soil treatments viz. granular formulation of Fipronil, Carbofuran and Imdachloprid and neem oil cake as post prune treatments against SHB were initiated. The experiments are in progress.



Molecular diagnosis of canker causing fungi in tea

Stem and branch canker caused by *Macrophoma theicola* has been reported as a serious problem in tea in the low country tea growing areas. The recent studies revealed *Fusarium* species, also associated with this disease. BLASTn search output for sequences obtained using *Fusarium* isolates showed highest similarity with 98% identity to *Fusarium solani*. BLAST search of the Internal Transcribed Region (ITS region)

sequences of some fungal isolates which were previously identified as *Macrophoma theicola* (based on morphological characteristics) showed highest similarity to *Lassiodiplodia theobroma*.

Prophylactic treatments for control of White Grubs

Although white grub incidence was considered as seasonal, significantly heavy white grub damages in nurseries and young tea in many areas appeared in the recent past. This has prompted to find alternate insecticides to Carbofuran. Accordingly, studies were initiated to screen alternate synthetic soil pesticides following laboratory bioassays, field and pot trials with granular formulations of Imidacloprid, Fipronil and Carbosulfan.

Unusual occurrences of *P. loosi* and *R. similis*

Amongst the tea nematodes, *P. loosi* and *R. similis* were encountered in areas where soil temperatures are low and high respectively. However, unusual occurrences of *P. loosi* and *R. similis* observed in Galle, Deniyaya and Kanneliya areas were found to cause economic damage to nurseries, young and mature tea. As such, special attention was paid to make the growers aware of this invasive pest occurrence, integrated nematode management methods and Good Agricultural Practices (GAPs). Field demonstration/model areas were also established. Laboratory culturing of the new nematode isolates recovered were initiated for further studies in respective elevations.

Identification of safe pesticides in designing IPM methods

Non target effects of pesticides on honey bees and earthworms

Additional data is required to generate information on non target effects of the pesticides intended for recommendation against various tea pests prior to their recommendations. Using standard laboratory bioassay protocols, effect of fipronil on honey bees and Imidacloprid, Fipronil and Carbosulfan on earthworms were assessed and the chemicals were ranked based on their non- target effects.

Fipronil showed the highest (87.5%) mortality of honey bees while Carbosulfan resulted in 57.5% mortality and Imidacloprid and Fenthion comparatively lower. Resultantly, Imidacloprid, Carbosulfan and Fipronil (Regent) against areal organisms ranked as 2 (Tolerable), 3 (Toxic) and 4 (Very Toxic) respectively.

Impacts of Imidacloprid, Carbofuran, Carbosulfan, Fipronil liquid (Regent) and Fipronil granules (3GR) on earthworms in soil were 100, 98, 82, 4 and 0 % mortality respectively. Therefore, Imidacloprid, Carbosulfan and Carbofuran were ranked as 4 (Very Toxic) against soil organisms while both Fipronil formulations were ranked as 1 (Harmless).

Semio chemical studies for reducing low country live wood termites

Expansion of vulnerability of mature tea to low country live wood termites and associated yield declines, were evident in the recent past in the low grown tea reducing crop and land productivity and sustainability of tea. Present management methods are resorted only through the adoption of appropriate GAPs, inclusive of maintaining health of tea bush with special emphasis on sanitation pruning and prune cut dressings. However, harnessing semio- chemicals associated with low country live wood termite infestations is a novel method, which needs to focus in the IPM program.

Hence, several bioassays with different fungal isolates recovered from rotted wood of LCLWT tolerant and susceptible cultivars and also from termites were continued. Frequencies of occurrences of nine fungal species isolated will be exposed initially to study substrate utilization of cellulose, pectin and lignin in rotted wood as criteria for potential ranking of cultivars.

A key for Blister blight severity assessment

A quantitative percentage scale was developed and validated for Blister Blight diseases caused by *Exobasidium vexans* in order to estimate disease severity efficiently, accurately and reproducibly. In order to train raters to improve their skills in the visual estimation of the disease and improve accuracy of the assessment, training software was developed. The key developed for severity assessment would be useful for, studying disease epidemiology, screening cultivars for resistance in breeding programs and evaluating the economic impact of a disease and the benefit of particular control strategies.

Plant defense elicitors in Blister blight disease management

Use of induced resistance in plants is a sustainable approach to plant protection. Nowadays the defense elicitors are gaining popularity. Studies are under way to understand the tea plants defense responses against blister blight causal agent, *Exobasidium vexans*, and to explore the possibility to incorporate defense elicitors to reduce fungicide usage in an integrated disease control strategy and also with bio -control agents thus, increasing the flexibility of disease management.

Risk Assessment Model for Blister Blight Leaf Disease in Tea

Preliminary model was developed to predict the direct risk of occurrence of blister blight in the field a week and two weeks in advance.

Research equipment grant of Rs. 1 Million was awarded for an Automated Weather Station by National Science Foundation of Sri Lanka for the purpose of validation of the .model and work is being continued.

CLIMATE CHANGE IMPACT ASSESSMENT

Assessment of the impact of global climate change on the productivity and profitability of the tea industry

Studies on physiological response of tea to global climate change and carbon sequestration.

A new model was developed by modifying Sheffield Dynamic Global Vegetation Model, to predict the impacts of climate change on the productivity of different tea growing regions representing different elevation zones of Sri Lanka. Model was validated using actual tea yields collected for a period of 20 years from the up, mid and low elevations. An acceptable accuracy in predicted yields was shown in comparison to actual yields in all three elevations.

Model simulations was done and an appreciable increases in tea yields was shown across all three elevational zones. The yield increase was attributable primarily to the positive impacts of increasing atmospheric CO₂ concentrations. When the positive impact of increasing CO₂ was eliminated, tea yields only in the up country showed an appreciable response to increasing temperature, whereas low country showed a negligible response and mid country yield with marginal response. Work is in progress to refine the model to increase the accuracy of its predictions.

Assessing the Impact of Climate Change on the Growth and Productivity of Tea

Analysis of monthly data for a 30 year period and recognition of long term trends, patterns and variations in tea growing regions completed.



Development of data base for daily rainfall and evaporation was completed for Ratnapura Talawakalle, and Passara Agro-meteorological stations.

A new line of investigation was commenced to find out (1) patterns of occurrence of droughts that affects on agriculture and (2) certainty of rainy days over the last 40 year period to facilitate identifying the correct time for cultural operations in tea using daily rainfall data collected from different agro-meteorological stations maintained by TRI. Collection of background information like soil type, water holding capacity (WHC) etc. completed for sites where TRI agro-meteorological stations are located. Analysis of all these data continues. Probability of occurring rains in poya days and day prior and after was computed using daily rainfall data of forty years collected from Talawakalle, Ratnapura and Passara.

Climate change and its affect on pest incidences

Incidences of different species of insects, mites and nematodes pests in the different agro-ecological regions were found erratic in the recent past with a few pests emerging as new and potential pests causing threat to tea while few pests lost severity levels in certain locations. Significant variations in weather parameters and crop management were also evident which warranted scientific validations and appropriate pest control methods.

As a preliminary study, information on biology and life cycle of shot hole borer, low country live wood termite, mites, *Pratylenchus loosi*, *Radopholus similis* and *Meloidogyne brevicauda* from different localities were correlated with long term weather data to identify weather related factors that attributes to the changes of pest emergence and loss of severity level and occurrence of natural enemy and their interactions.

Climate change impacts on tea nematodes

In order to evaluate the pathogenicity and symptomology caused by different tea nematodes, behavioral studies on *Pratylenchus loosi*, *Radopholus similis* and

Meloidogyne brevicauda with increased temperatures were compared with respective optimal temperatures *in-vitro*. Increased activity of *P. loosi* and *R. similis* were seen under 20-24°C and 24°-28°C respectively while *M. brevicauda* got inactive. The field experience of *P. loosi* becoming invasive in all tea growing areas and restrictions to *R. similis* and *M. brevicauda* incidences is therefore validated. However, further experimentation is underway with different nematode isolates.

MECHANIZATION OF FIELD PRACTICES

Development of appropriate mechanical devises and agronomic practices to overcome labour shortage

Evaluating half bush and full bush plucking systems using two plucking machines

a) Millakanda estate, Horana (2008)

Two plucking machines, one from Indonesia and other from China with the same technology were tested for two different plucking systems. Chinese one is lower in weight than Indonesian one. Both are operated from a 2-stroke engine with Petrol and 2T. Tea shoots are cut by reciprocating action of two blades and cut shoots are moved to a bag through blowing.

Under half bush plucking shoots were harvested only from half of the tea canopy in one week and from the balance half in the next week. Under full bush plucking, shoots were harvested from the entire canopy at fortnight interval.

There was approximately 60% yield loss due to both full-bush and half-bush mechanical harvesting when compared with manual harvesting. The mechanically harvested crop consisted of about 50 times more coarse leaf than manually harvested crop at the end of the pruning cycle.



Fresh and dry weights of pruned branches, number of leaves per bush showed no significant difference between full and half bush harvesting. Shoot number with one leaf & a bud (1L) and two leaves & a bud (2L) were higher in mechanically harvested crop compared to manually harvested but not with three leaves and a bud (3L). However, the number of shoots with four leaves and a bud (4L) and Banji shoots were higher in manually harvested crop than in mechanically harvested crop.

Mean output of the Chinese and Indonesian made machines was 173 and 189 kg/day respectively. Mean fuel consumption was approximately around 5 and l/day for the both machines.

b) Balangoda estate

There was approximately 30-40% yield loss due to both full-bush and half-bush mechanical harvesting compared to the manual harvesting. Half and full bush harvesting by mechanical method resulted in around 30-40 coarse leaf percentage compared to manually harvested crop. Tea cultivar, TRI 2026 recorded a higher yield than DG 39.

Evaluating the effect of mechanical pruning with and without resting tea bush

Manual and machine pruning were tested in a field at St. Coombs estate with and without resting of tea bushes prior to lung and clean pruning. Half of the plots were rested before pruning and both set of plots were pruned with and without leaving lungs. It was found that the labour requirement for manual and mechanical pruning was 50 LPH and 10 LPH, respectively, showing a 5 fold increase in labour productivity. Yield (second year after pruning) was not significantly affected by mechanical or manual pruning or lung or clean pruning.

Resting vs No resting achieved 2453 and 2411 kg MT/ha, respectively. Mechanical pruning vs Manual pruning achieved 2442 and 2411 kg MT/ha, respectively. With Lungs vs No lungs achieved 2440 and 2411 kg MT/ha, respectively. The highest yield was achieved with resting before mechanical pruning leaving lungs (2590 kg MT/ha).

Modifying bush management to improve efficiency of harvesting devises

A study was carried out at Galaboda estate to investigate the yield variation between manual and mechanical harvesting with different styles of pruning. Three different pruning systems were combined with plucking methods i.e. (1) mechanical plucking after lung pruning at 20" and tipping, (2) manual plucking after lung pruning at 20"and tipping and (3) mechanical plucking after cut-across at 26" (65 cm) and tipping.

It was found that mechanical harvesting reduced tea yield by 20-30% as compared with manual harvesting. Yield losses under mechanical harvesting were low with cut-across pruning compared to lung pruning at 20" (50 cm) height at the end of the pruning cycle. The coarse leaf content of mechanically harvested crop was 23% as compared to 2% with manual plucking.

ALTERNATIVE ENERGY SOURCES FOR DRYING TEA

Evaluating potential fuel wood species as a source of energy

Cultivation of Gliricidia at Raigam Estate and St Joachim estate, Ratnapura, TRI, Hantana and TRI, Passara.

Raigam estate: When Gliricidia is 4 year old, branches were lopped in two times in April and December. Results showed that 1mx 1m, 1m x 2m and 2m x 2m spacings (10000, 5000 & 2500 plants/ha respectively) yielded stem dry weights of 17.0, 9.5 and 4.2 t/ha/ from first lopping and 17.2, 7.9 and 4.0 t/ha from 2nd lopping and this equals to about 21, 10.8, and 5.1 t/ha/yr of fuel wood (with 20% mc) yield from a single lopping. The dry weights of leafy portion were 3.77, 1.87 and 0.93 t/ha from first lopping and 4.17, 2.79 and 1.25 t/ha from 2nd lopping, respectively for the same spacing.

The organic carbon content inside the Gliricidia plots was significantly higher (2.21%) than the adjoining tea lands (2.04%) due to the addition of green matter.

St. Joachim estate: When Gliricidia is 4 year old, branches were lopped at 8 month interval. Results showed that 1mx1m, 1mx2m and 2mx2m spacings yielded stem dry weights 23.3, 9.8, and 2.2 t/ha at each lopping. The dry weights of leafy portion were 4.51, 1.26 & 0.30 t/ha/lopping respectively for the same spacings. The dry weight percentages for stem and leafy parts were 42% and 27%, respectively.

TRI Hantana Regional Center: When Gliricidia is 2 year old, with 2nd lopping done at 8 month interval, 1mx1m, 1mx2m & 2mx2m spacings yielded stem weight (with 20% moisture) of 2.94, 1.57 and 0.49 t/ha, respectively. The dry weights of leafy portion were 1.86, 1.59 and 2.97 t/ha, respectively for the same spacings. Growth of Gliricidia is relatively poor at this location compared to that of other regions.

Glen Alpin Estate at Passara: When plants are 2 year old with 3rd lopping done at 8 month interval, 1mx1m, 1mx2m & 2mx2m spacings yielded stem weight (with 20% moisture), of 17.5, 17.6 and 10.8 t/ha, respectively. The dry weights of leafy portion were 10.9, 7.9 and 6.6 t/ha, respectively for the same spacings.



Cultivation of Calliandra calothyrsus at St Coombs Estate (2010)

When plants are 2 years old, with 3rd lopping done at 8 month intervals, 1mx1m, 1mx2m & 2mx2m spacings yielded stem weight (with 20% moisture), of 7.0, 6.0 and 5.0 t/ha, respectively. The dry weights of leafy portion were 10.6, 9.7 and 6.3 t/ha, respectively, for the same spacings.

The plant density of 10,000 plants/ha planted at 1m x 1m is thus found to be giving highest dry weight of both hard wood (stem) and leafy portion.

TEA PROCESSING TECHNOLOGY

Improvement of price and premium grade percentage by interchanging roll breaker meshes in processing low grown black tea

In low grown leaf type of tea processing, more than 80% of bought leaf factories processed tea leaves with lower than or around 50% good leaf standard. Therefore different factories tend to use No 3 mesh sieves instead of No 4 for separating tea particles at the rolling stage with a view to increase main grade percentage. A study was therefore, carried out to select No 3 and 4 mesh combination at the most suitable stage of the rolling to increase premium grades percentages and also net sale average of teas.

Results revealed that introducing only No 4 mesh to separate tea particle just after 1st rolling and combination of No 3 & 4 meshes to separate tea particle in subsequent rolling stages could successfully increase main grade percentages and also increase the price of main grades, even when the leaf standard was below 50%.

Screening for made tea quality of new tea cultivars planted in Uva region

Newly propagate tea cultivars planted in Uva region were assessed for quality in comparison with two known cultivars with better quality (DN) and very poor quality (TRI 2025). Out of six cultivars tested, two were promising for its quality as compared to DN. Therefore, when recommending cultivars for the Uva region, a special attention can be given to these two cultivars (U 5, U 208).



Improvement to drying process in Orthodox–Rotorvane tea processing

Orthodox-Rotorvane type of tea processing has been changed in the recent past in order to produce higher percentages of tea grades that contain smaller tea particles. As a result, drying of teas in fluidized bed drier was affected causing uneven drying mainly due to uneven fluidization of teas. Therefore, a study was conducted on fluidization behavior of teas with the view to improve the drying process. Results showed that by optimizing perforation size and number of perforations of the bedplate of the drier, fluidization could be improved and problems in drying could be successfully rectified.

IMPROVEMENT OF MADE TEA QUALITY

Flavonol Content of Sri Lanka Tea - Quantification of Kaempferol, Quercetin and Myricetin

It is recently reported that flavonol glycosides (FOGS) contribute to astringency of the tea brew. However, the quantitative data on FOGS is not available for Sri Lankan Tea. Hence, a project was undertaken to generate data for FOGS in Sri Lankan tea. There are more than 26 flavonol glycosides in tea and therefore, it is impossible to determine them as glycosides due to the unavailability of authentic standards. Therefore flavonol glycosides are quantified as flavonol aglycones – Myricetin, Quercetin and Kaempferol. Data from all the tea growing regions of Sri Lanka were gathered for each of the above flavonols using 58 black tea samples.

Inter-laboratory Testing Programmes

Inter-laboratory testing programmes are essential to maintain the proficiency of the analytical parameters. Therefore TRI continues to participate in these programmes conducted by both international and national agencies and participated in following PT programmes:

International Standards Organisation (ISO): 2nd round of the quantification of L-theanine using HPLC was carried out as per the ISO guidelines. The data were submitted.

Sri Lanka Association for Testing Laboratories (SLATL): TRI has participated in the inter-laboratory testing programme for the ISO 3720 parameters conducted by the SLATL and obtained satisfactory results.

Pesticide Residue Analysis Program

Maintaining pesticide residues in made tea below the stipulated Maximum Residue Limits (MRLs) is of paramount importance in marketing Ceylon tea as stringent quality control measures are implemented by the consumer countries. Therefore it is important to develop high-throughput methods to monitor pesticide residues in made tea. A multi-residue method was developed to analyse residues of Diazinon, Bitertanol, Hexaconazole,



Propiconazole and Tebuconazole in made tea simultaneously. Experiments are underway to incorporate Oxyfluorfen, Fipronil and Pyraclostrobin into the above multi-residue method. Limits of detection (LOD) were five times below the MRLs.

Quantification of gamm-aminobutyric acid (GABA) in tea

Similar to L-theanine, GABA is also known to impart stress relaxation effect. A project initiated to quantify the level of GABA using LC-MS/MS facility in collaboration with Italy revealed that Sri Lankan black tea, green tea, silver tips and white tea contain GABA and their content is in the ranges of 81-129, 13- 48, 63-442, and 83 – 803 mg/kg respectively.

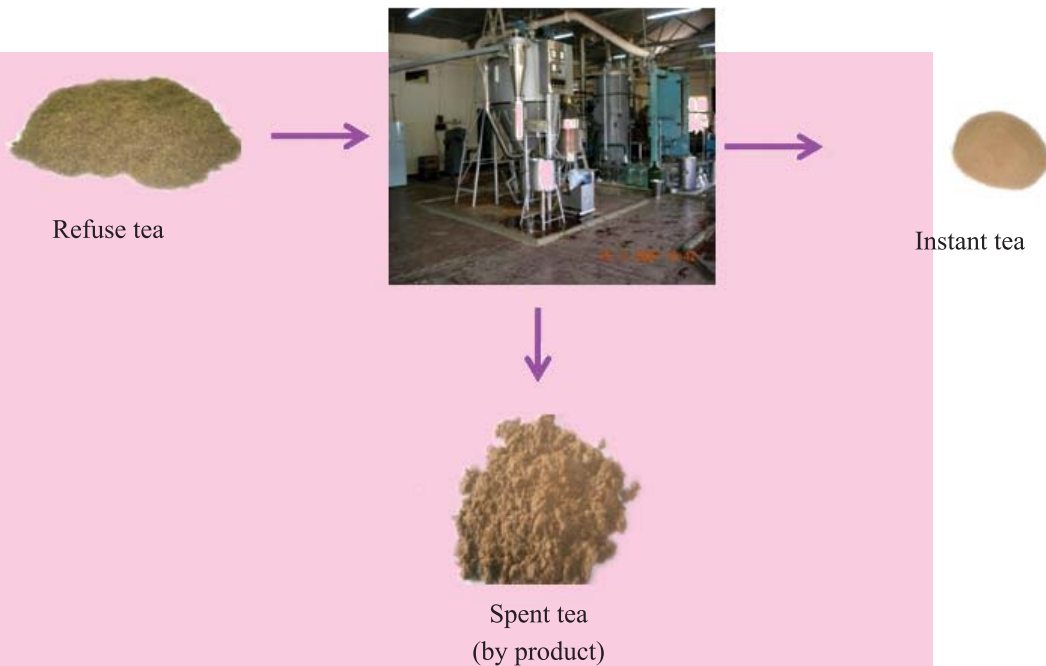
VALUE ADDED TEA PRODUCTS

Artificial Neural Networks for Predicting and Classifying Tea Flavor/Quality in Regional Teas in Sri Lanka

Analysis of regional tea samples for chemical constituents using HPLC was completed, except for catechins. 149 and 129 tea samples collected from different regions were analyzed for flavor and TF/TR respectively. Construction of profiles for flavor & organoleptic attributes in regional teas were completed. In order to improve the mutual agreement, statistical analysis for bias correction of tasters was also completed.

Biological effect of tea on human health

Replacing synthetic anti-oxidants in processed meat is important owing to health concerns. Therefore, a study was conducted to investigate the possibility of replacing synthetic antioxidants used in uncured pork sausages with natural antioxidants present in black and green tea. As it was found those both green and black teas have the favorable antioxidant activity (Lower 'Thiobarbituric Acid Reactive Substances' - TBARS values) in uncured pork sausages. Compared to the control sausage sample, both green and black tea extracts added sausage showed significantly low ($p < 0.05$) TBARS throughout 5 days storage period. The taste, texture and overall acceptance of BTE (black tea extracts) incorporated sausages were the highest ($p < 0.05$).



Improving the process for instant black tea production

In conventional instant tea manufacture, thermal evaporation is done to concentrate tea extract before spray drying. This causes deleterious effect to the quality of the final product. Membrane concentration technique is a non- destructive option to thermal concentration. Therefore possibility of applying membrane concentration technique in instant tea manufacture was studied. Chemical evaluation of samples revealed that the instant tea prepared by the membrane concentration technique was superior in chemical composition.

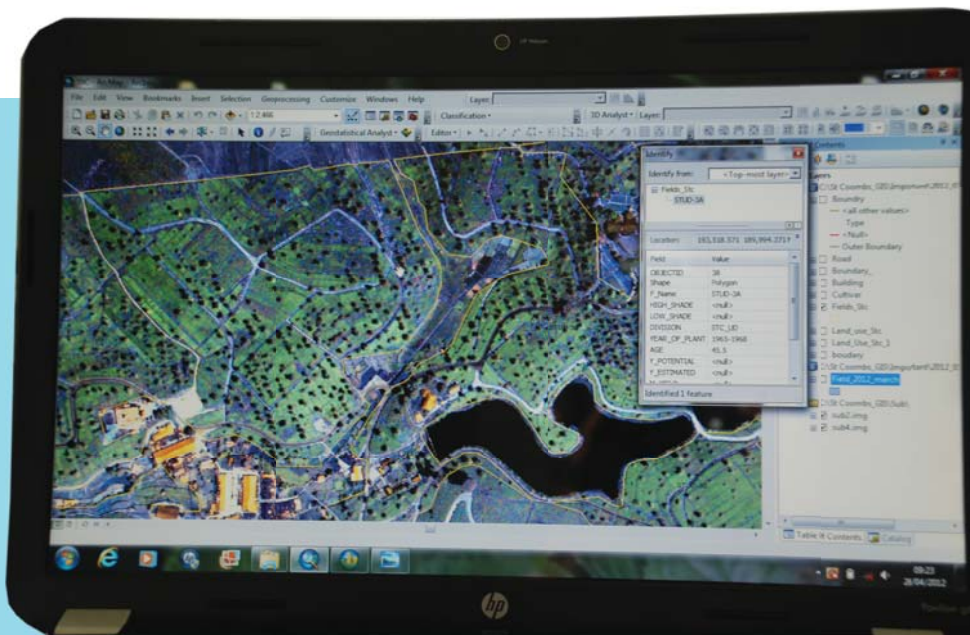
SOCIO-ECONOMICS

Determinants of Cost of Production (COP) of tea small holders in low country wet zone of Sri Lanka (Ratnapura district)

Data collection from 150 small holders in Ratnapura district through a survey was completed to estimate the Cost of Production (COP), identify determinants of COP and study the constraints faced by them. The results of ANOVA revealed that COP/kg for different extent category was significantly different. The lowest COP was obtained for the land category of 0.75 – 1.5 Ac which is significantly different from other land category. The highest share of COP accounted from labour and it was 72% of the total COP. According to the productivity estimations obtained for each extent category, 2.25-5 Ac group obtained comparatively higher productivity while the other categories remain almost same. This could be due to their high capacity to invest on crop, good management level and benefits receiving from bulk purchasing of inputs. There was a significant relationship between management level and production. Poor knowledge on new technology of farming, lack of awareness about finance and training institutions, high price fluctuation and low price of green leaf were recorded as main constraints faced by the small holders in the low country.

Development of a model for out grower system in tea estates

The out grower concept was introduced in Selagama estate belongs to Elkaduwa Plantation with 29 registered workers Company to develop a model to implement in tea estates as a strategy to shortage of workers and improve unproductive tea lands with workers' effective participation for the continuation of the industry. The aim of this project is to develop the institutional capacity, improve workers' self confidence and motivate them towards self reliance, in addition to the financial gain. Results of the preliminary analysis after 8 months of the commencement of the study revealed that average productivity of out growers' fields has improved in the year 2011 (835 kg) in comparison to year 2010 with a favorable weather condition (800 kg). However, productivity difference between year 2011 and 2008 (both years having more or less similar weather condition) is considerably higher, contributing to yield increase by 165 kg of made tea in



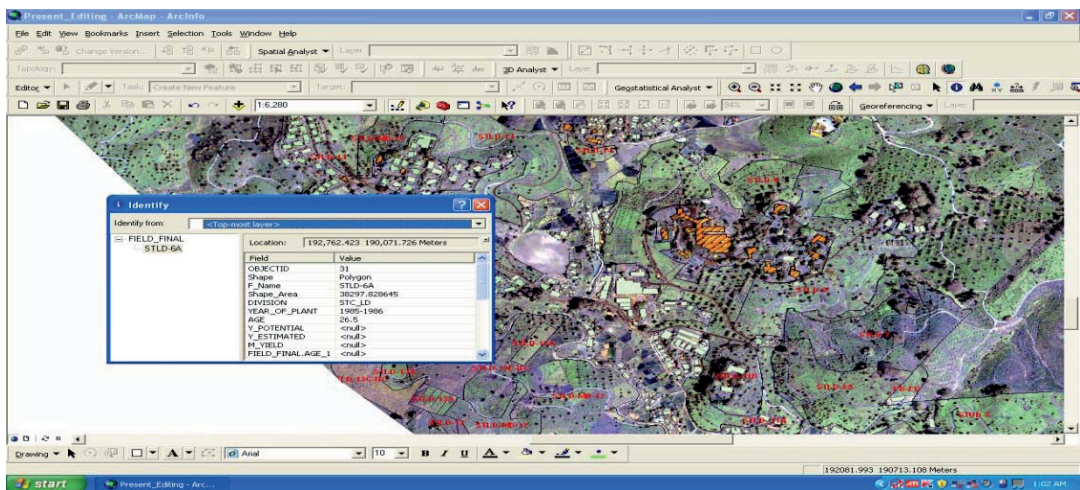
2011. Production of out growers' fields in 2011 was also higher than 2010 (about 5% increment) in the same fields. 25 % yield increment was observed in these fields when compared to yields obtained in 2008. Monthly additional income from out growers' plots is Rs. 2600 per family. Average monthly total earnings from the estate worker are about Rs. 5300/worker. Unfavorable weather condition badly affected the planned activities of the projects.

Implementation of Geo Graphic Information (GIS) System to Tea Plantation Management

Studies on the application of GIS & RS (Remote Sensing) techniques on Tea plantation management, conducted at St. Coombs estate as a case study was successfully completed.

GEOEYE 1 Geo 0.5m, PANSARPENED COLOR ARCHIVE 4 BANDS satellite image was subjected to digitization process using Arc map version 9.3 software. Field map, Land use map, Cultivar map, Road

map, Building map are available. 3D analysis techniques were used to create DEM (Digital Elevation Model) of St. Coombs Estate, using this DEM, Slope and Aspect maps were created. These maps will be published using arc publisher and user can view & analyze these maps using Arc reader which is a free & user friendly software. Estate management can use these maps for planning in various issues e.g. scheduling of major agricultural activities such as fertilizer, pruning, weeding replanting etc., and socio economic aspects in order to improve labor productivity. Thus this will lead to a Decision Support System (DSS) where record of almost every individual tea plant & corners of the field will be documented in digital manner & management will be able to take proper decision at proper time with the help of this package at the expense of a mouse click.



Impact of worker wage increase & fertilizer subsidy on Cost of Production

Impact of worker wage increase & fertilizer subsidy on Cost of Production (COP) was analysed for both corporate and small holding sector. Estimated COP (with TRI recommended practices) before wage increase in up, mid, low & uva was Rs. 334.66, 342.85, 355.06 & 399.85 per kg of made tea, respectively in corporate sector. Average reduction of COP due to fertilizer subsidy varies from Rs. 10.37 -16.59 per kg of made tea (3 -4 % decrease of total COP). Total COP has increased by around Rs. 42-47 per kg of made tea (12-13 % increase of total COP). Even though, at present there is no direct effect on COP in small holding sector, it can be expected the wage rate of skilled and unskilled workers might be increased up to Rs. 650 and Rs. 450 per day, respectively. COP in tea field achieving productivity level 3954 kg/acre/yr (national average productivity in small holding sector) is Rs. 37.80 per kg of green leaf. However, with wage revision (Rs. 572/day), COP has increased to Rs. 43.19 per kg of green leaf and it is a 14 % increase (Rs. 5.40 per kg of green leaf) of total COP. To minimize the negative effects of

wage revision, it is very necessary controlled COP by improving land and labour productivity. Use of good crop management and manufacturing practices, product diversification and value addition could ensure both higher productivity and NSA. As the labour related costs contributes to the largest share of the COP proper deployment of worker and offering task work or contracts to the workers will also help controlling the COP.

Performance of tea industry during last decade

The analysis on performance of tea industry was completed and the results revealed that there was an increase in extent and a positive growth rate of production in small holding sector during last decades. It can be also noted that cumulative growth rates of productivity in all the sectors (JEDB, SLSPC, management companies, small holdings) were found to be negative during last decade. However, average growth rate of productivity in Management Company was found to be positive during last three decades. It was also observed that financial efficiency is relatively higher in small holding sector than in corporate sector.

SERVICES TO STAKEHOLDERS

1. Advisory and Extension Programs

Advisory visits were made to tea plantations in the corporate sector and smallholdings to identify and solve the cultivation related problems in tea estates on request made by clients.

Majority of advisory visits has been undertaken in the corporate sector tea plantations and some visits were made to smallholdings to attend to special issues in collaboration with the staff of the Tea Small Holdings Development Authority. Total of 792 advisory and extension visits have been made by the staff of Advisory and Extension division. Almost 27% of visits made during the first quarter was mainly for land selection in the South Western sector. About 10% of visits were extension visits, mainly to monitor the adaptive trials.

Extension staff of the Deniyaya extension centre has made 248 visits for both corporate sector and small holdings visits which is 31% out of the total advisory and extension visits, whereas staff of up country region has made 232 visits for the year. Extension staff of Low country regional centre, Mid country, Galle, Passara and Kalutara centres have done 130, 58, 54, 48, and 22 visits respectively. Majority of advisory visits were mainly on investigating the land suitability for replanting. Requests for investigating the causes for yield declining, debilitation of bushes, nursery failures and pest and disease incidences were among the rest of advisory visits.

2. Educational and Training activities

Group Training programs: Total of 516 training programs, seminars, field days were conducted by the advisory and extension division, in collaboration with the research staff of the institute.

Majority of the training programs (39.7%) were conducted for small holders in Deniyaya region focusing mainly on fertilizer use, soil fertility, safe use of pesticides, problem of pest and diseases..



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Factory based Extension: Several training programs organized by the Tea Board and the TSHDA were conducted in Matara, Galle and Ratnapura districts to educate the Factory based Extension officers on the importance of concerning the MRL in made tea and proper maintenance of field records, specially on the use of agrochemical and fertilizers. During the discussion it was revealed that the extension workers who are directly attached to the factories have already convinced about the importance of maintaining proper field records..

3. Participatory Technology dissemination activities

Regional Technical and Extension Forum (RTEF): Twelve RTEF seminars were organized in collaboration with the TSHDA covering all eight Regional Manager Regions of TSHDA. Fertilizer use efficiency through proper soil management, shade management, performance of TRI 3000 and 4000 series tea cultivars were some of the important areas that were discussed at the RTEF. In addition, the outcome of the bush debilitation survey conducted in Deniyaya was discussed and the importance of strengthening the legal framework for inspecting commercial nurseries through the planting material act and establishing of standard commercial tea nurseries in all region were highlighted. Pruning, infilling of tea and its scientific back ground, Pest management and recommended pesticides for tea were the topics discussed at the RTEF in the Uva region.

Experiment and Extension Forum for the Smallholdings Sector: Two programs of Experiment and Extension Forum, conducted bi-annually for the Smallholdings sector, with the participation of officials from TRI, TSHDA, SLTB, SLPTOA and Tea society members were held in the months of July and December. "Current cost calculation of a tea small holder land and strategies to maximize profit", "Mechanization in tea cultivation", "Outcome of the Deniyaya region bush debilitation study", "Management of SHB, "Soil pH buffer and its applications, "Mix cropping/Intercropping options in tea small holder lands" and "Shade management" were the subjects discussed at the above *fora*. Tea grower's feedback on the current problems faced by small tea growers were also presented at the *fora*. During the open forum, the possibility of introducing mechanization in tea was highlighted.

Experiment and Extension (E & E) Forum for the Corporate Sector:

Two E & E Fora were held at TRI Talawakelle for CEOs/Corporate Manand Senior executives of the corporate tea sector. The details of the forums are as follows;

222nd E & E Forum - Date: 28th January 2011- Theme: “Addressing Productivity Decline through Proper Land Management”

Paper 1 -Factors Contributing to Productivity Decline in the Corporate Tea Sector by Dr. S Sidhakaran

Paper 11- Impacts of Some Basic Pruning Practices on Land Productivity by Dr. M A Wijeratne

Paper 111 - Compatibility of Scion and Stock of Selected Graft Combinations of Tea by Mrs. L A S P Jayasinghe

223rd E & E Forum -Date: 29th July 2011- Theme “The Challenges for Sri Lankan Tea - Satisfying Current Global Market Requirements”

Paper I - Quality Improvement of Orthodox Rotorvane Type of Tea through Optimization of Degree of Wither by Dr. W S Botheju

Paper II -Use of a Combination of Different Mesh Sizes for Roll-breakers in Orthodox Tea Processing for Quality Improvement by Mr. G L C Galahitiyawa

Paper III- Standards of Tea to Meet Market Requirements by Dr. Nimal Punyasiri

Regional Scientific Committee (RSC) seminars: Eight seminars organized by the Regional Scientific Committees were conducted covering all seven RSC regions. The subject areas such as "Enhancing fertilizer use efficiency by managing agricultural practices", " Chemical usage and alternative methods for controlling Pest & Diseases and the Weeds", “Management of human resources in the Plantation sector" "Importance of correct timing and methods of pruning" "GAP and GMP to enhance the productivity and the prices in up country region" were among the other important area which were highlighted at the above seminars. In Uva RSC which was held on 1st April 2011 the topics discussed were; Importance and management of shade in tea, Management of Good quality planting materials for replanting and Energy saving in tea manufacture

Stakeholder Forum Seminars: With the new initiative to conduct this forum in a participatory manner aiming to enhance the interaction between TRI scientists and the stakeholders, two seminars were conducted in April and October with the participation of CEOs and all the senior management of RPCs and other tea related organizations. Launching of the document of "Agronomic Profile of the Corporate Sector Tea Plantations", and "Agronomic Profiles of Tea Plantations of RPCs" and the presentation of the outcome of diagnostic survey were coincided with the stakeholder forum seminar held in April. Three senior Scientist/Extensionists of TRI made presentation on the current status and the adoption of TRI recommendations in the corporate sector tea

plantations, adoption of good agricultural practices for the higher productivity and the sustainability. Four senior planters made presentations on the cost of soil management, the success stories of burial of pruning, the chemotropic effect of tea roots and the alternate method of using rock phosphate in tea field.

4. Information dissemination

Advisory correspondence: Total number of 2,961 advisory correspondences has been sent out on various advisory matters and following the advisory visit to plantations and smallholdings. The majority of correspondence has been sent during the 2nd and 4th quarters of the year. As two monsoonal seasons were coincide with these two quarters, the information on weed management, pest and disease problems, information on other cultivation practices are sought by the growers, during this period.

Audio Visual and Information materials: Several extension and educational information materials were developed by the staff of advisory division for conducting extension programs, information dissemination and for publicity purposes.

Twenty four digital posters and twelve display placards on different subjects, eight leaflets/booklets and a wall chart on nursery management were among them. DVD pouches were prepared to safely carry the DVDs distribute by the Audio Visual Unit.

Fifteen Advisory Circulars were revised and issued with the collaboration of subject matter specialists.

Publications Issued

- Advisory Circular No: P A 2 – Drought Mitigation in Tea Plantations
- Guideline No: 01/11 – Measures to be Adopted on Tea Lands Following Drought (Sinhala / English)
- Guideline No: 01/11 – Guideline on Burying of Pruning to Improve Soil Fertility and Productivity of Tea Lands
- TRI update : Volume 13, No 02
- Thei Tathu:Volume7, Part 01
- Thei Thathu Vol 8 Part 1

Sale of Publications

Income generated through the sales of publications was Rs. 454520.50

In-house Printing/Duplicating works

The Unit has provided printing facilities for other divisions/units on request. This includes the printing of advisory circulars, proceedings of E & E forum, leaflets for free distribution at crop clinics, etc.

Website

The upgraded TRI website was launched by the Hon. Mahinda Samarasinghe, (MP), Minister of Plantations Industries, on 11th July 2011 . Web address - www.tri.lk

Photography Unit

Photography Unit covered all the functions of the institute and captured 6254 Digital Photographs and processed 568 official photographs and 705 private photographs. An income of Rs.17, 625 was earned by selling private photographs.

5. Stakeholders and Public relation activities:

Visitors to TRI: Total of 8,490 stakeholders, students, foreign personnel visited the TRI for educational and awareness purposes.

Extension campaign on nursery management were conducted at the Kalutara extension centre with the participations of senior government officials , staff of the TSHDA managers of the corporate sector tea plantations, commercial nursery owners, and tea small holders in the regions. All aspects of nursery management including the identification of suitable cultivars, suitable growing media and techniques of cleft grafting were demonstrated by the staff of Advisory, Agronomy, Plant Breeding and Entomology/Nematology divisions of TRI.

Staff of the Advisory division participated at seven public and educational exhibitions including the "*Dayata Kirula National Exhibition*" held at Buttala. Officer in charge of Uva Extension centre organized the *Dayata Kirula* exhibition activities.

Soil analysis: Soil analysis for pH was undertaken by the staff of extension centers at Galle, Passara, Ratnapura, Kandy and Deniyaya.

2,621 samples for pH and 386 samples for organic carbon have been tested by the advisory staff. According to the records majority of soil sample for pH testing (48.3%) have been received during the 2nd and 3rd quarter, before the pruning of mature tea fields.

Supply of new clonal cuttings: 7.8 million cuttings of TRI 3000 & TRI 4000 series have been issued to small holders and the corporate sector estates during the period from 2011 from six TRI, twelve TSHDA, Two private and twelve southern province small holder fields. Majority of cutting have been issued during 1st quarter (37%) and the 4th quarter (38.3%). It was observed that in Uva region, demand for cultivars such as TRI 4053, 4052, 4042 and 3019 was comparatively high. However, in the low country, the most demanding cultivar was TRI 4049 while in the mid country it was for TRI 4006 and 4046. In the up country region, however, the demand was more for TRI 4071, 4052 and 3019. **87**

Although the estimated cuttings to be supplied from mother bushes for 2011 was 15 million, targets could not be achieved mainly due to unfavorable weather conditions and less demand for TRI 3000 & TRI 4000 series cultivars (except for few) among small holders.

Commercial Nursery Inspection: On the request of TSHDA, 137 commercial tea nurseries have been inspected for approving the suitable plants for replanting and infilling. Generally, it was found that only about 55-60% of nursery plants inspected were suitable for recommending, in terms of the size of bags, number of leaves and the heights of the plants.

6 Extension Infrastructure Development activities

Upgrading Extension Centers: An extension centre was established at the premises of Nivitigalakelle Training centre of Rubber Research Institute to enhance extension and training facilities provided for tea growers in Kalutara district.

Development activities were initiated at the Galle extension to enhance the capacity of providing planting materials for tea growers.

Established an Information centre at the Mid country regional centre to disseminate tea information and technologies and to produce audio visual materials needed for extension and publicity activities in collaboration with Audio Visual center at Department of Agriculture and the university. Infrastructure for information centre and computers and the Internet facilities were acquired. Digital, printed and audio visual materials are being developed to equip the information centre.

7 Extension Research

Monitoring of the agricultural performance of tea plantations: The outcome of the diagnostic survey conducted in the corporate sector was presented as two documents: "Agronomic Profile of the Corporate Sector Tea Plantations, and twenty documents the "Agronomic Profiles of Tea Plantations of RPCs" at a stakeholder interaction workshop held on 4th April 2011 at Colombo. In addition, the outcome of the study was presented to the Hon. Minister, senior officials of the ministry and the CEOs of all RPCs in the country, at the Ministry of Plantation Industries. The adoption of TRI recommendations in the corporate sector and the problems encountered in adopting these are being monitored by the advisory staff to refine such recommendations.

Identifying and Assessing of widely adopted Agricultural practices by tea growers: Several investigations were conducted by the advisory staff at different workshops and

during their field visits to plantations and the smallholding, using different participatory data gathering techniques, in order to identify the widely used agricultural practices by tea growers. Some of the identified cultivation practices are; use of bed plants in tea fields, use of nursery bags with different height and width in tea nurseries, use of various types of soils in nursery bags, use of different shade materials in tea nurseries, approach grafting of seedling and VP tea planted in a single bag and use of concentrated fertilizer solution for controlling weeds in tea fields. The identified were discussed at the divisional meeting with the advisory staff for further clarification and some of them were publish as a preliminary communiqué in the "Tea News", to get the feedback from tea growers.

A nursery experiments were established at Talawakelle for a preliminary assessment of using bed plants, nursery bags with different height and width and testing possibilities of approach grafting between seedling and VP tea planted in a single bag. Arrangements have been made to establish the trials 2012.

A weed density study in new clearings at St Coombs estate was conducted as a pre-requisite for the trial in using concentrated fertilizer solution for controlling weeds in tea fields.

Public-private partnership extension approach: Several studies were initiated to assess merits of Public-Private Partnership (PPP) approach in the plantation sector to bridge the gap between public and private sector technology dissemination systems and to develop a mechanism to work in partnership with the private sector for developing extension and display materials. A committee was appointed to organize a forum to discuss the matters related to establishing the partnership among private extension systems in plantation sector, agrochemical and input dealers, the universities and other organizations which deal technology dissemination in tea sector.

Para Extension Approach (PEA) for the Corporate Tea Sector: In order to address the wide agricultural knowledge and adoption gaps at supervisory and worker level employees of corporate sector tea estates, the pilot scale collaborative project of *Para Extension Approach (PEA)* with Watawala Plantations Ltd, in six estates continued. Under this approach, qualified Field Officers/Assistant Field Officers/Welfare Officers/Estate Medical Assistants of estates were regularly trained by the TRI on tea harvesting and pruning to build their capacity as *Para Trainers*. The training covered not only tea related technical subjects but also subjects related to communication (to become effective *para trainers*), health, nutrition, etc related to worker productivity. Six programs were completed during the year and 30 para trainers were trained.

These *para trainers* in turn, started training their junior officers, worker groups such as plucking gangs and pruning gangs with the help of TRI. It was reported that the following outcomes were observed by the plantations management;

1. Improving accessibility to agricultural knowledge related information on good agricultural practices (GAPs) and improved agricultural technologies in supervisory and worker level plantation employees
2. Improving efficiency of training the plantation workers
3. Developing positive attitude of field staff and workers towards their job and implementation of GAPs
4. Improving work output and standard of work such as improved plucking average particularly of below norm pluckers, improved standard of plucking, improved attendance to work etc.

Cyber Extension activities: Cyber extension, using all possible information and communication technologies was initiated as an appropriate and timely information delivery mechanism affordable to tea growers both in corporate and smallholding sectors. The main objective of this initiative was to narrow down the technology adoption gap of tea growers by reducing time taken for information delivery between technology generation system and the technology user systems.

The main information centre is being established at the TRI mid country regional centre at Hantana, furnishing all the ICT facilities as well as the facilities to produce digital and AV materials necessary for Cyber extension activities.

A sample survey was conducted among all the categories of stakeholders in the plantation sector to assess their readiness to accept the cyber extension facilities and to identify their aspirations on the benefit of ICT for enhancing their profits.

Bush Debilitation survey in Deniyaya Region: A survey was carried out in collaboration with TSHDA, to identify the contributory factors for bush debilitation and issues related to yield decline in the Deniyaya region. Sixty stratified samples from smallholdings selected from the Senior Tea Inspector regions in Kotapola, Pasgoda and Akuressa were inspected and the growers were interviewed using a structured interview schedule by the advisory staff with the field staff of THSDA for collecting necessary information. Results showed that bush debilitation is associated with known factors such as severe SHB attack, Low country Live wood termite problems, nematode infestation, use of unsuitable planting materials, poor soil fertility, canker problem, senile condition of tea and adoption of bad agricultural practices.. The results were presented at the RTEF and E & E (Sinhala) and RSC forums.

Uncultivated land survey: Staff of the advisory division and the staff of some research divisions were actively participated in the data collection of the land use survey covering all tea growing regions organized by the Ministry of Plantation Industries, to identify the uncultivated tea land in the RPC sector.

8 Adaptive trials

Fertilizer Adaptive Trials: To elicit growers preference on TRI recommended fertilizers mixtures and the fertilizer mixtures preferred by the smallholders, adaptive trials were established in 26 Senior Tea Inspector ranges in collaboration with Soils and Plant Nutrition Division of TRI and the TSHDA. Regular monitoring and data collection were done by the staff of advisory division and the TSHDA. Ten progress monitoring meetings were held during the year to discuss the progress and identify the problems encountered.

Survey on the Performance of TRI 3000/4000 series Cultivar in tea smallholdings:

A collaborative survey with the Plant Breeding division and the TSHDA is being conducted in all tea growing regions, with the objective of identifying the grower perspective on TRI 3000/4000 series cultivars released by the TRI. Data collection in Deniyaya and Passara regions were completed and Kandy, Ratnapura regions are being proceeded. Results generated from Deniyaya regions showed that, out of the 50 stratified samples tested more than 90% growers cultivated only TRI 4042 and they were of the view that TRI 4042 possess more positive attributes. However, some growers were of the view that TRI 2026 and TRI 2025 cultivars are comparatively better than TRI 4042. Only about 5% of the samples in the study reported having specific problems related to new cultivars. Such lands were identified to study further. Growers commented negatively on the performances of TRI 3025, 4053 & 4052 due to their inherent features of producing flowers & buds and relatively low yields.

Adaptive trials on using Bio-Film Bio Fertilizers (BFBF Technology) in tea nurseries: In order to evaluate the efficacy, technical feasibility and economics of BFBF for producing low cost healthy and vigorous tea plant in farmer's tea nurseries, seven adaptive trials were established in the tea nurseries at Ratnapura, Galle, Deiyaya, Passara and Gampola areas. The assessment in Passara trial was completed and the progress of other trials are being monitored.

Adaptive trial on Champ DP(Dry Prill)

Champ DP(Dry Prill), an improved formulation of Copper Hydroxide which is a contact fungicidal formulation was previously tested by Plant Pathology Division and proved to be effective in controlling Blister Blight disease at experimental levels. Thus, an adaptive trial was initiated in order to study the practical applicability of this formulation at commercial level.

Two treatments, 0.1% Champ DP at 10 day interval and 0.08% Champ DP at 7 day interval were evaluated for its performance at commercial scale at Nuwara Eliya Estate. Also Champ DP was compared with blister blight control measures currently adopted by the estate i.e. Helmoxy (a contact copper fungicide) and, Helmoxy+ Hexaconazole. Trials were conducted during blister blight season covering different growth stages of tea on different cultivars susceptible to blister blight. The trials were managed by Nuwara Eliya Estate with TRI advice. The results revealed that Champ DP 0.1% at 10 day interval gave better control of Blister blight disease than that of normal copper fungicide and 0.08% Champ DP and was cost-effective. Champ DP 0.08% sprays at 7 day interval gave slightly better blister control than the normal copper fungicide. The recommended cocktail mixture of the normal copper + Hexaconazole at 7 to 12 day rounds showed better control of Blister blight than Champ DP.

9. Special Events

- Her Excellency, Nirsia Castro de Guevera, the Cuban Ambassador for Sri Lanka visited the Uva regional Extension centre.

10. Issues

Most of the RPC plantations in Uva region reported to make financial losses in the second half of the year due to high COP, decline of NSA and decline of the crop due to unfavorable weather pattern. Absentism of estate Employee and low productivity of lands are also associated with financial losses. Many of the plantations have suspended most of their Agricultural development activities owing to this situation.

11. Analytical Services

Development of regional analytical facilities for soil, plant and Fertilizer analyses

The main objective of this service to provide analytical facilities to stakeholders for soil, foliar and fertilizer analysis and assist site specific fertilizing.

The total numbers of soil, leaf, fertilizer and organic manure samples analyzed at Talawakelle, Walahanduwa and Hantane during 2011 are 5404, 248, 1834, and 31 respectively.

The total numbers of analysis performed on soil, leaf, fertilizer and organic manure at Talawakelle, Walahanduwa and Hantane during 1st January to 31st December were 15828, 912, 5037 and 138 respectively. Out of these analyses the highest number of analysis were performed for soil pH (4992) and soil organic carbon (3859). Total number of analysis performed for the year 2011 is 21915.

In addition to the soil analysis, Site Specific Fertiliser Recommendation (SSFR) schedules were also prepared.

IT Unit

Information Technology unit rendered its ICT related services to other divisions, units, regional and extension centers as well as to the TRI estates. These include:

- Administration and maintenance of Internet, e-mail and file servers

- Installation and troubleshooting of computers, computer accessories and Local Area Network (LAN)
- Installation, maintenance and updating Anti-Virus software
- Maintenance of Finger Print Scanners and software
- Preparation of technical specifications to purchase computers and computer accessories etc.

Major Improvements

- A new server computer was purchased and installed to use as the institutional e-mail server.
- Fifteen desktop computers and eight notebook computers were purchased and distributed in the head office and among other regional/ extension centers according to their requirements.
- Anti-Virus program was also purchased and installed in 111 desktop and notebook computers.
- Maintained the Fixed Assets Register of Computers, Accessories and Software to comply with the e-governance guidelines of ICTA.

General

- Completed the development of Alpha version of the Disease Assessment Software for Blister Blight in Tea in consultation with Plant Pathology Division.
- Involved in updating TRI Website with new information .
- Assisted Publications/ Publicity Officer in developing TRI Website, designing computer graphics and printing materials.
- Served as a member of several Technical Evaluation Committees for the procurement of computers and accessories.
- Assisted the staff of TRI in setting up multimedia and computer at the institutional stakeholder interaction forums.

Library

Main function of the library is the collection and dissemination of information based on the requirements of TRI scientist for work connected to their research and publications. The library renders its service to TRI staff, undergraduate and diploma students who undertake their projects at the TRI and also official requests made from other libraries and individuals.

The library involved in the following activities during the year:

- Acquisition, collection and maintenance of library materials
- Lending library materials
- Maintaining a collection of newspaper Clippings
- Photocopy Service
- Inter Library Loan Service

Acquisition

Four new books were added to the current collection of 4677 books.. The library procured 52 journals/serials through subscription, gift and exchange. It subscribed to 22 foreign journals. Three M Sc thesis of TRI officials were added to the library thesis collection.

Services

During the year, 512 news paper articles were sent to the Director. 3506 papers were photocopied for TRI staff from bound periodical collection and other library materials.

Forty students from Universities and Technical Colleges used the library facility.



Low country Regional Centre

M A Wijeratne

B Sc Agric (Ruhuna, Sri Lanka), Ph D (London, UK)

Officer-in-Charge

General

The TRI Low country Centre, Ratnapura is equipped with 4 laboratories attached to the Research Divisions viz. Agronomy, Entomology and Nematology, Plant Breeding, and Process Technology together with an Advisory and Extension section. Research units in consultation with the Heads of Divisions, carried out large number of laboratory, glasshouse, field, and factory investigations in the Low country plantations situated in Ratnapura and Kegalle districts.

Advisory and Extension section rendered its services by conducting advisory visits, and training programs in the form of field days, workshops and seminars etc for both corporate and small holder sector stakeholders. The staff members attached to Process Technology unit offered its services viz. advisory visits and problem diagnosis in relation to factory machinery and processing aspects for tea factories in the Low country region including the TRI St. Joachim factory.

The scheduled programs such as Experiment and Extension (E & E) and Regional Technical and Extension Forums (RTEF) were also held at the Low country Centre for the small holder sector with the participation of TRI, TSHDA, SLTB officials and the members of Tea Development Societies while Regional Scientific Committee (RSC) meetings were organized for the corporate sector stakeholders in the Ratnapura, Kegalle and Kalutara districts. Increasing land and worker productivity, reducing cost of production, adoption of good manufacturing practices (GMP) and Energy saving options and land degradation and climate change were the subject areas deliberated in those programs. In addition, two workshops including a field demonstration on the TRI evaluated tea harvesting

machines were organized by the staff of Agronomy unit of the Low country Centre for the prospective inventors, local university engineers and engineering firms dealing with designing and manufacture of machineries with a view to submit a project proposals. Assistance was also rendered by the staff of Agronomy unit to formulate nationally important project proposals on climate change and mapping of tea lands in Sri Lanka in collaboration with Department of Meteorology, Department of Agriculture, Survey Department and Land Use Policy Planning Department.

Staff

Mr. K G J P Mahindapala, Advisory Officer transferred to the Advisory and Extension unit of Low country Centre from Mid country Regional Centre with effect from 3rd January, and was again transferred to Galle Extension Centre with effect from 26th September to assume duties as Officer in charge of the Centre. Mr. T G N Mahinda, Advisory Officer attached to Matugama Extension Centre was transferred to the Low country Centre with effect from 5th September. Mrs K B M Sripalika, Experimental Officer attached to Process Technology unit resigned from the TRI services with effect from 1st November. Mr. N P S N Bandara returned to the TRI after submitting his postgraduate thesis upon completion of the studies at the Adelaide University, Australia and resumed duties in the Agronomy unit.

Human Resource Development and Capacity Building

Mr. S R W Pathiranage, Research Assistant, Agronomy, and Mr. M M A U B Marapana, Experimental Officer, Process Technology units followed a training program in China whilst Dr. M A Wijeratne, Officer-in-Charge of the Centre/Senior Research Officer, Agronomy unit participated in the TRI delegation to attend Tocklai Tea conference and a study tour to United Planters Association of South India (UPASI).

Training Opportunities

Mr Tofique Ahmed, Scientific Officer, Agronomy Department from the Bangladesh Tea Research Institute and Mrs. H I U Kaldera, Lecturer, Department of Plant Sciences, University of Colombo conducted postgraduate research projects on tea at the Low country Centre, Ratnapura in collaboration with the Post Graduate Institute of Agriculture, University of Peradeniya. Three university undergraduates and 08 apprentices from the government organizations were trained on tea related subjects and clerical and allied duties at the Low country Centre.

Infrastructure Developments and Maintenance

The routine maintenance work of water and electricity supplies, maintenance and repairs of staff quarters, office, and laboratory and other buildings, cleaning and maintenance of layout and repairs and services of Institute's vehicle fleet were satisfactorily attended. Field office of the Plant Breeding unit and two staff quarters were colour washed during the year. Repairing the fence around Low country Centre premises were completed.

Mid country Regional Centre

J C K Rajasinghe

B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Acting Officer-in-Charge

General

The TRI Mid country Centre, Hantana, Kandy is equipped with 4 laboratories attached to four Research Divisions viz. Agronomy, Entomology and Nematology, Plant Breeding, and Soils and Plant Nutrition together with an Advisory and Extension section. The land use pattern in hectares is as follows;

Seedling tea	2.00
VP tea (mature)	5.5
VP tea (young)	3.5
Mother bushes	2.75
Tea Nursery	0.2
Under Mana grass	0.5
Fruit trees	0.4
Coconut	0.81
Forestry	1.2
Marshy land	0.62
Building, gardens, paths and roads	5.77

Research units in consultation with the Heads of Divisions, carried out large number of laboratory, glasshouse and field, and factory investigations in the Mid country plantations situated in Kandy and Matale districts. Advisory and Extension section rendered its services by conducting advisory visits, and training programs in the form of field days, workshops and seminars for stakeholders, both in corporate and small holder sector. The scheduled programs such as Regional Technical and Extension Forums (RTEF) was also held at the Mid country Centre for the small holder sector with the participation of TRI, TSHDA, SLTB officials and the members of Tea Development Societies while a Regional Scientific Committee (RSC) meeting organized for the corporate sector stakeholders in the Kandy and Matale districts. Grafting of cultivars for combining desirable characteristics such as drought and disease tolerance, new developments in shot hole borer management, pruning of tea in the mid country regions, importance of minimizing the use of agro-chemicals in tea and proper shade management in tea were the subject areas deliberated in these programs. Presentations made the RSC forum was focused on pruning of tea in the mid country region followed by conducting lengthy interactive session to discuss issues in the region. Questions posed were mainly on timing of pruning, type and height of pruning, plucking, fertilizer usage, productivity improvement, weed, 97

pest and disease management. In addition to the scheduled programs, a Training of Trainers (TOT) program on “Shear harvesting” was conducted at Mid country Centre for the benefit of Tea Inspectors attached to TSHDA in Kandy and Matale regions to popularize the use of shears to address worker shortage. Two training programs on nursery establishment and management and tea cultivation techniques were also conducted for the first year students of Faculty of Agriculture, University of Peradeniya and the students of the Agriculture School, Kundasale respectively.

The staff of Mid country Centre actively participated in the “Deyata Kirula” exhibition organized in recognition of national development efforts at Buttala, and also at the “Crop Clinic” held at the TRI Matugama Extension Centre at the launching of tea nursery management techniques campaign. The staff of Advisory and Extension section extended their cooperation for the survey carried out by the Ministry of Plantation Industries to estimate extents of uncultivated lands in the corporate sector tea plantations in the Ratnapura district. Also, they conducted lectures and practical on tea cultivation at the Induction Training program conducted by TSHDA for the newly recruited Tea Inspectors at the Ratnasiri Wickramanayake Training Institute, Hantana, Kandy.

ADB Mother Bush Project

Mr J C K Rajasinghe, Senior Advisory Officer attached to Advisory and Extension Division, in his capacity as the Coordinator of Mother Bush project, inspected mother bush sites in Galle, Matara, Ratnapura, Kandy, Nuwara Eliya and Badulla districts to streamline the activities of each site to achieve the targets set for planting material requirements.

Adaptive Trials

Adaptive trials were commenced in 04 small holder properties in the Mid country to select the most suitable fertilizer mixture for the region, in collaboration with the Soils and Plant Nutrition Division and TSHDA. Adaptive trials on Bio Film Bio Fertilizer (BFBF) were also commenced at the Centre and at New Peacock Estate. An adaptive trial on new promising herbicides for the chemical weed control was laid out at the Mid country Centre in collaboration with the Agronomy Division.

Demonstration Plots

A section of the Centre’s nursery was used to lay out a demonstration plot on grafting of tea cultivars in collaboration with Agronomy Division. The demonstration plots on adoption of good agricultural practices (GAP) continued at the Centre to educate stakeholders and the general public.

Infrastructure Developments and Maintenance

The routine maintenance work of electricity supply, maintenance and repairs of staff quarters, office, and laboratory and other buildings, cleaning and maintenance of layout

and repairs and services of Institute's vehicle fleet were satisfactorily attended. A vehicle ramp was constructed at the Mid country Centre for facilitating vehicle cleaning and washing. A new telephone exchange with multiple extensions and a fax machine were installed at the Centre for the improvement of communications with stakeholders in the region and with the TRI Head office. The entire length of main entry road to the Centre was tarred.

Visitors to the station

I.	Tea Growers	-	350
II.	Students/ School Children	-	40
III.	General Visitors	-	176
IV.	Foreign Visitors	-	10
Total		-	576

Income (Rs.)

No. of VP cuttings sold	-	436,440.00
Income from sale of cutting	-	320,715.00
No. of VP plants sold	-	35,222.00
Income from sale of VP plants	-	633,996.00
Total crop harvested (kg)	-	16,517.00
Income from sale of green leaf	-	794,588.71
Guesthouse occupation charges	-	62,950.00
Charges for soil testing (pH)	-	36,955.00
Sale of TRI publications	-	83,125.00
Miscellaneous	-	28,200.00

Crop

The green leaf (kg) harvested, during the year 2011, is given below.

Month	Crop harvested/ Sold	Rate paid (Rs.)/kg	Income (Rs.)
January	752	51.20	38,477.40
February	910	55.13	50,143.30
March	2879	55.34	159,309.89
April	991	49.17	97,872.47
May	2307	46.31	106,812.17
June	1792	45.83	82,112.33
July	1139	46.85	53,337.15
August	913	43.76	39,927.88
September	628	42.20	26,476.60
October	1087	43.92	47,741.04
November	1229	42.04	50,413.16
December	890	48.48	41,965.32
Total	16517		794,588.71

Uva Extension Centre

K R W B Kahandawa

B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Officer-in-Charge

General

The TRI Uva Extension Centre, Palaghatenna, Passara is primarily an Advisory and Extension section equipped with a small scale laboratory for soil carbon and pH analysis. The extent of the center is 14.30 hectares. The land use pattern in hectares is as follows:

Mature tea in plucking	4.00
Young tea (Experimental block)	0.30
ADB Mother Bush	2.06
Buildings and Roads	0.79
Under Rehabilitation	0.40
Forest, Scrub and Grass land	6.75

Extension Centre in consultation with the Heads of Divisions at Head office, carried out large number of field, and factory investigations in the Uva plantations situated in Badulla and Monaragala districts. Extension Centre rendered its services by conducting advisory visits, and training programs in the form of field days, workshops and seminars for both corporate and small holder sector stakeholders. The scheduled programs such as Regional Technical and Extension Forums (RTEF) were held at the Uva extension Centre for the small holder sector with the participation of TRI, TSHDA officials and the members of Tea Development Societies while a Regional Scientific Committee (RSC) seminar was organized for the corporate sector stakeholders in the Badulla district. Pruning of tea in Uva, energy saving options in tea processing, proper shade management in tea, use of quality planting materials for replanting, and recommended pesticides and their correct use in tea were the subject areas deliberated in these programs. In addition to scheduled programs, staff of the Uva extension Centre in consultation with the Head, Advisory and Extension Division coordinated the assigned activities of tea research and extension by the Ministry of Plantation Industries (MPI) for the “Deyata Kirula” exhibition organized in recognition of national development efforts at Buttala. The staff of Advisory and Extension section extended their cooperation for the survey carried out by the MPI to estimate extents of uncultivated lands in the corporate sector tea plantations in the Badulla district as well. Also the Extension Centre completed its part of the Island wide survey commenced in collaboration with the Regional Centres of the Advisory and Extension Division by the Plant Breeding Division, to assess the perception of the newly introduced TRI 3000 and 4000 cultivars amongst the small holder stakeholders. This is to raise the confidence of the small holders and to strengthen the requisites for establishment and management of newly introduced cultivars in the sector. The center conducted three practical training programmes on various cultural aspects in tea plantation management for the undergraduates of the Tea technology and Value Addition Course of Faculty of Export Agriculture in Uva Wellassa University.

Her Excellency, Nirsia Castro de Guevera, the Cuban ambassador for Sri Lanka visited the Extension Centre on her visit to establish a Cuban friendship organization at Passara.

Staff Movements

Mr. D K D Disanayake, Technical Officer, was transferred to Uva Extension Centre to assist the Advisory and Extension program, reasearch trails and analytical activities from the Head office with effect from 01st November 2011.

Infrastructure Developments and Maintenance

The routine maintenance and repairs of staff quarters, office and other buildings, cleaning and maintenance of layout and repairs and services of Institute's vehicle were satisfactorily attended. Renovation of the driver's rest room of the circuit bungalow was commenced. Planting suitable tea cultivars on the new clearing block (0.1 ha) was also commenced.

Adaptive Trials

Adaptive trials were commenced in three small holder properties in the Uva to select the most suitable fertilizer mixture for the region, in collaboration with the Soils and Plant Nutrition Division and TSHDA. An adaptive trial on Bio Film Bio Fertilizer (BFBF) was also commenced at a commercial nursery, Hali Ela in collaboration with the Agronomy Division. Two more adaptive trials were initiated at the Haputale and Verallapathana Estates in Haputale and Madulsima respectively, to assess the commercial level adaptability on TRI 5000 series cultivars in collaboration with the Plant Breeding Division.

Research trials

Following trials are being either carried out by the respective Research Divisions or maintained at the Centre for subsequent follow up actions.

- Trials denoted as UVP9 and UVP10 carried out by Plant Breeding Division, are being maintained at the Field No 04 for the issuance of cuttings from TRI 5000 series and use as potential accessions respectively.
- Observational trial at Field No 02 to evaluate TRI 5000 series cultivars by Plant Breeding Division for evaluation purpose.
- A germplasm area at Field No 03 is being maintained for the conservation of valuable accessions.
- Trials, UST 01 and UST 02 with improved seed cultivars at Field No 03 and 04 respectively have been continued to evaluate to assess the potentials as alternative planting materials.
- The evaluation of grafted plants established in Field No 02 by Agronomy Division for their drought and disease tolerance continued.

- Evaluation TRI 5000 series cultivars together with a standard variety for their tolerance to parasitic nematodes continued at Field No with the inoculated beds tanks under controlled (Nematology Division)
- Evaluation of rain water harvesting techniques, Cassia and Gliricidia planted at different densities for the generation of “Dendro” power, nursery trial on Bio Film Bio Fertilizer and trials on Bio Fertilizer under field conditions, established by Agronomy Division also continued at Field Nos. 02 and 03.

Visitors

A total 787 personnel visited the Extension Centre and are as follows:

Category	Number
Foreign personnel	02
Planters	89
Small holders	187
Undergraduates	92
Students	38
Others	186
TRI Officers	193
Total	787

Crop

Monthly harvested crop form the tea extents, price offered by the factory for the green leaf supplied and their monthly income are as follows:

Month	Green Leaf (kg)	Price (Rs.)/kg	Amount (Rs.)
January	1308	47.48	62,103.84
February	1335	44.38	59,247.30
March	5133	50.21	257,727.93
April	3220	46.39	149,375.80
May	4876	39.61	193,138.36
June	4483	40.39	181,068.37
July	3070	41.46	127,282.20
August	2138	41.83	89,432.54
September	5022	38.53	193,497.66
October	3065	43.02	131,856.30
November	4407	44.62	196,640.34
December	2294	42.01	96,370.94
Total	40351	-	1,737,741.58

Income

Total income generated by the Centre through its activities and the income component breakdown is as follows:

Activity	Income (Rs.)
Sale of Green leaf (40351 kg)	1,737,741.58
Sale of VP Cuttings (398900)	295,790.00
Sale of VP Plants (2760)	49,680.00
Analytical Charges for Soil pH & Carbon	186,845.00
Sale of Publications (156)	55,945.00
Guest House Accommodation Charges	22,250.00
Sale of Firewood	23,420.00
Other	3,474.00
Total income	2,375,145.58

Galle Extension Centre

K D Dahanayake

Diploma in Agricultural Engineering

Officer-in-Charge (up to 23rd September 2011)

K G J P Mahindapala

B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)

Post Graduate Diploma (Applied Statistics)

Acting Officer-in-Charge (from 26th September 2011)

General

The TRI Galle Extension Centre, Talgampola is primarily an Advisory and Extension section equipped with a small scale laboratory for soil pH analysis, with an total extent of 35.6 hectares. The land use pattern of the Centre in hectares is as follows:

Mature tea in plucking	5.0
Young tea	2.4
ADB mother bush area	2.5
Nursery (tea)	1.0
Abandon for replanting/planting	3.5
Under rehabilitation (Mana & Guatemala)	1.6
Experimental trials	1.0
Coconut, Fruit trees and etc.	1.5
Forestry	7.3
Buildings, gardens, roads	9.8

Similar to other Regional Center TRI Kottawa Station is dedicated for Transfer of technologies, distribution of planting materials and monitoring of adaptive trials. This Center carried out large number of field investigations in corporate and proprietary estates as well as in smallholdings in Galle District and Akuressa region and prepare comprehensive reports on recommendations. It is worthy to note that most of the field problems observed were related to the bush debilitation due to deviating from basic agricultural practices. The scheduled programs such as Regional Technical and Extension Forums (RTEF) were organized by this centre for the small holding sector with the participation of TSHDA, and the executive committee members of Tea Development Societies while Regional Scientific Committee (RSC) seminar was organized in collaboration with Deniyaya extension centre for the corporate sector stakeholders in southern province. Timely important issues that are specific to the sector, were discussed in this scheduled programs.

In addition to scheduled programs, staff of the Galle extension Centre involved in nursey plant certification process in order to improve the quality of plants o by inspecting

commercial nurseries. Training of stake holder is a mandatory requirement of the technology transfer process. This station executed large number of training programs in the form of field days, workshops demonstrations and seminars for tea growers trainers and workers to develop their skills and improve the knowledge on new and existing technologies.

Distribution of newly improved planting materials is one of the major services offered to the growers in this region. About 366,750 cuttings of TRI 3025, TRI 3055, TRI 4042 and TRI 4049 cultivars were issued from approximately 2.5 ha of mother Bush area.

About 247 publications/extension materials were distributed. Also soil samples brought by the growers were tested for pH and necessary recommendations were given to ameliorate their soil.

Staff Movements

Mr. K D Dahanayake, Officer-in-charge retired from the TRI service with effect from 23rd September 2011 and Mr. K G J P Mahindapala took over the duties. Mr. S P Ratnayake was transferred to Deniyaya Extension centre.

Infrastructure Developments and Maintenance

Renovation of the Circuit bungalow was undertaken. The extent replanted in Field No. 06 this year was 0.15 ha and the cultivar used was TRI 4006.

Adaptive Trials

This station monitored the adaptive trials established in farmer's fields to assess the performance of proven technologies under grower's perspectives. Adaptive trials were commenced in four smallholder properties in the Galle district to select the most suitable fertilizer mixture for the region, in collaboration with the Soils and Plant Nutrition Division and TSHDA at Magedara, Wanduramaba, Ampegama, Hiniduma. An adaptive trial on Bio Film Bio Fertilizer (BFBF) was also commenced at a commercial nursery, at Wanduramba.

Research trials

Following trials are being carried out by the respective Research Divisions with the Collaboration of Galle Extension centre:

Plant Breeding Division:

- i) TRI 5000 series : LVP phase III trial at Field No. 03
- ii) Selectio for Low country Live Wood Termite resistance LVP phase II trial at Field No. 03

Soil and Plant Nutrition Division: Organic fertilizer trial at Field No. 07

Nematology Division: Nematode population monitoring trial at Field No. 04

Agronomy Division: Bio film Bio fertilizer trial at Field No. 02

Visitors

A total 493 personnel visited the Extension Centre and are as follows:

Category	Number
Foreign personnel	04
Tea Growers	431
Small holders	187
Undergraduates	07
Students	51
Total	493

Crop

Monthly harvested crop from the tea extents, price offered by the factory for the green leaf supplied and the monthly income are as follows:

Month	Green Leaf (kg)	Price (Rs.)	Income (Rs.)
January	2192	62.875	137,822.00
February	2099	63.315	130,799.19
March	2179	60.003	130,746.54
April	2300	59.519	136,893.70
May	2850	55.008	156,772.80
June	2573	57.006	146,676.44
July	1716	57.768	99,129.89
August	2449	57.649	141,182.40
September	2176	56.758	123,505.41
October	1694	56.296	95,365.42
November	2221	55.219	122,641.40
December	2254	59.009	133,006.29
Total	26703	-	1,554,541.48

Income

Total income of the Centre with its activities and the income component breakdown is as follows:

Activity	Income (Rs.)
Sale of Green leaf (40351kg)	1,554,541.48
Sale of VP Cuttings (398900)	258,540.00
Sale of VP Plants (2760)	107,502.00
Analytical Charges for Soil pH & Carbon	13,585.00
Sale of Publications (156)	27,240.00
Guest House Accommodation Charges	13,250.00
Other	8,529.00
Total Income	1,974, 976.58

Deniyaya Extension Centre

S P Rathnayake

B Sc Agric (Ruhuna, Sri Lanka) MBA (Whut, China)

Officer-in-Charge

General

The TRI Deniyaya Extension Centre, Ratnapura Road, Deniyaya is primarily an Advisory and Extension section equipped with a small scale laboratory for soil pH and Nematodes analysis on a total of 05.00 acres in extent. The land use pattern of the Centre in acres is as follows:

New clearings	0.5
Under Rehabilitation (Mana)	2.2
Buildings, gardens, roads	2.3

Extension Centre in consultation with the Heads of Divisions at Head office, carried out large number of field, and factory investigations in the low grown plantations situated in Matara and Hambantota districts. Extension Centre rendered its services by conducting advisory visits, and training programs in the form of field days, workshops and seminars for both corporate and small holder sector stakeholders. The scheduled programs such as Regional Technical and Extension Forums (RTEF) were held at the Deniyaya extension Centre for the small holder sector with the participation of TRI, TSHDA, and the members of Tea Development Societies while a Regional Scientific Committee (RSC) seminar was organized for the corporate sector stakeholders in the Matara district. Shade management, enhancing fertilizer use efficiency by managing agricultural practices affecting nutrient availability in tea growing soils of low country and the outcome of the bush debilitation survey in Deniyaya region etc. were the subject areas deliberated in these programs. In addition to scheduled programs, staff of the Deniyaya extension Centre in consultation with the Head, Advisory and Extension Division conducted the survey on bush debilitation in Deniyaya region in collaboration with TSHDA to identify the contributory factors with regards to Deniyaya region bush debilitation. 60 stratified samples tested in Kotapola, Pasgoda & Akuressa Senior Tea Inspector regions and results presented at the RTEF and E& E (Sinhala) and RCS forums. Combination of Pest & Diseases (Shot-Hole Borer, Nematodes & Canker) and bad agricultural practices have been supported for said condition.

The staff of Advisory and Extension section extended their cooperation for the survey carried out by the MPI to estimate extents of uncultivated lands in the corporate sector tea plantations in the Ratnapura and Badulla districts as well. Also part of the island wide survey commenced in collaboration with Plant Breeding Division, to assess the

perception of small holders on the newly introduced TRI 3000 and 4000 cultivars was completed. This is to raise the confidence of the small holders and to strengthen the requisites for establishment and management of newly introduced cultivars in the sector. New initiatives taken to evaluate the record keeping of fertilizer and chemical applications in small holder fields by entering information in the record book introduced by the TRI to the tea small holders in Matara district was executed in collaboration with TSHDA in few selected factories randomly. Observations emphasised the need to improve the record keeping.

Staff Movements

Mr. P K R C E Munasinghe Extension Officer, was transferred to Mid country Regional Centre with effect from 01st September 2011.

Extension and Experimental Forum

Mr. S P Rathnayake, Advisory Officer attached to Advisory and Extension Division, in his capacity as the Coordinator of the above forum, organized the forum bi- annually with the participation of TRI, TSHDA, SLTB, SLPTOA and the officials of tea societies. Current cost calculation in tea small holding and strategies to maximize profit, mechanization in tea, outcome of the survey on bush debilitation in Deniyaya region, Shot-Hole Borer control, soil pH buffer and its applications, mix cropping/intercropping options in tea small holdings and shade management were presented and a tea small holder was also made a presentation. During the open forum, the possibility of introducing mechanization in tea, importance of conveying important and relevant messages timely through mass media and making quality planting materials available to the growers, were highlighted.

Training Opportunities

A student from University of Ruhuna completed the research project and a Diploma student from NITA completed the in-plant training under the supervision of Mr. S P Rathnayake.

Infrastructure Developments and Maintenance

The land of the Center premises was surveyed and the constructions of the fence has completed accordingly. Constructions of the D-type Quarters and Concreting the internal roads commenced. Routine maintenance and repairs of staff quarters, office and other buildings, cleaning and maintenance of layout and repairs and services of Institute's vehicle were satisfactorily attended.

Adaptive Trials

Adaptive trials were commenced in three small holder properties in the Matara district to select the most suitable fertilizer mixture for the region, in collaboration with the Soil and Plant Nutrition Division and TSHDA. An adaptive trial on Bio Film Bio Fertilizer (BFBF) was also commenced in collaboration with the Agronomy Division and TSHDA at a commercial nursery on the site where TRI Deniyaya center was previously located.

Research Trials

Following trials are being carried out in the region in collaboration with the respective Research Divisions:

Collaboration with Plant Breeding Division :

- i) TRI 5000 series: LVP phase III trials at Indola, Kiruwanagaga and Deniyaya estates.
- ii) Improved seedling trial at Warapitiya Small holder's field

Collaboration with SPN Division :

- i) Fertilizer trial at Kuruduwatta Proprietary estate, Kotapola

Collaboration with Nematology & Entomology Division :

- i) TRI 5000 series monitoring trial at Deniyaya, TRI nursery
- ii) SHB trial at Deniyaya estate

Collaboration with Agronomy Division :

- i) Bio film Bio fertilizer trial at Richiland and Nilgiri Proprietary estates

Visitors

A total of 1038 personnel visited the Extension Centre. Its breakdown is as follows:

Estate management and Smallholders	-	769
University/Diploma students and others	-	269

Income

Total income of the Centre with its activities and the income component breakdown is as follows:

Activity		Income (Rs.)
Sale of Publications	-	43315.00
Testing 357 Soil Samples for pH	-	33915.00
Sale of 1300 nursery plants	-	23400.00
Miscellaneous	-	37652.90
Total	-	138282.90

Kalutara Extension Centre

Haran Jayaweera
Acting Officer-in-Charge

General

The TRI Kalutara Extension Centre, Niwithigalakelle, Matugama is primarily an Advisory and Extension Centre equipped with a small scale laboratory for soil pH analysis in a premises of Rubber Research Institute.

Extension Centre in consultation with the Heads of Divisions at Head office, Tea Research Institute Talawakelle, carried out large number of field, and factory investigations in the Kalutara plantations situated in Kalutara, Gampaha and Colombo districts. Extension Centre rendered its services by conducting advisory visits, and training programs in the form of field days, workshops and seminars for both corporate and small holder sector stakeholders. The scheduled programs such as Regional Technical and Extension Forums (RTEF) were held at the Kalutara Extension Centre for the small holders with the participation of TRI, TSHDA, SLTB officials and the members of Tea Development Societies while a Regional Scientific Committee (RSC) seminar was organized for the corporate sector stakeholders in the Kalutara district in collaboration with TRI -Ratnapura. Unavailability of good quality nursery plants in Kalutara was the major subject area deliberated in these programs. In addition to scheduled programs, staff of the Kalutara extension Centre in consultation with the Head, Advisory and Extension Division participated at the Education Exhibition at St. Mary's College, Matugama. More than 15000 stakeholders and general public attended at the exhibition. The staff of Advisory and Extension division extended their cooperation to organize the Crop Clinic for the benefit of tea growers in Kalutara, Colombo and Gampaha, which was successfully held with the participation of District Secretary, Divisional Secretaries and more than 500 stakeholders participated at this Crop Clinic. Three factory based extension programs were held in Palawatha, Katukalle, Hadigalla for the factory officers and extension officers with the collaboration of Assistant Tea Commissioner and TSHDA. The OIC participated the district Agriculture Council meeting at Kalutara DS office, representing TRI.

Staff Movements

Mr. Haran Jayaweera, Extension Officer attached to the Advisory and Extension Division TRI, Talawakelle was transferred to the Kalutara Advisory and Extension Centre as an Acting Officer-In-Charge with effect from 01st September 2011, and Mr. T N Mahinda Officer-In-Charge was transferred to Ratnapura Advisory and Extension Centre as a Advisory Officer.

Infrastructure Developments and Maintenance

The routine maintenance and repairs of laboratory, office and lecture hall, cleaning and maintenance of layout and repairs and services of the official vehicle were satisfactorily attended. A demonstration plot with new suitable tea cultivars with the help of Plant Breeding Division –Rathnapura, was established at the Center.

Adaptive Trials

Adaptive trials were commenced in two smallholder properties in the Meegahathenne and Giranchikanda in Kalutara district to select the most suitable fertilizer mixture for the region, in collaboration with the Soils and Plant Nutrition Division and TSHDA.

AWARDS/GRANTS, PUBLICATIONS, SPECIAL PRESENTATIONS AND STUDY PROGRAMS

Advisory and Extension Division

Publications

- Amaratunge M K S L D and Wanigasundera W A D P (2010), Strengthening Links among Key Stakeholders of Public-Private Partnership Extension Approach: Lessons Learnt from Tea Small Holding Sector in Sri Lanka, Sri Lanka Journal of Tea Science, Vol. 75 (1):1-16
- Sidhakaran V S (2010), Awareness Knowledge and Adoption of Agriculture Technologies by the Corporate Tea Sector in Sri Lanka, Sri Lanka Journal of Tea Science, Vol. 75 (1): 54-65

Special Presentations

- Mr. B A D Samansiri made a presentation on the outcome of Diagnostic Census on Corporate Tea Sector in Sri Lanka at the stakeholder forum held at Colombo on 4th April.
- Mr. J C K Rajasinghe made a presentation on the level of adoption of TRI recommendation in the Corporate Tea Sector at the stakeholder forum held at Colombo on 4th April.
- Mr. C J Liyanarachchi, Extension Officer conducted a Workshop/Seminar for Up-country Estates Executives and Field Staff of Agalawatta Plantation Company on "Replanting".

Study Programs

- Mr. B A D Samansiri assumed duties on 15th March, after completing 18 months study leave for pursuing PhD study program at the Post Graduate Institute of Agriculture, University of Peradeniya, on ICT use and information retrieval among stakeholders in the tea sector.
- Mr. K G J P Mahindapala, completed his post graduate diploma in applied statistics at PGIA.
- Ms. Hiromi Nishanthi, continued her M Sc program in Agriculture Extension (Development Communication) at the Post Graduate Institute of Agriculture, University of Peradeniya. She completed the data collection for the research conducted for her directed study.
- Mr. Rohitha Kumara and Mr. C Munasinghe, Extension Officers attended five -days workshop on the 'Training of Trainers" during the period of 17 - 21 October 2011 conducted by Skill Development Fund of the Ministry of Youth affairs and Vocational Training at "Nipunatha Piyasa", Colombo.

Agriculture Economics Division

Publications

B.M.M.S. Manchanaike, N.R. Abeynayake and H.W. Shyamalie (2011), Estimation of Cost of Production: it's share of determinants and constraints in the tea small holding sector in Ratnapura District,

Proceedings of 11th Agricultural Research Symposium, 2011, University of Wayaba: pp188-192

Special Presentations

Ms H.W. Shyamalie presented a paper on “කුඩා තේ ඉඩමක වර්තමාන තත්ත්වය පිළිබඳව ආර්ථික විශ්ලේෂණයක්” at the E & E forum (Sinhala) held on 24th June 2011 at the Auditorium of TRI Low country station, Ratnapura.

Ms H.W. Shyamalie presented a paper on Impact of wage increase & fertilizer subsidy on cost of production in the tea sector at Tea Research Board meeting held on 25th August 2011.

Study Programs

Ms. H W Shyamalie attended the workshop on “Social Sciences research and comprehensive research proposal development” held on 7th & 8th November 2011 at National Science Foundation, Sri Lanka.

Ms. H W Shyamalie attended the workshop on “Sustainable Agriculture for food security and poverty reduction” organized by Centre for Alleviation of poverty through sustainable Agriculture (CAPSA), at Faculty of Agriculture, University of Peradeniya.

Ms. H W Shyamalie attended awareness programme on “Corporate planning and budgeting” on 1st and 2nd December 2011 at the Academy of Financial Studies, Colombo.

Agronomy Division

Publications

Jayasinghe, S and K.G. Prematilake (2011). Grafting of tea for improving yield, tolerance to drought, pests and diseases. Proc. of the 222nd E & E Forum, Tea Research Institute of Sri Lanka, Talawakelle.

Prematilake, K.G. (2010). ‘*Gramoxone Sandaha Adeshakayak*’ (Alternatives for Gramoxone). ‘Thei Tathu’, A Newsletter, Tea Research Institute of Sri Lanka, Oct. Vol. 7 No 1.

Prematilake, K.G. (2010). Alternatives for Gramoxone. 'TRI UPDATE', A Newsletter, Tea Research Institute of Sri Lanka, Vol. 13, No 2.

Prematilake, K.G. (2011). 'Increasing tea productivity through Agro-forestry systems". Proc. of the Increasing Coconut Land Productivity through Agro-forestry Interventions held at the Coconut Research Institute, Lunuwila on 15th March. (Eds. Pushpakumara, D K N G, Gunasena, H P M, Gunatilake, H A J and Singh). A publication of CRI of Sri Lanka, World Agroforestry Centre, South Asia Office, New Delhi, India and Nat. multipurpose Tree Species Res. Network of Sri Lanka.

Senevirathne G, Jayasekara A P D A, De Silva MSDL and Abeysekara U P (2011). Developed microbial biofilms can restore deteriorated conventional agricultural soils. *Soil Biology and Biochemistry*, XXX 1.4.

Prematilake, K.G. and M.G. S. Liyanage (2011). The potential of exploitation of Gini sapu (*Michaelia champaca* L.) seeds as a natural herbicide. Proc. of the 6th World Congress on Allelopathy held in Gaungzhou, China, 15th-19th December, 2011.

Jayasinghe, L.A.S.P. and K.G. Prematilake (2011). Grafting of tea for improving yield and tolerance to drought. Proc. of the Int. Conf. on the Impact of Climate Change on Agriculture, Faculty of Agriculture., University of Ruhuna, 20-21st December, 2011.

Wijeratne, T.L., W.A.J.M.D. Costa, S.I. Woodward, M. Lomas and M A Wijeratne (2011). Prediction of impact of climate change on the tea yield of different elevational zones of Sri Lanka during the 21st Century, Proc. of the Int. Conf. on the Impact of Climate Change on Agriculture, Faculty of Agriculture., University of Ruhuna, 20-21st December, 2011.

Special Presentations

Dr. K G Prematilake made a presentation on 'Increasing tea land productivity through Agro forestry systems" at the Agro forestry symposium held at the Coconut Research Institute, Lunuwila on 15th March.

Dr. M A Wijeratne made the following presentations:

- Burying of pruning: A good agricultural practice, held at Hecktor Kobbakaduwa Research & Training Institute on 5th April.

- The impact of climate change at a meeting with the Secretary of the Ministry of Plantation Industries on 4th May.
- Mapping of tea growing areas of Ratnapura district at the MPI, Colombo on 30th June.

Dr. K G Prematilake and Dr. M A Wijeratne participated in a workshop on “Organic agriculture and forestry consultation” organized by the National Committee on Organic Agriculture and Forestry of the CARP in Colombo on 17th October.

Ms. Samanthi Jayasinghe and Ms. T L Wijeratne presented two papers at the International Conference on the Impact of Climate Change on Agriculture at the Faculty of Agriculture, University of Ruhuna, held during 20-21st December 2011.

Study Programs

Ms. T L Wijeratne returned from University of Sheffield, UK in October after completion of one year training on ‘Modeling on physiological responses and Carbon sequestration in tea to climate change’ as a research component of the Ph D programme.

N P S N Bandara returned from Adelaide University in November after submission of his Ph D thesis .

Dr. K G Prematilake toured China to participate at the 6th World Congress on Allelopathy held in Guangzhou during from 15th-19th December 2011 and presented a paper on “Potential of Gini Sapu seeds as natural herbicide”.

Dr. M A Wijeratne visited the Tea Research Institutes in Tocklai and UPASI Tea Research Foundation from 15th -24th November. 2011.

Biochemistry Division

Awards and Grants

Dr. I S B Abeysinghe and Dr. Nimal Punyasiri received the 1st Prize in the National Awards for Excellence in Agricultural Research held at the BMICH on 25th August 2011

‘Hiran Tillekeratne Research Award’ was awarded to Dr. K M Mewan for outstanding postgraduate research carried out during 2007 to 2009 in the field of Natural Science, on 21st Feb 2011 by University Grants Commission, Colombo, Sri Lanka.

Dr. P A N Punyasiri received a research grant worth of 9.3 Million from National Research Council of Sri Lanka to carry out a research on “Metabolite profiling of Sri Lankan Tea Germplasm” (Collaboration between Biochemistry & Plant Breeding divisions of TRI and University of Peradeniya).

Publications

Punyasiri, P.A.N, Somasiri, H.P.P.S, Thotawattage, G, Abeysinghe, I.S.B and Amarakoon, A.M.T (2011). L-Theanine Content in Sri Lankan Performance Liquid Chromatography Using O-Pthalaldehyde Derivatization. Proceeding of the 12th Government Food Analysts conference, 21-25th February, 2011, Brisbane, Australia p. 162

Jeganathan, B, Punyasiri, P.A.N, Madhujith, T (2011). Quantitative Analysis of Polyphenols, Flavonol Glycoside and Flavonols in Sri Lankan Black Tea. Proceeding of 16th Peradeniya University Research Session (PURSE), November 2011. p. 40

Dharmasena I, Jayawardena BC., Mahipala MBP, Thotawattage GH (2011). Antioxidant activities of black and green tea extracts in uncured pork sausages. Proc. of 21st Annual. Student Research Session, Dept. of Animal science, University of Peradeniya, page 9-10.

Nasriya M, Mewan KM, Premathilaka KBAG, Gimhani DR. (2011) Simple Sequence Repeat Markers Revealed Genetic Diversity of Old Seedling Teas in Sri Lanka. Proceedings of 11th Agricultural Symposium, Wayamba University of Sri Lanka, Makandura, 20-21 September, 2011, 11-15.

Study Programs

KM Mewan completed his postgraduate degree program on ‘Molecular Biology and Gene Technology’ conducted at University of Colombo in Oct 2011.

Special Presentations

Dr. P A N Punyasiri and Mr. G A A R Perera delivered lectures at the training seminar on ‘Sustainable Developments in Quality, Safety and Health Aspects of Tea’ organized by the Institute of Chemistry in Colombo on 2nd December, 2011 at Adamantane House, Colombo.

Entomology and Nematology Division

Awards and Grants

The research proposal on ‘Morphometric and molecular characterization of Sri Lankan populations of tea nematodes with reference to climate change scenario in tea plantations’ was recognized for funding by the Sri Lanka Council for Agricultural Research Policy.

Overseas Conferences

Dr. K M Mohotti, Head, Entomology and Nematology Division participated as a country delegate in the FAO IGG Working Group Meeting and the 1st African Tea Convention, Mombasa, Kenya in July 2011. He visited the Tea Research Foundation of Kenya and corporate sector and small holder tea gardens and factories of Kenya Tea Development Agency.

Dr. K M Mohotti attended the 23rd Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (MOP 23) and 9th Meeting of the Conference of the Parties to the Vienna Convention for the Protection of the Ozone Layer (COP 9) in Bali, Indonesia in November 2011. He made a technical presentation on success story in phasing out methyl bromide usage in tea plantations by introducing non chemical and chemical alternatives well before the targets stipulated by Montreal Protocol.

Plant Breeding Division

Awards and Grants

Research paper titled “Analysis of selected biochemical constituents in black tea for predicting the quality of tea germplasm in Sri Lanka” presented by J D Kottawa Arachchi, at the 23rd Annual Congress of Post Graduate Institute of Agriculture - 2011 was adjudged as the best presentation in the session on Biochemistry & Food Science and also as the best PGIA student presentation in the same session.

A research proposal developed jointly with Biochemistry division on “Metabolite Profiling of Tea Germplasm of Sri Lanka” that was submitted for National Research

Council was awarded a research grant worth of Rs. 9.3 million and the work has already been continued.

Research proposal developed jointly with Technology division on “Development of early selection criteria for screening tea germplasm for high black tea quality using a combination of biochemical and molecular markers” and the research proposal on “Development of disease resistant tea varieties through inter-specific hybridization and embryo rescue” that were submitted to the Council for Agricultural Research Policy under National Agricultural Research Plan was selected for funding.

Publications

Ariyaratna H A C K, Gunasekare M T K, Kottawa Arachchi J D, Paskarathevan R, Ranaweera K K, Ratnayaka M and Kumara J B D A P 2011. Morpho-physiological and phenological attributes of reproductive biology of tea (*Camellia sinensis* (L.) O Kuntze) in Sri Lanka, *Euphytica*, 181: 203-215.

Kottawa-Arachchi J D, Gunasekare M T K, Ranatunga M A B, Jayasinghe L and Karunagoda R P 2011. Analysis of selected biochemical constituents in black tea (*Camellia sinensis*) for predicting the quality of tea germplasm in Sri Lanka. *Tropical Agricultural Research* 23(1): 30-41

Abhayapala K M R D, Gunasekare M T K, Ranaweera K K, Ranatunga M A B and Weerasinghe P A 2011. A technique to rescue inter-specific hybrids of *Camellia sinensis* x *Camellia sasanqua*. In: Proc. 67th Annual Sessions of Sri Lanka Association for the Advancement of Science (SLAAS), Part I, 13pp

Pinnagoda D M, Wickramasinghe I P, Ranatunga M A B and Gunasekare M T K 2011. Evaluation of tea (*Camellai sinensis*) hybrid progeny using morphological and molecular markers. In: Proc. of Undergraduate Research, Dept. of Agricultural Biology, No. 2: 35-38

Ranatunga M A B, Gunasekare M T K, Pinnagoda D M and Wickramasinghe I P 2011. Development of RAPD based progeny analysis method to supplement conventional tea (*Camellia sinensis*) breeding programme. In: Proc. of National Symposium on Agricultural Biotechnology (*In press*)

Book Chapters

Gunasekare M T K Achievements, Challenges and Perspectives on Breeding of tea plant (*Camellia sinensis* L.) in Sri Lanka, *In: Global Tea Breeding: Achievements, Challenges and Perspectives of tea Breeding: (Eds. Liang Chen & Zeno Apostolides), Springer-Verlag, GmbH, (In press)*

Study Programs

K K Ranaweera completed his postgraduate degree and awarded an M Phil in Crop Science from Postgraduate Institute of Agriculture, University of Peradeniya.

M A B Ranatunga commenced his Ph D programme at Postgraduate Institute of Science, University of Peradeniya.

Process Technology Division

Publications

Delgamuwa, D P K R, Botheju, W S & Abeysinghe D C (2011). Effect of dhool temperature on quality of Orthodox Rotorvane tea and its grade out-turn percentage manufactured using two end attachments in different degrees of wither. Proceedings of 11th Agricultural Research Symposium, 20 – 21 September 2011.

Soils and Plant Nutrition Division

Publications and Presentations

Prof. A N Jayakody, Senior Research Officer compiled his review report on “Review on Research Studies conducted at the Tea Research Institute of Sri Lanka related to Exploitation of Soils for Tea” and made presentations to the TRI and Tea Research Board.

Prof. A N Jayakody, Senior Research Officer compiled his research report on “Perspectives for Improvement of the Tea Sector giving Preference to soils and The Strategic Research Plan” and made presentations to TRI and Tea Research Board.

Liyanage LRMC, Thanayamwatta DMGS, Wijayatunga WMS, Gunaratne GP, Jayakody AN, published a research paper on “Categorization of tea growing soils based on pH buffering capacity” at the 10th International Conference of the East and Southeast Asia Federation of Soil science societies held at Cinnamon Lake Hotel Colombo from 10 – 13 October 2011.

G.P. Gunaratne, L.R.M.C. Liyanage, A.N. Jayakody, W.M.S. Wijayatunga, S.M. Dissanayake, published a research paper on “Impact of locality conditions on potassium availability in tea plantations of Sri Lanka” at the International Symposium on Role of Potassium in sustaining the yield and its quality, organized by the International Potash Institute at the Hotel Topaz, Kandy on 27 – 28 October 2011.

H.A.C.R. Perera, G.P. Guneratne, M.N. Fernandopulle and L.R.M.C. Liyanage (2011) “Characterization of Soils in Tea Growing Regions of Sri Lanka in Relation to Magnesium Dynamics”, Proceedings of the 11th Agricultural Research Symposium, Wayamba University of Sri Lanka.

TRI ESTATES

St. Coombs Estate – Talawakelle

Superintendent

Mr. U C Oliver (Up to 14th August)

Mr. T M S K Tennakoon (from 15th August)

General

- The Minister of Plantation Industries Member of Parliament Honorable Mr. Mahinda Samarasinghe's representatives called over to St. Coombs to study unit operations of up country tea manufacture at the St. Coombs factory on 22nd April.
- Mr. Mahen Madugalle, Visiting Agent (VA) of the St. Coombs called over to St. Coombs to examine tea fields and agricultural practices adopted etc to make expert recommendations for productivity and profitability improvements of the Estate on 15th March.
- Messrs Forbes & Walker Tea Brokers (Pvt) Ltd. continued to function as the broker for sale of St. Coombs made tea to the Colombo tea auction during the year under review.
- Mr. U C Oliver resigned from the post of Superintendent of St. Coombs Estate with effect from 18th May 2011 and overlooked Estate activities from 18th May – 14th August 2011.
- Mr. T M S K Tennakoon was appointed as the new Superintendent of St. Coombs Estate with effect from 05th August 2011.
- The following members those of who were on check roll were absorbed to the permanent cadre of the Estate with effect from 01st January 2011.

Name

Post

Mr. K Rajkumar

Junior Assistant Clerk

Mr P Selvendran

Junior Assistant Field Officer

Mr S Sivan

Factory Mechanic

Mrs K Jothy

Creche Attendant

Mrs T Ponmany

Creche Attendant



The operational crop and yield figures of St. Coombs Estate and its factory in 2011 are given below as against 2010.

Table 1 - Operational crop and yield figures of the Estate

Category	2011		2010	
	Crop (kg made tea)	Yield (kg made tea ha ⁻¹ yr ⁻¹)	Crop (kg made tea)	Yield (kg made tea ha ⁻¹ yr ⁻¹)
St. Coombs	205,155	2,573	165,668	2,052
Lamiliere	103,350	2,221	92,250	1,940
Total	308,505	2,444	257,918	2,011
Bought Leaf	35,626	n/a	7,007	n/a
Grand Total	344,131	2,444	264,925	2,011

As it is evident from the Table 1, an average yield of 2,444 kg made tea ha⁻¹ yr⁻¹ was recorded in the year 2011.

Development Activities

Replanting

An extent of 2.00 hectares old seedling tea was uprooted and rehabilitated in St. Coombs Estate and Lamiliere section. Besides an extent of 2.00 hectare block of rehabilitated land was planted with new TRI cultivars.

ADB Mother Bush Project

A total of 798,278 vegetatively propagated shoots from TRI 3000 and 4000 series cultivars were issued to tea small holder and the Corporate Sector stakeholders. An improved profit of sum of Rs. 901,852.63 was recorded from the ADB Project.

Factory and Manufacture

- The volume of leaf bought was significantly improved based on operational feasibilities and profitability. A total of 35,626 kg of made tea was produced from bought leaf in 2011 which is the highest, dealt in the history of St. Coombs Estate when quantity supplied by the neighboring Waltrim Estate on contingency basis in 2008 was excluded. A sum of Rs. 2,924,538.34 was recorded as the profit of year 2011.
- The Estate with its leaf standard and factory improvements secured the St. Coombs mark at the 03rd position in the western high grown category in 2011.
- St. Coombs with the assistance of TRI scientists introduced 03 types of specialty teas to the Colombo tea auction. The specialty teas and average prices realized in 2011 are given below. This price realization was also contributed for the improvement of Nett Sale Average of the Estate.

Type	Rs. per kg
Silver Tips	13,000
White Tea	15,000
Golden Tips	18,000

- The Gross Sale Average for 2011 was Rs. 419.92, which is Rs. 79.65 above the Western High Grown elevation average.

Working and Trading Results

The St. Coombs Estate made a profit of Rs. 2,189,186.62 for the year under review.

St. Joachim Estate – Ratnapura

P S Habaragoda

Superintendent

General

- Messrs Forbes & Walker Tea Brokers (Pvt) Ltd and Bartleet & Co. Ltd continued to function as the brokers for sale of St. Joachim made tea to the Colombo tea auction during the year under review.
- The following development works were carried out in the St. Joachim factory.
 - i. Roller Nos. 1, 5 and 3 have been re-tabled, and for 02 new cones have been replaced.
 - ii. New meshes have been fitted to the roll breakers.
 - iii. The motor of the unused humidifier was repaired and now it is in working order.
 - iv. The 2/3T stalk extractor was repaired by the agent.
 - v. Firbro mat and the sifting room machinery including Middleton, Chota sifter, Michi were also repaired.
 - vi. The sprinkler was serviced after a long time and the defective wiring was also attended to.
 - vii. The colour sorters were checked and repaired.
 - viii. Alpex fire extinguishers were checked and replaced.
 - ix. A new lorry has been purchased
 - x. Mr. N M Amarasekera, Visiting Agent (VA) of the St. Joachim Estate called over to Estate to examine tea fields and agricultural practices adopted etc to make expert recommendations for productivity and profitability improvements of the Estate on 31st October.



Highlights

- The St. Joachim factory qualified to obtain the SLSI-SLTB Product Certification for 03 years since 27th December 2011.

The land use pattern of the Estate as at 31st December 2011 (in hectares) is as follows:

Land Use	Extent (ha)
VP tea in bearing	46.34
Major In filled area - Field No. 2f	1.18
Major In filled area - Field No. 8A	0.50
TRI coconut area	3.89
Nursery area	1.58
Estate Rubber	7.12
Mature Rubber (Intercropped area)	5.68
Paddy Fields	8.74
ADB Fields – New clearing tea	30.00
TRI Buildings & Experimental use - Field No. 9	11.02
Buildings, Roads, Jungle & Patna	25.93
Total	141.98

Crop (made tea kg)

The operational crop and yield figures of St. Joachim Estate and its factory in 2011 are given below as against 2010.

Table 1 - Operational crop and yield figures of the Estate

Category	Crop (kg made tea)		Variance (±)		
	2011	2010			
Tea					
St. Joachim	46,427	46,991	-564		
Bought Leaf	349,861	449,766	-99,905		
Total	396,288	496,757			
Rubber	Crop	Yield	Crop	Yield	Variance (±)
	(kg)	(kg ha ⁻¹ yr ⁻¹)	(kg)	(kg ha ⁻¹ yr ⁻¹)	
St. Joachim	12960	1138	9047	838	+3913 +300

Agricultural Practices

In general, Good Agricultural Practices (GAPs) were undertaken, with the inclusion of burying of pruning in pruned fields with a view to improving soil fertility status.

Infilling and New Clearing

Block infilling in Field No. 04 was carried out with a total of 15,350 plants and Field No. 03 new clearing was carried out with 8000 plants.

ADB Mother Bush Project

A total of 287,445 shoots were issued to small holder and the Corporate sector stakeholders as against 370,050 in 2010.

Factory Manufacture

A Net Sale Average (NSA) of Rs. 371.62 was achieved in the year 2011 as against Rs. 378.14 in 2010.

Bought Leaf

The bought leaf manufactured at St. Joachim factory showed a decrease of 99,905 kg. The leaf intake has decreased due to discontinuance of supplying leaf from Gamidiriya project.

Weather and Rainfall

An annual rainfall of 3583 mm was recorded on 148 wet days in 2011, as against 4968 mm on 184 days in 2010.

Working and Trading Results

The working results of St. Joachim Estate resulted in a Loss of Rs. 16,024,259.80 as at 31st December 2011 compared to a trading profit of Rs. 1,133,766/= in the previous year. It is primarily due to increase in labour wages and discontinuance of supplying leaf by Gamidiriya project.

ADMINISTRATION AND FINANCE

Special Highlights

- An upgraded website for the Tea Research Institute (TRI) was ceremonially launched by the Honorable. Mahinda Samarasinghe, Minister of Plantations Industries, on 11th July, 2011 at the auditorium of the Ministry of Plantation Industries, the secretary of MPI, Mrs. Malini Pieris together with its senior officials also participated at the launching.
- The Scheme of Recruitment (SOR) as per the guidelines of Management Services Division (MSD) Circular Nos. 30 and 30 (1) of the General Treasury was prepared along with the enhanced cadre in order to address the industry issues efficiently and effectively whilst paying attention to human resource development. The MSD approval was granted for the implementation of its provisions with effect from 16th September, 2011.
- A tree planting program was carried out at the Head Office premises in Talawakelle on 15th November, keeping in line with the national tree planting program, “Deyata Sevana”, launched by the Ministry of Environment to plant 1.1 million trees in the country to commemorate 65th birthday of His Excellency the President of Democratic Socialist Republic of Sri Lanka, Honorable Mahinda Rajapaksa along with the commencement of his 02nd term in the office.

Human Resource Development and Capacity Building

Overseas Training/Seminars/Conference

- Dr. S S B D G Jayawardena, Chairman, TRB joined the national delegation led by the the Honorable Minister of Plantation Industries to Indonesia to sign the MOU with the Ministry of Agriculture for the development of oil palm sector in Sri Lanka from 02nd - 04th January.

- Dr. S S B D G Jayawardena, Chairman, TRB participated as a member of the delegation with the Honorable Minister of Plantation Industries to Japan to discuss and identify development projects and strengthen tea promotion activities with the Japanese government and trade organizations from 11th - 21st February.
- Dr. I S B Abeysinghe, Director, TRI attended the National Conference on Tea held in Silguri, India as an “Invited Speaker” from 09th - 15th March.
- Mr. M M A U B Marapana, Experimental Officer, Process Technology Division attended the training course on Pollution-Free Tea Production Technology for Developing Countries conducted in China from 11th May - 05th July.
- Dr. S S B D G Jayawardena, Chairman, TRB participated as a member of the delegation with the Honorable Minister of Plantation Industries to Germany to discuss and identify developmental projects, activities related to strengthening tea promotion and maximum residue limits (MRLs) in processed tea with the German Tea Association and Council from 21st - 27th June.
- Dr. S S B D G Jayawardena, Chairman, TRB and Dr. K M Mohotti, Head, Entomology Division participated at the 19th FAO/IGG meeting on Tea and 1st Africa Tea Convention held in Kenya from 18th - 22nd July.
- Mr. K K Ranaweera, Experimental Officer, Plant Breeding Division attended the training course on Advance Certificate Program in Tea Plantation Management conducted by the Kothari Agricultural Management Centre in India from 1st September - 31st October.

- Mr. S R W Pathiranage, Research Assistant, Agronomy Division attended the training course on Comprehensive and Practical Technique of Agricultural Machinery conducted in Jinan, China from 17th October - 07th November.
- Dr. (Ms) M T K Gunasekera, Head, Plant Breeding Division participated as an invited scientist at the meeting of Expert Consultation on Agricultural Biotechnology, Biosafety, and Biosecurity held in Chinese Taipei, from 25th - 29th October.
- Dr. (Ms) M T K Gunasekera, Head, Plant Breeding Division; Dr. G P Gunaratne, Head, Soils & Plant Nutrition Division, Mr. B A D Samansiri, Head, Advisory & Extension Division; and Dr. M A Wijeratne, Senior Research Officer, Agronomy Division visited the United Planters Association in Southern India (UPSAI) and some tea plantations in South India followed by participating at the World Tea Congress organized by Tocklai Experimental Station in Jorhat, Assam from 16th - 25th November.
- Dr. I S B Abeysinghe, Director, TRI participated at the World Tea Congress, Tocklai Experimental Station from 21st to 25th November, 2011 in Assam, India.
- Dr. K M Mohotti, Head, Entomology Division participated at the Conference of Parties (COP) of Montreal Protocol and the Tea Ceremony held in Bali, Indonesia from 21st - 25th November.
- Dr. K G Prematillake, Head, Agronomy Division participated at the 06th World Congress on Allelopathy held in Guangzhou, China from 14th - 21st December.

a) Staff Recruitments

	Name	Designation	Date of appointment
1.	K J C J Rodrigo	Deputy Director (Administration)	01.02.2011
2.	R M R R L Ranaraja	Resident Engineer	02.05.2011
3.	T S Kumara	Accounts Clerk	16.05.2011
4.	V E Kumara	Accounts Clerk	16.05.2011
5.	A A H Chinthaka	Clerk/Typist	16.05.2011
6.	R A C Lasantha	Clerk/Typist	16.05.2011
7.	S A C Suraweera	Driver	16.05.2011
8.	M D Chandana	Driver	16.05.2011
9.	T K A Kumarasinghe	Driver	16.05.2011
10.	H A D Niranjana	Driver	16.05.2011
11.	K M T T Bandara	Driver	16.05.2011
12.	J S N Jayamohan	Driver (St. Joachim)	16.05.2011
13.	W A A H Shamaka	Technical Officer	01.08.2011
14.	E P A Wijewardena	Technical Officer	01.08.2011
15.	K A S A Rupasinghe	Technical Officer	01.08.2011
16.	C D Jayasinghe	Technical Officer	01.08.2011
17.	B M N J Basnayake	Technical Officer	01.08.2011
18.	R A I W K Ranatunge	Technical Officer	01.08.2011
19.	Ms D V R I Deniyapahala	Technical Officer	01.08.2011
20.	M G N J Kumara	Technical Officer	01.08.2011
21.	Ms R M E M K Randeniya	Technical Officer	01.08.2011
22.	Ms A V K S Perera	Technical Officer	01.08.2011
23.	Ms S M D D Samarakoon	Technical Officer	01.08.2011
24.	B M N J Basnayake	Technical Officer	01.08.2011
25.	M D K S Tilakasiri	Technical Officer	01.08.2011
26.	D K D Dissanayake	Technical Officer	01.08.2011
27.	G W M S N Gunasekara	Technical Officer	01.08.2011
28.	E N U Edirisinghe	Technical Officer	01.08.2011
29.	D L A L A Dasanayake	Research Officer	01.08.2011
30.	Ms H R M P Abeyratna	Research Officer	01.08.2011
31.	Dr W S Botheju	Head, Process Technology	01.08.2011
32.	Dr G P Gunaratne	Head, Soils & Plant Nutrition	01.08.2011

33.	T M S K Tennakoon	Superintendent (St. coombs)	15.08.2011
34.	S Parameswari	General Worker	01.10.2011
35.	K Rajaratnam	General Worker	01.10.2011
36.	G S Raju	General Worker	01.10.2011
37.	V Sabaratnam	General Worker	01.10.2011
38.	V Chandrasekeran	General Worker	01.10.2011
39.	V Radakrishnan	General Worker	01.10.2011
40.	A Krishnamenan	General Worker	01.10.2011
41.	K M S K Kodithuwakku	General Worker	01.10.2011
42.	G Periyasamy	General Worker	01.10.2011
43.	K Jayaratnam	General Worker	01.10.2011
44.	D Sylvester	General Worker	01.10.2011
45.	A Loganathan	General Worker	01.10.2011
46.	L R Rajalingam	General Worker	01.10.2011
47.	N Pushparaj	General Worker	01.10.2011
48.	W C Paul	General Worker	01.10.2011
49.	J Anthony	General Worker	01.10.2011
50.	P Selvaraj	General Worker	01.10.2011
51.	W M S J Weerasinghe	General Worker	01.10.2011
52.	H M Wijesekera	General Worker	01.10.2011
53.	P Selladurai	General Worker	01.10.2011
54.	P Vythilingam Pillai	General Worker	01.10.2011
55.	S Balakrishnan	General Worker	01.10.2011
56.	R Illangowan	General Worker	01.10.2011
57.	N Sivasubramaniam	General Worker	01.10.2011
58.	Ms S Hettiarachchi	General Worker	01.10.2011
59.	Ms I P S D Wickremasooriya	Technical Officer	01.11.2011

b) Promotions

Name	Designation	Date
W M S Wijetunge	Research Officer	01.08.2011
Ms R D P Senanayake	Research Officer	01.08.2011

c) Resignations

Name	Designation	Date
Ms R P De Silva Wijeratne	Clerk/Typist	01.01.2011
Ms R M D T Pallemulla	Research Officer	07.01.2011
Ms H A C K Ariyaratne	Research Assistant	07.03.2011
U C Oliver	Superintendent, St Coombs	18.05.2011

P G C Priyantha	Experimental Officer	01.07.2011
P M M Jayatillake	Experimental Officer	30.06.2011
P K P Muthukumarana	Experimental Officer	14.09.2011
Ms K B M Sripalika	Experimental Officer	02.10.2011

d) Retirements

Name	Designation	Date
K G Piyasena	Public Relations & Welfare Officer	16.01.2011
S Karuppiah	Telephone Linesmen	18.02.2011
J M Jothipala	Mason	05.05.2011
Ms J Jayasundara	Senior Research Officer	05.06.2011
Ms D M R Dissanayake	Accountant	02.07.2011
K D Dahanayake	Senior Advisory Officer	23.09.2011
R M K Dias	Hostel Care Taker	06.10.2011
Ms V Pahalage	Accounts Clerk	01.11.2011
G G E H Gamage	Chief Motor Mechanic	05.11.2011
M G Weeratillake	Cashier	23.12.2011

e) Transfers

Name & Designation	Place of Transfer	Date
T G N Mahinda Advisory Officer	Matugama Extension Centre to Low country Regional Centre	01.09.2011
Ms P V A R Abeysekera Experimental Officer	Mid country Regional Centre to Head Office	01.09.2011
P K R C E Munasinghe Extension Officer	Deniyaya Extension Centre to Mid country Regional Centre	01.09.2011
K M T T Bandara Driver	Head Office to Matugama Extension Centre	01.09.2011
H I Mettananda Driver	Galle Extension Centre to Head Office	01.09.2011
G G M Ranasinghe Driver	Matugama Extension Centre to Mid country Regional Centre	01.09.2011
S A C Suraweera Driver	Head Office to Galle Extension Centre	01.09.2011

T K A Kumarasinghe Driver	Head Office to Galle Extension Centre	01.09.2011
K G J P Mahindapala, Advisory Officer	Low country Regional Centre to Galle Extension Centre	26.09.2011
H Jayaweera Extension Officer	Head Office to Matugama Extension Centre	26.09.2011
S P D Tharanga Driver	Deniyaya Extension Centre to Head Office	03.10.2011 (for 3 months)
K Dissanayake Technical Officer	Head Office to Uva Extension Centre	01.11.2011
U K A B Uduwella Driver	Head Office to Deniyaya Extension Centre	08.11.2011 (for 3 months)

f) Vacation of posts

Name	Designation	Date
J W K K Jayasundara	Research Officer	23.02.11

g) Demised

Ms C N K Edirisinghe	Station Assistant	22.02.11
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Infrastructure Developments and Maintenance

Infrastructure Developments

- Renovation of the Circuit Bungalow at Galle Extension Centre, Talgampola was completed on a project cost Rs. 1,800,000.
- Fencing of the boundaries of newly established Deniyaya Extension Centre, was completed with a project cost of Rs. 1,000,000.
- Repairing of a fume hood of the Biochemistry Division's main laboratory in Talawakelle was completed with a project cost of Rs. 554,400.
- Construction of an Information Centre to the Advisory and Extension section at the Mid country Regional Centre, Hantana was completed.

- Construction of a tank to the Nematology laboratory to screen cultivars at Deniyaya Extension Centre was completed with an approximate project cost of Rs. 62,000.
- Repairing of the main entry road-side drains at the Head Office premises, Talawakelle was commenced in August on a project cost of Rs. 3,000,000.00 and work continued.
- Construction of a vehicle ramp at mid country Regional Centre was commenced in November on a project cost Rs. 200,000 and work continued.
- Construction of a fire wood shed to the Process Technology unit at St Joachim estate, Ratnapura was commenced in December on a project cost of Rs.100,000 and work continued.
- Construction of a fertilizer stores at the Low country Regional Centre, Ratnapura was commenced in December with cost of Rs. 850,000 and work continued.
- Construction of a 213 m length internal road was commenced in December with a project cost of Rs. 1,000,000 and work continued.
- Construction of a D type twin quarters at the Deniyaya Extension Centre was commenced in December with a project cost of Rs. 2,700,000 and work continued.
- Renovation of the Co-operative shop building at the Head Office premises, Talawakelle was commenced in December on a project cost of Rs. 200,000.00 and work continued.

Maintenance Work

- Annual color washing program viz. Director's Office, Biochemistry Division, Library, Resident Engineer's Office and Ladies Hostel; and external color washing programs viz. Administration and Laboratory buildings; A Type bungalow Nos. 2 & 14; B Type bungalow Nos. 10, 11, 07, 04 & 18; C Type bungalow Nos. 37, 16, 14, 30, 42, 27, 07, 28 & 18; D Type quarters Nos. 24, 17, 15, 47, 36 & 46; and E Type quarters Nos. 11, 02 & 08 were completed.
- Entry road to TRI from Mattakelle junction along the Hatton - Nuwara Eliya main road periodically maintained.
- Fire extinguishers available at the Head Office building complex, and building complexes at the Low- and Mid- country regional Centres tested for the ability to operate and replaced accordingly.
- New curtains were fixed to the Circuit bungalow at Head Office and Deputy Director Administration's office.

- Water filtration plant, sedimentation and storage tanks at Head Office were periodically cleaned. Plumbing repairs of the Circuit Bungalow at Head Office and main supply pipe-lines to A, B and C Type bungalows were completed. Installation of 10 plastic water tanks and corresponding pipe lines to selected B, C and D Type bungalows and quarters were completed. Five geysers to B and C Type bungalows and quarters were installed.
- Three phase over-head electricity main-line from the transformer situated at Electrical Unit to the Camellia hostel was repaired at the Head Office. A split type air condition was fixed to the board room situated in the library premise at the Head Office. Three phase over-head electricity main-line from the transformer situated at the vehicle park to the premises of bungalows, quarters and circuit bungalow was repaired at the Mid country Regional Centre, Hantana. A meter was also fixed to the water pump house at the Centre. A main switch was fixed to over head main-line for its effective and efficient distributions to Office building complex, bungalows, quarters and Circuit bungalow as well. In addition, routine maintenance work of electricity supply, maintenance and repairs of staff quarters, office, laboratory and other buildings and routine maintenance work of Telephone Exchange and its test room were satisfactorily attended. .
- **Board of Survey (BOS)**
Boards were appointed and carried out the survey on non-moving, redundant and unserviceable items from the TRI Estates, Centres, Divisions and Units as at 31 December 2011. Non-moving, redundant and unserviceable items identified as at 31 December 2010 from St Joachim Estate were disposed at public auction whilst items without saleable values were discarded in 2011.
- **Transport and Motor Garage**
An old Pajero was rehabilitated with a capital cost Rs. 1.65 Million whilst a van with 11 seats, a bus with 30 seats, and 03 field vehicles were repaired with an approximate cost of Rs. 1.82 Million. Day-to-day, scheduled and weekend transport services were satisfactorily provided to facilitate research & development activities and for welfare. Engine overhauls of 09 motor vehicles were also satisfactorily completed together with 19 suspension and 03 gear box repairs. Routine maintenance and day-to-day repairs of the vehicle fleet was also attended.

- **Procurement**

Twelve Minor Procurement Committee (MPC) meetings were organized for the purchase of both foreign and local items such as chemicals and glassware, machinery and laboratory equipment, agricultural inputs for tea cultivation, books and periodicals, spare parts for machinery and laboratory equipment and vehicles, office equipment and stationeries, fuel and lubricants, building materials and accessories for water and electrical supplies.

Four Departmental Procurement Committee (DPC) meetings were organized for the purchase of High Performance Liquid Chromatography (HPLC) system with online derivatization facility; Construction of a D type twin quarters for Deniyaya Extension Centre Completion of construction of circuit bungalow and B type bungalow for Deniyaya Extension Centre; Provision of security service to Head Office and its Centres. A Toyota corolla car (Model ZRE141) was purchased on Procurement of Vehicles for Government Agencies under the Financial Leasing Method for the Chairman, TRB. The vehicle used by the Chairman, TRB (Toyota Corolla EE110 No 301-2022) was auctioned for Rs. 1,405,262.

Financial Performences

TEA RESEARCH BOARD

STATEMENT OF FINANCIAL POSITION AS AT 31ST DECEMBER,2011

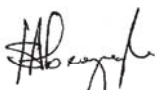
ASSETS	2011 Rs.(000)		2011 Rs.(000)	2010 Rs.(000)	
Non-current assets					
Property, plant and equipment	999,922	(Annex I-I)		963,274	
Less:- Accumulated Depreciation	(614,912)	(Annex I-I)		(586,963)	
	<u>385,010</u>			<u>376,311</u>	
Capital work-in-progress	11,706	(Annex II)		8,996	
Other Assets	<u>23</u>			<u>23</u>	
			396,739		385,330
Current Assets					
Inventories/Stocks	21,354	(Annex III)		19,261	
Trade and other receivables	101,378	(Annex IV,V, VI)		107,164	
Less:-Provision for Bad Debts	(62)	(Annex X)		(90)	
Prepayments	596	(Annex V)		986	
Cash and cash equivalents	59,691	(Annex VII,VIII)		68,826	
	<u></u>		<u>182,958</u>	<u></u>	<u>196,147</u>
Others: Identify Losses					
Excess & Shortages	<u>28</u>	(Annex IX)	<u>28</u>	<u>-</u>	<u>-</u>
Total Assets			579,725		581,478
LIABILITIES					
Current Liabilities					
Payables	19,904	(Annex X)		19,867	
Accrued Expenses	<u>29,362</u>	(Annex X)		<u>26,002</u>	
			49,266		45,869
Non-Current liabilities					
Provision for Gratuity	140,157	(Annex XII)		110,941	
Petrol Deposit Refundable	<u>24</u>	(Annex XIII)	<u>140,182</u>	<u>21</u>	
					<u>110,963</u>
Total Liabilities			<u>189,448</u>		<u>156,832</u>
Total Net Assets			390,278		424,645
NET ASSETS/EQUITY					
Tea Research Fund	268,710			295,526	295,526
Grants & Reserves	<u>121,567</u>	(Annex XI)	<u></u>	<u>129,119</u>	<u>129,119</u>
Total Net Assets/Equity			390,278		424,645



Internal Auditor



Chairman TRB



Director TRI



Accountant
for Senior Accountant

TEA RESEARCH BOARD

**STATEMENT OF FINANCIAL PERFORMANCE FOR THE YEAR ENDED
31st DECEMBER 2011**

		2011 Rs. '000	2010 Rs. '000
Operating Revenue			
Government Funds	Annex. XIV	316,066	282,974
Other Income	Annex. XIV,XVI,XVII	22,758	24,307
Other Income- Deferred Income	Annex. XIV	5,121	5,153
		<u>343,945</u>	<u>312,434</u>
Less. Net Losses of two estates (With prior years)	Annex. XVI,XVII	<u>-30,475</u>	
		313,470	
Operating Expenses			
Personal Emoluments	Annex. I	163,354	153,844
Travelling	-do-	9,587	6,750
Supplies and consumable used	-do-	23,124	21,149
Maintenance	-do-	27,270	24,272
Contractual Services-Security / Insurance	-do-	13,894	14,906
Electricity & Heating	-do-	14,994	14,066
Communications	-do-	2,425	2,587
Research and Development	-do-	34,268	23,140
Depreciation	-do-	25,927	26,656
Other operating expenses	-do-	<u>26,848</u>	<u>22,135</u>
Total operating expenses		<u>341,691</u>	<u>309,505</u>
Surplus/(Deficit) from operating activities		(28,221)	2,929
Finance Cost			
Gain on sales of property plant and equipment		<u>1,405</u>	<u> </u>
Total non operating revenue (expenses)			
Net surplus/(Deficit) before extra ordinary items		(26,816)	2,929
Extra ordinary items			
Prior year Adjustments		<u> </u>	<u>(505)</u>
Net surplus/(Deficit) for the period		<u>(26,816)</u>	<u>2,424</u>

TEA RESEARCH BOARD

CONSOLIDATED CASH FLOW STATEMENT FOR THE YEAR ENDED 31ST DECEMBER 2011

Cash Flow from Operating Activities	2011 Rs'000	2010 Rs'000
Surplus/(Deficit) from Ordinary Activities	(22,830)	897
Non- Cash movments		
Depreciation	31,576	32,113
Increase in provision for Bad Debts	(28)	(146)
Increase/(Decrease) in Payables	3,398	(3,125)
Increase in provisions relating to employee costs	29,217	7,737
Gain sale of fixed assets	(1,405)	-
(Increase) in other current assets(stocks) depo/prepay	(5,658)	899
Assets write-offs	(2,930)	(1)
Refund for Fixed Assets	(14)	(229)
Decrease/(Increase) in Receivables	9,799	(1,571)
Prior Years Adjustments		(505)
Accounting adjustment in capital reserve	(8,234)	(6,454)
Net Cash Flow from operating activities	32,891	29,615
Cash Flow from Investing activities		
Purchase of fixed assets	(44,302)	(30,097)
Interest on investments	2,581	2,032
(Increase)/Decrease Capital working-in-progress	(2,710)	3,963
Proceeds from sale of fixed assets	1,405	-
Cash Flow from Investing Activities	(43,026)	(24,102)
Net Cash Flow from Financing Activities		
Capital Grants- National Science Foundation	1,000	-
Net Cash Flow from Financing activities	1,000	
Net Increase/(Decrease) in Cash and cash equivalents	(9,135)	5,513
Cash and cash equivalents at beginning of period	68,826	63,313
Cash and cash equivalents at end of period	59,691	68,826

TEA RESEARCH BOARD

ST.COOMBS & LAMILLIERE ESTATES WORKING ACCOUNT FOR THE
PERIOD 1ST JANUARY TO 31ST DECEMBER 2011

<u>2010</u>		<u>INCOME</u>		<u>2011</u>	
<u>Rs.</u>	<u>Kg.</u>		<u>Kg.</u>	<u>Rs.</u>	
86,013,381.04	212,658.5	Tea Sales Gross Proceeds	307,340.0	127,261,739.63	(Note 1)
12,681,125.00	34,265.5	Tea Sales Ex Brokers(Gross)	36,791.0	14,228,109.50	
98,694,506.04	246,924	Tea Sales Local & Grades	344,131	141,489,849.13	
4,626,876.88		Add-			
805699.66		Sale of Green Leaf		-	
177,173.49		A&B Profit (Sale of VP Cuttings)		814,720.21	
445,725.31		Miscellaneous Income		382,274.49	
104,749,981.38		Deferred Income		445,725.31	
		Total Income		1,642,720.01	
				143,132,569.14	
		<u>EXPENDITURE</u>			
		<u>Less: Estate Expenditure</u>			
37,121,848.46		General Charges		50,062,345.46	
11,503,289.07		Field work & Cultivation		13,069,118.76	
41,732,735.61		Production		57,756,901.84	
2,210,127.26		Bought Leaf(including transport charges)		11,531,695.70	
92,568,000.40				132,420,061.76	
		<u>Administration & Finance</u>			
4,012,229.29		Bonus and Holiday pay		5,066,144.46	
1,733,717.51		Depreciation		1,608,653.21	
5,745,946.80				6,674,797.67	
1,195,423.21		<u>Sales Tax & Distribution Expenses</u>			
99,509,370.41		Brokerage,Handling chgs.,& Sales Expenses		1,848,523.09	
5,240,610.97		Total Expenditure		140,943,382.52	
		Profit/(loss) for the year		2,189,186.62	
218,872.37		Less: Over Value Unsold Tea 2010		148,860.50	
521,408.03		Prior Year Adjustment (Provision for Gratuity)		14,963,762.29	
740,280.40		Profit/(loss) transferred to TRI Operating A/c		15,112,622.79	
4,500,330.57				(12,923,436.17)	

Note:- 1.

6966 Kgs unsold Teas valued NSA @ Rs.405.78

TEA RESEARCH BOARD
ST. JOACHIM ESTATE WORKING ACCOUNT FOR THE
PERIOD 1ST JANUARY TO 31ST DECEMBER 2011

2010		2011	
<u>Rs.</u>	<u>cts.</u>	<u>Rs.</u>	<u>cts.</u>
186,700,139.10	491,679	143,699,321.20	(Note 1)
1,174,804.75	5,168	998,021.05	
187,874,943.85	496,847	144,697,342.25	
INCOME		INCOME	
Tea Sales Gross Proceeds		Tea Sales Gross Proceeds	
Tea Sales Ex Brokers(Gross)		Tea Sales Ex Brokers(Gross)	
Tea Sales Local & Gratuies		Tea Sales Local & Gratuies	
Add:		Add:	
Sale of V.P.Plants		Sale of V.P.Plants	
Miscellaneous Income		Miscellaneous Income	
Income from Rubber		Income from Rubber	
Deferred Income		Deferred Income	
Total Income		Total Income	
192,627,624.54		152,702,392.69	
EXPENDITURE		EXPENDITURE	
Less: Estate Expenditure		Less: Estate Expenditure	
General Charges		General Charges	
Field work & Cultivation		Field work & Cultivation	
Production		Production	
Expenditure on Rubber		Expenditure on Rubber	
Bought Leaf(including transport charges)		Bought Leaf(including transport charges)	
4,190,072.14		3,291,031.14	
3,552,727.27		4,341,976.19	
6,118,518.28		5,966,243.42	
1,129,431.57		1,973,118.84	
167,450,897.43		143,864,045.66	
182,441,646.69		159,436,415.25	
Administration & Finance		Administration & Finance	
Bonus and Holiday pay		Bonus and Holiday pay	
Depreciation		Depreciation	
2,944,754.40		2,944,754.40	
3,677,024.89		4,040,594.60	
5,277,270.30		6,985,349.00	
3,774,941.15		2,304,888.24	
191,493,858.14		168,726,652.49	
1,133,766.40		(16,024,259.80)	
(552,833.51)		(1,525,920.37)	
Profit (Loss) transferred to TRI Operating A/C		Profit (Loss) transferred to TRI Operating A/C	
580,932.89		(17,550,180.17)	

Note:- (1) 25832 Kgs unsold Teas valued C.O.P. @ Rs.359.31



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கணக்காய்வாளர் தலைமை அபிபதி திணைக்களம்
AUDITOR GENERAL'S DEPARTMENT



මගේ අංකය
எனது இல
My No. } PY/A/TRB/FA/2011

මගේ අංකය
உமது இல
No. }

දිනය
திகதி
Date } 30 September 2012

The Chairman,
Tea Research Board.

Report of the Auditor General on the Financial Statements of the Tea Research Board for the year ended 31 December 2011 in terms of Section 14(2)(c) of the Finance Act No.38 of 1971.

The audit of financial statements of the Tea Research Board (TRI) for the year ended 31 December 2011 comprising the statement of financial position as at 31 December 2011 and the statement of financial performance and cash flow statement for the year then ended and a summary of significant accounting policies and other explanatory information, was carried out under my direction in pursuance of provisions in Article 154(1) of the Constitution of the Democratic Socialist Republic of Sri Lanka read in conjunction with the Section 13(1) of the Finance Act, No.38 of 1971 and Section 15 of the Tea Research Board Act No.52 of 1993. My comments and observations which I consider should be published with the annual report of the Board in terms of Section 14 (2)(c) of the Finance Act, appear in this report. A detailed report in terms of Section 13(7)(a) of the Finance Act was issued to the Chairman of the Board on 10 May 2012.

1:2 Management's Responsibility for the financial statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Sri Lanka Accounting Standards and for such internal control as the management determines is necessary to enable the preparation of financial statements that are free from material misstatements, whether due to fraud or error.

අංක 306/72 පොල්දූව පාර,
වත්තරමුල්ල , ශ්‍රී ලංකාව

දුරකථනය
தொலைபேசி
Telephone. } 2887220

இல. 306/72, பொல்துவ வீதி,
புத்தரமுல்லை இலங்கை

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ஈ- மெயில்
E-mail. } oaggov@sltnet.lk

1:3 Auditor's responsibility

My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with Sri Lanka Auditing Standards. Those standards require that I comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatements.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgments, including the assessment of the risk of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Board's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Board's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by the management, as well as evaluating the overall presentation of the financial statements. Sub-sections (3) and (4) of Section 13 of the Finance Act, No.38 of 1971 give discretionary powers to the Auditor General to determine the scope and extent of the audit.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my qualified audit opinion.

1:4 Basis for qualified opinion

My opinion is qualified based on the matters described in paragraph 2:2 of this report.

2. Financial Statements

2:1 Opinion

In my opinion, except for the effects of the matters described in paragraph 2:2 of this report, the financial statements give a true and fair view of the financial position of the Tea Research Board as at 31 December 2011 and its financial performance and cash flow for the year then ended in accordance with Sri Lanka Accounting Standards.

2.2 Comments on Financial Statements

2:2:1 Sri Lanka Accounting Standards

- (a) Contingent liabilities which could be occurred from the court cases filed against the Board had not been disclosed in the financial statements in terms of SLAS 12.
- (b) Fully depreciated assets which are being used at present had not been revalued in terms of Sri Lanka Accounting Standard No.18.
According to the Chairman's comments, action had been taken to revalue these items with the assistance from Valuation Department.

2:2:2 Accounting Deficiencies

Following observations are made.

- (a) Payments amounting to Rs.2,381,613 made in 2003 to obtain ISO certificate had been shown under land and buildings in the financial statements without being shown separately as a non current asset.
- (b) Action had not been taken to transfer the goods in transit valued at Rs.34,518 relating to the year 2009 to the relevant accounts.
- (c) Value of a vehicle received from Ministry of Finance and Planning had not been ascertained and taken into accounts.
- (g) Minor repairs to the buildings at St. Coombs factory totalling Rs.111,039 had been shown under work in progress without being charged against the profit.
- (h) Factory development expenses relating to St. Coombs Estate amounting to Rs.5,494,090 had been shown as work in progress in the accounts although it had already been completed as at 31 December 2011.
- (i) Different rates for depreciation had been applied for the same category of fixed assets such as computers, electrical equipment and furniture.

2:2:3 Unreconciled Balances

Following unreconciled balances were observed in audit.

- (a) Following fixed assets balances could not be reconciled with the fixed asset schedules furnished by the Board as those assets were not classified in the ledger.

Description -----	Amount ----- Rs.
Fixed assets TRI T'Kele	89,702,632
Fixed assets TRI Rathnapura	11,621,908
Fixed assets TRI Hanthana	12,064,360
Fixed assets TRI Kottawa	3,003,998
Fixed assets TRI Passara	2,084,061
Fixed assets TRI Deniyaya	2,813,438
Fixed assets TRI Deniyaya	1,224,761
Fixed assets TRI Mathugama	294,624
Fixed assets St Coombs Estate	17,321,421
Fixed assets St Jochem Estate	17,095,102
	----- 157,226,305 =====

- (e) Differences amounting to Rs. 1,993,319 were observed in debtors schedule of St. Coombs Factory accounts as compared with creditors in the financial statements of Sri Lanka Tea Board and Tea Small Holdings Development Authority as at the end of the year under review for purchasing tea .

2:2:4 Accounts Receivable and Payable

The following observations are made.

- (a) The analytical charges receivable as at the end of the year under review were Rs.152,920 and out of that, balances amounting to Rs..121,070 were outstanding for more than five years.

- (b) According to the age analysis, trade and sundry debtors amounting to Rs. 307,751 had remained outstanding for more than 4 years without being recovered.
- (c) Checkroll debts such as loans, advances etc. at St. Joachim Estate amounting to Rs. 22,175 had not been recovered for more than five years.

2:2: 5 Non-compliance with Laws, Rules, Regulations and Management Decisions

Instances of non-compliance with the following Laws, Rules, Regulations etc., observed in audit are given below.

Reference to Laws, Rules, Regulations and Management Decisions	Non-compliance
(a) <u>Employees' Provident Fund Act</u> <u>No.15 of 1958</u> <u>and Employees' Trust Fund Act</u> <u>No.46 of 1980</u>	EPF contributions on fixed allowances had not been deducted from the employees and the EPF and ETF contributions of the employer on those allowances had not been remitted for the year under review and previous years.
(b) <u>Public Enterprises Circular</u> No PED/12 of 02 June 2003 Paragraph 6:5:1	The draft Annual Report for 2011 had not been furnished to the Auditor General within 60 days after the closure of the financial year.
(c) <u>Treasury Circular</u> (i) No.842 of 12 December 1978	Fixed assets register had not been updated properly and the lands belonging to the Board had not been included in the fixed assets register.

3. Financial Review

3:1 Financial Results

According to the financial statements presented, the operating activities of the Board for the year under review had resulted in a net deficit of Rs. 26.8 million as against the net surplus of Rs.2.9 million for the preceding year, thus indicating a deterioration of Rs.29.7 million in the financial results due to the loss of St. Coombs and St. Joachim Estates amounting to Rs.30.5 million.

3:2 Operating Results of the Estates

The Board had managed two estates namely St Coombs Estate and St. Joachim Estate and the operating results of these Estates for the year under review as compared with the preceding year is given below.

	St. Coombs Estate (Including Section)	Lamilier	St. Joachim Estate	
	<u>2011</u>	<u>2010</u>	<u>2011</u>	<u>2010</u>
<u>Tea Sales</u>				
Quantity (Kilograms)	<u>344,131</u>	<u>246,924</u>	<u>396,287</u>	<u>496,847</u>
Sales Value (Rs.'000)	<u>141,490</u>	<u>98,695</u>	<u>144,697</u>	<u>187,875</u>
Other Income (Rs.'000)	<u>1,643</u>	<u>6,055</u>	<u>8,005</u>	<u>4,753</u>
Total Income (Rs.'000)	<u>143,133</u>	<u>104,750</u>	<u>152,702</u>	<u>192,628</u>
<u>Less :</u>				
Total Expenditure (Rs.'000)	<u>140,942</u>	<u>99,509</u>	<u>168,726</u>	<u>191,494</u>
Operating Profit /(Loss) (Rs.'000)	<u>2,189</u>	<u>5,241</u>	<u>(16,024)</u>	<u>1,134</u>
Prior year adjustments (Rs.'000)	<u>(15,112)</u>	<u>(741)</u>	<u>(1526)</u>	<u>(553)</u>
Net Profit/(Loss) (Rs.'000)	<u>(12,923)</u>	<u>4,500</u>	<u>(17,550)</u>	<u>581</u>
	=====	=====	=====	=====
Cost of Production per Kilogram of Tea (Rs)	413.43	371.92	394.24	365.11
Yield per Hectare (Kilograms)	2,444	2,011	1,002	1,016
Net Sales Average (Rs.. per Kilogram)	405.78	394.85	359.31	372.72

Following observations are made in this connection.

- Although the sales quantity of the St.Combes Estate had increased by 97,207 kilograms in the year under review as compared with the preceding year, the operating profit had decreased by Rs.3,051,424. This was mainly due to the increase of the bought leaf expenses. However the net profit had decreased by Rs.17,423,767 as compared with previous year due to the adjustments of under provision for gratuity in preceding years.
- The sales quantity of St.Jochims Estate had decreased by 100,560 kilograms when compared with the previous year and the profit had converted into a net loss of Rs.17,550,180 as against the net profit of Rs.580,933 for the previous year. It was observed in audit that although the St.Jochim Estate had entered the Memorandum Of Understanding (MOU) with Ruwanpura Gamidiriya Ekabadda Samagama (GAMIDIRIYA) to get more production and make a profitable factory, a net loss of Rs. 17,550,000 had occurred during the year under review.

4. Performance review

4:1 Functions of the Board

- (a) The major functions of the Tea Research Board are to conduct, assist and encourage scientific and technical researches and investigations relating to the problems and matters connected with the cultivation and production of tea, diversification of production from tea as well as the dissemination and publication of results of research works at the directions of the Board including the prevention and control of pests that damage tea cultivation and the improvement of the quality of tea.

According to the information made available the financial performance of the Board as at the end of the year under review is given below.

Program me	Allocation for the year			Utilization			Utilization as a percentage
	<u>Recurrent</u>	<u>Capital</u>	<u>Total</u>	<u>Recurrent</u>	<u>Capital</u>	<u>Total</u>	%
	Rs. Mn	Rs. Mn	Rs. Mn	Rs. Mn	Rs. Mn	Rs. Mn	
Crop Improvement	13.65	13.89	27.54	13.42	7.54	20.96	76.10
Land Productivity Improvement	13.82	16.07	29.89	14.50	10.15	24.65	82.46
Crop Management	29.61	12.64	42.25	26.38	5.88	23.26	76.35
Post – Harvest Technology	14.17	14.11	28.28	15.03	11.07	26.10	92.29
Resources Planning	5.40	1.25	6.65	3.11	0.54	3.65	54.88
Services to Stake holders	38.25	38.54	76.79	38.13	12.24	50.37	65.59
Research Management	113.63	27.56	141.19	113.76	15.80	129.56	91.76
Internal Services and Maintenance	50.74	31.30	82.04	51.69	9.15	60.84	74.15
Total	279.27	155.36	434.63	276.02	72.37	348.39	91.15

- (b) Activities of the factories were not included in the Action Plan. Therefore the progress of the activities of the factories and the estates of the Board could not be ascertained in audit.

4:2 Management inefficiencies

Following observations are made.

- (a) According to the information made available, a sum of Rs.27,090,600 had been receivable from 10 officers who had obtained study leave with full pay and failed to serve the compulsory periods of service, had not been recovered from the relevant parties even up to 31 March 2012.
- (b) A sum of Rs. 4,142,173 had been shown in the accounts under work in progress as Lowery Tea Processing Project since 1982. According to the information made available, six machines had been installed in six factories in the up country to test the suitability of Sri Lanka Tea processing and resulted those machineries were unsuitable for the tea production process in Sri Lanka and therefore the project was abandoned.
However it was observed in audit that those machines were still idling at the factories where installed and shown in the accounts as work in progress for a long period.
- (c) Out of the total land to the extent of 143.810 hectares at St.Joachim Estate 17.675 hectares had been encroached by external parties over a long period and constructed permanent houses and cultivated paddy, tea, rubber, coconut and other crops. Therefore the Estate is loosing income from those cultivation and no action had been taken against those people to vacate those lands up to 31 March 2012.
- (d) Certain external parties not relevant to the Board and St. Coombs Estate were cultivating vegetables in large extent and were earning large income without obtaining proper approvals from the Board and the Ministry of Plantation Industries. The details of unauthorized land utilizations had not been made available to audit although called for.
- (e) A sum of Rs.125,000 had been paid by the Board as legal fees for a case filed by a Montessori school teacher against the Board and the Montessori Parent's Association was housed at the Board's premises. It was observed in audit that this is not relevant to the Board as the management of the Montessori is empowered to the executive committee of the Montessori school.

- (f) A court case had been filed by the National Estate Services Association at Rathnapura against the Board in 2008 regarding the promotion of two employees who were working at St. Joachim Estate . It was observed in audit that the Board had proceeded the case without coming to a settlement and a sum of Rs. 901,500 had been paid to the private lawyers up to the end of the year under review. However the case had not been finalized even up to 31 March 2012.

4:3 Human Resource Management

Following observations are made.

(a) Cadre Position

According to the letter dated 24 August 2011 of the Department of Management Services, the approved new cadre of the Board was 443 and the cadre position of the Board as at 31 December 2011 as per the reports submitted by the Board is given below. However no action had been taken by the Board to fill the vacancies.

Grade	Approved Cadre	Actual Cadre	Vacancies
-----	-----	-----	-----
Executive Grades	87	39	48
Non Executive Grades	206	121	85
Minor Grades	<u>150</u>	<u>80</u>	<u>70</u>
Total	443	240	203
	====	====	====

According to the chairman's reply the Ministry of Plantation Industries gave approval to fill only the most essential posts until the Scheme of Recruitment was approved in September 2011. The Institute is now in the process of recruiting personnel following the approval of new Scheme of Recruitment.

(b) Cost of Personnel

According to the information made available the cost of personnel for the year under review as compared with the previous year excluding factory workers, is given below.

Staff Category	No of Employees		Total Emoluments		Cost per Employee	
	2011	2010	2011	2010	2011	2010
			Rs.	Rs.	Rs.	Rs.
Executives	51	48	25,622,590	24,989,897	516,598	527,662
Non Executives	145	138	51,148,457	49,360,723	375,473	380,282
Minor Employees	75	47	17,368,699	15,216,663	232,250	327,002
	271	233	94,139,746	89,567,283	371,604	415,720

(c) Recruitments

Following observations are made relating to the appointment of Deputy Director (Administration) made on 01 February 2011.

- (i) The officer who recruited as per the paper advertisement on 14 November 2010 had not possessed required qualifications and experience.
- (ii) According to the interview mark sheets, it was observed in audit that high marks had been given to the said applicant by the Interview Board among other four applicants without giving acceptable reason.
- (iii) According to the information made available, sums of Rs.699,592 and Rs. 308,097 had been paid as salaries and indoor and out door labour charges respectively from February 2011 to January 2012 to the above said officer by the Board.

4:4 Utilization of Motor Vehicles

Following observations are made in connection with the vehicles fleet of the Board consisting of 50 vehicles, 09 lorries, 13 tractors and 42 motor bicycles .

- (a) Eleven motor vehicles were idling without repairing for a long period.

- (b) Two motor bicycles were not included in the verification reports as compared with the schedules.
- (c) A sum of Rs. 1,650,000 had been paid to a private garage to re fix a new body and an engine to a vehicle of the Board during the year under review. However it was observed in audit, the Board approval for the repair and prior approval from the Commissioner of the Motor Traffic for the replacement had not been obtained. The repairs made were not in a satisfactory condition as this vehicle had been sent again to repair before lapse of 06 months.
- (d) Eight vehicles had met with accidents during the year under review. A sum of Rs.142,715 had been paid for repairs for five vehicles and out of that Rs.99,028 only had been received as insurance compensation . The Board had not recovered the insurance claims for the repairs totaling Rs. 162,075 for the other three vehicles even up to 31 March 2012.

4:5 Investment of Gratuity Provision

Gratuity provision amounting to Rs.140,157,472 had not been invested separately by the Board to face future liability as prescribed in payment of Gratuity Act No.12 of 1983.

5. Accountability and Good Governance

Corporate Plan

- 5:1 The Corporate plan had not been reviewed annually as per the Public Enterprises Circular No. PED/12 of 02 June 2003. Therefore, the action plan prepared for the year under review along with actual progress could not be compared with the corporate plan for 2008 -2012.

5.2 Internal Audit

The internal audit unit should be independent from the Director of the Board. As per the organization chart of the Board, the Internal Auditor is working under the Director of the Board and not under the Chairman and the Board of Directors of the Board.

5:3 Budgetary Control

Significant variations were observed in audit between the budget and the actual thus indicating that the budget had not been made use as an effective instrument of management control.

6. Systems and Controls

Deficiencies in systems and controls observed during the course of audit were brought to the notice of the Chairman of the Board by my detailed report issued in terms of section 13 (7)(a) of the Finance Act. Special attention is needed in respect of the following areas of control.

- (a) Accounting
- (b) Granting of scholarships
- (c) Settlement of Advances
- (d) Assets management
- (e) Receivables and payables
- (f) Financial management
- (g) Budget
- (h) Estates Management


H.A.S. Samaraweera
Auditor General

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