

ANNUAL REPORT

2012



Tea Research Institute of Sri Lanka
Talawakelle
Sri Lanka

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Cover



Fertilizer adaptive trials

A study has been carried out to compare tea crop response to TRI interim recommendation and farmer practiced fertilizer mixtures with present TRI fertilizer recommendations in order to formulate efficient nutrient management package to tea growing areas.

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TEA RESEARCH INSTITUTE OF SRI LANKA

The Tea Research Institute of Sri Lanka (TRISL) 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

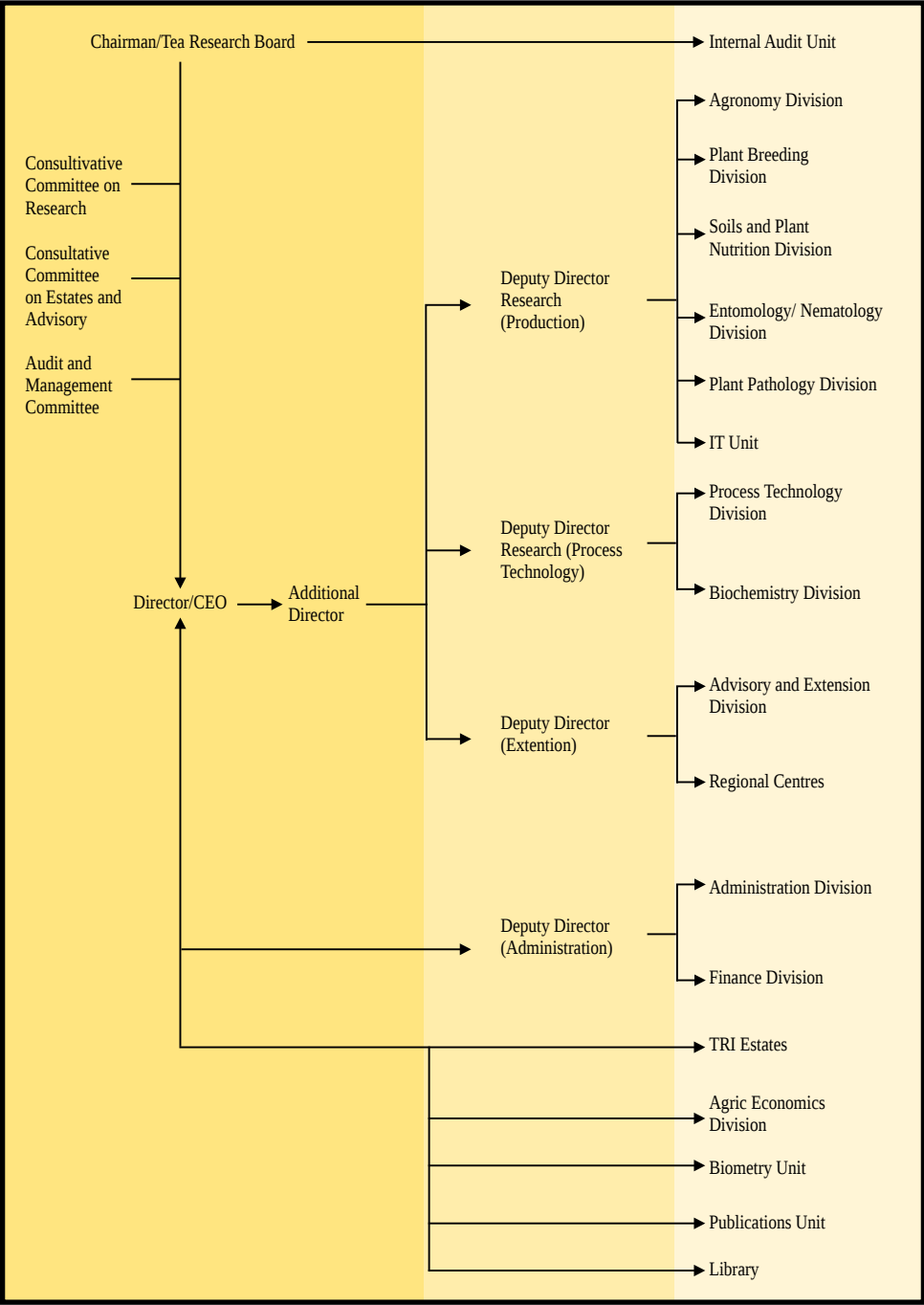
To achieve excellence in tea research and to provide technological guidance to the tea industry, in order to make Sri Lankan tea the most preferred tea in the world, at a competitive price

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



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



Mr. P L U Dissanayake
Representative
Ministry of Plantation Industries



Dr. D V Seevaratnam
Representative
Planters' Association



Mr. L P Jayasinghe
Representative
Sri Lanka Private Tea Factory
Owners' Association



Mr. Ajith Abeysekara
Representative
Government Treasury

Members of the Tea Research Board cont.



Mr. Prasanna Fernando
Member nominated by
Hon. Minister



Mr. N Padmasiri Kariyawasam
Representative
Tea Small Holdings Development
Authority



Dr. D S A Samaraweera
Observer Member



Mr. J M B J Bandara
Representative
Sri Lanka Federation of Tea Small
Holdings Development Societies



Mr. M D B C Jayasundera
Member nominated by
Hon. Minister
From April 2012



Dr. K. Mohotti
Convenor/ Secretary to the TRB

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
- 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
Department of Crop Science, 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 Development Authority
- Mr. S K L Obeysekare
Director/ Chief Executive Officer
Balangoda Plantation Ltd. and Madulsima Plantation Ltd.
- Mr. L P Jayasinghe
Representative, Geo Tech Ltd.
- Mr. P M Samarasinghe
General Manager (Production), Agro Technica Ltd.
- Mr. Fred R Amarasinghe (Up to May 2012)
Forbes & Walker Tea Brokers (Pvt) Ltd.
- Mr. S Sirisena (From May 2012)
Director/Chief Executive Officer, Lanka Commodities Brokers Ltd.
- Mr. G D V Perera
Director, Lankem Tea & Rubber Plantations (Pvt) Ltd.
- Mr. L J Pieris
Managing Director, Helix Engineering (Pvt) Ltd.
- Dr. L S K Hettiarachchi
Additional Director, Tea Research Institute of Sri Lanka
Convenor/Secretary

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, Faculty of Agriculture,
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 Plantations Ltd.
- Mr. S Wirasinghe
Ex-Director (Extension), Department of Agriculture
- Mr. T A G de Mel
General Manager, Balangoda Plantations PLC
- Dr. V S Sidhakaran
Senior Advisory Officer, Tea Research Institute of Sri Lanka
Convenor/Secretary

Members of the Audit and Management Committee

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

REPORT OF THE CHAIRMAN, TRB

On behalf of the Tea Research Board (TRB), I have great pleasure in presenting the Annual Report, Audited financial statement of the Tea Research Institute of Sri Lanka (TRISL) for the year 2012.

Year 2012 was an another eventful year for the tea industry which had to face many unexpected challenges ranging from adverse weather conditions in certain tea growing regions to uncertainties in marketing due to unstable socio-economic situations prevailed in major tea consuming countries in the Middle East. Total tea production during 2012 was approximately 327.2 million kilograms reflecting a very marginal variation over the previous year which was 328.2 million kilograms. During 2012 too contribution of the smallholder sector tea production was 71% with a record of 233 million kilograms.

Annual rainfall, the most vital weather parameter which influences the yield of tea, during 2012 was very erratic and in certain tea growing regions like Uva, Mid country and some areas in the Low country, effect of drought was serious to the extent of government considering compensation to smallholder tea growers. Although dry conditions prevailed in certain areas of the Low country impact on total production was minimal as certain areas recorded higher yields. It is very striking to note that in spite of fairly serious drought conditions in many tea growing regions during 2012, total national tea production remained same as that of 2011. This point to the fact that tea smallholders and plantations have adopted good agricultural practices recommended by the institute to conserve moisture and these practices have mitigated the effect of drought.

During 2012, Tea Research Board guided the Tea Research Institute to review the 2008-2012 Corporate Plan in relation to the R & D achievements and their impact on the industry. Having implemented

the 2008-2012 Corporate Plan, 2013-2017 Corporate Plan was prepared through a participatory process which involved serious consultations with all stakeholders where each stakeholder was given an opportunity to make comments and suggestions on the new Corporate Plan. Advice and suggestions from other professional associations, scientific organizations and universities were received to revise and improve the R & D agenda of the institute. Finally, new Corporate Plan for the period 2013-2017 was approved by the Board and implementation of the action plan prepared is being reviewed quarterly through various formal mechanisms including the regular divisional reviews carried out with the participation of reputed scientists from universities and other Crop Research Institutes.



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B Sc Agric (Ceylon)
M Sc (Kyoto, Japan)
Ph D (Kyoto, Japan)*

Tea Research Board decision making process on matters related to R & D, technology transfer, advisory services and management of two estates of the Institute are guided by the recommendations made to the Governing Board by the Consultative Committee on Research and Consultative Committee on Estates & Advisory Services. These committees are chaired by two prominent Board Members and other members from industry represented by Senior Chief Executive Officers, recognized scientists from universities and Crop Research Institutes. Through this process, industry stakeholders, scientists of other organizations are given an opportunity to become partners in formulating the research agenda of the Institute. Governing Board always ensures that recommendations of the above Consultative Committees held quarterly are implemented and monitored regularly at monthly Board meetings.

The above procedure allows Tea Research Board to identify R & D needs, technology transfer and training needs and current and emerging

challenges to the industry. Tea Research Board then guide the Tea Research Institute's scientists on their R & D initiatives and Technology transfer procedures. Tea Research Board then facilitate the establishment of certain formal and informal mechanisms for regular interaction with the industry stakeholders and maintain a constant dialogue with the Institute. In order to ensure smooth and effective transfer of technological information to smallholder growers through the extension services of Tea Small Holdings Development Authority (TSHDA), Tea Research Board (TRB) emphasis is given to TRI/TSHDA Linkage Meetings held twice a year where action plan and joint responsibilities are identified. It is through this mechanism industry planting material needs, adaptive research programs, demonstration programs and other activities are discussed and agreed upon.

One of the most effective and highly accepted industry dialogues, TRB has initiated is the "Stakeholder Forum" where in 2012 the theme was "Quality Through Improving Post-harvest Handling and Factory Operations". Very senior level Chief Executive Officers and Senior Managers participated at this seminar. Unique feature introduced to this concept to ensure high acceptance is that few speakers at this forum are industry stakeholders who are experts in certain specialized fields. This mechanism has ensured and encouraged lateral flow of valuable information and experiences among the industry stakeholders.

Experiment & Extension (E&E) forum held twice a year at Tea Research Institute, Talawakelle is an another forum where predominantly scientific presentations are made with few presentations on matured technology ensuring quick dissemination of information on current industry status, matured technological messages on issues related to the industry. Tea Research Board guided TRI to make this forum more acceptable and valuable to participants by inviting a reputed industry stakeholder to make a presentation on a subject relevant to the stakeholders interest. During 2012, theme for the 224th E&E forum was "Efficient Crop Water and Soil Management System for Sustainability" and "Strategic Cost Management Approaches for Enhanced Profitability" at the 225th E&E held in July.

While serving the information and training needs of plantation sector through regular advisory services, Low-country Regional Centre at Ratnapura initiated activities on Data collection and analysis on climate change in tea growing Agricultural Ecological Regions (AER) and impacts, Development of irrigation technologies for tea, popularization of tea harvesting machines and Mapping of tea lands in Sri Lanka. Advisory & Extension Centres at Deniyaya, Passara, Kottawa, Matugama and Hantana

continued to play a vital role in carrying out extension services to smallholder sector. Mid country Regional Centre at Hantana played a major role in technology transfer activities to Regional Plantation Companies (RPCs), Sri Lanka State Plantations Corporation (SLSPC), Janatha Estates Development Board (JEDB) and Elkaduwa Plantations and Mid country smallholder sector while attending to R & D activities, co-ordination of 'Mother Bush Program' and 'Tea Nursery Certification Program'.

Technology Division of TRI, Talawakelle and Ratnapura, during 2012, carried out a very vital function of extending advisory services to RPC factories and a large number of private tea factories. Regular visits, calibration of machinery, advise on tea machinery and tea manufacture were the services rendered to the industry. Under the National Energy Management Plan, TRI jointly with Sri Lanka Sustainable Energy Authority (SLSEA) initiated an energy conservation program in the tea manufacturing sector for the first time in 2012. This was a very positive step taken by TRI in relation to the energy needs of the industry and its cost effectiveness in manufacture. This program will be continued through 2013 by appointing Energy Managers in the bought leaf factories and Tea Shakthi Factories. This program will involve training, demonstration on energy conservation and energy auditing with a view to reduce cost of energy in tea manufacture.

Having realized the current grave situation in the availability, price and use of fuel wood in the tea industry, Tea Research Board appointed a high powered committee to carry out a survey, study and submit a report on requirement, availability and strategies to ensure continuous supply of fuel wood for the tea industry for its commercial viability and sustainability. This report was submitted for discussion at the Golden Share Holders' Meeting under the Ministry of Plantation Industries and to seek agreement to implement the suggestions.

Cost of production of tea was a major issue and challenge to the commercial viability of the tea industry. High cost of production due to wage increase and low productivity threatened the tea industry survival since 2011. TRI was requested to carry out investigations and develop a "Out-grower Model" as a solution to this issue. Agricultural Economics Division initiated a Pilot Project at Matale to work-out a suitable out-grower model. Results and observations were presented to the Ministry for further discussion with the industry stakeholders. TRI also presented to RPC sector an economic model for replanting and infilling to ensure economic viability through increase in productivity.

Tea Research Board encouraged TRI to work in collaboration with other institutes and also promote Public/Private Partnership in technology development. In this respect TRI has already initiated R & D and field testing of 'Biofilmed Biofertilizer' with the Institute of Fundamental Studies (IFS). On Public/Private Partnership, TRI signed a Memorandum of Agreement (MoA) with a private company involved in cosmetic marketing to develop tea based cosmetic products under the Institute mandate to promote product development. During 2012 initial work on testing 'Slow release fertilizer' developed by Sri Lanka Institute of Nanotechnology [Private] Limited (SLINTEC) was tested by the TRI and stage has reached to sign a MoA to further develop the invention of SLINTEC for its application in tea fields.

During 2012, St. Coombs estate of TRI performed extremely well realizing a profit of Rs. 23 million and also received a Presidential Award for Excellence in manufacture. While St. Joachim Estate continued to reduce financial losses it has also received an award for Best Factory Small Scale Ratnapura Region.

During 2012, TRI management took the leadership role in organizing the Bi-annual Plantation Crop Research Symposium which was held from September 20-21, 2012. Scientific excellence of TRI was recognized by awarding best presentation award, best scientist award at the above Symposium. Tea Research Board in 2012 approved a scheme to recognize and reward scientists for their excellence performance and contribution to the industry. At the above symposium, three awards were presented to TRI scientists through a stringent evaluation of their contribution by an independent committee.

The Tea Research Board through Audit & Management Committee continued to monitor the administrative and financial management of the Institute to ensure highest degree of compliance of government instructions and circulars on good governance. 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

His Excellency the President met board members, senior executives of the organizations on 2nd April 2012 at the Temple Trees to make them aware about the government's forward plan. Importance of managing finances with the approved budget, attending to matters reported in the COPE report, importance of public days, updating institute's website, providing information through 1919 were highlighted. Special attention was drawn to the public enterprises guidelines for good governance.

TRI participated at the 'Dayata Kirula' exhibition in Oyamaduwa. The Hon. Minister visited the TRI stall on the 4th February 2012.

The Minister of Plantation Industries, Hon. Mahinda Samarasinghe visited TRI on 17th August. The Hon. Minister was briefed on the Human and Financial resource status at the Institute. Difficulties in attracting and retaining scientists and officers belong to other categories were highlighted. As this is a common issue for all R & D institutions, Hon. Minister requested to submit a joint proposal to enhance remunerations and other facilities in order for him to submit a cabinet paper.

The Fourth Symposium on Plantation Crop Research was held on 20th-21st September 2012. The Hon. Minister of Plantation Industries Mr. Mahinda Samarasinghe was the Chief Guest. There were 300 participants (190 from the Crop Research Institutes and 104 from the private sector). Rewarding scheme for the scientists at Crop Research Institutes were implemented and awards were given at the symposium to encourage the scientists.

24th meeting of ISO/TC34/SC 8 (Food Products-Tea) was held from 26th-28th June in Colombo, Sri Lanka. The Sri Lankan delegation comprised officers from TRI where important issues on international standard for Theanine in tea, White tea, Good manufacturing practices, Microbiological parameters for tea were discussed.

FAO/IGG meeting was held from 30th January-1st February. Sri Lankan delegation comprised officers from TRI and they made significant contributions at the working group on MRL.

At the MPI progress review meeting the Hon. Minister instructed TRI to expand the project proposal on 'Mechanization of tea plucking' in collaboration with TSHDA which could be funded under government budget proposal for promotion of mechanization in tea plantations. Rs. 100 mn is allocated for this purpose. Also the Hon. Minister requested TRI to prepare a proposal on establishment of bi- and poly-clonal seeds gardens and to promote irrigation techniques to minimize the impact on drought.

Intersessional meeting of the Inter Governmental Group (IGG) on tea was held on 17th-18th September 2012. The main objective of the meeting was to prepare action plan for the working groups on MRLs, MRLs in tea brew, tea trade and quality, organic tea, climate change, and tea Smallholders.

A meeting was organized jointly by TRI and Sustainable Energy Authority (SEA) on 15th November for the stakeholders to launch the National Energy Programme for the tea sector. CEOs, and senior officials from the RPCs and PTFOA were attended the meeting.

Findings of the above adaptive trials were presented to the Hon. Minister on the 11th December 2012 and to the officials from the Ministry, TSHDA, Federation of Smallholders and National Fertilizer Secretariat (NFS). It was agreed to implement the recommendation by the TRI.



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Ph D (Sheffield, UK)*

Research, advisory and extension matters

The Institute's draft Corporate Plan for 2013-2017 was presented to the stakeholders as part of a formulation of Corporate Plan for 2013-2017 and Corporate Plan for 2013-2017 was finalised.

RESEARCH HIGHLIGHTS

Crop Improvement

Grower perception on TRI 3000 and TRI 4000 series cultivars

An island wide survey was completed with the collaboration of TSHDA to assess grower perception on performances of recently released new tea cultivars. Results revealed that tea growers in all regions/districts have a good perception on performances of TRI 3000 and 4000 series cultivars. The higher potential of new cultivars to withstand drought and tolerance to pest and diseases contributed significantly to the higher acceptance.

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

Evaluation of TRI 5000 series cultivars using 23 adaptive trials was continued. Three new trials were established in the corporate sector estates and Smallholder properties in different agro-climatic regions.

First cycle yield and growth performance evaluations of a trial in IM1a agro-climatic region were completed. Results revealed that one cultivar tested in this region was yielding more than the popular existing high yielding cultivars TRI 2025 and TRI 4042.

Steps have been taken to propagate planting materials to establish adaptive trials in Smallholder lands in order to evaluate the potential of TRI 5000 series cultivars under Smallholder conditions. Grower driven, community-based trials will be established to evaluate new cultivars with the partnership with TSHDA in 2013.

Drought tolerant ability of TRI 5000 series cultivars in IU3c region were evaluated using newly developed drought susceptibility index and preliminary results showed high potential of new cultivars to withstand drought compared to the existing cultivars.

Morphological and molecular characterization of TRI 5000 series cultivars has been completed in the Up country region and a preliminary cultivar identification guide has been prepared for easy identification of new improved cultivars.

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

Among the fifteen cultivars screened for resistance to *Pratylenchus loosi* in Up country, six cultivars were chosen in to resistant and or tolerant category. Final recommendations need to be made in accommodating other proven characteristics of the cultivars.

Improved seeds as alternative planting materials for marginal tea growing areas

A new poly-clonal seed garden has been established at TRI Regional Station, Kottawa in order to meet future demand for improved seeds.

Characterization and metabolite profiling of tea germplasm

The first attempt on large scale metabolite profiling of the Sri Lankan tea germplasm using a high throughput technique has been continued. Profiling of major metabolites were completed for 87 accessions and results revealed that there is a wide variation in the contents of major catechins, caffeine and theabromine in the tea germplasm.

Use of Marker Assisted Selection (MAS) in tea breeding

Integration of Marker Assisted Selection (MAS) into conventional tea breeding program is a supplementary tool to develop a new improved cultivar within a short period of time. In our breeding, development of tea cultivars highly tolerant to blister blight leaf disease is one of the key objectives. Hence an EST-SSR marker based study was carried out to identify a DNA marker for early selection of the trait by employing individuals from a segregating population for blister blight disease resistance. A putative marker was identified and further studies on sequence characterization and validation of the marker is in progress.

Land Productivity Improvement

Improvement of soil fertility and tea yield through application of Bio-filmed bio-fertilizers (BFBF)

Trials carried out with mature tea at Holyrood estate (TRI 2025) and New Peacock estate (TRI 3043) showed that the yield of mature tea supplied with the full dose of TRI recommended fertilizer mixture ('VPUM') was comparable with that of BFBF + ½ of 'VPUM' treatment. Further, soil carbon content, available phosphorus, exchangeable potassium and soil microbial biomass carbon levels were improved with application of BFBF.

In a another experiment conducted at Blackwood estate, Haldummulla showed that BFBF application to organically grown immature tea has improved tea yield during the first year after bringing into bearing (3rd year after planting). Results also showed

that soil microbial biomass carbon (MBC), N and K contents improved with BFBF treatments.

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

Several studies on grafting of tea were conducted at the TRI main station (Talawakelle) and regional stations (Mid country and Uva) and in Balangoda estate (Low country) with the objectives of identifying compatible tea 'scion' and 'stocks' for grafting.

The graft combinations having 'scions' with Blister blight and Shot hole borer resistant and high yielding characteristics and 'stocks' with high rooting, drought tolerance and Nematode (*Pratylenchus loosi*) resistance were tested in the field. Experiment conducted in Uva region has shown promising results with graft combinations of TRI 4046 and TRI 3019 (scions) on DN (stock).

Evaluation of new grass species for soil rehabilitation

Two grass species, viz. 'Hybrid Napier' (variety CO-3) and 'East Indian Lemon grass', were planted at St. Joachim estate, Ratnapura, Houpe estate, Kahawatta and TRI Regional Centre, Kottawa to evaluate the biomass production in comparison with 'Guatemala' and 'Mana'. 'Hybrid Napier' produced the highest fresh weight of loppings followed by 'Guatemala'. A higher population of earth worms was found in soils planted with 'Hybrid Napier' and 'Mana' than the other treatments. The highest white grub population was recorded in soils planted with 'Guatemala' and 'Lemon grass' and the lowest was in soils planted with 'Mana' and 'Hybrid Napier'.

Integrated Approach to Soil Fertility Management

New fertilizer recommendation for mature tea: Fertilizer adaptive trials in Smallholder lands

The objectives of this study was to compare tea crop response to TRI interim recommendation and farmer practiced fertilizer mixtures with present TRI fertilizer recommendations in order to formulate efficient nutrient management packages to the tea growing areas. Adaptive trials were carried out in twenty six sites representing all senior tea inspectors (STI) regions in Galle, Matara, Kalutara, Ratnapura, Kegalle, Kandy, Gampola and Bandarawela TSHDA regions.

Based on the results 'U834', 'UT752', 'VPLC 880' for Low country, 'U834', 'UT752', 'VPUM 910' for Mid and Up country and 'U834', 'UT752', 'VP Uva 945' for Uva region were found to be suitable.

Evaluation of nutrient releasing pattern using bio-availability in slow release fertilizers

Three different slow releasing fertilizer products produced by Nano Technological Institute of Sri Lanka (SLINTEC) were tested for their slow releasing characteristics under greenhouse conditions. Field trials were initiated to establish the slow releasing characteristics in different tea growing regions for the said purpose.

Development of bio-organic fertilizers for tea

Eight efficient nitrogen fixers and eight P solubilizers were evaluated for their efficiency in plant growth promotion under *in-vitro* conditions and nutrient uptake under nursery condition.

Five out of eight nitrogen fixers and four out of eight P solubilizers were superior over rest of the isolates in growth and dry matter accumulation. Among the treatments, half rate of the recommended N and P in 'T 65' is comparable with the recommended rate of 'T 65'.

Crop Management

Screening of herbicides

Two herbicides, 'Trigger' (Glyphosate Iso Propyl Amine + Carfentrazone Ethyl) and 'Rapid' (Glyphosate Iso Propyl Amine + MCPA) were tested during the year to control boarderrange of weeds in tea lands. Both weedicides at varying rates mixed with sulphate of ammonia (for Trigger) and 'Activator' (for Rapid) were found to control both common weeds and other problem weeds such as 'Passali Kodi', 'Getakola' and *Caladium* satisfactorily.

Protection of vulnerable stages of tea from Shot Hole Borer

Chemical and non-chemical stem protectants against SHB were tested to identify prophylactic measures to control the pest.

Fipronil amongst stem protectants tested during the period under review, 1:1 Lime: Sulphur mixture was equally effective in terms of bio efficacy as a chemical treatment against SHB. However, practical difficulties encountered in mixing lime and sulphur. A new formulation with adhesive properties was developed to overcome the mixing problem.

Wood rot associated fungal species in Low country Live-Wood Termite (LCLWT)

The LCLWT, *Glyptotermes dilatatus* mostly attacks unhealthy mature tea bushes leading to, with die-back followed by wood rot caused by saprophytic and other fungi.

In order to develop a new IPM method to control LCLWT, studies were conducted to identify the wood rot associated fungal species in tea and the relationship between these fungal species and LCLWT infestation. Among the fungal species identified *i.e.* (*Acremonium* spp.- large, *Acremonium* spp.- small, *Nectria* spp., *Fusarium* spp., *Motreilla* spp., *Aspergillus* spp., and *Verticillium* spp and another non-spore forming 29 fungal species), *Acremonium* spp. was the most prominent fungal species in infested and non-infested or susceptible and tolerant cultivars.

Evaluation of alternate wound cut dressings against Low-country Live-Wood Termite (LCLWT)

Eight alternative wound dressings and paints were screened and compared with the existing recommendation of Candarsan for their ability to prevent wood rot. Of the tested formulations, Brunolium 15% proved to be the protectant with best fungicidal properties, persistency, ease of application, cost effectiveness and it had no effect on non-target organisms.

Natural defenses in tea against Blister blight

Plants have evolved complex defense mechanisms against diseases. Infection of diseases can result when a pathogen is able to overcome the host defenses.

Natural defence responses induced during Blister blight development caused by *Exobasidium vexans* was investigated. Study of leaf anatomical characteristics in relation to Blister blight disease in selected tea showed that trichome density and cuticle thickness significantly varied with cultivars and the resistant cultivars had highest trichome density and thickest cuticle compared to susceptible cultivars. Trichome density showed significant negative relationship with blister blight severity.

Plant defence elicitors in Blister blight disease management

The effect of two chemical plant defence elicitors salicylic acid and benzothiodiazole (BTH) against Blister blight disease was studied. The elicitors were tested under field conditions in TRI 2024, a susceptible cultivar to blister blight. The results suggest that salicylic acid and BTH can be integrated with copper fungicides in order to reduce fungicide usage and achieve better control of the disease.

Screening synthetic fungicides

To test the adaptability of fungicides, 'Champ' DP 37.5% and pyrachlostrobin, adaptive trials were conducted. Both fungicides were found to be user-friendly and practically effective in controlling blister blight disease under estate field conditions.

Climate Change Impact Assessment

Studies on physiological responses of tea to global climate change

The carbon profile of a matured tea plant grown in Sri Lanka was established with the objective of using the data in carbon trading mechanisms in future in the Up, Mid and Low country tea growing regions. Results revealed that the highest carbon content in terms of biomass present in the collar region and big roots (diameter more than 0.5 cm). The lowest carbon content is found in immature parts such as feeder roots and green twigs. The biomass content in each of above parts of seedlings was significantly higher than that of VP plants. There was no significant difference in biomass content of tea plants grown in different elevations in Sri Lanka.

Mechanization of field practices

Manual and mechanical pruning were tested with and without resting of tea bushes prior to lung and clean pruning at St. Coombs estate. Although there was no marked difference in tea yield between different pruning treatments at the 4th year of the cycle, the highest yield was achieved by the treatment combination of resting before pruning and manual pruning leaving lungs.

Tea Processing Technology

Development self-cleaning sifter for low grown tea grading process

A ball tray arrangement coupled with Michie Sifter was tested as a self-cleaning sifting machine in Low country tea grading in order to use it as a continuous sifting machine. Initial studies on optimizing the operational parameters of existing Michie Sifter was completed and fabrication of the ball tray arrangement and coupling with the existing Michie was also completed. The self-cleaning sifting machine performance tests are in progress.

Improvement to drying process in Orthodox-Rotorvane tea processing

Fluidizing behaviour of teas using different bedplates with varying opening area percentages and perforation sizes was studied with the objective of developing fluidized bed tea drying model. Three different bedplates with modified dimensions have been identified to improve fluidizing behaviour of teas.

Developing energy optimizing model for Variable Speed Drive (VSD) to determine moisture content of withered leaf

Four quadratic equations were developed to predict airflow rate at different static pressure for four different frequencies using the test rig designed. These four equations were incorporated into previously developed mathematical model and the computer program (Q-Basic) to calculate real time moisture content of withering leaves was successfully executed. Four other equations were also developed to estimate the power consumption during withering. Developing an automated withering system is in progress.

Product Development

Improving the process for instant black tea production

Application of membrane filtration technique for concentration of tea extract

In order to study the possibility of utilizing 250 Da membrane to improve the quality of instant black tea further, operating parameters (temperature and pressure) for 250 Da membrane were optimized and instant black tea was prepared by membrane pre-concentration of tea extract using the 250 Da membrane under optimized operating parameters followed by thermal concentration. Instant black tea samples were analyzed for chemical composition.

Socio- Economics and Resource Planning

Mapping of tea lands in Sri Lanka using GIS technology

A draft map categorizing all tea growing DS Divisions into different productivity classes were prepared in collaboration with the Natural Resource Management Centre, Department of Agriculture. Mapping of tea lands in all tea growing districts was initiated in collaboration with Land Use & Policy Planning Department (LUPPD) and Survey Department.

Investigation of potentials of tea based eco-tourisms in tea Up country plantations

The study was focused on identifying potential for ecotourism in tea estates as an alternative source of income. Thirteen tea estates representing all plantation companies in the Up country were selected to identify the potential resources available in this respect.

The results revealed that a substantial fraction of interviewed visitors' (87.8%) wished to visit tea estates as an alternative to the traditional sites of tourism in the near

future. The average willingness to pay (WTP) had significant association only with age, nationality, income and level of education of visitors. Majority (86%) of estate workers were willing to work in an ecotourism project. The study concludes that there is significant potential for implementing ecotourism in up country tea plantations.

Inter-regional productivity variations among tea small holdings in the Up country

In order to propose appropriate strategies for improving productivity efficiency, variation in productivity among the tea smallholders and contributory factors for productivity variation were studied. Family labour, hired labour, amount of fertilizer, chemical cost, health condition and experience of the farmers were identified as contributory factors for productivity variation in smallholders in Up country Sri Lanka.

Services to Stakeholders

Stakeholder forum seminars

As a new participatory approach started in 2011 with the aim of enhancing the interaction between TRI scientists and the stakeholders a seminar was conducted on 23rd November under the theme of “Quality through improving post harvest handling and factory operations” in Colombo with the participation of CEOs and all the senior management of RPCs and other tea related organizations.

Adaptive Trials

Fertilizer adaptive trials

The adaptive trials of TRI recommended fertilizers mixtures and the fertilizer mixtures preferred by the smallholders were completed and the proposed recommendations were forwarded to the ministry.

Para Extension Approach (PEA) for the corporate tea sector

After the successful completion of the para extension pilot project at Watawala Plantations PLC., PEA was extended to three more RPCs (Kahawatte Plantations PLC- Nawalapitiya region, Talawakelle Tea Company PLC- Talawakelle region, and Watawala Plantations PLC- Hatton region) during the year while continuing the pilot scale project at the Watawala Plantations- Lindula region. This approach should reduce the agricultural knowledge and adoption gaps at supervisory and worker level employees of corporate sector tea estates through “Para Trainers”.

Cyber extension activities

The main information centre to be used on cyber extension activities was established at the TRI Mid country Regional Centre at Hantana with the objective of narrowing down 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

TRI officers have inspected 137 commercial tea nurseries in 2012. It was found that only about 55- 68% of nursery plants inspected were suitable for planting.

Crop clinics

A mini 'Crop Clinic' program was conducted in the Kelinkanda area of Matugama region in collaboration with the staff of TSHDA and the Kelinkanda Small Holdings Development Society. All aspects of nursery management were addressed at the clinic.

ADB mother bush project

Only 6.6 million cuttings of TRI 3000 & TRI 4000 series have been issued to Smallholders and the corporate sector estates. The extreme weather condition experienced in 2012 adversely affected the performance of mother bushes which resulted in falling short of achieving the set target of the year

Development of a model for out-grower system in tea estates

The study on development of a model for out-grower system in tea estates was continued in Selagama estate, Matale in order to improve land productivity of the estate thereby making it as a profit oriented enterprise and also to improve living standards of workers. Establishment of shade trees on the out-growers' field was completed. Monitoring of out-growers' fields was continued and records on plucking, fertilizer application, weeding, income and price of green leaf have been maintained.

Extension of the out-grower model to other estates were discussed at the Golden Share Holders' meetings. The Hon. Minister highlighted the importance of out-grower concept under present day socio economic scenario and advised TRI to develop a proposal to establish out-grower trials in different tea growing regions under different scenario. A proposal to establish our grower systems in different RPCs was formulated and it was decided to get the feedback from RPCs on the proposed model and implement.

Collaborative work/ links with other organizations

MOU between M/s Natures Beauty Creations Ltd. and TRI were signed in July and research work was started on “Investigate the properties of fresh tea extracts and their stability when incorporated in a cosmetic formulation”.

Prof. Zvi Mendel, Entomologist, Department of Entomology and Dr. Stanley Freeman, Pathologist, Dept. of Plant Pathology and Weed Research, Agricultural Research Organization (ARO), The Volcani Center, ISRAEL visited TRI to explore possibilities of initiating collaborative work with the TRI. The areas identified for possible collaborative projects were management of Shot Hole Borer and studies on wood rotting fungi associated with Low country Live Wood Termite.

A Chinese delegation comprising senior officials/scientists from Guangdong Academy of Agricultural Sciences (GDAAS) visited TRI. The possible areas of collaborations were identified as exchange of tea resources/ varieties and scientists.

The first meeting of the private sector extension personnel was held on 8th June. It was agreed to establish a database on extension personnel at tea factories/input dealers *etc*, organize a special forum for private extension personnel, and identify training needs of extension personnel.

Sri Lanka Institute of Nanotechnology (SLINTEC)

A collaborative project on “Soil fertility improvements using slow releasing fertilizer” was continued with Sri Lanka Institute of Nanotechnology (SLINTEC). The glasshouse trials were completed and establishing field trials are in progress.

Uva Wellassa University

Scientists at TRI continued to provide services for the degree programme on Tea Technology and Value Addition, Uva Wellasa University.

TRI-IFS

Collaborative work on the use of Bio-filmed bio fertilizer (BFBF) in tea with Institute of Fundamental Studies was continued. Adaptive trials on the use of BFBF were completed and use of BFBF in immature tea fields is in progress.

Awards and Recognition

Dr. M T K Gunasekare and Mr. M A B Ranatunga received Presidential Awards for Scientific Research for 2007 and 2009 respectively.

Dr. M A Wijeratne was invited to make a presentation on “Analysis of climate change on tea sub sector in Sri Lanka” at the consultative session on climate change organized by the FAO/IGG.

Drs. M A Wijeratne, K M Mohotti and Mr. B A D Samansiri were awarded the first, second and third prizes for excellence in tea research at the 4th Plantation Crop Research Symposium held on 20-21 September 2012 under the TRI reward scheme.

Ms. N N K Wellala won the prize for the best paper/ presentation at the 4th Symposium on Plantation Crop Research for her paper on “Use of geographic information system in tea plantation management-A case study at St. Coombs estate, Talawakelle”.

Dr. K M Mohotti, Head, Entomology and Nematology Division was appointed as the President of the Institute of Biology of Sri Lanka for the year 2012-2013 as recognition to his continued service to the biological sciences in Sri Lanka since 1989.

Dr. P A N Punyasiri won the award for the Best Paper (Tea Sector) for his paper titled ‘Chemodiversity of Sri Lankan Tea Germplasm; 1. Preliminary Quantification of Principle Metabolites using high throughput High Performance Liquid Chromatography’ at the 4th Plantation Crop Research Symposium. 20-21 September 2012, Colombo, Sri Lanka.

Dr. K M Mewan was awarded “SLAAS Postgraduate Research Award 2012-Commendation Award” in recognition of his contribution towards postgraduate research carried out in Sri Lanka, by the Sri Lanka Association for the Advancement of the Science (SLAAS) at its 68th Annual Session held on 10th December, 2012, Colombo, Sri Lanka.

Dr. H W Shyamalie’s paper on “Potential for Eco-tourism in Up country Tea Estates in Sri Lanka” received a Gold medal for the Agricultural Economics for research study in Sri Lanka, 2012, from Sri Lanka Agricultural Economics Association (SAEA).

A Merit Award was received for TRI website “www.tri.lk” under the Government Category of the “BestWeb.lk 2012” competition organized by the LK Domain Registry of Sri Lanka.

Administrative and financial matters

Dr. L S K Hettiarachchi was appointed as Additional Director of the Institute in August 2012.

Dr. V S Sidakaran and Mr. J C K Rajasinghe were appointed as Principal Advisory Officers and Dr. H W Shyamalie was appointed as Senior Research officer in August 2012.

Mr. N D M Karaunadasa and Mr. B M B Basnagoda were appointed as Administrative Officers and Ms. T L Samaraweera was appointed as Public Relations Officer in April 2012.

Mr. G B Jayawadane assumed duties as Accounting Officer in September 2012.

Ms. D S C Weerasooriya and Ms. R M N M Ariyaratne were appointed as Management Assistants (Accounts) in December 2012.

Mr. P D Upali, Experimental Officer, Mr. W P A N Jayasinghe, Chief Clerk and Mr. S G Punchibanda, Accounting Officer retired from the services after rendering their valuable services to TRI.

A meeting with the treasury representatives was held on 7th June. 'Physical and financial progress of the first quarter' was presented. Issues related to cash flow problems and its effect on R & D work was discussed. Also the need for investing money on repair/maintenance of TRI infrastructure was highlighted. Treasury representatives accepted the need and requested to submit a proposal. TRI submitted the proposal to improve the working and living conditions at the Tea research institute.

COPE meeting was held on 24th July 2012. There were no serious issues raised on 2010 TRI audit report. However revaluation of TRI fixed assets, amendments to the current SOR to attract and retain scientists was discussed.

A programme on transforming the organization through team building was conducted successfully for the executive staff.

A workshop on "Skills development for drivers and minor employees" was conducted successfully.

Human Resource development

Dr. N P S N Bandara successfully completed his Ph D degree at Adelaide University, Australia on 'Agronomy of irrigated tea in the low elevation growing areas of Sri Lanka'.

Mr. J D Kottawa-Arachchi completed his postgraduate degree and awarded M.Phil in Agricultural Biology from Postgraduate Institute of Agriculture, University of Peradeniya.

Ms. Hiromi Nishanthi, successfully completed the M Sc program in Development Communication at Postgraduate Institute of Agriculture, University of Peradeniya.

Mr. A K Mudalige completed his B Sc degree at University of Sabaragamuwa.

Interaction meetings

The quarterly tripartite meeting of CTTA-TRI-SLTB was reactivated and a meeting was held on 17th December. The subjects discussed were moisture content in tea, high incidence of extraneous matter (Iron fillings), adulteration and contamination of tea with chemicals, MRLs, use of foliar applications which are not recommended by the TRI and R & D work on value addition.

On the request of the National Research Council, a presentation was made by the TRI to the representatives from the private sector on potential areas for private-public partnership in TRI R & D programme. The joint proposals could be considered under the budget proposal 2012-65 for funding and interested parties were requested to submit proposals.

TRI-TSHDA interaction meetings were held on 5th April and 31st July 2012. The key issues discussed were adaptive trials on fertilizer, survey on new cultivars (3000 and 4000 series), streamlining the pilot project on record keeping of pesticide usage by Smallholders, monitoring of direct planting and follow up on socio-economic survey on Smallholders with the Census Department.

Publications

- Annual Report 2011 - Sinhala/ Tamil/ English
- Sri Lanka Journal of Tea Science - Vol. 75 Part 1
- Revised Advisory Circular PU 1 - Pesticide Use in Tea Fields (English & Sinhala)

- Revised Advisory Circular PU 2 - Chemical Control of Diseases (English & Sinhala)
- Revised Advisory Circular PU 3 - Chemical Control of Weeds (English & Sinhala)
- Revised Advisory Circular PU 4 - Chemical Control of Insect, Mite and Nematode Pests (English & Sinhala)
- ටේ තතු වෙළුම - 8 කාණ්ඩ 2 - 2011 දෙසැම්බර්
- Proceedings of the 4th Symposium on Plant Crop Research

TRI estates

St. Coombs estate recorded a yield of 2,293 kg/ ha in the year 2012. The estate made a profit of Rs. 22,967,383.95 for the season.

St. Coombs estate achieved the highest net sale average in western high grown category. The estate also received the all time record price for Dust No.1 and the estate ranked first in the western high grown category. The estate replanted 1.92 ha with new TRI cultivars.

St. Joachim estate won the Presidential Award for the best tea factory (small scale) in Ratnapura region.

I thank the Chairman and the Board of Management for their continuous support, advice and guidance extended to me during the year to carry out my duties. My great appreciation to the TRI staff for extending their fullest cooperation to achieve the goals set in the corporate plan.



Dr. I S B Abesinghe
Director
Tea Research Institute of Sri Lanka

TRI STAFF MEMBERS

DIRECTORATE

Director

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

Additional Director

L S K Hettiarachchi
B Sc (Peradeniya, Sri Lanka)
Ph D (Aberdeen, UK)
(from 06.08.2012)

Office Staff

S M Jayasingham, Secretary to the Director
A P V Kalyani
Stenographer (English)
Devika Ratnayake
Stenographer (English)
R J Rayappen, Clerk
P Selvaraj, General Worker

AGRICULTURAL ECONOMICS DIVISION

Actg Head

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

Research Officer

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

Technical Officers

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

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 (Peradeniya, Sri Lanka)
M Phil (Peradeniya, Sri Lanka)
Ph D (Queensland, Australia)

Research Assistants

N P S N Bandara
B Sc Agric. (Peradeniya, Sri Lanka)
Ph D (Adelaide University, Australia)
S R W Pathiranage
B Sc Agric (Ruhuna, Sri Lanka)
(Low country Regional Centre)
T L Wijeratne
B Sc Agric. (Peradeniya, Sri Lanka)
M Sc (Peradeniya, Sri Lanka)

D M S Nawaratne

B Sc (Peradeniya, Sri Lanka)

M Phil (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 (up to 03.08.2012)

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 (Peradeniya, Sri Lanka)

M M N Damayanthi

B Sc Agric (Peradeniya, Sri Lanka)

M Phil (Peradeniya, Sri Lanka)

D W Vithana, 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 (up to
22.10.2012)

General Worker

N Sivasubramaniam

BIOCHEMISTRY DIVISION

Acting Officer-in-Charge

K M Mewan

B Sc Agric (Ruhuna, Sri Lanka)

Ph D (Colombo, Sri Lanka)

Research Officer

Senior Research Officer (contractual)

P A N Punyasiri

Grad. Chem, Ph D (Peradeniya, Sri Lanka)
(up to 04.10.2012)

Research Officer

G A A R Perera

B Sc Agric (Peradeniya, Sri Lanka)

M Sc (USJ, Sri Lanka)

Experimental Officers

G H Thotawattage

B Sc Agric (Peradeniya, Sri Lanka)

M Sc (Peradeniya, Sri Lanka)

Technical Assistant

H M S B Heenkenda

Technical Officers

R M E M K Randeiya

Diploma in Agriculture, (up to 31.7.2012)

E N U Edirisinghe

Diploma in Agriculture

Skilled Mechanic

M W Silva

General Worker

G Periyasamy

ENTOMOLOGY AND NEMATOLOGY DIVISION

Head

K M Mohotti
B Sc (Peradeniya, Sri Lanka)
Ph D (Reading, UK)
C.I. Biol. (SL)

Experimental Officers

D D Liyanage
B Sc (Kelaniya, Sri Lanka)
N Navaratne
R D P D Senanayake
B Sc (Peradeniya, Sri Lanka)
M Sc (PGIS, Sri Lanka)
P G D S Amarasena
B Sc (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
C De Seram (up to 01.11.2012)

Technical Officers

E P Wijewardana (up to 31.07.2012))
B M N J Basnayake (up to 31.07.2012)

General Workers

S Hettiarachchi (from 01.10.2011)
V Sabaratam (from 01.10.2011)

PLANT BREEDING DIVISION

Head

M T K Gunasekare
B Sc Agric (Ruhuna, Sri Lanka)
Ph D (Southampton, UK)
Senior Research Officer (up to 05.01.2012)

M A B Ranatunga
B Sc Agric (Peradeniya, Sri Lanka)
M Sc (TNAU, India)
Senior Research Officer
Acting Officer-in-Charge (from 05.01.2012)

Research Assistants

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) up to 14.07.2012.
T M Sarathchandra
B Sc (Canterbury, UK)
(Mid country Regional Centre)
J D Kottawa Arachchi
B Sc (OUSL, Sri Lanka)
M Phil (Peradeniya, Sri Lanka)
K K Ranaweera
B Sc Agric (Ruhuna, Sri Lanka)
M Phil (Peradeniya, Sri Lanka)
A K Mudalige
Diploma in Agriculture
B Sc Agric Sci & Mgt (Sabaragamuwa,
Sri Lanka) (Low country Regional Centre)

Technical Officers

M G M Kumara

HNDD (Agric)

D V R Deniyapahala

Diploma in Agriculture (up to 31.09.2012)

PLANT PATHOLOGY DIVISION**Senior Research Officers**

N H L Pradeepa

B Sc (Ruhuna, Sri Lanka)

M Sc (GBPUAT, India) (on study leave)

G D Sinniah

B Sc (EUSL)

Ph D (Peradeniya, Sri Lanka),

(Contractual)

Research Officers

D L A L A Dassanayake

B Sc Agric (Peradeniya, Sri Lanka)

(up to 10.02.2012)

Technical Officers

D G N P Karunajeewa

Diploma in Agriculture

C D Jayasinghe

Higher National Diploma in Agriculture

(up to 27.07.2012)

**SOILS & PLANT NUTRITION
DIVISION****Head**

G P Gunaratne

B Sc Agric (Peradeniya, Sri Lanka)

M Phil (Peradeniya, Sri Lanka)

Ph D (Peradeniya, Sri Lanka)

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 (Dharwat, India)

W T B D Priyantha

B Sc (SJU, Sri Lanka)

S M Dissanayake

B Sc (Wayamba, Sri Lanka)

J R Y Abeywardane

O G K A Gunaratne

Dip in Agriculture

ACLT (OUSL, Sri Lanka)

W M J C Bandara

B Sc (OUSL, Sri Lanka)

Technical Officers

M D K S Thilakasiri (up to 22.10.2012)

Diploma in Agriculture

R A I W K Ranatunge (up to 27.07.2012)

Diploma in Agriculture

K A S A Rupasinghe (up to 22.10.2012)

Diploma in Agriculture

A V K S Perera (up to 31.07.2012)

Diploma in Agriculture

General Worker

D Silvester

V Rathakrisnan

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 (Moratuwa, 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 Priyanthi
N D T (Moratuwa, Sri Lanka)
L Jayasinghe
W M U A B Marapana
B Sc (SJU, Sri Lanka)
A Chamindra
S P Dayananda (up to 02.01.2012)
B Sc Engineering (Peradeniya,
Sri Lanka)
M S Weerawardena
B Sc Engineering (Peradeniya,
Sri Lanka)

Staff of the mechanical workshop

A Nandasiri, Chief Mechanic
L Weerasooriya, Mechanic
M Gabrial, Mechanic
N Bowei, General Mechanic

General Worker

R Illangovan
S Selvadurai

ADVISORY AND EXTENSION DIVISION

Head

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

Principal Advisory Officers

J C K Rajasinghe
B Sc Agric (Peradeniya, Sri Lanka)
M Sc (PGIA, Sri Lanka)
Officer-in-Charge, Mid country Regional
Centre (from 6.8.2012)
V S Sidhakaran
B Sc Agric (Peradeniya, Sri Lanka)
M Sc (Peradeniya, Sri Lanka)
Ph D (TNAU, India), (from 6.8.2012)

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)
(Low country Regional Centre)

Extension Officers

H J M De Silva
B Sc Agric (Ruhuna, Sri Lanka)
(Mid country Regional Centre)
H Jayaweera
Actg. Officer-in-Charge
Kaluthara 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)
M Sc (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 (up to 31.07. 2012)
N S Ekanayake

C S K Kiribathgoda
Stenographer/ Typist (English)

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

PUBLICATIONS AND PUBLICITY UNIT

Publications/Publicity Officer

K P H Liyanage
B Sc (OUSL, Sri Lanka) (up to 28.02.2012)
G W M S N Gunasekara
Diploma in Agriculture
Technical Officer (up to 01.10.2012)
I W M Nihal Kumara
Typist/Clerk
K G R Niroshan
Photographer
J T Thevadasan
Photographer
A Krishnamenan
General Worker

LIBRARY

R W M S K Amunugama
Diploma in Library Science
Library Assistant
S Parameswari
General Worker

INFORMATION TECHNOLOGY UNIT

Udeni D Alagiyawadu
Experimental Officer

ADMINISTRATION DIVISION

N D M Karunadasa,
Administrative Officer
S Shanmuganathan,
Stenographer/ Typist (English)
T L Samaraweera,
Public Relations & Welfare Officer
P D S de Silva, Clerk/ Typist
W M S R Wanasinghe, Clerk/ Typist
R M D K Rathnayake, Clerk/ Typist
C Jeyaram, Clerk/ Typist
S Dharmalingam, Clerk/ Typist
A A H Chinthaka, Clerk/ Typist
V Chandrasekeran, General Worker
N. Pushparaj, General Worker

Guest Houses/ Circuit Bungalow

R Mahendran,
Guest House Keeper
R M B D Rathnayake
Circuit Bungalow Keeper (Colombo)
G Weerapperuma,
Guest House Keeper

Purchasing Unit

B Tillakaratna, Purchasing Officer
K R M Priyantha, Clerk/ Typist

Internal Audit Unit

R Kariyawasam, Internal Auditor
P S Wickramasinghe
Internal Audit Officer
N C Jayaweera, Internal Audit Clerk
(Temporarily transferred to the Finance
Division)
W N K I Ariyaratne, Internal Audit Clerk

Engineering Unit

R M R R L Ranaraja, Resident Engineer
C J B Abeykoon, Clerk of Works
J G Gamage, Filter Plant Assistant
W C K Fernando, Chief Plumber Mechanic
P T Perera, Clerk/ Typist
U D W Rathnasiri, Filter Plant Assistant
R A C Lasantha, Clerk/ Typist
K A F Dharmadasa,
Assistant Plumber Mechanic
R Jeyaraj, Carpenter
S Balakrishnan, General Worker
W Christy Paul, General Worker
H M Wijesekera, General Worker
A Loganathan, General Worker

Telephone Exchange

K M Seneviratne Banda,
Telephone Operator

P K N Damayanthi,
Telephone Operator cum Receptionist
P Vythilingam Pillai, General Worker

Electrical Unit

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

Transport Unit

M L H Perera, Transport Officer
 (up to 31.03.2012)
 S H Chandrasena, Clerk/ Typist
 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
 H I Mettananda, Driver Class I
 U K A B Uduwella, Driver, Class I
 M B S Priyashantha, Driver Class II
 S P Dammika Tharanga, Driver, Class II
 H A D Niranjana, Driver, Class II
 T K A Kumarasinghe, Driver, Class II
 M D Chandana, Driver
 W M S J Weerasinghe, General Worker

Motor Garage

W G Wijeratne, Motor Mechanic
 K Rajaratnam, General Worker

FINANCE DIVISION

M V Mohan, Accountant
 CIMA (London)-Intre,
 AAT (Sri Lanka)- Associate
 W M T B Weerasekera, Accountant
 CBA (Sri Lanka) (from 14.05.2012)
 S G Punchibanda (retired on 25.11.2012)
 Senior Accounting Officer
 G B Jayawardena, Accounting Officer
 B Com Sp (Kelaniya, Sri Lanka)
 CBA (Sri Lanka) (from 05.09.2012)
 V Pahalage, Accounts Clerk
 M G Weeratilleke, Cashier
 B K S Herath, Accounts Clerk
 A A A P Amaratunge, Accounts Clerk
 H B Thalagahagoda
 Accounts Clerk cum Cashier
 Saman Hewasiliyan, Accounts Clerk
 W A Nishantha
 Data Entry Operator cum Accounts Clerk
 AAT (Sri Lanka) Part I & II
 I G N C Jayaweera AAT (Sri Lanka) Final
 Internal Audit Clerk
 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
 G S Raju, General Worker

Stores

K T U Kulatunga
 Assistant Store Keeper
 H P W Gunasekara
 Stores Assistant
 K M S K Kodithuwakku, General Worker

RESEARCH HIGHLIGHTS

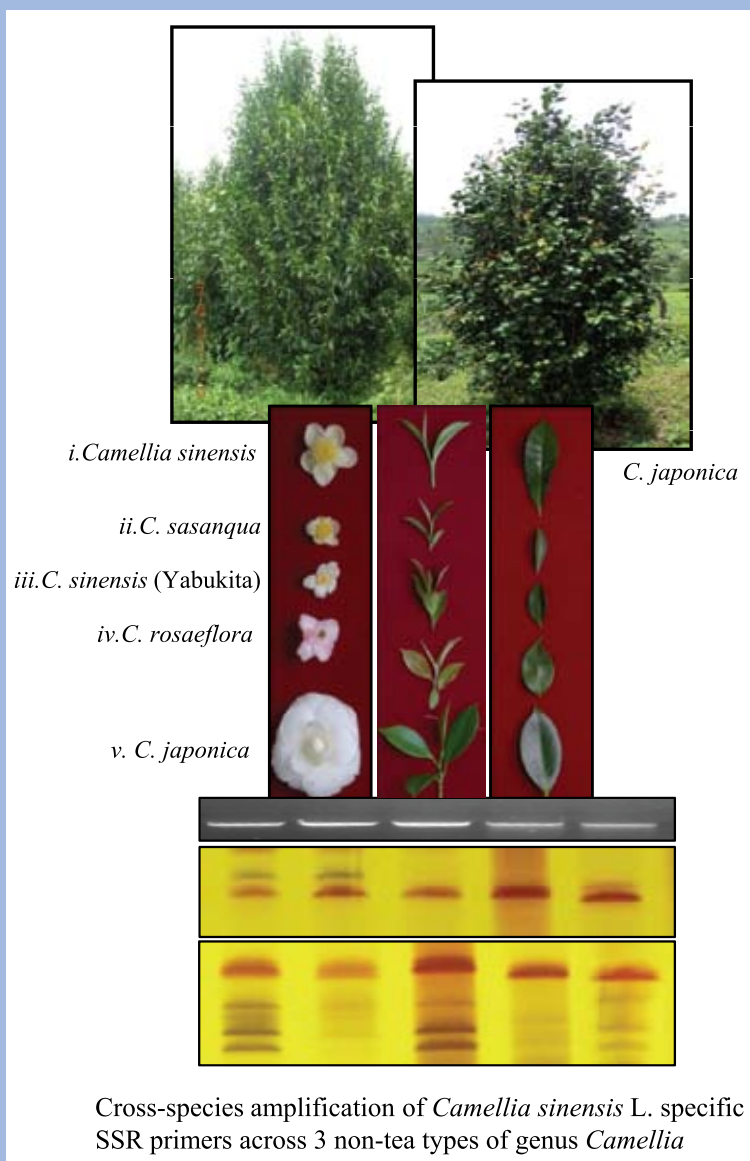
CROP IMPROVEMENT

Application of molecular technology to support genetic conservation and improvement of tea

Parentage analysis of inter-specific hybrids: Cross species amplification ability of SSR primers

Use of inter-specific hybridization in tea improvement is one of the techniques with a huge potential in introducing novel genes into cultivated teas thus increasing the genetic diversity of tea genetic pool in Sri Lanka. Proper exploitation, efficient conservation, effective utilization of potential sources in hybridization and subsequent evaluation of parentage of hybrids are key areas with paramount importance towards successful implementation and monitoring of such programs, where DNA marker based characterization could play a significant role in achieving above goals. In this regard, choice of the marker system would be powerful enough for the above purposes where use of highly informative and reproducible microsatellite/ SSR markers is one of the best suits for tea which shows very close genetic resemblance between accessions.

Therefore, as an initial step, cross-species amplification ability of SSR primers, previously developed for cultivated tea, were tested across 3 non-tea types namely *Camellia sasanqua*, *C. japonica* and *C. rosaeflora* and results revealed that some of the SSR primers studied could be used effectively to confirm identity of parentage of the inter-specific hybrids. Further work is in progress.



Use of MAS in tea breeding

Tea, being a predominantly out-breeding woody perennial, integration of Marker Assisted Selection (MAS) into conventional tea improvement program is a promising supplementary tool towards increasing efficiency of such programs which ultimately help breeders to release a new improved cultivar within a comparatively shorter period of time. In tea improvement programs in Sri Lanka, development of tea cultivars highly tolerant to blister blight leaf disease, one of the devastating disease, which causes huge yield loss annually, is one of the key objectives that second only to high yield and quality. Presently, due to unavailability of laboratory/ bio assays, in every phase of the tea improvement program, selection for blister blight tolerance is carried-out solely by means of field assessments which is very laborious, tedious and time consuming process that completely dependent on environmental factors. Therefore, an EST-SSR marker based study was carried out to identify a DNA marker for early selection of the trait by employing individuals from a segregating population for blister blight disease resistance. A putative marker was identified and further studies on sequence characterization and validation of the marker is in progress.

Characterization and metabolite profiling of tea germplasm

Characterization of tea germplasm is a pre-requisite in crop improvement programs to select potential parents for hybridization aiming rational utilization of tea germplasm in tea breeding and crop improvement program. Recent study on floral characterization of tea germplasm revealed that Sri Lankan tea germplasm is predominantly represented by 'Cambod' type accessions.

The first attempt on large scale metabolite profiling of the Sri Lankan tea germplasm using a high throughput technique has been continued. Profiling of major metabolites were completed for 87 accessions and results revealed that there is a wide variation in the contents of major catechins, caffeine and theabromine in the tea germplasm. The metabolic profiles generated have been effectively used in choosing accessions of desired characteristics in tea breeding program to generate progenies with wide variations.

Screening of 5000 series tea cultivars for drought tolerance

A preliminary study was conducted with the objective of evaluating drought tolerant characteristics of new accessions to be released as TRI 5000 series tea cultivars in comparison with the known drought tolerant cultivars (TRI 2025, TRI 4042, TRI 3019 and DN) at the TRI Uva regional centre. Physiological parameters such as Photosynthesis, Transpiration, Stomatal Conductance and Relative Water Content and Total Soluble Sugar content were used to differentiate the accessions. The cluster analysis based on drought susceptibility index showed that TRI 5000 series accessions, 89 and 199 were more drought tolerant and accessions 243, 21, 5 and 208 were more

drought susceptible than the other accessions. Further investigations are required to confirm these results.

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

Selection of tea cultivars resistant and or tolerant to economically important tea pests has been continued as a prime step in the integrated pest management and a measure of minimizing requirement for other pest control and pesticide usage *etc.*, During the period under review, potential accessions selected by the Plant Breeding Division and seed stocks for Low, Mid and High elevations were exposed to screening against *Pratylenchus loosi*, *Radopholus similis*, Shot hole borer (SHB) and Low country live wood termite (LCLWT) following standard protocols at various localities.

Among the fifteen cultivars screened for resistance to *Pratylenchus loosi* in Up country, six cultivars were identified as resistant and or tolerant. Final recommendations need to be made after considering the other proven characteristics of the cultivars. The SHB infestation levels of the cultivars screened in the seed stock trial, commercial evaluation trial, planted in 2009 Phase II trial and 5000 series in Uva trial under field conditions are to be confirmed after further bioassays, evaluation of growth responses and statistical validations.

Further, LCLWT free seed stocks were identified in the commercial evaluation trial, seed stock trial, Phase II trial in St. Joachim estate and Phase II 2009 planting in Kottawa. Those need to be validated after conducting bioassays and evaluation of growth responses.

Development of new tea cultivars

Controlled hybridization is the main method of obtaining genetic variation and developing new tea cultivars to meet emerging challenges in the global tea industry. Hybridization program of 2011/2012 was focused on enhancing fruit set and retention of inter-specific hybrids to overcome fertilization barriers using the information generated previously. Different *Camellia* species were used as potential parents in the program. Fruits are being monitored. Sixty six seeds from another cross between two diverse parents have been harvested and germinated in the sand bed.

To identify widely adaptable tea cultivars for better exploitation in diverse agro-ecologies, four multi location trials consisted with accessions selected from hand crosses made from controlled hybridization programs during 2003-2005 were established at Talawakelle, Ratnapura, Hantana and Passara. These crosses were made using diverse parental materials which were not recurrently used in the previous breeding programs and promising accessions were selected based on preliminary evaluations based on yield and visual growth performances.

Estate cultivar selection program

Estate cultivar selection program has been practiced with two fold objectives; selection of promising land races to develop new tea cultivars and to conserve seedling diversity in old seedling tea fields. Thirty seven seedlings have been selected from Glenanore estate, Haputale for further evaluations and program is being continued.

Results from a recent study conducted to analyze the genetic diversity of estate selections in the germplasm using molecular markers revealed the wide genetic variation among them. The study was further directed to identify most diverse estate selections and their origins which facilitate selection of parents for future crossing programs. This is the first attempt on a comprehensive genetic diversity analysis of estate selections in Sri Lanka and the results warrant that the estate cultivar selection program has to be continued with giving more emphasizes to their origin/location.

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

To elicit growers’ perception and to assess the suitability of new tea cultivars on various agro-climatic regions, evaluation of TRI 5000 series potential cultivars on 23 adaptive trials with the partnership of growers has been continued. Three new trials were established in the corporate sector estates and Smallholder properties in different agro-climatic regions.

First cycle yield and growth performance evaluations of one trial were completed in IM1a agro-climatic region. Results revealed that one cultivar tested in this region was yielding more than the popular existing cultivars/ controls, TRI 2025 and TRI 4042. Evaluations on quality and tolerance to Shot Hole Borer are being carried out. Evaluation of tolerance of TRI 5000 series accessions in WL2a region to Low country live wood termite is being carried out. Drought tolerant ability of TRI 5000 series cultivars in IU3c region were evaluated using newly developed drought susceptibility index and preliminary results showed high potential of new cultivars to withstand drought compared to the existing cultivars. Study is being continued to validate the results.

Morphological and molecular characterization of TRI 5000 series cultivars has been completed in the Up country region and a preliminary cultivar identification guide has been prepared for easy identification of new improved cultivars.

Steps have been taken to propagate planting materials to establish adaptive trials in Smallholder lands in order to evaluate the potential of TRI 5000 series cultivars under Smallholder conditions. Grower driven, community-based trials will be established to evaluate new cultivars with the partnership with TSHDA in 2013.

Improved seeds as alternative planting materials for marginal tea growing areas

Demand for improved seeds as alternative planting materials for marginal growing conditions has been increased considerably over last decades. Stakeholders were linked with commercial seed gardens to facilitate seed collection during peak fruiting season in 2012. A new polyclonal seed garden has been established at TRI Regional Station, Kottawa in order to meet future demand for improved seeds.

Use of *in-vitro* techniques to supplement the conventional tea breeding program

Research activities aimed at developing necessary tissue culture protocols to supplement the conventional tea breeding program has been continued. An attempt was made to develop plants through direct somatic embryogenesis from cotyledon tissues to facilitate mass multiplication of hybrid seeds. Optimum growth regulator combinations and basal medium have been identified for induction of embryogenesis and somatic embryo germination. Plants generated from somatic embryos are being maintained under poly house for further evaluations.

Grower perception on TRI 3000 and TRI 4000 series cultivars

An island wide survey was completed with the collaboration of TSHDA to assess grower perception on performances of recently released new tea cultivars. Results revealed that tea growers in all regions/ districts have a good perception on performances of TRI 3000 and 4000 series cultivars. Survey results showed that potential of new cultivars to withstand drought and tolerance to pests and diseases is higher compared to old cultivars viz, TRI 4042, TRI 3055, TRI 4049, and TRI 4052 thus leading to higher acceptance among growers.

Screening quality aspects of seedling tea cultivars planted in Dimbulla region

Newly propagated seedling teas planted in Dimbulla region were assessed for quality in comparison with known cultivars, one with better quality (DT1) and the other having very poor quality (TRI 2025). Out of six seedling teas tested, two were promising (Code Nos 8 & 9) for its quality having comparable quality with DT1. In addition, both seedling teas were quick fermenters like DT1.

Out of six newly propagated tea cultivars planted in Uva region, one more cultivar (U 89) was found to be promising for its quality. These cultivars were subjected to assess the quality aspects as against two known cultivars with better quality (DN) and very poor quality (TRI 2025). Therefore, when recommending cultivars for the Uva region, a special attention need to be paid regarding this cultivar.

LAND PRODUCTIVITY IMPROVEMENT & CROP MANAGEMENT

Land Productivity Improvement

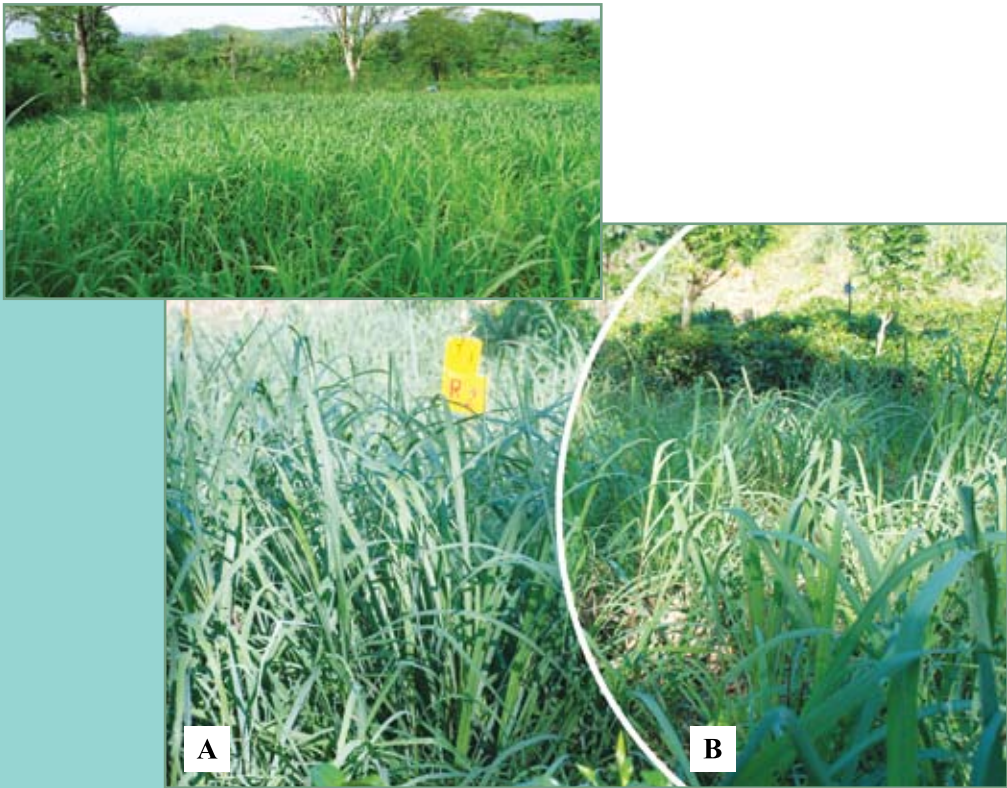
1. Improvement of land productivity through agronomic practices

Evaluation of new grass species for soil rehabilitation

Two grass species, viz. 'Hybrid Napier' (variety CO-3) and East Indian 'Lemon grass' (*Cymbopogon flexuosus*), were planted at St. Joachim estate, Ratnapura, Houpe Estate, Kahawatta and TRI Regional Centre, Kottawa in 2011 to evaluate the biomass production in comparison with 'Guatemala' (*Tripsacum laxmum*) and 'Mana' (*Cymbopogon confertiflorus*). 'Hybrid Napier' produced the highest fresh weight of loppings (111-277 kg/ha/yr) followed by Guatemala (72-163 t/ha/yr). Mana grass recorded less weight of loppings than Lemon grass. Soil pH, carbon and nutrient content improved with cultivation of grasses and addition of grass loppings. A higher population of earth worms was found in soils planted with 'Hybrid Napier' and 'Mana' than the other treatments. The highest white grub population was recorded in soils planted with 'Guatemala' and 'Lemon grass' and the lowest was in soils planted with 'Mana' and 'Hybrid Napier' at St. Joachim estate. The Soil Quality Index reported with 'Hybrid Napier', 'Lemon grass', 'Gautamala', 'Mana' and untreated treatments was 5.5, 5.8, 5.5, 5.2 and 4.9 respectively.

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

An experiment was initiated in 2011 at New Peacock estate to investigate the feasibility of *in situ* rehabilitation of old and debilitated tea lands to minimize or eliminate unproductive period of soil rehabilitation. Harvesting of old tea plots planted with 'Gliricidia', 'Mana' and *Flemingia* (*in situ* rehabilitation) continued during 2012 whilst adding the loppings of green manure crops/ rehabilitation grasses to same tea plots. In terms of biomass production, *in situ* rehabilitation has supplied 32-41 t/ha of 'Mana' loppings, 4.4 t/ha of *Flemingia* loppings and 3-6 t/ha of 'Gliricidia' loppings during 2012 in comparison with



Above:

A new grass species Hybrid Napier (CO-3) - A potential alternative grass which is under evaluation for rehabilitation

Below:

- A. 'Mana' treated with BFBF + $\frac{1}{2}$ commercial fertilizer during 12 months period
- B. 'Mana' treated with commercial fertilizer during 24 months period. (Recommended practice of TRI)

90 t/ha of 'Mana' loppings in the fully rehabilitated plots with grass planted after uprooting of old tea.

Application of Bio-filmed bio-fertilizer (BFBF) to reduce soil rehabilitation period

Two experiments were commenced at New Peacock estate, Pussellawa and Haupe estate, Kahawatta in 2011 to investigate feasibility of using BFBF to reduce soil rehabilitation period. Six treatments combining BFBF application, planting of 'Mana' grass and direct planting (without

soil rehabilitation) were tested. Cultural practices including loppings of 'Mana' and soil nutrient analysis were carried out during the year. The growth of 'Mana' treated with BFBF + $\frac{1}{2}$ CF (T1) withing the period of 12 months showed better growth performance compared to the recommended treatment with CF (T4) alone during the period of 24 months for rehabilitation. Direct planting with tea treated with BFBF + $\frac{1}{2}$ CF also showed the better growth of tea.

Validation of Soil Quality Index

Soil Quality Index estimates at New Peacock estate- Pussellawa, Gonekelle estate- Passara, Doloswela and Watapota estates- Kahawatte, Stelenburge estate- Gampola, Hatale estate, Panwila and Pitakanda estates- Matale before rehabilitation were 5.4, 4.9, 6.32, 5.46, 5.75, 5.93 and 4.84 respectively. Ninth and 10th soil sampling were done from old tea lands of Baument estate, Gampola and St. Joachim estate, Ratnapura before planting of rehabilitation grasses. Similarly, 11th and 12th soil samplings were done from old tea lands before soil rehabilitation and following rehabilitation from St. Coombs estate in August and September 2012, respectively. Soil analysis for all physical, chemical and biological parameters are in progress.

Evaluation of drip and sprinkler irrigation systems in mature tea

A new drip irrigation system was established at a Smallholder property in Kahawatte to evaluate growth of tea under drip irrigation in smallholdings as well as to study Smallholder attitudes and perception towards advanced irrigation techniques.

General cultural practices and plucking continued in the drip/ sprinkler/ rain-fed experimental blocks of St. Joachim estate. However, application of water through sprinklers was disturbed due to illicit removal of some sprinklers. A section of the field, under drip irrigation was planted with 'Hybrid Napier' grass (*Pennisetum typhodiou purpureum* = *Pennisetum purpureum* X *Pennisetum americanum*) species for rehabilitation and the grasses were lopped every 3 months.

Evaluation of growth performances of new shade tree species

Seeds of *Derris mycophylla* (Derris) and *Cassia nodosa* (Pink Cassia) were obtained for field planting. Seedlings of *Cassia* spp could not be raised due to poor germination and hence, only *Derris* seedlings were field planted at Ratnapura.

2. Integrated approach to soil fertility improvement

Improvement of soil fertility and tea yield through application of Bio-filmed bio-fertilizers (BFBF)

BFBF with selected inocular were tested in immature and mature tea at St. Joachim estate, Ratnapura, TRI Regional Centre at Kottawa, Elkaduwa estate and Holyrood estate with the objectives of improving soil conditions, growth and yield of immature

tea whilst reducing application of chemical fertilizers. The soil physical and chemical properties and yield of tea treated with BFBF and half dosage of 'T 750' were comparable with those of control plots fertilized with recommended dose of 'T 750'.

Two trials carried out with mature tea at Holyrood estate (TRI 2025) and New Peacock estate (TRI 3043) showed that the yield of mature tea supplied with the full dose of 'VPUM' was comparable with that of BFBF + ½ of 'VPUM' treatment. Further, soil carbon content, available phosphorus, exchangeable potassium and soil microbial biomass carbon (MBC) have been improved by application of BFBF.

A separate field trial conducted at Stassen Blackwood estate at Haldummulla showed that BFBF application to organically grown immature tea has improved tea yield during the first year after bringing into bearing (3rd year after planting). Results also showed that soil microbial biomass carbon, N and K contents improved with BFBF treatments.

3. Investigating the compatibility of 'stock' and 'scion' for grafting to improve productivity & quality of tea

Several studies on grafting of tea were conducted at the TRI main station (Talawakelle) and regional stations (Mid country & Uva) and in Balangoda estate (Low country) with the objectives of identifying compatible tea 'scion' and 'stocks' for grafting with special reference to high yield, high quality, drought tolerance and pests and diseases tolerance. Seven graft combinations established in the St. Coombs estate have given higher yields than the control cultivars (scion) at the second year of the second cycle. A well known quality cultivar TRI 777 on TRI 2025 has been one of the combinations given significantly higher yield (74% increase) than TRI 2025.

Several graft combinations having scions with Blister blight and Shot hole borer resistant and high yielding characteristics and stocks with high rooting, drought tolerance and Nematode (*Pratylenchus loosi*) resistance have also been tested in the field. Experiment conducted in Uva region has shown promising results with graft combinations of TRI 4046 and TRI 3019 (scions) on DN (stock). One nursery trial with several graft combinations having suitable characteristics for Mid country region was successfully completed and plants were ready for planting in the field.

Graft combinations for drought tolerance were raised in the nursery successfully, and planted in the field at Balangoda estate using TRI 4000 series cultivars as 'scions' and drought tolerant estate cultivars, DG 7 and DG 39 as 'stocks'.

4. Root growth studies on tea

Root growth of 5 tea cultivars was compared with seedlings in the nursery and plants were planted in the field for further investigations. Total root dry weight, root length and total shoot dry weight were higher in seedling than in cultivars. Specific leaf area of cultivars was higher than that of seedling.

Experiment on burying of prunings with 5 tea cultivars conducted at Concordia estate has shown a higher % of active feeder roots at a depth of 15 cm in about 12 months after pruning. Root growth studies using root windows were in progress at St. Coombs estate. The objectives of the study was to investigate variation of root growth under different nutrient levels and canopy architecture in the nursery, with centering, tipping and plucking operations of immature tea and with formative pruning in the field.



Visual observation of roots through a root window

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

Scientific validation of natural sustenance of soil and crop productivity and level of natural biological control mechanisms and pest, disease and weed incidences under organic tea cultivation was continued in TRI Organic Conventional (TRIORCON) and Biodynamic Organic Conventional (BIDORCON) trials at Talawakelle and Geragama.

During the period under review, prune time data of the fourth pruning cycle of the TRIORCON trial was generated. The assessments also included post prune recovery, dry matter partitioning, nutrient analysis of soil and leaf litter. The results showed comparatively greater mean fresh weight dry weight ratio of both prunings and whole bush, number of shoots emerged per bush, number of prune cuts per bush and prune cut diameter under organic than the conventional system. This was attributed to more than 30% dry matter in the root system and higher root starch content in organically grown tea. Further, the soils exhibited a greater organic carbon as compared to the conventional system. Hence, the results supported that the organic cultivation methods in tea help assist in carbon capturing and accumulation and a means of carbon sequestration with least usage of external inputs. Maximizing C accumulation and conservation of dry matter and carbon sources were least under conventional system.

Amelioration of high soil pH levels in organically managed tea lands through sulphur amendments

Despite several environmental benefits in organic tea cultivation, presence of soil pH above the optimal range has become a major constraint. This is a limitation in majority of organically managed tea estates in Sri Lanka and India owing to organic inputs causing indirect effects in increasing soil pH.

In order to lower the soil pH in organic tea soils using natural and sustainable means, a series of experiments was conducted. Amelioration of organic tea soils with high pH was done using different doses of sulphur amendments alone and incorporated with compost. The pH levels were correlated with yield, prune time and post prune assessments too.

The results showed that increased soil pH by 1 caused a mean yield reduction by 8%. The efficient soil pH reduction was achieved by application of 45 g of elemental sulphur and 300 g of compost added at the ratio of elemental sulphur 300 g: compost 2 kg per bush. Hence, soil treatment of sulphur incorporated with compost is beneficial and feasible in terms of practicality and cost of application. Furthermore, as organic sources are important as nutrient supplements in organic tea cultivation, restricted use of dolomite in composting and after pruning is suggested.

Role of GAPs on yield sustenance and SHB and LCLWT management in Deniyaya region

TRI recommended good agricultural practises (GAPs) in crop, soil and pest management in immature and mature tea in two Smallholder tea lands were monitored as a demonstration and a model trial in order to compare with the grower practices. Results showed the superior growth and yield responses and crop health under TRI managed systems that comprised of recommended GAP.

Plant Nutrition and Fertilizers

Integrated approach to soil fertility management

New fertilizer recommendation for mature tea: Results of fertilizer adaptive trials

The objectives of this study was to compare tea crop response to TRI interim recommendation and farmer practiced fertilizer mixtures with present TRI fertilizer recommendations in order to formulate efficient nutrient management packages to the tea growing areas.

Twenty six sites were selected representing all senior tea inspectors (STI) regions in Galle, Matara, Kalutara, Ratnapura, Kegalle, Kandy, Gampola and Bandarawela **55**

TSHDA regions. The experimental plots were demarcated to assign five treatments viz. 1). VP/LC880, VP/UM 910 and VP/UVA945 (NPK) P & K₂O constant, N source-Urea 2). U709 (NPK) N: K₂O 2:1, N source-Urea 3). T1130 (NPKS) N: K₂O 2:1, N source-SA 4). U709+Kieserite (NPKSMg) N: K₂O 2:1, N source-Urea 5). UT752 (NPKS) N: K₂O 2:1, N source-Urea, SA + 2 bags dolomite per year per acre.

No significant differences in soil pH were observed among different types of fertilizer mixtures in all regions except for Kandy and Gampola regions. However, lowest pH levels have been observed in 'T 1130' fertilizer applied plots. There was no significance difference in soil available phosphorous, potassium, magnesium due to application of different fertilizer mixtures. The soil sulphur (SO₄²⁻) content significantly varied among the plots receiving different fertilizer mixtures. 'T 1130' applied plots showed the highest sulphur content in all the regions as it contains sulphur from sulphate of ammonia, the source of nitrogen. There are no significant differences in leaf N, P, K, Mg and S concentration observed among the different types of fertilizer used in the adaptive trials.

Twelve out of twenty six sites, recorded highest green leaf yield for 'U 834' mixture for each agro climatic zone viz, Low, Mid and Uva regions. The second highest green leaf yield was recorded in plots applied with TRI interim recommendation ('UT 752') in four out of twenty six sites. Of the twenty six sites, four trials showed higher green leaf yields with the application of 'T 1130' mixture and only two trial sites gave highest green leaf yield for 'U 709'. Of the twenty six sites, four trials showed higher green leaf yields for the application of 'VPLC 880' mixture. When the cost/benefit analysis is concerned, 'U 834', 'UT 752' and 'U 709' showed higher profit when compared with present recommendations in the Low country trials. In the Mid and Up country trials, 'U 834', 'UT 752' mixtures gave higher profit when compared with present recommendations. However, as far as Uva region is concerned, 'U 709' gave higher profit only in one location compared with present recommendations. Cost/benefit analysis has primarily been used for the final selection of fertilizer for each region together with practical aspects of technology dissemination. Accordingly the following recommendations are proposed.

Region	Mixtures proposed
Low country	U834, UT752, VPLC 880
Mid & Up country	U834, UT752, VPUM 910
UVA	U834, UT752, VP Uva 945



Adaptive fertilizer trial at Kuruwita

Evaluation of nutrient releasing pattern using bio-availability in slow release fertilizers

Three different slow releasing fertilizer produced by Nano Technological Institute of Sri Lanka (SLINTEC) together with grass fertilizer mixture were compared with sowing of perennial Tall-fescue grass (*Festuca arundinacea*) using a greenhouse pot experiment for a period of 12 month period. The main objective of this experiment is to study nutrient releasing patterns of slow releasing fertilizer.

This study revealed that the application of slow releasing fertilizer contributed to higher yield throughout cropping period without any yield reduction. Shoot nutrient uptake showed significant differences among treatments. The treatment [(MMT+KCl) + (MMT+Urea+NANO HA)] showed the highest nutrient uptake compared to the other 5 treatments throughout the cropping period. However, the differences were wider at latter stages. And soil available nutrients also showed slow releasing pattern.

Therefore, it could be concluded that the fertilizer tested have slow releasing nature but it should be tested under field conditions before recommendations for tea. The field trials have already been commenced in different tea growing regions for the said purpose.

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

Plant Growth Promoting Rhizobacteria (PGPR) are beneficial, free living, associative or symbiotic soil bacteria isolated from the rhizosphere of plants, which have been shown to improve plant growth and yield. The main objectives of this study were to evaluate the already selected eight efficient nitrogen fixers and eight P solubilizers under *in-vitro* conditions, for their efficiency in plant growth promotion and nutrient uptake under nursery condition. Treatments to evaluate N fixers were 1). absolute control, nitrogen fixers as single inoculations along with N excluded from 'T 65' 2). nitrogen fixers as single inoculations along with $\frac{1}{2}$ of the N excluded from 'T 65', and 3). recommended rate of 'T 65'. Treatments to evaluate P solubilizers were 1). absolute control 2). P solubilizers as single inoculations along with P replaced with ERP from 'T 65' (3) P solubilizers along with $\frac{1}{2}$ P with di ammonium phosphate + $\frac{1}{2}$ P with ERP in 'T 65' and (4) recommended rate of 'T 65'.

Five out of eight nitrogen fixers and four out of eight P solubilizers were superior over rest of the isolates in growth and dry matter accumulation. Among the treatments, half rate of the recommended N and P in 'T 65' is comparable with the recommended rate of 'T 65'.

Effect of application of inorganic nitrogen with compost manure on soil bulk density (measurement of soil compaction) of soils

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 properties.

Application of increasing rates of N as urea not significantly influence bulk density. No significant effect on bulk density was found due to application of increasing rates of compost, though bulk density averaged over N rates with compost application, was high or compared to without compost treatment.

Effect of application of different rates and proportions of urea and sulphate of ammonia (SA) in combinations on micro nutrient availability

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.

The copper concentration of soils showed a significant variation with rate of nitrogen and proportion of Urea:SA in the mixture. When the rate of N application was increased, the Cu concentration decreased. Similarly when, the proportion of sulphate of ammonia in the mixture increased the Cu concentration of soil decreased. The zinc, iron and manganese concentration did not show significance difference with the rate of nitrogen applied and with the proportion of Urea:SA used in the mixture.

Crop Management

Screening of herbicides

Two herbicide formulations viz. 'Trigger' (glyphosate iso propyl amine-179 g/ L + carfentrazone ethyl - 6.5 g/ L) and 'Rapid' (glyphosate iso propyl amine-293 g/ L + MCPA iso propyl amine-58 g/ L) were tested during the year to control boarder range of weeds in tea lands. 'Trigger' at the rate of 4-8 ml/ L with sulphate of ammonia (4g/ L) and 'Rapid' at the same rate with 'Activator' (1 ml/ L) were effective on controlling common weeds. Both formulations at varying rates from 5-15 ml/ L mixed with sulphate of ammonia (for 'Trigger') and Activator (for 'Rapid') were found to control other problem weeds such as 'Passali Kodi', 'Getakola' and *Caladium* satisfactorily. 'Amalai' weed can also be controlled by spraying 'Trigger' at the highest rate (15 ml/ L).

Evaluating potential fuel wood species as alternative sources of energy

The data collection from the experiments on cultivation of '*Gliricidia*' as energy plantations at Raigam estate and St. Joachim estate in the Low country, TRI Mid country station, Hantana and Glen Alpin estate, Passara were continued. *Calliandra* was tested at St. Coombs estate, Talawakelle. The main objectives of these experiments were to identify the most suitable planting density and assess species suitability for fuel wood and green manure yield of the above species in different tea growing regions. Fuel wood yields (at 20% moisture content) of '*Gliricidia*' varied from 4-19 t/ha/lopping and dry matter yield of green manure from 1- 4 t/ha/lopping at different spacing (2500-10000 plants/ha) and in different locations. *Calliandra* has produced 4-12 t/ha/lopping of fuel wood yield at St. Coombs estate.

CROP PROTECTION

Identification of safe pesticides and designing IPM methods

An understanding on pests leading to crop losses and respective Management methods adopted in tea in the different tea growing countries was recognized as a step in amending Integrated Pest management (IPM) packages inclusive of replacing old pesticides and introducing new and safe pesticides. Further, this was identified at FAO/IGG forums in view of harmonizing MRLs in all tea growing countries as a means of appropriate pesticide residue monitoring. As an initial step to achieve the above, information on different foliage stem and root pests, pesticide usage and IPM strategies was obtained from the different tea growing countries including Sri Lanka, India, Bangladesh, Japan, Kenya, Zimbabwe, Malawi, Iran, Argentina and China data through questionnaires.

The number of insect, nematode and mite pests, diseases and weeds causing crop losses was attributed to age of tea plantations and changing climate.

Data also revealed that among the leading tea growing countries, Sri Lanka maintains adopting high levels of IPM strategies with least and rational use of pesticides despite occurrences of many key pests. The use of tolerant cultivars, biological and cultural methods *etc.* were highlighted in assuring product quality aimed at international standards. Overall, emerging new and unusual pest and disease incidences in countries with less cultivation experiences were evident and seems to be an alarming situation requiring harmonizing pesticide usage and MRLs for the benefit of producers and consumers.

Non-target effects of pesticides on honey bees

Any agrochemical will make impacts on nature biodiversity in the agro-ecosystem at varying degrees of effects. It is therefore, mandatory that before making pesticide recommendations to tea, non-target effects be evaluated under standard protocols. During the period under review, the non-target effects of Brunolium on honey bees were established using standard laboratory bioassay protocols and found to

be acceptable for recommendation in tea against Low country Live Wood Termite.

Existence of possible biotypes of shot hole borer (SHB) and association with *Fusarium* fungal isolates

The tea shot hole borer (*Xyleborus fornicatus*) is known to be symbiotically associated with *Ambrosia* fungus, although few evidences suggest that it associate with few other fungal species locally. However, recent reports indicated that a few other new host plants such as 'Avocado' also seems to be heavily infested by the shot hole borer that infest tea and the distinctly varied symptoms are shown as reported from countries, Israel, Florida and California *etc.* Further, possible existence of insect biotypes and association with different *Fusarium* fungal isolates were attributed to such varied host range and distinct symptoms. This is a new research experience for the scientists in Sri Lanka and identified as a researchable area owing to similar symptoms that possibly have caused due to insect-disease complexes for the possible strengthening of IPM of SHB.

As a collaborative initiative with the Agriculture Research Organization, Israel and Invasive Pest Research Institute of University of Florida, collection of shot hole borer and affected tea stems were made in ten tea estates in the different agro ecological regions. Insect specimens including eggs, larvae and adult beetles were preserved, mass cultured and fungal cultures of borer infested tea galleries were maintained in the Entomology and Pathology laboratories for further work on insect-fungus complex and molecular studies. In addition to tea, shot hole borer association was found with 'Avocado', 'Rambutan' and 'Castor' of which the former two host plants were new records in Sri Lanka which needs further investigation.

Prophylactic measures for pest control

Protection of vulnerable stages of tea from Shot Hole Borer

SHB is a key pest in tea which invades at various susceptible stages of the crop. In the IPM, protection of tea at such critical points from SHB

is important and the institute continues to evaluate various chemical and non chemical stem protectants against SHB.

Fipronil amongst stem protectants tested during the period under review, 1:1 lime sulphur mixture was equally effective in terms of bio efficacy as the chemical treatment against SHB. However, practical difficulties encountered in mixing lime and Sulphur lead to make a formulation with adhesive properties. Hence the ordinary mixture and formulated 1:1 lime sulphur mixture were tested in SHB active tea estates in three agro ecological regions the results of which are pending.

Wood rot associated fungal species in Low-country Live-Wood Termite (LCLWT)

The LCLWT, *Glyptotermes dilatatus* mostly attacks unhealthy mature tea bushes leading to die-back followed by wood rot caused by saprophytic and other fungi. Having understood the need of the relationship between wood rot associated fungal species and LCLWT infestation, studies were undertaken to identify wood rot associated fungal species in tea in order to propose new and alternative IPM methods.

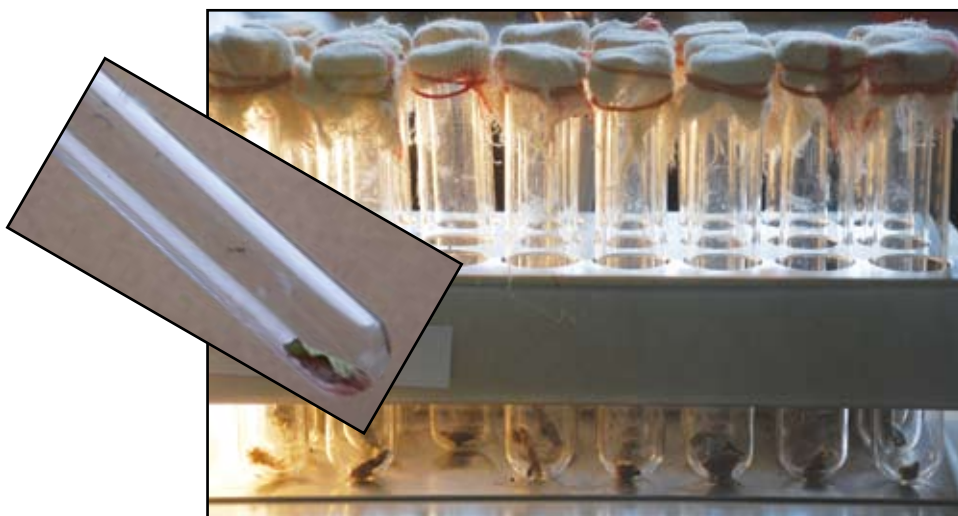
Among the fungal species identified i.e. (*Acremonium* spp-large, *Acremonium* spp-small, *Nectria* spp., *Fusarium* spp., *Motreilla* spp., *Aspergillus* spp., and *Verticillium* spp., three unidentified fungal species and another non-spore forming 29 fungal species), *Acremonium* spp. was the most prominent fungal species in infested and non-infested or susceptible and tolerant cultivars. Continuation of work using some other susceptible and tolerant cultivars is in progress.

Evaluation of alternate wound cut dressings against LCLWT

A persistent and cost effective wound dressing that could also be used in all Low grown tea areas against LCLWT is a timely need for the industry owing to non availability of the chemical. Hence, eight alternative wound dressings and paints were screened in comparison with the existing recommendation of Candarsan for preventing wood rot after pruning. Candarsan, Brunolium 15% (V/V), Brunolium 3%, their wax mixtures and enamel paint were evaluated as prune cut protectants by checking the fungal colony formation at 8 weeks after treatment. Of the tested formulations, Brunolium 15% proved to be the protectant with best fungicidal properties, persistency, ease of application, cost effectiveness and with no effects on non-target organisms.

Semio-chemical studies for reducing insect, nematodes and mite pest damages Semio-chemical studies with Low country live wood termite

In a series of studies, isolation of attractive compounds to LCLWT from powdered rotted stumps and healthy stems of tea cultivars, TRI 2023, TRI 2027, TRI 4042 and TRI 4049 was performed. Percentage responses of termite alatae were also observed. Results showed that the extract of rotted stems was more responded than the extract of healthy stems, irrespective of the cultivar sensitivity to LCLWT infestation.



Laboratory rearing of *Macrocentrus* for mass release to totrix active regions

Several orientation bioassays for this purpose using fractions of extracts of rotted stems, and obtained from column chromatography and isolation of volatile compounds from rotted stems of tea cultivars TRI 2023, TRI 2027, TRI 4042 and *Gliricidia sepium* are tested in order to understand the responsible chemical compounds that exhibit resistance to LCLWT in tea.

Mass rearing of *Macrocentrus*

Owing to population drop of *Macrocentrus* under field conditions due to hyper parasitism and inferior field and crop management practices and the restrictions in chemical treatments, it was recognized that the TRI recommended cultural and biological control methods be strengthened in effective management of Tea tortrix. Release of mass reared *Macrocentrus* to Totrix active regions was therefore recommenced and augmentation of the biological control agents through GAPs was also initiated at TRI.

Development of short cut methods for screening tea cultivar against Shot-Hole Borer

It was evident that the experimental methods used in screening cultivars for SHB lead to inconsistent results owing to the pest behavior and response in tea. To study differential susceptibility levels of tea cultivars to SHB attack a). the bio assays using glass jars b). olfactometric principles c). artificial diet media prepared using tea bark extracts and using nursery tea plants under natural infestation were compared with the conventional tray method. Bio assay using glass jars which was found to be the most appropriate method as a short cut method under laboratory conditions and forced infestation of nursery tea plants under natural conditions will be studied in detail with a selected tea cultivars with known tolerance levels.

Natural defences in tea against Blister blight

Plants have evolved complex defence mechanisms against diseases. Infection of diseases can result when a pathogen is able to overcome the host defences. Natural defence responses induced during Blister blight development caused by *Exobasidium vexans* was investigated. Formation of superoxide and hydrogen peroxide, increased activities of chitinase, glucanase, peroxidase enzymes and higher total protein concentration was observed in resistant cultivar, TRI 2043 compared to susceptible cultivar, TRI 2025.

Study of leaf anatomical characteristics in relation to Blister blight disease in selected tea cultivars TRI 777, DN, DT1, N2, TRI 2023, TRI 2024, TRI 2025, TRI 2043, TRI 3020, TRI 3072, TRI 4006, TRI 4052, TRI 4078 and TRI 4079 showed that trichome density and cuticle thickness significantly varied with cultivars and the resistant cultivars had highest trichome density (TRI 2043, DN, DT1 and TRI 3072) and thickest cuticle (DN, TRI 4079, N2, DT1 and TRI 3072) compared to susceptible cultivars (TRI 2023, TRI 2024 and TRI 2025). Trichome density showed significant negative relationship with Blister blight severity. These information shed light into underlying natural defence mechanism of tea against Blister blight disease.

Plant defence elicitors in Blister blight disease management

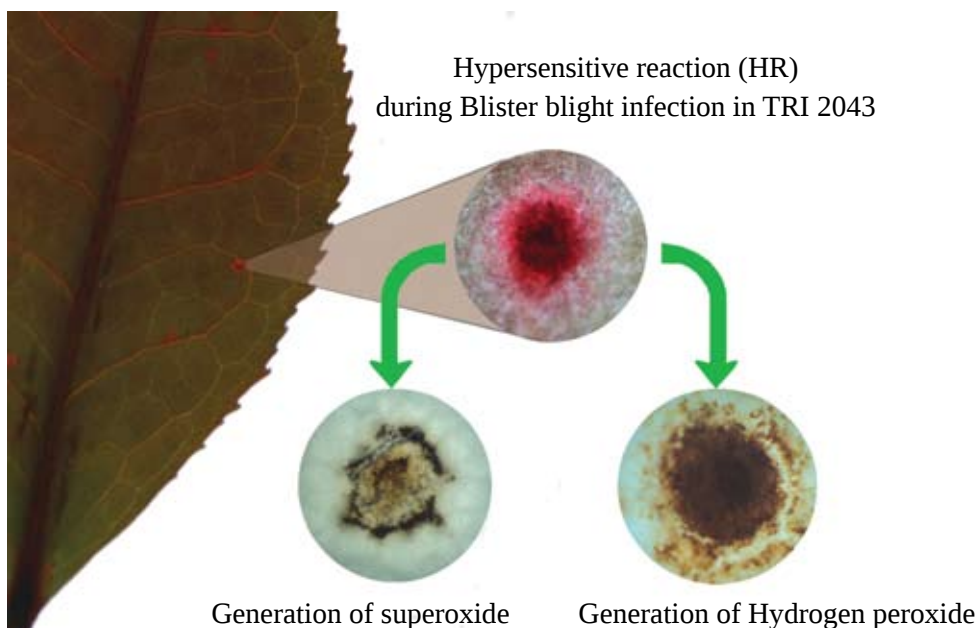
Increasing concerns over conventional fungicide due to resistance development in pathogen, health and environmental problems have favoured the introduction of elicitors in disease management. Elicitors are compounds that can induce defence responses of host plants.

The effect of two chemical plant defence elicitors salicylic acid and benzothiadiazole (BTH) against Blister blight disease was studied. The elicitors were tested under field conditions in TRI 2024, a susceptible cultivar to Blister blight. The treatments used were: elicitors alone at 500 ppm and 1000 ppm, 250 ppm elicitor + 0.05% copper fungicide (37.5%), 0.1% copper fungicide and untreated control.

Blister blight severity was lower in all the treatments except salicylic acid alone at 500 ppm and 1000 ppm when compared with control. Blocks treated with salicylic acid alone showed slightly higher Blister blight severity. Cocktail mixture of 250 ppm salicylic acid with 0.05% copper fungicide gave comparable results with 0.1% copper standard fungicide while 250 ppm BTH with 0.05% copper fungicide showed lower Blister blight severity than that of 0.1% copper standard fungicide. The results suggest that salicylic acid and BTH can be integrated with copper fungicides in order to reduce fungicide usage and achieve better control of the disease. Investigations on the underlying mechanisms of these plant defence elicitors are in progress.

Molecular diagnosis of canker causing fungi in tea

To diagnose canker causing fungi in tea using molecular methods, Internal Transcribed Regions (ITS) regions of 25 *Macrophoma theicola* isolates were sequenced. BLASTn



analysis of the sequences revealed that they belong to 03 different anamorphic stages of the genus *Botryosphaeria*. These species were *Botryosphaeria mamane*, *B. dothidea* and *B. theobromae*. The above isolates were previously identified as *M. theicola* based on their morphological characteristics.

Currently, Bitertanol is recommended for control of stem canker and temporarily suspended in plucking fields due to residue issues. An attempt was made as to whether Hexaconazole, the only recommended systemic fungicide for the use in plucking field, can also be used to control Stem canker. Total of 106 isolates of *M. theicola* both from baseline (population that has never been exposed to Hexaconazole) and non-baseline (population that has been exposed to Hexaconazole) populations were tested *in-vitro* for their sensitivity to Hexaconazole. The mean EC_{50} values of Hexaconazole of the non baseline isolates were significantly higher than that of baseline isolates. This indicates a trend in resistance development against Hexaconazole in the non baseline isolates.

Screening synthetic fungicides establishing Maximum Residue Limits (MRLs) & Post Harvest Intervals (PHIs)

To test the adaptability of fungicides, adaptive trials for copper fungicide, champ DP 37.5% and synthetic fungicide pyrachlostrobin were completed in collaboration with Advisory and Extension Division. Both the fungicides were found to be user-friendly and practically effective in controlling Blister blight disease under estate field conditions.

CLIMATE CHANGE IMPACT ASSESSMENT

Studies on physiological responses of tea to global climate change

The carbon profile of a matured tea plant grown in Sri Lanka was established with the objective of using the data in carbon trading mechanisms in future in the Up, Mid and Low country tea growing regions. Results revealed that the highest carbon content in terms of biomass present in the collar region and big roots (diameter more than 0.5 cm). The lowest carbon content is found in immature parts such as feeder roots and green twigs. The biomass content in each of above parts of seedlings was significantly higher than that of VP plants. There was no significant difference in biomass content of tea plants grown in different elevations in Sri Lanka.

Shoot growth pattern of tea was studied in TRI 2025 and DT1 with the aim of identifying any differences to be used in crop simulation models. The shoot extension rate of the DT1 was significantly higher than that of TRI 2025. Average time taken by the bud to become pluckable stage was 42.25 and 43.15 days for DT1 and TRI 2025, respectively. The total number of shoots was significantly higher in DT1 than TRI 2025. The individual shoot weight was significantly higher in TRI 2025 than in DT1.

Analysis of climate change in different tea growing regions

A collaborative project was initiated with the Department of Meteorology and Natural Resource Management Centre, Department of Agriculture to analyze long term trends of rainfall and temperature in tea growing agro-ecological regions (AER). As rainfall surfaces developed for different AERs did not match with the actual variation of rainfall of respective stations, it was decided to identify most appropriate rainfall station representing each AER for the analysis. The temperature data was not available on AER basis and hence, available data representing all tea growing districts were extracted. The trend analysis is in progress.



Automated weather station established in a tea plantation

Climate change and its affect on pest incidences

Studies on nematode species have been prioritized to identify the climatic attributes to immergences or interruptions to pest, natural enemy and their interactions. During the period under review, *Radopholus similis* from six localities covering tea and banana were mass cultured *in-vitro*. This included the source of new occurrence of *Radopholus similis* in 'Guatamala' at St. Joachim estate, Ratnapura. Further, mortality of five populations of the nematode was tested in aqueous and soil media under different temperatures *in-vitro*.

Deviations in survival, behavioral and mortality differences were observed in the different *R. similis* populations. Higher survival mechanisms were probably due to adaptations to climate change or possible emergence of biotypes/isolates which will be studied in depth.

MECHANIZATION OF FIELD PRACTICES

Mechanization of field practices

Motorized tea harvesters were tested under different bush management systems to evaluate efficiency of harvesting machines and impacts of mechanical harvesting on tea yield. A new system of half-bush harvesting (harvesting of half of the plucking table at a given round) was tested with conventional full-bush harvesting at Millakanda estate and Balangoda estate in the Low country. There was no significant difference between half and full bush mechanical harvesting. At both sites, mechanically harvested tea bushes recorded significantly lower yield than manual harvesting. Mechanically harvested crop had higher coarse leaf content than manual harvesting. Mean output of the motorized machines varied from 173-189 kg of leaf/day. Mechanical harvesting was found to be not viable hence, the experiment was terminated in May 2012.

Two experiments carried out to test harvesting machines under different bush management systems (lung and cut-across pruning) at Galaboda estate and St. Joachim estate were in progress. Plucking and other field operations were carried out during the year and yields were recorded and it is premature to make any conclusive remarks.

Manual and mechanical pruning were tested with and without resting of tea bushes prior to lung and clean pruning at St. Coombs estate. Although there was no marked difference in tea yield between different pruning treatments at the 4th year of the cycle, the highest yield was achieved by the treatment combination of resting before pruning and manual pruning leaving lungs.



Motorized tea harvesters in operation

TEA PROCESSING TECHNOLOGY & PRODUCT DEVELOPMENT

Phenolic profile of Sri Lankan green tea on multiple brewing

Green tea industry has been developing gradually for decades in Sri Lanka, but the first priority has been given to black tea production. Since several years, the green tea market is growing due to higher demand made by the increasing awareness of the people on beneficial health effects of drinking green tea. Also export percentage has been increasing too. Thus, there is an emerging need of doing research on green tea as well. Green tea, which originated in China, is still the main beverage used by the Chinese and Japanese people. Chinese people brew green tea for consecutive nine times. Mostly they discard the first brew due to its bitterness and they prefer the 4th brew. In this study, the variation of phenolic profile including individual catechins, caffeine, total polyphenols amino acids was analyzed and established in consecutive brews of green tea, using a set of green tea samples collected locally and from China and Japan. Total polyphenol content in the 2nd brew of Sri Lankan, Chinese and Japanese green teas are significantly high relatively to the other brews. The content of total polyphenol was slightly decreased when proceed with the next brew. Also it was further reduced as the number of brews increased. Epigallocatechingallate -3(ECGC) was the most abundant individual catechin in those collected green tea samples and their multiple brews. Total catechin content of the tea brews get reduced along with the increasing number of brewing times. But in the second brew, it shows a higher value than the first brew; that is the highest level. Also from the normal condition to the brew it became lowered. As a future study, it is planned to determine the antioxidant activity in multiple brews to evaluate its antioxidant capacity.

Development of standards for tea

Chemical composition of Sri Lankan Silver tips and White tea

International Standards Organization (ISO) is in the process of setting up a standard for 'White tea'. In addition, Sri Lanka has developed a 'White tea' for the first time and Sri Lanka wanted to include the 'Silver tips' in to a separate category. To achieve the above, exploitation of other cultivars with a potential to use in processing of 'White tea' and 'Silver tips' and biochemical characterization of above products has been carried out. The chemical composition of the Sri Lankan 'Silver tips' and 'White tea' were determined using 10 sets of individually processed 'Silver' and 'White tea' samples. For both types, high level of caffeine content was reported (4.5-5% on dry weight basis) and the value ranged between 41.05 to 52.44 and 43.15 to 50.27 (mg/g sample dry weight) for 'Silver tips' and 'White tea' respectively.



Pilot scale experimental Fluidized Bed Drier (FBD) unit

Improvement to drying process in Orthodox-Rotorvane tea processing

Three bed plates with modified dimensions are tested and identified for performing better fluidization in Fluidized Bed Drier (FDB) with present style of Orthodox Rotorvane mix tea processing. This should be further tested in pilot scale and commercial scale FBD.

Development self cleaning sifter for Low grown tea grading process

A ball tray arrangement coupled with Michie Sifter was tested as a self cleaning sifting machine in Low country tea grading in order to use as a continuous sifting machine. Initial studies on optimizing the operational parameters of existing Michie Sifter was completed and fabrication of the ball tray arrangement and coupling with the existing Michie was also completed. The self cleaning sifting machine performance tests are in progress.

Improvement to drying process in Orthodox-Rotorvane tea processing

Orthodox-Rotorvane type of manufacture has been changed in the recent past in order to produce higher percentages tea grades that contain smaller size tea particles. With the objective of developing fluidized bed tea drying model for the production of quality Orthodox-Rotorvane teas at lower cost, fluidizing behaviour of teas using different bedplates with varying opening area percentages and perforation sizes was studied. Three different bed plates with modified dimensions have been identified to improve fluidizing behaviour of teas. Further, a study on drying curves for teas at different drying temperatures in the range of 110 - 127° C was conducted. It revealed that the teas could be dried at lower temperatures than the present recommended temperatures. It was intended to continue the study for obtaining optimum range of drying temperatures for Orthodox-rotorvane teas.

Developing energy optimizing model for Variable Speed Drive (VSD) to determine moisture content of withered leaf

Four quadratic equations were developed to predict airflow rate at different static pressure for four different frequencies (35 Hz, 40 Hz, 45 Hz & 50 Hz) using test rig designed and fabricated at Process Technology Division. These four equations were incorporated into previously developed mathematical model and the computer program (Q-Basic) developed to calculate real time moisture content of withering leaves was successfully executed. Four other equations were also developed to estimate the power consumption during withering. Developing an automated withering system is in progress.

Improving the process for instant black tea production

Application of membrane filtration technique for concentration of tea extract

Possibility of applying membrane concentration technique to improve the quality of instant black tea was studied previously using 5000 Da membrane. In order to study the possibility of utilizing 250 Da membrane to improve the quality of instant black tea further, operating parameters (temperature and pressure) for 250 Da membrane were optimized and instant black tea was prepared by membrane pre-concentration of tea extract using the 250 Da membrane under optimized operating parameters followed by thermal concentration. Instant black tea samples were analyzed for chemical composition.

SOCIO-ECONOMICS AND RESOURCE PLANNING

Mapping of tea lands in Sri Lanka using GIS technology

A draft map categorizing all tea growing DS Divisions into different productivity classes were prepared in collaboration with the Natural Resource Management Centre, Department of Agriculture. Under the direction of the Ministry of Plantation Industries, mapping of tea lands in all tea growing districts was initiated in collaboration with Land Use & Policy Planning Department (LUPPD) and Survey Department. As a pilot project, the mapping of tea lands in the Galle district was commenced by the LUPPD in 2012.

Analyzing comparative advantage of the Sri Lankan tea industry to improve profitability

Comparative advantage is an added advantage of a country vis-a-vis other countries. Traditionally, the comparative advantage phenomenon was referred to as a country's advantages in terms of basic factors. This is known as the factor comparative advantage and associated with the added advantages of a country with respect to factors of production such as land, labour, natural resources and capital compared to other countries.

The study aims to analyze the different component of cost of tea production in Sri Lanka and other tea exporting countries, analyze the break-even cost of tea production, evaluate the international competitiveness of Sri Lankan tea industry, analysis the competitiveness gap and identify opportunities for reducing cost and enhancing competitiveness and suggest the industry development strategies.



A draft map of a tea growing area generated by GIS technology

The analysis was based on the secondary data. Data collection was completed from Lippakelle, Sarnia, Palmerston, Eldonhall, Drayton, Diyagama East, Diyagama West, Guaravilla, Glenugie, Strathdon, Kew, Gonapitiya, Ragalla and Gampaha estates.

Investigation of potentials of tea based eco-tourisms in tea Up country plantations

In tea plantations, eco-tourism is a cutting edge opportunity to plantation managers to improve their returns. The study was focused on identifying potential for ecotourism in tea estates as an alternative source of income.

Thirteen tea estates representing all plantation companies in the Up country were selected randomly to identify the potential resources available in this respect (*e.g.* natural resources, physical infrastructure). A questionnaire-based survey was carried out with an intercept sample of 100 visitors, both local and foreign at 'Temple of Sacred Tooth Relic', Kandy and 'Elephant Orphanage', Pinnawala. Perception of estate workers' on tea based ecotourism was studied using 100 workers in selected estates.

The results revealed that Alton, Lethenty, Dayagama West and Talawakelle estates have high potential while Diyagama East, Theresia, Osborne, Queensberry, Kirklees and Fairlawn have moderate potential for implementing tea based eco-tourism. A substantial fraction of interviewed visitors' (87.8%) wished to visit tea estates as an alternative to the traditional sites of tourism in the near future. The average willingness to pay (WTP) for the package for a day in tea based ecotourism sites was \$ 60 (SD 25.8). WTP had significant association only with age, nationality, income and level of education of visitors. Majority (86%) of estate workers in the sample were willing to work in an ecotourism project. The study concludes that there is significant potential for implementing ecotourism in up country tea plantations and investment in such project would boost up the tea sector.

Resource use efficiency in tea manufacturing in Dimbula region

Data were collected from five orthodox factories and two CTC tea factories to analyze resource use efficiency in tea processing. The results of the analysis showed that there were variations of cost of tea manufacturing among the sample estates. Factory capacity vs. its current working capacity is one of the factors which had a high impact on manufacturing cost. Capacity of the selected factories varies from 28% to 55%.

Average cost of orthodox tea manufacturing (excluding general charges) varied from Rs. 56.00 to Rs. 88.18 per kg and CTC tea manufacturing varied from Rs. 64.53 to Rs. 81.43 per kg. Labour cost accounts about 33 percent of total manufacturing cost. The highest cost component of tea manufacturing was drying (Rs. 18.40/ kg and 38.47/ kg, for orthodox and CTC tea manufacturing, respectively).

It also revealed that labour use efficiency of selected estates varied from 17.56 kg/man day to 55.4 kg/man day. Average labour use efficiency of selected tea factories in Dimbula planting district is very much lesser than Up country orthodox tea manufacturing (45 kg/man day) and CTC tea manufacturing (80 kg/man day).

Findings revealed, the factory should be operated at full capacity for optimum resource use efficiency and thereby reduce the unit cost of tea manufacturing. Buying bought leaf to the factory, proper supervision & monitoring, practice energy saving techniques and use of alternative energy sources are some of the strategies could be followed to reduce cost of tea manufacturing.

Inter-regional productivity variations among tea small holdings in the Up country

The objectives of this study were to compare the variation in productivity among the tea Smallholders, examine contributory factors for productivity variation and suggest appropriate strategies for improving productivity efficiency. Data were collected from randomly selected 100 tea smallholdings in the Up country. The results revealed that tea productivity among the smallholders in the study area is highly varied from 72.83 to 2201.17 kg/ ac/ yr. Technical efficiencies of tea smallholders ranged from as low as 0.033 percent to as high as 0.953 percent. Levels of experience, health condition of farmers had a significant positive effect on technical efficiency. Family labour, hired labour, amount of fertilizer, chemical cost, health condition and experience of the farmers were identified as contributory factors for productivity variation in smallholders in Up country Sri Lanka. Therefore, more attention should be paid to these contributory factors to formulate appropriate strategies for improving productivity efficiency. Awareness programme on adoption of good agricultural practices and knowledge on tea farming should be arranged by the organization concerned to improve production efficiency of the smallholders in the Up country.

Development of a model for out-grower system in tea estates

The study on development of a model for out-grower system in tea estates has been continued in Selagama estate, Matale in order to improve land productivity of the estate thereby making it as a profit oriented enterprise and also to improve living standards of workers by earning additional income. Establishment of shade trees on the out-growers' field was completed. Monitoring of out-growers' fields was continued and records on plucking, fertilizer application, weeding, income and price of green leaf have been maintained.

The preliminary analysis showed that average monthly production of green leaf of an out-grower's field has improved in 2012 (1396 kg) as compared to 2011(1152 kg) and 2010 (1032 kg). Productivity of out-growers' fields has also improved in 2012 as compared to 2011 and 2010 by 21 and 35 percent, respectively. Average monthly income of an out-grower from their plot has increased in 2012 (Rs. 3500) as compared to 2011 (Rs. 2600).

Identification of contributory factors for below norm pluckers in St. Coombs estate

The impact of below norm pluckers on cost of plucking is significant and may directly lead to increase cost of production. Therefore, research was commenced in St. Coombs estate with the objectives of identifying the levels (degree) of below norm pluckers, studying contributory factors and suggesting measures to reduce below norm pluckers. Secondary data were collected from the estate records and 32 pluckers were randomly selected from each division to get their age, height, education level, experience on plucking, health condition, training and walking distance from field to weighing point *etc.* Data collection was completed and analysis is in progress.

Cost management strategies to increase profitability of tea plantations

Experimental data and data collected from the estates records were analysed and identified some effective cost management strategies. Saving from contract plucking was estimated as Rs. 2.41 per kg of made tea. Cost saving (Rs. 17.69 per kg of made tea) due to block plucking was compared with normal plucking. Improvement of plucker intake, fixing plucking norms depending on growing seasons (rush crop & lean periods) and category of fields (high & low yield) and mechanization of field practices (especially harvesting) have been identified as the most effective means for reducing cost of plucking in the field.

The cost saving using 'TRI Selective Tea Harvester' as compared to manual harvesting was around Rs. 2.00 to 32 per kg of made tea. Adopting shorter plucking rounds was advantageous as compared to extended plucking rounds, in addition to quality improvement. The additional income (excluding increment of NSA due to quality improvement) was Rs. 31,624 per hectare when plucking intake is 15 kg per day.

Improving marginal tea lands is one of the important strategies to reduce cost of production. The results revealed that by improving low yielding “C category” fields with below breakeven productivity (1300 kg/ ha/ yr), up to 1500 kg/ ha/ yr productivity level, the cost of production can be reduced to a considerable level by saving Rs. 12.16 per kg of made tea. Diversification of unsuitable lands may lead to land productivity improvement by optimum utilization of resources. Planting *Gliricidea* and *Eucalyptus* in unsuitable lands is also an economically viable option.

SERVICES TO STAKEHOLDERS

1. Problems Identification and Solving

Advisory visits are basically scheduled based on the request made by corporate sector tea plantations and tea Smallholders to identify and solve the cultivation related problems. Priority is being given to corporate sector tea plantations and the requests of smallholdings are addressed jointly with the TSHDA.

Advisory and extension visits

Total of 788 visits have been done by the staff of Advisory and Extension Division. Almost 32% of visits have been done during the 1st quarter as majority of land selection visits in the South Western sector were done during this period. The least number of visits have been done during the 4th quarter.

Extension staff of the Up country region visited 256 corporate sector tea plantations and this was 32% out of the total advisory and extension visits. Staff at Ratnapura region has made 152 visits during 2012. Extension staff of Kottawa, Deniyaya, Matugama, Kandy and Passara centers have undertaken 107, 89, 86, 63, and 35 visits respectively. Majority of advisory visits were mainly on investigating the land suitability for replanting. Requests for investigating the causes for yield declining, pest attacks, debilitation of bushes, nursery failures and disease incidences were among the rest of the advisory visits.

2. Residential Training Programs

The tea modules of the residential training programs coordinated by the National Institute of Plantation Management, for the extension personnel involved in the plantation sector, plantation management and the school leavers were conducted at the TRI. Seventeen extension officers from the tea, rubber, coconut and the other agricultural sectors attended 10 days residential training program on Plantation Extension Management. Thirty one school leavers who wish to join the plantation sector attended the 10 days 'Induction Training Course on Plantation Management'.



3. Participatory Technology Dissemination Activities

Regional Technical and Extension Forum (RTEF)

Fourteen RTEF seminars were organized in collaboration with the TSHDA covering all eight regions demarcated for Regional Managers of TSHDA. Various subject areas selected by the RTEF committee were discussed at the above *fora*. The special issues raised at the above forum were discussed further at the E & E Forum and the TRI-TSHDA Interaction Monitoring Committee Meetings.

Experiment and Extension (E & E Sinhala) Forum for the smallholdings sector

Mr. S P Rathnayake, Advisory Officer attached to Advisory and Extension Division, in his capacity as the coordinator organized the Extension and Experimental forum for the smallholding sector, bi-annually with the participation of TSHDA, SLTB, SLPFOA and the officials of Tea Development Societies. Thematic areas discussed at the forum were 'Current challenges in the tea industry and the way

forward', 'Proper water management for successful tea plantation', 'Tea Smallholder expectations and the future potential', 'Outcome of Adaptive Fertilizer trials' & '3000/4000 series cultivar survey and Tea growers' feedback.

Experiments and Extension (E & E English) Forum for the Corporate Sector

Two E & E fora were held during the year 2012 at TRI, Talawakelle for CEOs and senior managers of corporate sector plantation companies. The details of the technical presentations made given below.

224th E & E Forum held on 17th February 2012

The following three presentations were made under the theme "Efficient Crop, Water and Soil Management Systems for Sustainability".

- | | |
|-----------|---|
| Paper I | A Management Commitment to Technology Adoption: A Success Story on Innovative Tea Harvesting System by Dr. M A Wijeratne, Dr. H W Shyamalie and Mr. Hemantha Kahatapitiya |
| Paper II | Feasibility of Using Soil pH Buffering Capacity for Dolomite Recommendation by Mr. L R M C Liyanage |
| Paper III | Response of Low Grown Tea to Irrigation by Mr. S Bandara |

Dr. I S B Abeysinghe, Director, Tea Research Institute delivered the key note address at this meeting.

225th E&E Forum held on 27th July 2012

The following three presentations were made under the theme "Strategic Cost Management Approaches for Enhanced Profitability".

- | | |
|-----------|---|
| Paper I | Strategic Cost Management for Profitability of Tea Plantations by Dr. H W Shyamalie |
| Paper II | Implementation of Lean Management for Enhancing Profitability by Mr. Alex Samuel |
| Paper III | Strategic Cost Management in Black Tea Processing by Dr. W S Botheju |

Dr. I S B Abeysinghe, Director, Tea Research Institute delivered the key note address and Mr. Roshan Tissaaratchy, Senior Director-Sales, Dilmah made the invited guest speech at this meeting.

Regional Scientific Committee (RSC) seminars

Seven seminars were organized by the Regional Scientific Committees covering six RSC regions. The subject areas such as “Importance of micro-nutrients for tea, “Management of Low country Live Wood Termites and Shot hole Borer” “Cost saving strategies for tea sector” were among the areas which were highlighted at the above seminars. RSC, Uva seminar was held at Badulla in April with the objective of initiating strategies to discover the way out of the present crisis of Uva tea industry. Forty five estate managers in Uva and tea brokers participated at the seminar and shared their views with TRI scientists regarding low productivity, high cost of production and low NSA reported in plantations in Uva. The present situation of the Uva tea industry was analyzed and many possible strategies evolved from the forum were identified to overcome the present situation.

Stakeholder Forum seminar

With the aim of enhancing the interaction between TRI scientists and the stakeholders, one seminar was conducted on 23rd November on the theme of “Quality through improving post harvest handling and factory operations” at the HARTI, Colombo with the participation of CEOs and all the senior management of RPCs and other tea related organizations. Mr. Niraj De Mel, Managing Director of Vanrees Ceylon Ltd made a presentation on ‘Tea market and quality demands - current status and future scenario’, Dr. W S Boteju, Head, Process Technology Division, TRI, on “The importance of post harvest handling and factory operations in improving quality of tea’ Mr. Ananada Fernando, Director/ CEO, New Vidanakanda Estate, on ‘Improving quality by proper factory operations - Success stories’ and Mr. Jayantha Edirisinghe, Tea Commissioner, Sri Lanka Tea Board, on ‘Project on upgrading green tea leaf standards B - Leaf 60’.

Training of Trainers (ToT) Programmes

Several special in-service ToT training programmes were carried out at Low country station for the extension officers attached to private extension agencies such as, private tea factories, agro-chemical companies in the Low country region.

4. Dissemination of Information

Advisory correspondence

A total number of 2,710 advisory correspondences has been sent out on various advisory matters and following the advisory visits made by the staff of the advisory division to plantations and smallholdings during the year. The majority of correspondence has been sent during the 1st and 2nd quarters of the year. As the first inter-monsoon rains and south-west monsoonal rains coincide with these quarters, the information on weed management, pest and disease problems, information on other cultivation practices and land suitability reports for replanting are sought by the growers, during this period.

Of the total number of correspondence, 25% has been sent out by the advisory and extension staff in the Up country region.

Production of audio visual and information materials

Several extension and educational information materials were developed by the staff of advisory division for conducting extension programs, disseminating information and publicity purposes. Six digital posters and ten display boxes on different subjects were prepared for display purposes in 'Dayata Kirula' exhibition at Oyamaduwa. A modal tea factory and other display materials were fabricated for the 'Agriculture Exhibition' at Gannoruwa held for the centenary celebration of the Department of Agriculture. Officer-in-Charge of Mid country Regional Centre organized the exhibition activities.

Eight Advisory Circulars were revised and issued in both English and Sinhala languages with the collaboration of subject matter specialists during 2012.

Publications

The Publication Unit of the Institute handled work related to printing, publishing, issuing institute's journals, periodicals, books, monographs, pamphlets and proceedings. The following publications were issued during the year.

- Annual Report 2011 - Sinhala/ Tamil/ English
- Sri Lanka Journal of Tea Science - Vol. 75 Part 1
- Revised Advisory Circular PU 1 - Pesticide Use in Tea Fields
(English & Sinhala)
- Revised Advisory Circular PU 2 - Chemical Control of Diseases
(English & Sinhala)
- Revised Advisory Circular PU 3 - Chemical Control of Weeds
(English & Sinhala)
- Revised Advisory Circular PU 4 - Chemical Control of Insect, Mite
and Nematode Pests
(English & Sinhala)
- තේ නතු වෙළුම - 8 කාණ්ඩ 2 - 2011 දෙසැම්බර්
- Proceedings of the 04th Symposium on Plant Crop Research

The income generated by sale of publications is as follows.

	No of sales	@ Rs.	Amount Rs.
Advisory Circular Folder	99	500.00	49,500.00
Chemical Control of Tea Pests (English)	64	150.00	9,600.00
Chemical Control of Tea Pests (Tamil)	15	50.00	750.00
Field Guide Book (Tamil)	22	125.00	2,750.00
Shoot growth and harvesting of tea	72	100.00	7,200.00
Monograph No. 06	25	100.00	2,500.00
Monograph No. 07	23	100.00	2,300.00
Tea & Health	176	750.00	132,000.00
Tea for Health (English)	261	100.00	26,100.00
Tea for Health (Sinhala)	183	125.00	22,875.00
Weeds of tea lands in Sri Lanka	61	200.00	12,200.00
Handbook on Tea	285	1500.00	427,500.00
Twentieth Century Tea Research	14	2000.00	28,000.00
Wall Chart on Major pest of tea	52	100.00	5,200.00
Extension Pamphlets			
තේ දළු හෙලීම	134	20.00	2,680.00
තේ නවාන් පාලනය	138	20.00	2,760.00
තේ පඳුරු කප්පාදු කිරීම	154	20.00	3,080.00

Total

Rs. 737,015.00

The photography unit covered the events at E & Es, seminars, workshops, symposiums and other functions of the institute and produced 2282 photographs in digital form and 504 printed form.

5. Stakeholders Interaction and Public Relation Activities

Visitors to TRI

Total of 11,726 stakeholders, students, foreign personnel visited the TRI for educational and awareness purposes. Majority of them have visited during the second and third quarters of the year. Of the total 60% have visited the TRI main station at Talawakelle and 10% and 9.7% have visited the Low country Regional Station Ratnapura and the Extension Centre at Deniyaya, respectively.

‘A Mini Crop Clinic’ program was conducted in the Kelinkanda area of Matugama region and organized by the OIC of Matugama centre in collaboration with the staff of TSHDA and the Kelinkanda Small Holdings Development Society. All aspects of nursery management including the identification of suitable cultivars, growing media and techniques of cleft grafting were demonstrated by the staff of Advisory, Agronomy, Plant Breeding and Entomology/Nematology divisions of TRI.

Advisory and Extension Programs

Major Activities	TK	RT	KY	GL	DN	UV	MT	TOTAL
Visitors to the division/ centre	7,126	1,179	971	547	1,148	928	122	11,726
Advisory correspondence	692	458	147	416	346	146	505	2,710
Advisory visits	256	152	63	107	89	35	86	788
Group training approaches	55	51	85	37	118	13	35	507
Distribution of publications	180	149	562	290	1,764	112	48	2,455
Soil samples tested for pH		776	576	261	404	1,266	16	3,297
Soil samples tested for C%		-	-	-	-	514		514
Sale of VP cuttings (TRI 3000 & 4000 series)		-	431,700	393,580	-	354,750		1,142,700
Commercial nursery inspection	18	110	163	48	69	93	9	510
Visits/involvements in adaptive trials	9	26	30	17	7	16		123
Exhibitions/ Crop Clinic	'Dayata Kirula' and Agriculture Exhibitions at Gamoruwa & Labuduwa, Mini Crop Clinic at Matugama							

TK: Talawakelle, RT: Ratnapura, KY: Kandy, GL: Galle, DN: Deniyaya, UV: Badulla, MT: Kalutara

Staff of the Advisory division participated at three public and educational exhibitions including the 'Dayata Kirula' national exhibition held at Oyamaduwa, Anuradapura Officer-in-charge of Mid country Regional Centre organized the 'Dayata Kirula' exhibition activities.

Officer-in-charge and the staff of Kottawa Advisory & Extension centre participated at 5 day exhibition organized in the Southern Province by the Ministry of Agriculture.

6. Services to Stakeholders Soil Analysis

Several services such as soil analysis for pH and organic carbon were undertaken by the staff of extension centers at Galle, Uva, Ratnapura, Kandy and Deniyaya. In addition, issuing of limited amount of new clonal materials and tea plants were also undertaken as a service to the stakeholders. Altogether 3,297 samples for pH and 514 samples for organic carbon have been tested by the advisory staff.

Supply of new clonal cuttings

Mr. Janaka Rajasinghe, Principal Advisory Officer, in his capacity as the Coordinator of ADB Mother Bush project, visited all the mother bush sites in Galle, Matara, Rathnapura, Kandy, Nuwara Eliya and Badulla districts to streamline the activities of each site in order to achieve the targets.

However, the extreme weather condition prevailed in the country adversely affected the performance of mother bushes which resulted in falling short of achieving the set target of the year. A total of 6.6 million cuttings of TRI 3000 & TRI 4000 series have been issued to smallholders and the corporate sector estates during the year from mother bushes established on six TRI, twelve TSHDA, two private and twelve Southern province smallholder fields.

A thorough review of the mother bush program was done by the coordinator of the mother bush program to identify the reasons for not being able to achieve the targets of issuing new clonal cuttings and following reasons were identified as main causes.

- Making unrealistic annual estimates
- Planting large extent of mother bushes confined only to two locations
- Selecting unsuitable land for establishing the mother bushes in some locations
- Not evaluating the performance of cultivars planted for large scale planting
- Unawareness of user's preferences for cultivars
- Not adopting appropriate practice for bringing in to bearing
- Selecting cultivars which are not recommended for the region
- Inadequate inputs given
- Experiencing severe droughts
- High demand only for few cultivars
- Poor awareness on new cultivars

Commercial nursery inspection

On the request of TSHDA, 510 commercial tea nurseries have been inspected for approving the suitable nursery plants for replanting and infilling. It was found that only about 55- 68% of nursery plants inspected were suitable for recommending, in terms of the size of bags, number of leaves and the height of the plants.

7. Extension Infrastructure Development Activities

Upgrading extension centers

Facilities of the Matugama Advisory and Extension centre were enhanced to provide effective advisory and extension services to the Smallholders and RPC estates in the Kalutara district.

Development activities initiated at the Galle Extension Centre were continued by establishing a poly-clonal seed garden with the extent of one acre and planting of 0.4 ha of *Gliricidia* as an energy crop. Soil rehabilitation of a block of 2 ha block in field no. 2 and 4 was done during the year.

Censes of timber trees in Deniyaya, Kottawa, Passara Extension Centers and Mid country regional were done in order to prepare a timber inventory during the later part of the year.

Although the basic infrastructure development for the information centre was almost completed during the year, the activities were not commenced due to the lack of human resource.

8. Extension Research

Identifying and assessing of widely adopted agricultural practices by tea growers

A nursery experiment was established at Talawakelle to make a preliminary assessment of the use of bed plants, nursery bags with different height and width and testing possibilities of approach grafting of seedling and VP tea planted in a single bag. Plants will be ready for field planting in April 2013.

A nursery with the potential shade tree species *Trema politoria* (Family - *Ulmaceae* or *Urticaceae*) ‘Gadumba’ was established at Talawakelle, for field testing in 2013.

Public-Private Partnership extension approach

At present, various firms and organizations are actively involved in disseminating tea cultivation and manufacturing related information to tea growers. Whilst considering this trend as a positive development beneficial to end-users, distortion of information cannot be ruled out due to complexity of the process involved which is questionable at



times. It was felt therefore, a gathering of all private sector extension personnel under the guidance of Tea Research Institute is a need of the hour for the betterment of Tea industry in Sri Lanka. The following objectives were formulated during the meeting;

- To build up a proper database including all the extension arms of tea factories and input dealers involved in tea extension services for making coordinated efforts in working towards the betterment of tea growers.
- To identify needs of the personnel involved in tea extension activities and to prepare a mechanism to provide them with the needed assistance, including training, in order to build up their technical capabilities (capacity building)
- To explore the possibility of getting assistance of private tea extension personnel in conducting various activities such as Adaptive Research, field surveys and Crop Clinics *etc.*
- To make use of Private sector extension network for getting quick and reliable feedback on TRI recommendations.
- To act as a monitoring body to gather timely information on various inputs used (which are not recommended by the TRI), activities carried out (which might be harmful to tea) and Pest/Disease outbreaks occurred in different regions.

Proposed composition of the forum was TRI officials (Chairman- TRB, Director- TRISL, Additional Director- TRISL, Heads of Divisions, SRO-Technology Low country Centre, Advisory & Extension staff), TSHDA (GM, DGMs, AGMs, RMs), SLTB (Tea Commissioner, Assistant Tea Commissioners), Private Sector (Companies

dealing with fertilizer and agrochemicals used in tea sector, Private sector extension organizations), tea factories which have extension arms, NGOs which are actively involved in tea extension activities and any other personnel invited by the committee to address important contemporary issues.

Para Extension Approach (PEA) for the corporate tea sector

PEA has been initiated in the previous years as a pilot scale project with the main objective of generating “Para Trainers” in tea plantations by training selected field staff. After adequate training, the “Para Trainers” were utilized by respective estates to train their workers and supervisors. Considering the success achieved in the pilot project, PEA was extended to three more RPCs (Kahawatte Plantations PLC- Nawalapitiya region, Talawakelle Tea Company PLC-Talawakelle region, and Watawala Plantations PLC- Hatton region) during the year while continuing the pilot scale project at the Watawala Plantations- Lindula region.

The new PEA projects were implemented with necessary modifications based on the lessons learnt from the pilot project. Three new “Para Trainer” groups each consisting 30-40 field staff members were regularly trained on the subject areas of adults learning, effective training methods and skills, leadership, farmer field school concept (FFS), tea nursery plant production, replanting and after care, tea harvesting and pruning, practices to mitigate drought effects, soil fertility management and shade management. Fourteen PEA programs (4 for Kahawatte Plantations, 3 for Talawakelle Plantations and 7 for Watawala Palantations - both Hatton & Lindula) were conducted during the year. These programs were conducted by the TRI extension staff and some of the research staff from Entomology, Pathology and Agronomy Divisions.

FFS concept that proved successful in other sectors in Sri Lanka and in many developing countries was introduced in the name of Plantation Worker Field School (PWFS) to some estates wherein the “Para Trainers” conducted field schools to groups of selected estate workers regularly on specific subjects (good harvesting practices, identification of seasonal pests, safe and effective pesticide spraying). These PWFSs were conducted in fields, information centers, green leaf weighing sheds and muster sheds of their estates. The Para Extension Approach adopted in tea estates helped to multiply the desirable changes in good agricultural practices, skills and attitudes among estate field staff and workers.

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 narrow down the technology adoption gap of tea growers through

enhancing information delivery by reducing time taken in between technology generation system and the technology user systems.

The main information centre was 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. Digital content are being developed to disseminate through the information centre.

A survey conducted in tea sector revealed the mobile phones and SMS facilities are the most prepared digital channels for technology dissemination in the tea sector. Therefore, the potential to use the GSM modems, cell phone and frontline SMS facilities were tested for disseminating tea technology to small tea growers and the planters of RPC plantations.

9. Adaptive Trials

Fertilizer adaptive trials

The collaborative adaptive trials of TRI recommended fertilizers mixtures and the fertilizer mixtures preferred by the smallholders were completed and the output, the appropriate fertilizer mixtures for different regions, were presented at the E & E form and the special meeting held at the Ministry of Plantation Industries.

Survey on the performance of TRI 3000/4000 series cultivars in tea smallholdings

A collaborative survey with the Plant Breeding Division and the TSHDA was completed and the output was presented at the E & E Forum held on 21st December at Low country Regional Station.

Adaptive trials of the use of Bio-filmed Bio-fertilizers (BFBF Technology) in tea nurseries

Seven adaptive nursery trials were established at Ratnapura, Galle, Deniyaya, Passara and Gampola areas to evaluate the efficacy, technical feasibility and economics of BFBF for producing low cost healthy and vigorous tea plant in farmer's tea nurseries were completed and the data analysis is being done to make the final conclusion.

Adaptive trial on the use of Champ for controlling Blister blight in mature tea fields

Adaptive trial on the use of Champ was successfully completed and the data and the other observation were submitted to Agro Chemicals and Machinery Screening Committee (ACMSC) for necessary recommendations.

Adaptive trial on screening synthetic fungicides establishing Maximum Residue Limits (MRLs) & Post Harvest Intervals (PHIs)

Adaptive trials on copper fungicide, Champ DP 37.5% and synthetic fungicide pyrachlostrobin were completed in collaboration with Plant Pathology Division. Both the fungicides were found to be user-friendly and practically effective in controlling Blister blight disease under estate field conditions.

Adaptive trial on the use of Trigger and Rapid controlling weeds

Adaptive trials conducted at Pelmadulla estate, Siripagama and Talawakelle areas on the use of 'Trigger' and 'Rapid' for controlling weeds were successfully completed and the tea data and the observation were submitted to ACMSC for necessary recommendations.

10. Audio Visual Service

Mr. Neville Ekanayake, Technical Officer of Advisory and Extension Division attended the following activities of the audio visual services of the Division.

- Provided the services for 43 events viz. symposium, meeting, training programme and workshops, visits of groups of university students/trainees, three exhibitions 'Dayata Kirula', Gannoruwa and Lubuduwa Agriculture exhibitions and other special occasions.
- 232 video films on tea were copied and distributed among the stakeholders of the tea industry.
- New AV and multimedia system was installed in the lecture hall and auditorium.
- Preparation of video clip on laboratory activity, recording video/photo of special events of the Institute, designing printing material for TRI publications and preparing technical specifications for purchasing AV equipments and computer accessories were undertaken.

Besides the responsibilities of the Audio Visual Unit overlooked the services of the project (Main Photocopy Service) an income of Rs. 23,557 was generated from the services offered.

11. Library

Main function of the library is the collection and dissemination of information on the requirements of TRI scientist for work connected to their research and publications. The library involved in the following activities during the year.

- Acquisition, collecting and maintaining of library materials
- Lending library materials
- Maintaining a collection of news clippings
- Photocopy service
- Inter library service

Sixteen new books were added to the current collection of 4702 books. The library procured 39 journals/serials through subscription, gift and exchange and subscribed to 15 foreign journals. Two Ph D thesis and one M Phil thesis of TRI officials were added to the library thesis collection during the year.

During the year, 469 news paper articles were sent to the Director. Under Inter Library Loan Service (ILL) 4 articles were supplied to outside libraries and one article for TRI user. 7998 papers were photocopied for TRI staff from bound periodical collection and other library materials.

Thirty four students from universities and technical colleges used the library facility.

Information Technology Unit - IT unit

A merit award was received for TRI website “www.tri.lk” under the Government Category of the “BestWeb.lk 2012” competition organized by the LK Domain Registry of Sri Lanka.

Information Technology Unit rendered its ICT related services to other divisions, units, regional and extension centers as well as TRI estates. These included

- Administration & maintenance of Internet, e-mail and file servers
- Installation and troubleshooting of computers, computer accessories and Local Area Network (LAN)
- Installation and maintenance of Anti-Virus software with up-to date security
- Updating TRI website with new information
- Maintenance of finger-print Scanners located at TRI head office and Low country Regional Centre and its software
- Maintenance of the fixed assets register of computers, accessories and software

Pest diagnostic services

Nematology and Entomology laboratories at Talawakele, Hantane, Ratnapura and Deniyaya continued to undertake nematode and insect pest diagnostic services for addressing nursery, young and mature tea related issues for the benefit of the Smallholder and cooperate sector growers. Tea exporters were also assisted in addressing issues in connection with stored and ware house pest control. Assistance in pesticide residue monitoring and data on MRLs *etc.* helped both growers and exporters immensely.

Training programs on IPM

In view of dissemination IPM packages for effective pest control measures, expert advices and on-farm training programs were offered. These included safe use of pesticides, non- chemical pest management, nursery fumigation, nematode management, organic farming for managers and field staff of corporate sector and Smallholders. In addition, divisional staff assisted in routine advisory and extension services, estate visits, seminars and Crop Clinics *etc.*

Services to stakeholders

Four made tea samples and six water samples were tested for microbial contamination.

Analytical services

Development of regional analytical facilities for soil, plant and fertilizer analysis

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

The total number of soil, leaf, fertilizer and organic manure samples analyzed at Talawakelle, Walahanduwa and Hantane TRI centers during the year were 5748, 130, 1681, and 36 respectively.

The total number of analysis performed on soil, leaf, fertilizer and organic manure at Talawakelle, Walahanduwa and Hantane during 1st January to 31st December 2012 were 15277, 538, 3972 and 164 respectively. Out of these analyses the highest number of analysis were performed for soil pH (5,534) and soil organic carbon (3,712). Total number of analysis performed for the year 2012 is 19,951. In addition to the soil analysis, Site Specific Fertiliser Recommendation (SSFR) schedules were also prepared.

Advisory service

Division members attended to investigate the problems related to tea withering, rolling, fermentation, drying and grading in black tea processing. The problems identified include discoloration of withered leaves, airflow problems of withering and drying, appearance of made tea, low drier outputs, uneven drying, smoke problems *etc.*

In addition, division helps to select the best tea factories in different regions under National Award program with the Sri Lanka Tea Board and to recommend new type of packing materials, to register new tea factories, to inspect and recommend new color sorting machines *etc.*

Training programs

Division members conducted training programs for superintendents, assistant superintendents, factory executives, factory officers, factory supervisors, factory workers organized by NIPM, different regional plantation companies and broker companies *etc.* In addition, training program for leaf suppliers organized by Tea Board & NIPM in different parts of the tea planting regions were also assisted by the staff of the division.

Seminars/ meetings

Senior members in the division conducted RSC seminars, experimental & extension forums and factory demonstrations. Divisional members conducted several seminars under 'B Leaf-60' program organized by Tea Commissioner Division under SLTB. They participated different kind of meetings related to tea industry.

TRI REGIONAL CENTRES



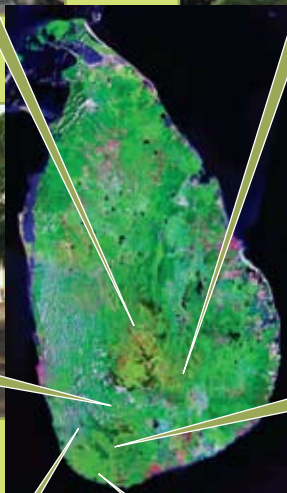
Hantana



Passara



Ratnapura



Deniyaya



Matugama



Galle

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 Regional Centre, Ratnapura has 4 research units viz. Agronomy, Plant Breeding, Entomology and Nemotology, Process Technology and Advisory & Extension unit. Scientific staff of research units, carried out field and laboratory experiments and factory investigations at St. Joachim estate and other plantations in the Low country region. The Advisory and Extension officers carried out 152 advisory and extension visits and 30 extension and training programs in the form of field days, workshops and seminars *etc.* for both corporate and smallholder sector stakeholders. During the year, they have inspected 110 commercial nurseries in Ratnapura and Kegalle districts. Fifty four advisory and extension visits in relation to tea manufacture and testing of factory machineries were undertaken by the scientific staff of the Process Technology unit attached to the TRI Low country Centre. They also offered services to improve the tea processing at St. Joachim estate factory.

Regional Scientific Committee seminars for the corporate sector estates and Regional Technical Extension Forum (RTEF) and Experiment and Extension (E & E)forum for tea smallholders were conducted as planned at the TRI Low country Regional Centre. Uncultivated land survey of RPC estates in the region was carried out by the Advisory & Extension unit and scientific staff under the guidance of the Ministry of Plantation Industries. Mr. C J Liyanaarachchi, Extension Officer coordinated students' training activities of the TRI Low country Station.

The number of visitors to TRI Low country Regional Center during the year was more than 1279. Technical staff of the TRI Low country Regional Centre made technical presentations at the 'Plantation Crop Research Symposium' and 'Stakeholder forum' held in Colombo and other scientific forums. Mr. G L C Galahitiyawa, Senior Research Officer, visited tea factories of the Low country region to select best factories for national awards. Dr. M.A.Wijeratne joined the Sri Lanka delegation for FAO/IGG meeting on tea held in Washington DC in September 2012. He also addressed tea industry stakeholders on climate change impacts on tea and adaptation measures in other local forum.

Administration and staff movements

Hon. Minister of Plantation Industries visited TRI Low country Centre twice during the year.

Mr. P D Upali, Experimental Officer attached to the Plant Breeding division retired from the TRI service with effect from 14th July 2012. Mr. B M B Basnagoda, was appointed as Administrative Officer with effect from 1st May 2012. Mrs. Chandima de Seram was transferred from Entomology Division to the Agronomy Division, TRI Low country Regional Center with effect from 1st November 2012.

During the year, TRI Low country Regional Center organized a 'Free eye clinic' with the assistance of newly established private eye hospital at Ratnapura, 'Free medical examination camp' by the General Hospital, Ratnapura and 'HIV AIDS Programme' by the officials of the Department of Labour, Sabaragamuwa Zonal Labour Office, Ratnapura for the benefit of staff and workers of the Low country Regional Centre.

Human resource development/ training

Dr. M A Wijeratne, Officer-in-Charge and Mr. Sampath Pathiranage, Research Assistant visited India and China respectively, for short term overseas training. Dr. N P S N Bandara was awarded Ph D from the Adelaide University, Australia. Mr. Sampath Pathiranage registered for postgraduate leading to Ph D at the Post Graduate Institute of Agriculture, University of Peradeniya. Mr. Toufic Ahmed from Bangladesh Tea Research Institute carried out his research project leading to Ph D at the TRI Low country Regional Centre. Mr. A K Mudalige resumed his duties in the Plant Breeding Division in March 2012 after completion of his B Sc (Agric) Degree at the Sabaragamuwa University. Four university undergraduates and 20 apprentices from government training and apprentice establishments were trained on tea related subjects and clerical and allied duties at the TRI Low country Centre.

Infrastructure development

The maintenance repairs of staff quarters, office, seminar hall, laboratory and other buildings, routine maintenance work of water and electricity supply system and cleaning and maintenance of layout were satisfactorily done. Repairs and services of institute vehicles were undertaken on priority basis with available funds. A finger-print machine was installed at the TRI Low country Station, Ratnapura in April 2012. Electricity supply was given to St. Joachim estate pump house and newly built fertilizer stores of the TRI Low country Station. Internal and external colour washing of 'B-05', 'B-03', 'B-04', 'C-16', 'D-02' bungalows and hostel double room no. 3 and 4 were completed. Internal and external colour washing of 'C-07' and 'C-11' bungalows were in progress.

Mid country Regional Centre

J C K Rajasinghe

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

Officer-in-Charge

The TRI Mid country Center, 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)	4.5
VP (uprooted for replanting)	1.00
VP tea (young)	3.5
Mother bushes	2.75
Tea nursery	0.2
Under <i>Mana</i> grass	0.5
Fruit trees	0.4
Coconut	0.81
Forestry	1.2
Marshy land	0.62
Building, garden, paths and roads	5.77

Research units in the Center, in consultation with the Heads of Divisions, conducted number of research activities in the laboratories, glass house and in the field in Mid country plantations situated in Kandy and Matale districts. Advisory & Extension section, in its capacity as the outreach arm of the institute, extended services through organizing field visits, training and awareness programs including field days, seminars, and workshops for the benefit of tea growers, both in corporate and Smallholder sector in the Mid country. Scheduled programmes such as Regional Technical and Extension forums (RTEF) were also held at the Mid country Station, taking in to account the needs and request coming from the small holdings sector, with the participation of TRI, TSHDA officials and the members of Tea Development Societies in Kandy & Matale. RTEF programs were conducted following a novel approach ensuring active participation of the forum members through group discussions and collective assignments. 'Micro nutrient Management of tea', 'Effect of global climate change on tea in the Mid country region' and 'Good manufacturing practices (GMPs)' were the subject areas deliberated in the RSC seminar. Presentations made by TRI scientists were followed by a lengthy interactive session where issues related to Mid country were discussed.

Apart from the scheduled programs, Advisory & Extension unit of the Mid country Center conducted 15 tailor-made training programs, 6 skill training programmes, 3 field demonstrations and 16 seminars/ lectures (including RTEF and the RSC) with the participation of relevant research units, to address the issues specific to tea growers in the Mid country region. Two training programmes on nursery management and 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 Advisory staff of the center actively participated in ‘Deyata Kirula’ national exhibition held in Anuradapura and played a key role in setting up an attractive stall for TRI, while coordinating all related activities successfully. The staff also participated actively in ‘Agricultural Exhibition’ organized by the Department of Agriculture in parallel to its 100th year celebration in July 2012 held in Gannoruwa. Model tea factory along with a model tea field was established in the Exhibition site to suit the theme.

Survey on performance of TRI 3000/4000 series cultivars

Advisory staff of the center in collaboration with Plant Breeding staff successfully completed the survey to assess the performance of TRI 3000 & 4000 series cultivars in 48 smallholder sites in Kandy and Matale districts.

Adaptive trials

Adaptive trials on Bio-filmed Bio-fertilizer were successfully completed in 5 nursery sites and the data collected were sent to Biometry unit for analysis. A new adaptive trial to evaluate TRI 5000 series cultivars was established at Sogama estate in Paradeka, Pussellawa while the performance of earlier established trial at Nawalapitiya was closely monitored. Centering was done in the adaptive trial on improved seedlings laid out in Hangurugama estate, Medamahanuwara. Applicability of few treatments to manage Shot hole borer were tested in another trial set up on Osada Plantation in Dolosbage jointly with Entomology staff.

Demonstration plots

Demonstration plots on adoption of Good Agricultural Practices (GAPs) continued at the regional center to educate the stake holders 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. 0.5 km length two concrete tracts were laid to the entry road of ARP quarters at the center. Fixing iron grills for the windows of OIC’s quarters and the office was completed.

Visitors to the station

I.	Tea growers		
	- Planters	-	81
	- Smallholders	-	179
II.	Students/ School children	-	300
III.	General visitors	-	401
IV.	Foreign visitors	-	10
	Total	-	971

Income

Number of VP cuttings sold	-	4 21,700
Income received from sale of cuttings (Rs)	-	316,275
Number of VP plants sold	-	43,027
Income received from sale of VP plants (Rs)	-	7, 74,486
Total crop harvested (kg)	-	10,197
Income received from sale of green leaf (Rs)	-	555,345.34
Guest house accommodation charges (Rs)	-	78,650
Income received from soil pH testing (Rs)	-	10,085
Sale of TRI publications (Rs)	-	52,795
Miscellaneous (Rs)	-	23,877

Crop

The green leaf (kg) harvested during the year 2012, is given below.

Month	Crop harvested/ sold (kg)	Rate (Rs) per kg	Income received (Rs)
January	880	45.88	40,374.40
February	806	48.40	39,010.40
March	797	50.20	40,009.40
April	1420	58.61	83,226.20
May	831	59.73	49,635.63
June	466	55.46	25,844.36
July	758	55.85	42,334.30
August	1087	55.10	59,893.70
September	559	57.67	32,237.53
October	573	52.95	30,340.35
November	1528	54.54	83,337.12
December	492	59.09	29,072.28
Total	10,197		5, 55,315.67

Uva Extension Centre
K R W B Kahandawa
B Sc Agric (Peradeniya, Sri Lanka) M Sc (Peradeniya, Sri Lanka)
Officer-in-Charge

The TRI Uva Extension Centre, Pelgahatenne, Passara is primarily a regional advisory and extension office established in 1931. It provides services to Uva tea plantations which spread over an extent of 20539 ha in estate sector and 9219 ha in smallholding sector directly and indirectly. The extension centre equipped with a small scale laboratory for soil pH and carbon analysis. Field trials and demonstration plots are laid out in part of the total extent of 14.3 ha in the center. The land use pattern in hectares is as follows.

Land use pattern (ha)

Mature tea in plucking	-	4.00
Young tea	-	0.70
Mother bushes	-	2.06
Buildings/ roads	-	0.79
Forest/ shrub/ grass land	-	6.75
Total extent	-	14.30

Staff movements

Mr. G Weerapperuma (Guest House Keeper) was transferred to the Head Office with effect from 1st October 2012.

Advisory and extension activities

The extension center in consultation with the Heads of the Divisions at head office implemented a large number of field investigations in plantations situated in Badulla and Monaragala districts. By conducting advisory and extension visits, training programmes in the form of seminars, workshops, and field days the Extension Centre rendered its service in this year too for both corporate sector and smallholdings.

Regional Scientific Committee: Uva workshop was held at Badulla in April with the objective of identifying strategies to address the present crisis situation in the tea industry in the of Uva region. Forty five estate managers in Uva, officials of Sri Lanka Tea Board and tea brokers participated to share their views with TRI scientists on issues such as low productivity, high cost of production and low net sale averages reported in plantations in Uva. The present situation of the Uva tea industry was critically analyzed and many possible strategies were identified and recorded to overcome the situation.

Two Regional Technical Extension Forum meetings were held at the centre for officials of TSHDA and Tea Smallholding Development Societies. The topics discussed were ‘Soils and its nutrient management in Uva’, ‘Soil water management and drought’, and ‘Improvement of productivity in smallholdings in Uva’.

A programme was conducted at the centre for all the estate managers of Namunukula Plantations on ‘Programming of pruning’. Four programmes on ‘Harvesting practices’ were conducted for field staff and selected puckers in Gonakelle and New Burg estates. One day training programs for four consecutive times were held at the centre on ‘Deferent agricultural practices in tea plantation management’ for the students who follow Tea Technology and Value Addition Course and Export Agriculture Course at Faculty of Export Agriculture in Uva Wellassa University.

A total of 1780 soil samples received from estates and smallholdings were tested for pH and organic carbon content in the year.

A summary of advisory and extension activities in the year is given as follows.

Advisory visits made to estates and smallholdings in Uva	-	35
Advisory letters issued	-	146
Seminars/ Field days/ Training programs held for Estates/ Smallholders/ Students	-	13
Regional seminars held in the area	-	03
Meetings/ Seminars attended by the OIC	-	52
Soil samples tested for pH	-	1266
Soil samples tested for organic carbon content	-	514
VP cuttings issued/ sold	-	382850
VP plants sold	-	4298
No. of publications sold	-	112
Commercial nursery inspections	-	93

Collaborative research

Data were collected from Telbedde, Downside, Welimada, Nayabedde, Verellapatne Adawatte, Roeberry, Glennanore and Liyangahawela estates for the survey on ‘Assessing the impact of recent drought in Uva region’ conducted by the Agronomy Division.

Participatory observations were made in two adaptive trials evaluating the commercial level adaptability on new cultivars and seedlings at Haputale and Verellapatane estates which are carried out by the Plant Breeding Division. The center coordinated the activities in reviving of bi-clonal seed gardens in El-tab estate and Welimada estate.

Adaptive trials

The three fertilizer adaptive trials were conducted and concluded with TSHDA on locations at Haliela, Bandarawela and Boralanda in order to find the response to five selected different fertilizer mixtures in smallholdings in Uva. An adaptive trial was started at Mahadowa estate, Madulsima to test the use of loric acid for controlling mites with the assistance of Entomology Division.

Field trials

Following field trials have been maintained by the Center in order to assist the respective Research Divisions to conduct their research work at regional level.

- UVP 9 and UVP 10 trials of Plant Breeding Division are in progress in field no. 04 for the issuance of cuttings of TRI 5000 series and to evaluate as potential tea cultivars respectively.
- Phase I trial with about 400 plants of 43 accessions was newly commenced and up keeping of TRI 5000 series phase III trial in field no. 02 was continued as an observational trial by the Plant Breeding Division.
- Germplasm collection in field no. 03 was maintained to conserve valuable accessions.
- UST 1 and UST 2 (seedling trials) in field no. 03 and 04 are in progress for further evaluations.
- Up keeping of grafted plant block in field no. 04 and 02.
- Evaluation of new cultivars to nematodes tolerance was carried out in tank beds in field no. 1 by the Nematology Division.
- Evaluation of rainwater harvesting techniques, trial of *Cassia* and *Gliricidia* planted at different densities for the generation of “Dendro” power, nursery trial on bio filmed bio fertilizer under field conditions established by Agronomy Division also continued in field no. 02 and 03.

ADB Mother Bush Project

Of the expected target of 40,000 cuttings, 382,850 cuttings (96%) of TRI 3000 and TRI 4000 series cultivars were issued from 2.06 ha mother bush site at the centre and necessary routine maintenance activities were carried out.

Visitors

A total of 975 personnel visited the center as follows.

Foreign visitors	-	01
Planters	-	96
Smallholders	-	223
School students	-	14
Undergraduates	-	197

Others	-	309
TRI officers	-	135
Total	-	975

Trainees

Mr. Y K H M C Wijayantha, a trainee from NAITA completed the six-month industrial training at the Center on field practices.

Infrastructure development and maintenance

- Repairing work of main entrance road of the centre was completed with the financial assistance of the Ministry of Economic Development at a cost of Rs. 3208645.00 on a request made by the Centre
- Replanting work of demonstration block (0.2 ha) of seed and VP plants was completed
- Construction work of the renovation of drivers' rest room was completed

Crop

Monthly crop harvested from 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.)	Amount (Rs.)
January	2086	39.34	83314.84
February	2776	43.49	120728.24
March	3973	48.57	192968.61
April	4349	57.44	249806.56
May	5652	52.46	296503.92
June	3220	51.65	166313.00
July	2267	51.00	115617.00
August	4177	48.10	200913.70
September	2246	52.42	117735.32
October	4405	56.34	248177.70
November	4349	57.09	248284.41
December	3232	56.77	183480.64
Total	42732		2223843.94

Income

Highest ever total annual income of the centre was reported. Total income generated from the centre through its activities and the income component breakdown is as follows.

Item	Income (Rs.)
Sale of green leaf (42732 kg)	2223843.94
Sale of VP cuttings	306680.00
Sale of VP plants	77364.00
Soil analytical charges	251340.00
Sale of publications	24820.00
Guest house accommodation charges	20300.00
Sale of firewood	36360.00
Other	6306.00
Total income	2947013.94

Special Issues/ Events

- A prolonged drought was experienced from May to September in IU3c, IU2, IM1a, IU3d and IU3e agro-ecological regions in Uva and the crop was affected severely during this period. The importance of soil moisture management in Uva tea lands was highlighted from the survey conducted to assess the impact of drought in the region. Mr. K R W B Kahandawa, Extension Officer/ OIC participated as a technical committee member to the regional workshop on “Land Degradation Assessment and Monitoring for Sustainable Land Management and Climate Change Adaption in South Asia” held at Hotel Topaz, Kandy on 28th to 31st August.
- Mr. K R W B Kahandawa, EO/ OIC participated at the quarterly meeting of the Government Agent and Assistant Government Agents of the Badulla District held at TRI Uva Centre in August and made a presentation on Uva Tea Industry.
- Mr. K R W B Kahandawa, EO/ OIC participated to the Smallholders meeting with the Hon. Minister of Plantation Industries held at Bandarawela in September.
- Technical Officer, Mr. D K D Dissanayaka participated in a short training program on ‘Agro-meteorology’ at Gannoruwa in July. He also participated in the ‘Survey on uncultivated land’ conducted by the Ministry of Plantation Industries.

Galle Extension Centre

K G J P Mahindapala

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

PG. Dip. (Applied Statistics)

Officer-in-Charge

General

The TRI Galle Extension Centre, Talgampola is primarily an Advisory and Extension section equipped with a small scale laboratory for soil pH analysis and with a total extent of 33.92 hectares to carryout field trials at regional level. The land use pattern of the Centre in hectares is as follows:

Mature tea in plucking	5.70
Young tea	1.40
ADB mother bushes	2.03
Tea nursery	0.50
Abandon for replanting/planting	1.90
Land prepared and grass planted area in 2012 for replanting	1.60
Under rehabilitation ('Mana' & 'Guatemala')	1.40
Experimental trials	1.00
Seed garden	0.33
Area under coconut, fruit trees <i>etc.</i>	1.50
Utilized marshy land	0.20
Unutilized marshy land	1.00
Forest cover	5.56
Buildings, Gardens, Roads, Weather Station	9.80

Similar to other regional stations, TRI Kottawa Station is dedicated for transfer of technologies, distribution of planting materials and monitoring of adaptive trials. This station carried out number of field investigations in corporate and proprietary estates as well as in some smallholdings in Galle district and Akuressa region and prepare comprehensive reports with recommendations to rectify issues that emerge in tea lands. It is worthy to note that most of the field problems reported in 2012 was associated with adverse climatic conditions and labour problems. Hence, the scheduled programs such as Regional Technical and Extension Forums (RTEF) Regional Scientific Committee (RSC) seminar were targeted to discuss these issues.

In addition to scheduled programs, staff of the Galle Extension Centre involved in plant certification process in order to improve the quality of plants in this year too by inspecting commercial nurseries. Training of stakeholder is a mandatory requirement

in the technology transfer process. This station executed number of training programs in the form of field days, workshops, demonstrations and seminars *etc.* for tea growers trainers and workers to develop their skills and improve the knowledge on new and existing technologies.

Advisory and extension activities

1. Advisory correspondences - 416
2. Visits
 - Advisory visits - 57
 - Extension visits - 50
 - Commercial nursery inspections - 48
3. Training programs
 - General training program - 33
 - RSC seminar for planters - 1
 - RTEF for TSHDA - 2
 - Video programs exhibited - 10 video sessions

In addition to that, 290 publications/ extension materials, which carry information on tea cultivation, were distributed. Two hundred and sixty one soil samples sent by the growers were tested for pH and necessary recommendations were given to ameliorate existing problems in soil.

4. Exhibition

TRI took part in preparing a stall in the five days exhibition organized by Southern province Agriculture Ministry.

Advisory Officer actively participated in the crop clinic held at Kelinkanda, organized by TRI Kalutara Centre.

5. Meetings

Advisory officer attended 52 meetings on making policy decision and monitoring and management of extension activities.

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 on fertilizer mixtures established in four smallholder properties (at Magedara, Wanduramaba, Ampegama and Hiniduma) were successfully completed.

An adaptive trial on Bio-filmed Bio-fertilizer (BFBF) for nursery, too was completed and results on growth measurements revealed that there were no significance difference between 'T 65' existing recommendation and ½ rate of 'T 65' with BFBF.

A field survey was conducted in Galle district to assess the perception of Smallholders towards the TRI 3000 and 4000 series cultivars and to identify cultivars that are not performing well in Smallholder conditions based on the field observation. According to the results, about 75% of the growers in the region have 'Good' perception on the new cultivars. Further, it was observed that TRI 4042, 4049, 3055, 3069 cultivars perform better than that of TRI 3025, 4052, 4053 and 4061.

VP cuttings of potential TRI 5000 series cultivars were propagated to supply nursery plants for four small holders (each ¼ ac in size) for adaptive trial in Galle district.

Research trials

Following trials have been 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: one cycle was completed and based on the performance four cultivar have been identified for adaptive trials.
- ii) Screening of accessions in LVP phase II trial in field no. 03 for tolerance to Low Country Live Wood Termite: One cycle was completed

Entomology & Nematology Division

- i) Nematode population monitoring trial at field no. 04
- ii) Assessment of effectiveness of wound dressing on pruning cuts in relation to wood rot

Agronomy Division

- i) Bio-filmed Bio-fertilizer trial at field no. 02
- ii) Evaluation of performance of different grass species for the purpose of soil rehabilitation in tea

ADB mother bush project

Distribution of newly improved planting materials is one of the major services offered to the growers in this region. Although drought prevailed in the initial half year severally affected the shoot production in mother bushes, 393,580 cuttings of TRI 3025, TRI 3055, TRI 4042 and TRI 4049 cultivars were issued from 2.1 ha mother bush area and it was 7.3% higher than the amount issued in the last year.

Moreover, 50000 nursery plants were propagated and 37,708 VP Plants were sold of which 23,950 plants were given to Tea Smallholding Factories PLC. for them to supply to their smallholders.

A total of 536 personnel visited the Extension Centre. Details are as follows;

Category	Number
Smallholders	429
Corporate sector and propriety estate	64
Foreign visitors	05
Students	37
Others	12
Total	547

Infrastructure developments and maintenance

Renovation of 'D' 3 quarters was completed and 90% of repairing work of 'C 3' quarters was completed. Following field development activities were carried out:

- A poly-clonal mini seed garden, consist of seven combinations (TRI 3055, KP 204, KEN 3/16 TRI 2022, TRI 2025, S 106 and TRI 2016) was established in an area of 0.33 ha in field no. 7.
- *Gliricidia* as an energy crop was planted in a block of 0.4 ha in field no. 2.
- Land preparation and grass planting for the purpose of replanting was completed in 1.6 ha block in field no. 2 and 4.
- Preliminary work of pilot project on contract grower system for nursery was initiated.
- 90% of the work related to censuses of timber trees were completed.
- 536 plants were used for infilling of tea in field no. 1.

Special events

- Advisory officer served as a member of a committee appointed by the Director to synthesize the outcome of the fertilizer adaptive trials conducted in smallholding land.
- Advisory officer attended the AGM of Planters Association.
- Advisory officer has been working as editor of '*Thei Thathu*' news letter dedicated for Tea Smallholders.
- Advisory officer worked as the convener of the TRI-TSHDA interaction monitoring committee.
- Advisory officer assisted the pilot project of 'Mapping of Tea land' in Galle district initiated by Land Use Policy Planning Department (LUPPD).

- Advisory officer assisted the ‘B Leaf 60’ awareness program conducted by Sri Lanka Tea Board.

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)	Amount (Rs)
January	1988	55.007	109,353.92
February	1001	54.435	54,489.44
March	1798	58.736	105,607.33
April	1555	65.494	101,843.17
May	2192	64.010	140,309.92
June	1895	63.009	119,402.06
July	2012	63.666	128,095.99
August	1929	63.001	121,528.93
September	2348	65.222	153,141.26
October	2460	64.000	157,440.00
November	2524	63.010	159,037.24
December	2561	63.010	161,368.61
Total	24263	-	1,511,617.87

Income

Total income of the centre with its activities and the income component as a breakdown is as follows.

Activity	Income (Rs)
Sale of green leaf	1,511,617.87
Sale of VP cuttings	285,000.00
Sale of VP plants	714,669.00
Analytical charges for soil pH	17,385.00
Sale of publications	26,845.00
Guest house accommodation charges	18,200.00
Other	26,350.00
Total income	2,600,066.87

Note: Timber trees worth of Rs. 1,444,469.26 which have been fallen down due to bad weather were given to the State Timber Corporation.

Deniyaya Extension Centre

S P Rathnayake

B Sc Agric (Ruhuna, Sri Lanka) M BA (Whut, China)

Officer-in-Charge

General

The TRI Deniyaya Extension Centre, Rathnapura 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 5.00 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 investigations in the Low grown plantations situated in Matara and Hambantota districts and rendered its services by conducting advisory visits, training programs in the form of field days, workshops and seminars etc. for both corporate and Smallholder sector stakeholders. Many training programs in the form of field days, workshops and seminars were successfully conducted in and outside of Regional Center for Regional Plantation Sector as well as for Tea Smallholder Sector. Tea nursery, Soil and shade management, Bush debilitation in Deniyaya region and the way forward, Tea productivity improvement through good agricultural practices (GAPs) and Awareness on weather station and Meteorological data were the themes received high priority. The other scheduled programs such as Regional Technical and Extension Forums (RTEF) were held at the Deniyaya extension Centre for the Smallholder sector with the participation of TRI, TSHDA, and the members of Tea Development Societies while a Regional Scientific Committee (RSC) seminar was jointly organized by Deniyaya and Kottawa, TRI Regional centers for the corporate sector stakeholders in the Matara and Galle districts. Uncommon pests and diseases outbreaks and control measures, Sustainable tea cultivation through GAPs and Proper usage of agro-chemicals and Cost saving strategies for tea were the subject areas deliberated in these programs respectively. In addition to the scheduled programmes, staff of the Deniyaya Extension Centre in consultation with the Head, Advisory and Extension Division, conducted and attended programs on 'Efficient usage of tea fertilizer for the stakeholders to mark the national fertilizer week' and 'Extension campaign to promote organic farming in Deniyaya' and also extended the fullest corporation in the events of 4th Plantation Crop Research Symposium and Stakeholder forum held in Colombo.

Staff movements

Mr. S P D Tharanga, Driver, was transferred to the Head Office, Talawakelle and Mr. M D Chandana, Driver, assumed duties at Deniyaya, TRI with effect from 18th September 2012.

Advisory and extension activities

Item	Number
Visitors to the division (from Estate/Students/Foreigners/ Smallholders/Others)	1148
Advisory correspondence with estate/Smallholders	346
Advisory visits (on call & routine) to corporate sector & small holding sector	89
Training programs/ Seminars/ Group discussions/ Field days/ Demonstrations/ Educational/ Familiarizations and Meetings	118
Issue of publications/ Leaflets/ Pamphlets	1764
Soil samples tested for pH	404
Soil samples tested for C%	-
VP cuttings sold	-
Commercial nursery inspection	69
Exhibitions	-
Visits/ involvements in experiments (adoptive trials)	07
VP plants issued	535

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 society members. Presentations on current challenges in the tea industry and the way forward, Proper water management for successful tea plantation, Tea Smallholder expectations and the future potential, outcome of adaptive fertilizer trials and TRI 3000/4000 series cultivar survey and a tea grower feedback were presented in these forums followed by a lengthy open forum to discuss the possibility of containing the cost of production, productivity improvement in tea lands, importance of timely mass media messages and importance of proper records keeping.

Adaptive trials

Adaptive trials were completed in 3 smallholder properties in Matara to select the most suitable fertilizer mixture for the region, in collaboration with the Soils and Plant Nutrition Division, TRI and TSHDA. An adaptive trial on Bio Filmed Bio Fertilizer (BFBF) was also completed at the commercial nursery established at the former premises of Deniyaya Regional Center in collaboration with the Agronomy Division, TRI and TSHDA.

Research trials

Following trials have been 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 Smallholder's field in Warapitiya.

Collaboration with Soils and Plant Nutrition Division

- i) Fertilizer trial at Kuruduwatta proprietary estate, Kotapola.

Collaboration with Nematology & Entomology Division

- i) TRI 5000 series monitoring trial at TRI Deniyaya Regional Centre, nursery.

Collaboration with Agronomy Division

- i) Bio-filmed Bio-fertilizer trial at Richiland and Nilgiri proprietary estates.

Visitors

A total of 1148 personnel visited the Deniyaya Extension Centre and the breakdown is as follows.

Estate management and smallholders	-	794
University/ Diploma students and others	-	354

Training opportunities provided by the Regional Centre

An undergraduate student from University of Ruhuna, completed the final year research project under the supervision of Mr. S P Rathnayake.

Infrastructure Developments and maintenance

Constructions of the 'D' type quarters and concreting of the internal roads were completed. Also the routine maintenance and repairs of staff quarters, office and other **115**

buildings, cleaning and maintenance of layout and repairs and services of Institute’s vehicle were satisfactorily attended.

Income

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

Activity		Income (Rs)
Sale of publications	-	22020.00
Testing soil samples for pH	-	33060.00
Sale of 535 plants	-	9630.00
Miscellaneous	-	17219.27
Total	-	81929.27

Labour force

Number on check-roll - 2

Kalutara Extension Centre

Haran Jayaweera

Acting Officer-in-Charge

General

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

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 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 *etc.* for both corporate and Smallholder sector stakeholders. The scheduled programs such as Regional Technical and Extension Forums (RTEF) were held at the Kaluthara Extension Centre for the Smallholders 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 the TRI Low country Regional Center, Ratnapura. Good nursery plants, new cultivars, management of horse hair blight and white root disease in Kalutara and need for quality planting materials for replanting were the major subject area deliberated in these programs. The staff of Advisory and Extension Division and TSHDA extended their cooperation to organize the 'Mini Crop Clinic' which was successfully held with the participation of more than 250 stakeholders for the benefit of tea growers in Kelinkanda. Five Factory based extension program were held, for the factory and extension officers with the assistance of Assistant Tea Commissioner and TSHDA. A training Program/ workshop on tea for managers and assistant managers of Kotagala Plantations- Low country was successfully held with the participation of general manager and with more than 60 managers and assistant managers.

Acting OIC participated the district agriculture council and district development council, Kalutara, representing TRI. Kalutara Advisory and Extension Centre organized two tea base farming programs for the properties in Kalutara district with the collaboration of TSHDA officials. A workshop for the extension officers of private tea factories was successfully held with the participation of Head, Advisory and Extension Division with the collaboration of Assistant Tea Commissioner.

Staff movements

Mrs. T L Samaraweera, Public Relations Officer attached to TRI, Talawakelle was transferred to the Kalutara Advisory and Extension Centre with effect from 17 July 2012.

Advisory and extension activities

	RPC	Smallholders
No of advisory visits	26	60
Field days	1	5
Seminars	1	2
Training programs	6	20
RTEF	02	
Commercial nursery inspections	14	
Mini Crop Clinic	01 at Kelinkanda. 250 Participants attended	
Visits to adaptive trials	To seed garden and TRI 5000 series cultivar plots	
Internal meetings	Heads of Divisions meetings	- 12
	Advisory Officers' Forum	- 2
	E&E (Sinhala)	- 2
	E&E (English)	- 2
External meetings	District Agriculture Council	12
	District Development Council	8

Adaptive trials and new initiatives

- Adaptive trials were commenced in 2 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.
- Adaptive trial in smallholder property in Meegahatane in Kalutara district on TRI 5000 series and seed cultivar, in collaboration with Plant Breeding Division.
- Establishment of poly-clonal seed garden in Meegahathanna in collaboration with Plant Breeding Division.
- Establishment of the demonstration plot with new suitable tea cultivars with the help of Plant Breeding Division, Ratnapura.

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.

Visitors

Category	Number
Planters	20
Smallholders	98
Students	12
Total	130

Income

Total income of the centre with its activities and the income component is given bellow.

Activity	Income (Rs)
Sale of publications (100)	11025.00
Soil analysis for pH	1520.00
Total	12545.00

AWARDS, GRANTS, STUDY PROGRAMS, PUBLICATIONS AND SPECIAL PRESENTATIONS

Advisory & Extension Division

Awards/ Grants

- Mr. B A D Samansiri was awarded the third position of the “Best Scientist of the Tea Research Institute of Sri Lanka in 2012”.

Study Programs

- Mr. Rohitha Kumara attended a training on “Tea Tasting and Quality Assurance” at Kothari Agricultural Management Centre, India from 1st September 30th November 2012.
- Ms. Hiromi Nishanthi, successfully completed the M Sc program in ‘Development Communication’ at Post Graduate Institute of Agriculture, University of Peradeniya.
- Mr. J C K Rajasinghe, Mr. Janaka Mahindapala, Mr. T G N Mahinda, Mr. K R W B Kahandawa, Mr. C J Liyanarachchi, and Ms. Hiromi Nishanthi attended the training program on “Module Writing” conducted at the Open University and coordinated by the National Institute of Plantation Management.
- Mr. D K D Dissanayaka, Technical Officer participated in the short training program on ‘Agro meteorology’ at Gannoruwa on 4th-5th July 2012.
- Mr. N S Ekanayake, Technical Officer of Audio Visual Unit attended two months training program on ‘Video editing with Adobe Premiere Pro CS4’.

Agricultural Economics Division

Awards

- Oral presentation titled “Implementation of geographic information system to tea plantation management” by Ms. N N K Wellala, Dr. J Gunathilake and Dr. H W Shyamalie, received the award for the best oral presentation and the paper at the 4th Plantation Crop Research Symposium organized by Crop Research Institutes of Sri Lanka.
- Paper on “Potential for Eco-tourism in Up country Tea Estates in Sri Lanka” received a Gold Medal for the Agricultural Economics for research study in Sri Lanka, 2012, from Sri Lanka Agricultural Economics Association (SAEA).

Study Programs

- Mr. K W N Nadeeshani attended the two day workshop on “Social Sciences research and comprehensive research proposal development” held at National Science Foundation, Sri Lanka on 24th & 25th February 2012.
- Dr. H W Shyamalie attended the workshop on “Introduction to sampling and basic principles of sample selections” organized by SLAAS held on 15th June 2012.
- N L Rajawardana, final year student, University of Peradeniya completed her final research project on “Investigation of potentials of tea based eco-tourisms in Up country tea estates”.
- D P L K Dissanayake, HNDDT student, Naiwala completed a study on “Resource use efficiency of tea processing in the Up country”.

- K M P N Abhayapala, undergraduate student from University of Uva Wellassa completed his final year research project on “Productivity variations among tea small holdings in the Up country”.

Agronomy Division

Awards

Dr. M A Wijeratne received the first prize for excellence in tea research at the 4th Plantation Crop Research Symposium held on 20th-21st September 2012.

Study Programs & Foreign Visits

Dr. M A Wijeratne joined Sri Lankan delegation participated at the FAO/IGG sessions held in Washington DC in September, 2012.

Ms. Samanthi Jayasinghe left for China to follow a training course on ‘Pollution free tea production technology for developing countries’ from 04th May- 29th June 2012.

Mr. A P D A Jayasekara left for Australia to participate in a workshop on ‘Effective use of microbial fertilizers for an improved economy and environment in Sri Lanka’ and for 16th Australian N-fixation Conference from 17th June 2nd July 2012, held under AusAID PSLP Agreement 56648.

Dr. N P S N Bandara successfully completed his Ph D degree from Adelaide University, Australia and awarded the degree on 28th August 2012. The thesis is on ‘Agronomy of irrigated tea in the low elevation growing areas of Sri Lanka’.

Biochemistry Division

Awards & Grants

“Best Paper (Tea Sector) Award” was awarded to Dr. P A N Punyasiri for the paper titled ‘Chemodiversity of Sri Lankan Tea Germplasm; 1. Preliminary Quantification of Principle Metabolites using high throughput High Performance Liquid Chromatography’ at the 4th Plantation Crop Research Symposium. 20-21 September 2012, Colombo, Sri Lanka.

Dr. K M Mewan was awarded “SLAAS Postgraduate Research Award 2012-Commendation Award” in recognition of his contribution towards postgraduate research carried out in Sri Lanka, by the Sri Lanka Association for the Advancement of the Science (SLAAS) at its 68th Annual Sessions held on 10th Dec, 2012, Colombo, Sri Lanka.

Study Programs

- Mr. H M S B Heenkenda, Technical Assistant continued his ACLT training program at Open University of Sri Lanka.
- Dr. P A N Punyasiri participated in a meeting on ‘Accredited Laboratory Facility’ organized by the Industrial Development Board on 18th January 2012 at Industrial Development Board (IDB), Colombo, Sri Lanka.
- Dr. K M Mewan attended a workshop on ‘Module writing systems for the resource persons (module writers)’ at Open University of Sri Lanka, Nawala, Colombo, Sri Lanka.
- Dr. P A N Punyasiri and G A A R Perera participated in a seminar on ‘Agilent Spectroscopy’ on 24th April 2012 at Galadari Hotel, Colombo, Sri Lanka.
- Dr. K M Mewan participated in a seminar on “New developments and applications in Life Science Technologies (PCR, RT-PCR & Q-PCR)” on 8th May 2012 in Colombo, Sri Lanka.
- Dr. K M Mewan participated in a workshop on ‘Bio-safety of Genetically Engineered Crops: Best Practices from Laboratory to Farmers Fields’ conducted by ICGEB and GeneTech Institute from 21st to 25th May, 2012 at the National Science Foundation, Colombo, Sri Lanka.
- Dr. P A N Punyasiri attended the ISO SC 34/TC 8 meeting held in Colombo from 26th to 28th June 2012.
- Mr. GAAR Perera participated in a three day training programme on ‘Occupational safety & health and fire safety towards enhancing labour productivity’ organized by National Institute of Labour Studies, Colombo from 7th to 9th Nov, 2012.
- Dr. K M Mewan participated in a training programme on ‘Transforming the Organization through Team Building’ conducted by Skills Development Fund, Ministry of Youth Affairs & Skills Development on 4th Dec, 2012, TRISL Talawakelle, Sri Lanka.
- Ms. G H Totawattage participated in a workshop on ‘Bioassay Techniques’ organized by ITI, Colombo on 18-20th Dec 2012 at ITI Auditorium, Colombo, Sri Lanka.

Entomology & Nematology Division

Awards

- Dr. K M Mohotti, Head, Entomology and Nematology Division was awarded the second prize for best tea scientist at the Fourth Crop Symposium held in Colombo.
- Dr. K M Mohotti was appointed as the President of the Institute of Biology of Sri Lanka as recognition to the technical inputs rendered to the biological sciences.

Foreign Visits

- Dr. K M Mohotti attended the International Brain Storming Session on Tea Shot Hole Borer and *Fusarium* Complex held in California, USA in 2012 on an invitation by the Institute of Invasive Pests of California University and Avocado Association. He made visits to Shot Hole Borer affected avocado plantations and landscapes.

Study Program

- Ms. P D Senanayake, Research Officer, continued with the post graduate studies Kelaniya University leading to Ph D.

Plant Breeding Division

Awards

- Dr. M T K Gunasekare and Mr. M A B Ranatunga received Presidential awards for Scientific Research for 2007 and 2009 respectively.
- A collaborative research paper presented by Dr. P A N Punyasiri at the 4th Symposium on Plantation Crop Research was adjudged as the best paper in the tea sector.
- Mr. M A B Ranatunga has been appointed as a member of the Publications and Presentation Panel (PPP) of the Institute from October.
- Mr. M A B Ranatunga served as a resource personnel on the Capacity of Panelists at the Uva Wellassa University Research Symposium held in November.

Study programs

- Mr. A K Mudalige returned from University of Sabaragamuwa after completing his B Sc degree in March.

- Mr. J D Kottawa-Arachchi completed his postgraduate degree and awarded an M Phil in Agricultural Biology from Postgraduate Institute of Agriculture, University of Peradeniya.
- Mr. M A B Ranatunga and Mr. R Paskarathevan continued their postgraduate degrees.
- Mr. M A B Ranatunga attended a workshop on “Biosafety of Genetically Engineered Crops: Best Practices from Laboratory to the Farmers’ Fields” at NSF conducted by ICGEB and GeneTech Institute, Colombo in May.
- Mr. M A B Ranatunga and Mr. J H N Piyasundara attended a workshop on “Module writing for NIPM Diploma” at the Open University of Sri Lanka.

PUBLICATIONS AND SPECIAL PRESENTATIONS

Advisory & Extension Division

Publications

Samansiri B A D, Wanigasundara W A D P (2012) Use of “Information Center” approach in Agricultural Extension: Potential for using conventional information channels and ICT to integrate extension services for small and middle level tea growers in Sri Lanka. (Abstract) Proceeding of Development Challenges in the Asia Pacific: Millennium Development Goals and Beyond 9th International conference of NAPSIPAG, Colombo, page 88.

Sidhakaran V S (2012) Scope of private extension for the corporate sector tea plantations; Clientele perspectives. Proceedings of the fourth symposium on plantation crop research, September 20-21, 2012. Taj Samudra Hotel, Colombo, Sri Lanka.

Saman Ratnayake submitted an article on ‘Alga/Lichen condition appeared in tea lands and control measures’.

J C K Rajasinghe submitted a short article on collar rot experienced in Yatinuwara area under the title of ‘තේ වගා බිමේ සනීපාරක්ෂාව නොමැති වීම රෝග වලට අනවැරදිම’.

Special Presentations

Mr. B A D Samansiri made a presentation at the 9th International Conference of the Network of Asia Pacific Schools and Institute of Public Administration and Governance (NAPSIPAG) on the “Use of Information Center approach in Agricultural Extension: Potential for using Conventional Information Channels and ICT to Integrate Extension Services for Small and Middle level Tea Growers in Sri Lanka”, on 13th December at the Taj Samudra, Colombo.

Mr. Saman Ratnayake made a special presentation on ‘Tea Nursery Management’ as a visiting lecture for final year students of the Faculty of Agriculture at Mapalana on 24th March 2012.

Mr. K R W B Kahandawa participated at the quarterly meeting with the Government Agent and Assistant Government Agents of the Badulla District held at TRI Uva Centre on 15th August and made a presentation on Uva Tea Industry.

Agriculture Economics Division

Publications

Abhayapala K M P N., Shyamalie H W and Sampath Dharmadasa R A P I Productivity Variation Among Tea Smallholders in Up Country of Sri Lanka. Vol.I. pp 277-280. Proceedings of Research Symposium. ISSN 2235-9877. November 2012, Uva wellassa University of Sri Lanka.

Wellala N N K., Gunatilake J and Shyamalie H W Implementation of Geographic Information System to tea plantation management. Eds. L S K Hettiarachchi and I S B Abeysinghe. pp 359-370. Proceedings of 4th Symposium on Plantation Crop Research. 20th -21st September 2012. Taj Samudra Hotel, Colombo.

Wellala N N K., Gunatilake J and Shyamalie H W Application of Geographic Information System for Tea Plantation management as Decision Supporting Tool: A case study at St. Coombs Estate, Talawakelle, Sri Lanka. Eds. H Mehmood, R P De Silva and N K Tripathi, pp 178-182. Proceedings of 4th International Conference on Geo-information Technology for Natural Disaster Management. ISBN 978-616-90698-2-9. 7th -8th November 2012. Colombo, Sri Lanka.

Special Presentations

Dr. H W Shyamalie presented a paper on “Impact of political/ economical unrest on middle East & North African countries on tea sector in Sri Lanka” at the TSHDA auditorium, on 19th March 2012.

Dr. H W Shyamalie made a presentation on “Economic Model for Replanting” on 29th May 2012 at the Auditorium of Planters’ Association of Ceylon.

Dr. H W Shyamalie presented a paper on “Strategic cost management for profitability of tea estates” for 224th Experiment & Extension held on 29th July 2012 at the Auditorium of Tea Research Institute.

Dr. H W Shyamalie made a presentation on “Economic Model for Replanting” on 15th August 2012 at the Auditorium of Tea Research Institute.

Ms. N Nadeeshani presented a paper on “Implementation of Geographic Information System to tea plantation” at 4th Plantation Crop Symposium held on 22nd September 2012 at Taj Samudra Hotel, Colombo.

Dr. H W Shyamalie presented a paper on “Strategic Cost Management for Profitability of Tea Plantations” on 19th October 2012 at the Auditorium of Research, Advisory and Extension Centre- Low Country Region, Ratnapura

Dr. H W Shyamalie delivered a lecture on “Cost of tea cultivation” on 25th October 2012 at the Auditorium of Tea Research Institute.

Dr. H W Shyamalie presented a paper on “Cost Saving Strategies for Tea Sector” for Regional Scientific Committee held on 1st November 2012 at the Advisory and Extension Centre, Kottawa.

Ms. N Nadeeshani presented a paper on “Application of Geographic Information System for tea plantation Management as Decision supporting Tool”- A case study at St.Coombs estate, Talawakelle on 8th November 2012 at the 4th International Conference on Geo-Information Technology for Natural Disaster Management.

Dr. H W Shyamalie presented a paper on “කුඩා තේ ඉඩමක නිෂ්පාදන පිරිවැය පිළිබඳ විශ්ලේෂණයක්” for Regional Technical and Extension Forum (RTEF)- Ratnapura held on 30th November 2012 at the Research & Advisory and Extension Centre- Ratnapura.

Dr. H W Shyamalie presented a paper on “ලාභදායී තේ වගාවක් සඳහා පිරිවැය කළමනාකරණය” for Regional Technical and Extension Forum (RTEF)- Nuwara Eliya held on 3rd December 2012 at the auditorium of Research & Advisory and Extension Centre, Hantana.

Dr. H W Shyamalie delivered a lecture on “Application of Economic Principles to Tea Sector” on 19th December 2012 at the Auditorium of Tea Research Institute.

Agronomy Division

Publications

Abeyratna O P I A, Wijeratne T L, Gunatilaka R P D, Jayasinghe H A S L (2012). The shoot growth pattern of tea (*Camellia sinensis*) during different stages of the pruning cycle. *In* Proc. of the Research. Symposium, University of Uva Wellassa, Sri Lanka, Nov. 22-23, Badulla: 281-283 pp.

Bandara N P S N (2012). Micro irrigation techniques in low grown tea, Proc. of the of 4th Plantation Crop Research Symposium, held on 20-21st September in Colombo.

Bandara N P S N (2012). Irrigation in tea. Proc. of the 224th E & E Forum of the TRI, 27th January 2012.

Caldera H I U, De Costa W A J M, Wijeratne M A and Ranwala S M W (2011). Response of stomatal characteristics of Sri Lankan tea cultivars to environmental change. Proceedings of the International Conference on the Impact of Climate Change on Agriculture. December 20, 2012. Faculty of Agriculture, University of Ruhuna, Kamburupitiya, Sri Lanka. Pp 114-122.

Prematilake K G (2012). Do our herbicide application methods safe enough and effective enough?, CROP LIFE, Sri Lanka Plant Protection Industry Journal, Crop Life of Sri Lanka, which is a full member of Crop Life Asia. Vol. 5, August 2012, pp 58-61.

Rasith M J A, Damayanthi M M N, Alwis L M H R (2012). Identification of Drought tolerant Accessions of tea (*Camellia sinensis*) in Uva region. In Proc. of the Research Symposium of University of Uva Wellassa, Sri Lanka, November 22-23, Badulla, 233-237 pp.

Swarnamalli M A N, Prematilake K G, Gunatilaka R P D, Jayasinghe H A S L (2012). Perception of tea Smallholders in Badulla district in adopting mix crop cultivation. In Proc. of the Research Symposium of University of Uva Wellassa Sri Lanka, November. 22-23, Badulla, 227-229 pp.

Wijerathne M A (2012). Climate Change, Agriculture & Pests and Diseases Management, Sri Lanka Plant Protection Industry Journal, Crop Life of Sri Lanka, which is a full member of Crop Life Asia, Vol. 5, August 2012, pp 20-21.

Wijeratne M A, Shaymalee H W and Kahatapitiya H (2012). Shear harvesting, its agronomic, economic and practical advantages/ aspects, Proc. of the 224th E & E Forum of the TRI, 27th January 2012.

Special Presentations

Dr. K G Prematilake served as a resource person and made a presentation on ‘Effective use of spray machines in tea cultivations’ at a workshop on ‘Selection and use of sprayers for crop protection in Sri Lankan conditions’ organized by Farm Mechanization Research Centre and Agricultural Machinery Manufacturers & Suppliers Association at the HARTI, Colombo on 15th June.

Dr. M A Wijeratne made presentations on climate change impacts on tea and adaptation measures at the Annual General Meetings of Planter's Associations at Nuwara Eliya, Kandy, Badulla, Kandy, Avissawella and Dikoya planting districts, Tea Exporters Association and Sri Lanka Tea Factory Owners Associations of some regions.

Dr. N P S N Bandara made a presentation on 'The use of Micro irrigation techniques in low grown tea' at the 4th Plantation Crop Symposium held in Colombo on 20th- 21st September 2012.

Biochemistry Division

Publications

Meran E P K, Mewan K M and Abeysinghe I S B (2012). Use of microsatellite markers to identify genetically diverse individuals from old seedling tea (*Camellia sinensis* L.) populations in Sri Lanka. Fifth Annual Scientific Sessions, Institute of Biochemistry, Molecular Biology and Biotechnology, University of Colombo, Sri Lanka. April, 2012, Colombo, Sri Lanka. pg 21.

Punyasiri P A N, Brasathe J and Madhujith W M T (2012). Quantification of Flavonols in Sri Lankan Black Tea. Proc. of Int. Conference on Chemical Sciences, Colombo, Sri Lanka June, 2012, Colombo, Sri Lanka.

Sandaruwan N B W P, Samarasinghe S I and Punyasiri P A N (2012). A Study of the Interactions of Milk with Different Grades of Black Tea Polyphenols and Determination of their Antioxidative Properties. Proc. of Int. Conference on Chemical Sciences, Colombo, Sri Lanka June, 2012, Colombo, Sri Lanka.

Mewan K M, Abeysinghe I S B, Saha M C, Yongzhen-Pang, Karunanayake E H, Tirimanne T L S, Everard J M D T and Dixon R A (2012). Development of genomic and EST microsatellite markers and their usefulness in genetic conservation and improvement of tea (*Camellia sinensis* L). In Proceedings of the 4th Plantation Crop Research Symposium. September, 2012, Colombo, Sri Lanka. Pg 85- 103.

Nimal Punyasiri P A, Brasathe Jeganathan, Dananjaya Kottawa-Arachchi J, Mahasen A B Ranatunga, I Sarath B Abeysinghe, Kumudini Gunasekare M T, and Ratnayake Bandara B M (2012). Chemodiversity of Sri Lankan Tea Germplasm; 1. Preliminary Quantification of Principle Metabolites using high throughput High Performance Liquid Chromatography. In Proceedings of the 4th Plantation Crop Research Symposium. September, 2012, Colombo, Sri Lanka.

Special Presentations/ Meetings

Dr. P A N Punyasiri conducted a guest lecture at the Kandy District Planters Association meeting on 5th June 2012, Kandy, Sri Lanka.

Dr. P A N Punyasiri and Dr. K M Mewan participated in a meeting on 'Private public partnership' with the Chairman, National Research Council, on 8th Aug 2012 at NRC, Colombo, Sri Lanka.

Dr. PAN Punyasiri and Dr. K M Mewan and Mr. G A A R Perera participated in a meeting on 'Private Public Partnership' with two scientists from Natures Beauty Creations Ltd which was chaired by Director, TRI on 9th Aug 2012 at TRISL, Talawakelle, Sri Lanka.

Dr. P A N Punyasiri and Dr. K M Mewan participated as resource persons in a Workshop on 'Know Your Tea' organized by Unilever Sri Lanka Ltd on 03rd October 2012 at Nuwara Eliya, Sri Lanka.

Two research papers were presented by Dr. P A N Punyasiri and Dr. K M Mewan at the 4th Symposium on Plantation Crop Research which was held in September.

Entomology & Nematology Division

Publications

Jayani K L D S, Mohotti A J, Weerakkody W A P and Mohotti K M (2012). Suitability of Vermiwash as an alternative fertigation option for tea (*Camelia sinensis* (L.) Kuntze) and Citrus (*Citrus aurantifolia* L.) in hydroponics, International Conference on Soilless Culture, Shanghai, China. 25.

Mohotti K M, Priyadarshani K C, Amarasena P G D S and Nugaliyadda L (2010). Potential Use of Soil Organic Amendments for the Management of Up country Live Wood Termites. Sri Lanka Journal of Tea Science, Vol. 75, Part 1, 42-53.

Mohotti K M, Amarasena P G D S, Sagarika P L T and Gajanayake K G M C P B (2012). Impact of soil pesticides on microbial activity of different tea soils in Sri Lanka, Environmental toxicants and their effects on species and ecosystems, Supplementary Booklet, 32nd Annual Sessions of the Institute of Biology Sri Lanka, 6-13.

Senanayake R D P D, Mohotti K M and P A Paranagama (2011). Kiromonal activity of ethyl acetate extract from rotted tea stems for low country live wood tea termite *Glyptotermes dilatatus* Bugnion & Poppof (Isoptera: Kalotermitidae), 12th Annual Research Symposium, University of Kelaniya, 154.

Special Visitors

Prof. Zvi Mendel, Entomologist, Department of Entomology and Dr. Stanley Freeman, Pathologist, Dept. of Plant Pathology and Weed Research, Agricultural Research Organization (ARO), The Volcani Center, ISRAEL made a study tour to the Division to learn about research progress made on shot hole borer in tea with special reference to insect fungal associations.

Dr. Muralidharan, Director, TRA and two scientists from Tocklai Tea Research Association, India visited Entomology and Nematology Laboratories.

A group of students from Michigan University, USA and University of Peradeniya visited Entomology and Nematology Laboratories on Study Abroad Training especially on pest management organized by the Agricultural Education Unit of the University of Peradeniya.

Training Programs

The following programs were conducted during the period under review.

Training on 'Safe use of pesticides' conducted for operational level staff of Talawakele Plantations PLC.

A field day on 'IPM of tea pests' for Kiruwanaganga estate staff.

Training on 'Pest management and organic farming' was conducted to management trainees of Watawala plantations and trainee assistant managers of Frotoft estate.

Field awareness program at Matugama for a smallholder group.

Awareness programme on 'Pest management for Management' for trainees from A. Buar & Company.

Training on 'SHB and Nematode Sampling techniques' for assistant superintendents and field officers of Pupuressa region.

'Mini Crop Clinic' at Matugama for smallholders.

Special presentations

Dr. K M Mohotti delivered the following presentations.

'White Grub Control' at RTEF, Mid country.

'New recommendations on Shot hole borer and Live wood termite management' at RTEF, Galle.

'Shot hole borer and mite control' at RTEF, Low country.

Plant Pathology Division

Publications

Pradeepa N H L, Weerasena O V D S J, Liyanaarachchi C J, Wijesundera R L C and Abeysinghe I S B (2012). Identification of *Macrophoma theicola* Petch in Tea using ITS region sequencing. pp 116-117. Proceedings of Fifth annual scientific sessions of IBMBB. University of Colombo. 27th April 2012. Colombo.

Sinniah G D, Alagiyawadu U D and Wasantha Kumara K L (2012). An assessment key for tea blister blight: Development and validation. pp 135-144 4th Symposium on Plantation Crop Research. 20-21st September, 2012. Taj Samudra, Colombo.

Pradeepa N H L, Weerasena O V D S J, Liyanaarachchi C J, Karunajeewa D G N P, Wijesundera R L C and Abeysinghe I S B (2012). Sensitivity of *Macrophoma theicola* Petch isolates to the fungicide hexaconazole in tea in Sri Lanka. pp 155-161 4th Symposium on Plantation Crop Research. 20-21st September, (2012). Taj Samudra, Colombo.

Samarasekara L A A S, Chandrasena G and Sinniah G D (2012). Induced biochemical defence mechanisms in tea against Blister blight. In Ed. R P De Silva Proceedings of Research Symposium of Uva Wellassa University, 22- 23 November 2012, pp 203-206.

Trainees

L A A S Samarasekara, Final year student of Uva Wellassa University, successfully completed her final year research project on Induced biochemical defence mechanism of tea against blister blight.

A S Prasanga, student of NAITA, Naiwalla, successfully completed his in plant training from April- July 2012.

Plant Breeding Division

Publications

Gunasekare M T K, Ranatunga M A B, Piyasundara J H N and Kottawa-Arachchi J D (2012). Tea genetic resources in Sri Lanka: Collection, conservation and appraisal. International Journal of Tea Science, 8 (3) 51-60.

Piyasundara J H N, Ranatunga M A B, Gunasekare M T K, Upali P D, Paskaradevan R, Kottawa-Arachchi J D, Ranaweera K K, Sarathchandra T M and Mudalige A K (2012). Improved tea seeds as a source of planting material: A strategy for adaptation to

climate change. 1-9 pp. *In* Eds. L S K Hettiarachchi and I S B Abeysinghe Proceedings of the Fourth Symposium on Plantation Crop Research- Technological Innovations for Sustainable Plantation Economy. Tea Research Institute of Sri Lanka, St. Coombs, Talawakelle, Sri Lanka.

Ranaweera K K, Gunasekare M T K and Eeswara J P (2012). Integration of low cost micro-propagation technique to accelerate the breeding program of tea *Camellia sinensis* (L.) O. Kuntze. 35-44 pp. *In* Eds. L S K Hettiarachchi and I S B Abeysinghe Proceedings of the Fourth Symposium on Plantation Crop Research- Technological Innovations for Sustainable Plantation Economy. Tea Research Institute of Sri Lanka, St. Coombs, Talawakelle, Sri Lanka.

Punyasiri P A N, Jeganathan B, Kottawa-Arachchi J D, Ranatunga M A B, Abeysinghe I S B, Gunasekare M T K and Bandara B M R (2012). Chemodiversity of Sri Lankan tea gemplasm: Preliminary quantification of major metabolites in tea accessions by High Performance Liquid Chromatography. 105-121 pp. *In* Eds. L S K Hettiarachchi and I S B Abeysinghe. Proceedings of the Fourth Symposium on Plantation Crop Research- Technological Innovations for Sustainable Plantation Economy. Tea Research Institute of Sri Lanka, St. Coombs, Talawakelle, Sri Lanka.

Ruwanpura U D R E, Ranatunga M A B and Alwis L M H R (2012). Morphological characterization of newly improved tea (*Camellia sinensis* L O Kuntze) cultivars. *In* Ed. R P De Silva. Proceedings of the Research Symposium of Uva Wellassa University. (I) 263-266.

Book Chapters

Gunasekare M T K (2012). Tea Plant (*Camellia sinensis*) breeding in Sri Lanka; *In*: Global Tea Breeding- Achievements, Challenges and Perspectives. Ed. Liang Chen, Zeno Apostolides, Zong-Mao Chen, Springer- Verlag Berlin Heidelberg/Zhejiang press, e-ISBN 978-3-642-31878-8.

Special Presentations

Two research papers were presented by J H N Piyasundara and K K Ranaweera at the 4th Symposium on Plantation Crop Research which was held in September.

Process Technology Division

Publications

Raveendran K, Amarasinghe A D U S and Botheju W S (2012). A study on Fluidization behavior of Orthodox- Rotorvane teas. Proceedings of the 4th Symposium on Plantation Crop Research September 20 -21. pp 283-293.

Soils and Plant Nutrition Division

Publications

Liyanage L R M C, Jayakody A N, Wijayathunge W M S, Gunaratne G P (2012). Feasibility of using soil pH buffering capacity for dolomite recommendation for tea growing soils in Sri Lanka. Proceedings of the, 4th Symposium on Plantation Crop Research Colombo, pp 253-264.

Special Presentations

L R M C Liyanage made a presentation on “Feasibility of using soil pH Buffering Capacity for Dolomite Recommendation” at the 224th Experiment and Extension Forum (English) held at the auditorium, TRI Talawakelle on 17th February 2012.

Dr. G P Gunaratne made a presentation on Results of Adaptive Trials at the Ministry of Plantation Industries on 26th June 2012.

L R M C Liyanage made a presentation on “Feasibility of using soil pH buffering capacity for Dolomite recommendation for tea growing soils in Sri Lanka” at the Fourth Symposium on Plantation Crop Research held at Hotel Taj Samudra, Colombo on 20-21 September 2012.

Dr. G P Gunaratne made presentations on “Fertilizer adaptive trials- Results and Recommendation” at the 28th Experiment and Extension Forum (Sinhala) held at TRI, Ratnapura on 21st December 2012.

TRAINEES

Biochemistry Division

Six undergraduate students started their final year research projects and two post graduate students started their M Phil Degrees on two NRC funded research projects.

Agronomy Division

Five university undergraduates completed their final year projects at the TRI, Talawakelle and Low country Regional Center, Ratnapura. Five NAITA trainees were trained at the division (Talawakelle and Ratanapura) on field and laboratory activities.

Entomology & Nematology Division

Four undergraduate and one Ph D student projects were supervised on Integrated pest management, Non-chemical pest control and Organic tea cultivation by Dr. K M Mohotti.

Soils and Plant Nutrition Division

N P R S W Jayasooriya and K M K P Kulathunge HNDT (Agriculture) students have successfully completed their familiarization training at the Division.

M M P Jayasundara, K H U D S H Uluwatta and W M S L Wattagama, HNDT (Agriculture) students have successfully completed their in-plant training at the Division.

Dulani Dayarathne a student from the Open University of Sri Lanka has successfully completed her familiarization programme at the Division.

U R H S Bandara from Kalani Valley Plantation has undergone a training on Soil, plant and fertilizer analysis at the division from 6- 24 August 2012.

Suresh Kumar an undergraduate student from Rajarata University of Sri Lanka has successfully completed his final year research programme at the Division.

TRI ESTATES

St. Coombs Estate - Talawakelle

Superintendent - Mr. T M S K Tennakoon

Staff Members

1. D H Jayatillake
Chief Clerk
2. H M Badra P K Jayathilake
Associate Member-Australian Computer Society
Certificate Course in Human Resource Management
Senior Assistant Clerk
3. T G S Chandrakanthi
Clerk
4. K Rajkumar
Junior Assistant Clerk
5. E M Dayaratne
Head Factory Officer
6. H M R Kuladasa
Assistant Factory Officer
7. S M Sunil Shantha
Assistant Factory Officer
8. P Mohotti
Junior Assistant Factory Officer
9. S Sivan
Factory Mechanic
10. Nimal De Silva
Field Officer
11. N Illangeswaran
Field Officer
12. I W M D Alahakoon
Assistant Field Officer
13. S Suresh
Field Officer
14. S D Perera
Junior Assistant Field Officer



15. S Fernando (Pending disciplinary inquiry)
Estate Medical Practitioner
16. D Puniyamoorthy (On no-pay leave)
Welfare Officer
17. G N Sylvester
Creche Attendant
18. K Jothy
Creche Attendant
19. T Ponmany
Creche Attendant
20. K Selvaraj
Driver
21. S Christopher
Driver
22. T Ramanathan
Driver
23. R Udayakumar
Driver
24. D Sundareson
Driver

Achievements

St. Coombs was awarded for the following achievements:

- Award for the highest sale average for the year 2012 in Western High Grown category
- Gold Award for being in the 1st rank in 2012 in Western High Grown category
- Award for achievements in the all time record price for Dust No.1 (Rs. 700.00)
- Award for most no. of the top prices for Dust No.1 Grade
- The Gross Sale Average for 2012 was Rs. 456.67, which is Rs. 69.83 above the Western High Grown elevation average

Crop & yield

	2012	2011
St. Coombs	185,5032,282	205,1552,573
Lamiliere	107,3782,309	103,3502,221
Total	292,8812,293	308,5052,444
Bought leaf	83,831 -	35,626 -
Grand total	376,7122,293	344,1312,444

A yield of 2,293 kg/ha was recorded in the year 2012.

Replanting

- 1.92 ha of rehabilitated land was planted with new TRI cultivars
- Field no. 13B (Planting 2009) was taken into the revenue extent in year 2012

ADB Mother Bush project

526,652 VP shoots from TRI 3000 & 4000 series cultivars were issued to Tea Smallholders and the Corporate Sector. Profit made from this Project for the Year 2012 was Rs. 432,192.43.

Factory and manufacture

Increased the bought leaf production and profitability

Crop : 83,831 kg (MT)

Profit : Rs. 1,420,097.14

General

- M Madugalle, visiting agent visited the estate on 25th July 2012.
- M/s. Forbes & Walker Tea Brokers (Pvt) Ltd. continued auctioning the St. Coombs teas.
- P H G K Jayaratne, Senior Assistant Factory Officer and P Selvendran, Junior Assistant Field Officer resigned from the posts w.e.f. 5th March 2012 and 25th April 2012 respectively.
- D Puniyamoorthy is on “No-Pay Leave” w.e.f 28-06-2012 to 28-06-2014.
- S Fernando, Estate Medical Practitioner has been suspended from his services w.e.f. 10th May 2012 and pending disciplinary inquiry.

Working results

- The estate made a profit of Rs. 22,967,383.95 for the season.

St. Joachim Estate - Ratnapura

Superintendent - Mr. P S Habaragoda

St. Joachim estate staff list

1. Nilani Koralage
Snr. Asst. Clerk
2. K M G L Dias
Jnr. Asst. Clerk
3. A Sivanandhini
Jnr. Asst. Clerk
4. S K Edirisinhge
Asst. Factory Officer
5. J R Yapa
Asst. Factory Officer
6. H T K Nihal
Jnr. Asst. Factory Officer
7. D A J Pushpakumara
Jnr. Asst. Factory Officer
8. P P Wickremaratna
Jnr. Asst. Fact. Officer
9. Rohana Premalal
Jnr. Asst. Fact. Officer
10. W N Perera
Jnr. Asst. Fact. Officer
11. V Ariyaraj
Jnr. Asst. Fld. Officer
12. J Senadeera
Jnr. Asst. Fld. Officer
13. M K Pulle
E.M.A
14. M W Jayasekera
Storekeeper/Clerk
15. J Kumara
Lorry Driver
16. N Jayamaha
Suptd's Driver



Achievements

Presidential Award for Best Tea Factory of (Small Scale) of Ratnapura Region 2012.

Hectarage as at 31st December 2012

1.	V.P. tea in bearing *	46.34
2.	Major in-filled area Field no. 2f	1.18
3.	Major in-filled area Field no. 8A	0.50
4.	TRI coconut area	3.89
5.	Nurseries	1.58
6.	Estate rubber	7.12
7.	Mature rubber (Inter- crop area)	5.68
8.	Paddy fields	8.74
9.	ADB fields- N.C. tea *	30.00
10.	TRI buildings and exp. use field no. 9	11.02
11.	Buildings, roads, jungle & patna	25.93
		141.98

As per a bush count undertaken in Dec 2012, the effective hectarage is given below

V.P. tea bearing estate	- 13.40 ha
ADB land released for plucking	- 12.07 ha
Total effective hectarage	- 25.47 ha

Crop (made tea kg)

The production on St. Joachim estate in 2012, compared to the previous year was as follows

A). TEA

Year	Made tea (kg)	
	Estate crop	Bought crop
2011	46,427	349,861
2012	45,305	237,760
Variance	-1122	-112,101

Estate crop continues to decrease as the effective bush count is coming down year on year.

B). RUBBER

Year	Estate crop (kg)	Yield (kg)
2011	12960	1138
2012	11233	1040
Variance	-1727	-98

Cultural operations

The normal GAPs were undertaken, with the inclusion of burying of pruning in pruned fields with a view of improving soil fertility status.

Tea infilling, new clearing, rubber planting

Block infilling in field no. 04 was carried out and field no. 03 new clearing was carried out as follows.

Tea

Year	Field no.	Total no. of plants put out	Resupplied
2011/2012	03	16,500	3000
2010/2011/2010	04	14,350	2,500
2011/2012	Nursery Block	975	132

Rubber

2010	10	511	-
2011/2012	03	1339	111

Nursery plants

Nursery plants sold for the year- 99,443.

ADB mother bush project

A total of 250,650 shoots were issued to Smallholders and the Corporate Sector as against 287,445 in 2011.

Factory manufacture

A NSA of 389.70 was achieved in the year 2012 as against 371.62 in 2011.

Bought leaf

The bought leaf manufactured at St. Joachim factory showed a decrease of 112,101 kg. The leaf intakes have decreased due to heavy competition with private factories in the area.

Weather and rainfall

Rainfall of 3516.20 mm was recorded on 153 wet days, as against 3582.66 mm on 148 wet days in 2011.

Trading results

The working results of St. Joachim estate resulted in a loss of Rs. 6,728,147.00 approximately as at 31/12/2012 compared to a trading loss of Rs. 16,024,259.80 in the previous year.

Staff appointments and resignation

N D A Gunawardena, Chief Clerk of St. Joachim estate resigned from service with effect from 10/02/2012.

General

- M/s. Forbes & Walker Tea Brokers (Pvt) Ltd and Bartleet & Co. Ltd continued to be the brokers of St. Joachim teas.
- The following development work were carried out in the St. Joachim factory.
Roller No. 08 was re-tabled.
- The visiting agent Nimal M Amarasekera made two visits to this estate on 19th April 2012 and 4th October 2012.

ADMINISTRATION AND FINANCE

Special highlights

- Prof. Zui Mendel, Entomologist and Dr. Stanly Freeman, Pathologist, Agricultural Research Organization, Israel visited TRI from 28th February to 2nd March, 2012.
- Students of Saga National University, Japan visited TRI from 2nd to 5th October, 2012.
- Students from Michigan State University, USA visited TRI from 27th May to 1st June, 2012.

1. Human Resource Development and Capacity Building

a) Staff strengthening and motivation

Staff Recruitments

Name	Designation	Date
W M T B Weerasekera	Accountant	14.05.2012
T L Samaraweera	Public Relations & Welfare Officer	17.07.2012
B M B Basnagoda	Administrative Officer	23.04.2012
N D M Karunadasa	Administrative Officer	05.06.2012
G B Jayawardena	Accounting Officer	05.09.2012
R M N M Ariyaratne	Management Assistant	03.12.2012
D S C Weerasooriya	Management Assistant	03.12.2012
W A N S Wijesinghe	Administrative Officer	23.04.2012

Promotions

Name	Designation	Date
Dr. L S K Hettiarachchi	Additional Director	06.08.2012
Dr. H W Shyamalie	Senior Research Officer	06.08.2012
Dr. V S Sidhakaran	Principle Advisory Officer	06.08.2012
J C K Rajasinghe	Principle Advisory Officer	06.08.2012

Resignations

Name	Designation	Date
P K S Dayananda	Experimental Officer	02.01.2012
Dr. M T K Gunasekera	Head, Plant Breeding	05.01.2012
D L A L A Dassanayake	Research Officer	10.02.2012

K P H Liyanage	Publication/Publicity Officer	28.02.2012
M L H Perera	Transport Officer	31.03.2012
A J Gamage	Experimental Officer	03.08.2012
E P Wijewardena	Technical Officer	31.07.2012
R M E N K Randeniya	Technical Officer	31.07.2012
B M N J Basnayake	Technical Officer	31.07.2012
D V R I Deniya Pahala	Technical Officer	31.07.2012
I P S D Wickremasooriya	Technical Officer	31.07.2012
A V K S Perera	Technical Officer	31.07.2012
R A I W K Ranatunge	Technical Officer	27.07.2012
C D Jayasinghe	Technical Officer	27.07.2012
Ranjani Jayasinghe	Clerk/Typist	07.08.2012
S Bastian	Driver	07.09.2012
G W M S N Gunasekera	Technical Officer	01.10.2012
W A A H Shamaka	Technical Officer	22.10.2012
K A S A Rupasinghe	Technical Officer	22.10.2012
M D K S Tilakasiri	Technical Officer	22.10.2012
R Mahendran	Guest House Keeper	26.11.2012

Retirements

Name	Designation	Date
P D Upali	Experimental Officer	14.07.2012
W P A N Jayasinghe	Chief Clerk	26.01.2012
S G Punchibanda	Accounting Officer	25.11.2012

Termination

Name	Designation	Date
K J C J Rodrigo	Deputy Director (Admn)	02.02.2012

Transfers

Name & Designation	Place of Transfer	Date
M D Chandana, Driver	TRI Regional Advisory and Extension Centre, Deniyaya	17.09.2012
S P D Tharanga, Driver	TRI, Talawakelle	17.09.2012
L R M C Liyanage, Research Assistant	TRI Mid country Station, Hantane	15.10.2012
G Weerapperuma	TRI, Talawakelle	15.10.2012
Chandima de Seram	TRI Low country Station, Ratnapura	01.11.2012

b) Overseas Training/ Seminars/ Conference

- Dr. S S B D G Jayawardena, Chairman, TRB participated at the “Tea Traders Annual Reception and Foodex 2012” in Japan from 5th - 13th March, 2012.
- Dr. S S B D G Jayawardena, Chairman, TRB participated as a Member of the delegation with the Honourable Minister of Plantation Industries from 6th - 12th May, 2012 in Australia.
- L A S P Jayasinghe, Experimental Officer, TRI attended the training course on “Pollution free tea productive technology for developing countries” from 4th May - 29th June 2012 in China.
- A P D A Jayasekera, Experimental Officer attended the training course on “Effective use of Microbial fertilizer for an improved Economy and Environmental in Sri Lanka” from 17th June- 1st July, 2012 in Australia.
- Dr. K M Mohotti, Head, Entomology & Nematology Division participated at the “Brainstorming meeting on shot hole borer” from 12th - 14th August, 2012 at University of California, USA.
- A L R U Kumara, Extension Officer attended the training programme on ‘Tea Testing and quality assurance’ from 1st- 30th November, 2012 at Kothari Agricultural Management Centre, India.
- Dr. I S B Abeysinghe, Director, TRI and Dr. K M Mohotti, Head, Entomology & Nematology Division participated at the ‘International meeting of the Inter Government Group on Tea’ from 17th- 21st September, 2012 at Washington, USA.
- Dr. S S B D G Jayawardena, Chairman, TRB participated at the ‘India International Tea Convention’ held in India from 7th- 9th November, 2012.

c) Local Training/ Seminars/ Workshops

U A Wickremasinghe, Electrical Foreman, Electrical Division, attended two days training on “Electrical energy conservation in industries and services organizations” at the Institute of Industrial Techno Management (Pvt) Ltd.

Various research divisions of the Tea Research Institute had trained 14 University Students and 12 Diploma students from other Institutions.

2. Infrastructure Developments and maintenance

a) Infrastructure developments

- Repairing of the main entry road-side drains at Head Office, Talawakelle was completed at a cost of Rs. 300,000.00.
- Construction of a vehicle ramp at TRI Mid country Regional Centre, Hantane was completed at a cost of Rs. 228,434.00.
- Construction of fertilizer stores at TRI Low country Regional Centre, Ratnapura was completed at a cost of Rs. 926,175.04.
- Concreting of a 213 m length internal road at TRI Advisory & Extension Centre, Deniyaya was completed at a cost of Rs. 989,540.72.
- Construction of 'D Type' twin quarters at TRI Advisory & Extension Centre, Deniyaya was completed at a cost of Rs. 3,142,059.25.
- Renovation of 'D Type' quarters at TRI Advisory & Extension Centre, Kottawa was completed at a cost of Rs. 1,000,087.00.
- Renovation of Drivers' Rest Room at the Uva Extension Centre, Passara was completed at a cost of Rs. 644,428.17.
- Renovation of TRI Sports Club roof at Head Office, Talawakelle was completed at a cost of Rs. 1,028,960.97.
- Modification of Reception Counter at the Head Office was commenced in December, 2012 with a cost of Rs. 885,381.92. Work is in progress.
- Renovation of 'C Type' quarters at TRI Advisory & Extension Centre, Kottawa was commenced in October, 2012 and the work is in progress at a cost of Rs. 740,823.04.
- Construction of Well and Pump House at Head Office, Talawakelle was commenced in December, 2012 and work is in progress at a cost of Rs. 1,813,287.06.

b) Maintenance work

- Annual colour washing programme including Director's Office, Board Room, Library, Laboratory buildings, Purchasing Unit, Transport Unit, General Stores, Resident Engineers's Office, Administration building (external) Ladies Hostel Room Nos. 4, 6, 7, 8, 12 & 13; - 'A Type' Bungalows 9, 3 - 'B Type' Bungalow 14- 'C Type' Bungalows 56, 28, 25, 51, 09, 55, and 6 - 'D Type' Quarters 24, 40, 53, 54 were completed.
- Total of 258 MB Job cards were completed.
- Entry road to TRI from Mattakelle junction on the Hatton-Nuwara Eliya main road periodically maintained.
- Water filter plant, sedimentation tank and storage tanks at Head Office were periodically cleaned.

- 280 WS job cards were completed.
- Installation of plastic water tanks at staff quarters, A 6, C 16, C 20, C23, C24, C 27, C 28, D 32, C 42, C 54, C 55 , C 58, D 59, Dukes Bungalow, and Technology Division were completed.
- Installation of pressure pump at motor garage was completed.
- Installation of water geysers at A 06, A 05, B 01, C 04, C 52, Camellia Hostel, and Ladies Hostel were completed.

c) Telephone exchange

- Two new telephone connections were given.
- Attended to 28 maintenance jobs (Office 17 nos. Bungalow 11 nos.)
- Attended to 236 nos. break downs.
- Fixed 03 new telephone instruments.

d) Electrical unit

- Undertaken maintenance work at quarters, hostels, laboratories of TRI, St. Coombs estate, Dukes Bungalow, Colombo Guest House and sub stations.
- Re-wiring & installation of Guest House and 'D Type' bungalow were completed.
- Installation of street light at Deniyaya Regional Centre was completed.

e) Procurement activities

Departmental Procurement Committee (Major & Minor)

- Nine Departmental Procurement Committee (Minor) meetings were organized for the purchase of both foreign and local items such as chemical 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.
- Thirteen Departmental Procurement Committee (Major) meetings were organized for the purchase of fertilizer, expenditure for organizing the 4th Symposium on Plantation Crop Research, disposal of Nissan Sunny car GK 2184, firewood for St. Coombs & St. Joachim estates, annual journals for library, PABX system for telephone exchange, multi wall paper sacks & rigid tea sacks for St. Coombs & St. Joachim estates, insurance coverage for buildings and vehicles, sale of used motor vehicles, provision of security service to head office and its centres, 14 nos. computer *etc.*

f) Transport and Motor Garage

Nine vehicles were rehabilitated/repared with an approximate cost of Rs. 1,939,349.00. Day-to-day, scheduled and weekend transport services were satisfactorily provided to facilitate R & D activities and for welfare. Routine maintenance and day-to-day repairs of the vehicle fleet was also attended. Completed overhauling of engines, service and lubrication, replacement of tyres and tubes and miscellaneous repairs related to wear and tare.

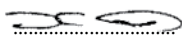
- Vehicle fleet mileage done - 959703 km
- Motor bicycle mileage done - 65882 km

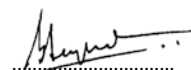
FINANCIAL PERFORMANCES

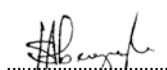
TEA RESEARCH BOARD

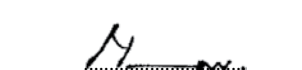
STATEMENT OF FINANCIAL POSITION AS AT 31st DECEMBER 2012

	Note	2012 Rs. '000	2012 Rs. '000	2011 Rs. '000
ASSETS				
Non-Current Assets				
Property, Plant and Equipment	03	1,052,526		999,922
Less:- Accumulated Depreciation		<u>651,875</u>		<u>614,912</u>
			400,651	385,010
Capital work-in-progress	04		<u>5,348</u>	<u>11,706</u>
			<u>405,999</u>	<u>396,716</u>
Intangible Assets	05		<u>2,404</u>	<u>23</u>
			408,403	396,739
Current Assets				
Inventories/Stocks	06		20,112	21,354
Trade and Other Receivables	07	65,953		101,378
Less:-Provision for Bad Debts		<u>103</u>		<u>62</u>
			65,850	101,317
Deposits and Prepayments	08		13,287	596
Cash and Cash Equivalents	09		<u>53,978</u>	<u>59,691</u>
			<u>153,227</u>	<u>182,958</u>
Excess & Shortages	10		<u>29</u>	<u>28</u>
Total Assets			561,659	579,725
LIABILITIES				
Current Liabilities				
Creditors and Payables	11	15,539		19,904
Accrued Expenses	12	<u>33,086</u>		<u>29,362</u>
			48,625	49,266
Non-Current Liabilities				
Provision for Gratuity	13	142,640		140,157
Petrol Deposit Refundable	14	26		24
Bank Overdraft	15	<u>2,500</u>		<u>-</u>
			145,167	140,182
Total Liabilities			<u>193,791</u>	<u>189,448</u>
Total Net Assets			<u>367,868</u>	<u>390,278</u>
NET ASSETS/EQUITY				
Tea Research Fund			240,030	268,710
Grants & Reserves	16		<u>127,838</u>	<u>121,567</u>
Total Net Assets/Equity			<u>367,868</u>	<u>390,278</u>


Internal Auditor


Chairman - TRB


Director - TRI


Accountant/ For Senior Accountant

TEA RESEARCH BOARD

**STATEMENT OF FINANCIAL PERFORMANCE FOR THE YEAR ENDED
31st DECEMBER 2012**

		2012	2011
	Note	Rs. 000	Rs. 000
Operating Revenue			
Government Funds		283,186	316,066
Other Income	17	30,765	22,758
Other Income- Deferred Income		8,517	5,122
		322,468	343,946
Add: P/L from Two Estates	18	13,768	(30,476)
		336,236	313,470
Operating Expenses			
Personal Emoluments	19	178,069	163,354
Travelling		9,178	9,587
Supplies and Consumables		20,819	23,123
Maintenance		25,717	27,270
Contractual Services-Security / Insurance		14,865	13,894
Electricity & Heating		17,504	14,994
Communications		2,948	2,425
Research and Development		38,985	34,268
Depreciation		29,697	25,927
Other Operating Expenses		26,927	26,848
Total Operating Expenses		364,711	341,690
Surplus/(Deficit) from Operating Activities		(28,475)	(28,219)
Finance Cost			
Gain on sales of Property Plant and Equipment		-	1,405
Net surplus/(Deficit) before extra ordinary items		(28,475)	(26,814)
Prior Year Adjustments (Schedule D)		(206)	-
Net surplus/(Deficit) for the period		(28,681)	(26,814)

TEA RESEARCH BOARD**CONSOLIDATED CASH FLOW STATEMENT FOR THE YEAR ENDED
31ST DECEMBER 2012****Rs. '000****Cash Inflow / (Out Flow) from Operating
Activities**

Surplus / Deficit from Operating Activities before
Adjustments (28,681)

Adjustment for

Prior year Adjustment	206	
Provision for Gratuity	19,502	
Depreciation	36,963	
Interest Income on Investment	(4,782)	
Deferred Income	(9,819)	
		42,070

Operating Cash Inflow / (Out Flow) before Changes in
Working Capital **13,389**

Changes in Working Capital

Increase / Decrease in Inventories	1,242	
Increase / Decrease in Trade. Deposits & Other Receivables	22,570	
Increase / Decrease in Excess & Shortage	(1)	
Increase / Decrease in Creditors & Other Payables	(927)	
Increase / Decrease in Refundable Deposit	2	
		22,886
		36,275

Less: Gratuity Paid.	17,019	
		17,019

Net Cash Inflow / (Out Flow) from Operating
Activities 19,256

Cash Inflow /(Out Flow) from Investing Activities

Interest on Investing Activities.	4,782
Purchase of Fixed Assets	(32,547)

Net Cash Inflow / (Out Flow) from Investing Activities	(27,765)
--	-----------------

Net Cash Inflow / (Out Flow) from Operating & Investing Activities	(8,509)
--	---------

Cash Inflow / (Out Flow) from Financing Activities

Increase / Decrease in Grants-PHDT St. Joachim Estate	10
Grants received for Tea Factories Studies	286

Net Cash Inflow / (Out Flow) from Financing Activities	296
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Net Increase / (Decrease) in Cash and Cash Equivalents	(8,213)
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Cash & Cash Equivalents at beginning of the year	59,691
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Cash & Cash Equivalents at end of the year	51,478
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TEA RESEARCH BOARD
ST.JOACHIMESTATE WORKING ACCOUNT FOR THE
PERIOD 1ST JANUARY TO 31ST DECEMBER 2012

2011		2012	
Rs. Cts	Kg's	Rs. Cts	Rs. Cts
143,699,321.20	391,715.00	110,783,994.43	(Note. 01)
998,021.05	4,572.00	988,810.26	
<u>144,697,342.25</u>	<u>396,287.00</u>	<u>111,772,804.69</u>	<u>111,772,804.69</u>
93,402.50			
1,093,058.42			
5,962,870.00			
855,719.52			
8,005,050.44			
<u>152,702,392.69</u>			<u>15,524,064.26</u>
			<u>127,296,868.95</u>
3,291,031.14		2,371,521.84	
4,341,976.19		3,321,848.52	
5,966,243.42		6,012,817.64	
1,973,118.84		2,156,741.99	
143,864,045.66		111,689,602.38	
<u>159,436,415.25</u>			<u>125,552,532.37</u>
2,944,754.40		2,628,254.96	
4,040,594.60		4,935,540.25	
<u>6,985,349.00</u>			<u>7,563,795.21</u>
2,304,888.24		1,904,386.93	
<u>168,726,652.49</u>			<u>135,020,714.51</u>
(16,024,259.80)			(7,723,845.56)
(1,525,920.37)			(1,140,965.92)
<u>(17,550,180.17)</u>			<u>(8,864,811.48)</u>

(Note.01).3495.75kgs unsold Teas valued NSA Rs. @388.37

REPORT OF THE AUDITOR GENERAL



විගණකාධිපති දෙපාර්තමේන්තුව கணக்காய்வாளர் தலைமை அபிபுதி திணைக்களம் AUDITOR GENERAL'S DEPARTMENT



මගේ අංකය
எனது இல
My No.

LP/D/TRB/FA/2012

ඔබේ අංකය
உமது இல
Your No.

දිනය
திகதி
Date

29 November 2013

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 2012 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 (TRB) for the year ended 31 December 2012 comprising the statement of financial position as at 31 December 2012 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 17 July 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.

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.

අංක 306/72 පොල්දූව පාර,
බත්තරමුල්ල, ශ්‍රී ලංකාව

දුරකථනය
தொலைபேசி
Telephone. } 2887028 - 34

இல. 306/72, பொல்துவ வீதி,
பத்தரமுல்லை இலங்கை

ෆැක්ස් අංකය
பக்ஸ் இல
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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 2012 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 (LKAS)

Although new accounting Standards (LKAS) should be applied for preparing financial statements from 2012, the Board had not been followed the following accounting standards for the year under review.

- (a) The value of the fixed assets which are being used at present, had not been revalued and shown in fair value in accordance with LKAS 16. Further according to this Standard the land and buildings are separate assets and accounted separately. However, the Board had shown the value of Land and buildings in the accounts together.

The Chairman of the Board has stated in his reply that the Department of Valuation had undertaken the re-valuation process and it was almost completed.

- (b) Gratuity provision as at the end of the year under review had not been measured in accordance with LKAS 19.
- (c) Contingent liabilities regarding pending court cases against the Board had not been disclosed as per LKAS 37.

2:2:2 Accounting Policies

Following observations are made.

- (a) According to the notes submitted along with the financial statements for the year under review, the fixed assets had been shown under 12 categories with the depreciation rates (note 2c). However, the machinery and equipment and its rate of depreciation had not been included in those categories.

Although it was stated in the notes that the policy of the depreciation had been changed in the year under review, no any changes had been made when compared with the previous year.

- (b) Although the gratuity provision had been made by the Head Office of the Board after the completion of one year service, whereas the two factories had been made provisions after the completion of five years service . Therefore the policy had not been applied consistently by the Board for the provision for gratuity.

2.2.3 Accounting Deficiencies

Following observations are made.

- (a) Fifty two acres of the land belonging to the St. Jochim Estate had been acquired by Sri Lanka Army in 1983 and Rs.8,700,621 had been received from Divisional Secretariat, Kuruwita on 17 October 2012. This amount had been shown under the miscellaneous income. However, the Board had not taken steps to identify the cost of the land and adjust with the income received.

- (b) Member fee amounting to Rs.193,014 had been paid by the Board to Plantation Human Development Trust for the welfare activities of Estate workers which had been capitalized without charging to the profit.
- (c) According to the verification sheets as at 31 December 2012, cash in transit amounting to Rs.121,128 at Walahanduwa Laboratory and Deniyaye Extension Centre had been shown under cash without showing separately as cash in transit in the financial statements.
- (d) Gratuity provision amounting to Rs.100,265 had been made as at 31 December 2012, although it had been already paid during the year under review.
- (e) Grants received for on going projects amounting to Rs.3.34 million had been shown under creditors and payables.

2:2:4 Unreconciled Balances

Following unreconciled balances were observed in audit.

- (a) Fixed assets valued at Rs.158,196,303 could not be reconciled with the fixed asset schedules furnished by the Board as those assets were not being classified in the ledger. Following observations also were made in audit.
 - (i) Fixed assets valued at Rs.307,920 purchased during the year also had not been categorized and debited to the relevant accounts at Extension Centre at Mathugama.
 - (ii) It was observed in audit that the fixed assets valued at Rs. 662,077 at Chemistry Lab, Colombo were not physically identified as there was no such Laboratory at Colombo belonging to the Board.
- (b) Fixed assets amounting to Rs. 1,052 million shown in the balance sheet as at 31 December 2012 had not been reconciled with the ledger accounts.
- (c) Although according to the schedules of the provision for gratuity for the year under review was Rs.13,449,924 , a sum of Rs.12,365,666 only had been charged against the profit. Therefore a difference of Rs. 1,084,258 had been observed in audit. Further, a difference of Rs. 595,132 also was observed for the provision for gratuity of the employees of the St. Coombs Estate for the year under review.

2:2:5 Overstatements and understatements in the accounts

- (a) Interest income on fixed deposits for 90 days of the year under review had not been taken into accounts. Therefore the interest income received and receivable on fixed deposits had been understated by Rs.155,413.
- (b) An Automated weather System amounting to Rupees one million donated by the National Science Foundation during the year under review had not been capitalized in the accounts. Further, a sum of Rs.315,728 spent by the Board for the same project had been charged against the profit without capitalizing in the accounts. Therefore the asset account had been understated by Rs.1,315,728 and the grant account had been understated by Rupees one million.
- (c) Four computers purchased under Methyl Bromide (MeBr)Project amounting to Rs.578,372 during the year under review had not been capitalized. Therefore the asset account and the grant account had been understated by the same amount.

2:2:6 Accounts Receivable and Payable

The following observations are made.

- (a) Trade and sundry debtors at head office and St.Coombs Factory amounting to Rs. 885,969 and Rs. 725,067 respectively had remained outstanding for more than 4 years without being recovered.
- (b) Opening balances of sundry debtors amounting to Rs. 97,371 had not been recovered, although there were transactions with them during the year under review.

The Chairman of the Board has stated in his reply that the amounts are related to the welfare associations of the Board and action would be taken to recover all balances in the year 2013.

- (c) Action had not been taken to recover / settle following deposits.
 - (i) Fuel deposits amounting to Rs. 51,575 which were deposited before 1998.
 - (ii) Refundable deposits amounting to Rs.38,400 received in 2010 and 2011.
 - (iii) Retention money amounting to Rs.61,440.

2:2: 7 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) Employees' Provident Fund Act No.15 of 1958 and Employees' Trust Fund Act No.46 of 1980	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 from previous years up to 30 May of the year under review.
(b) Financial Regulations - No. 177(1)	Passara Station had been spent daily collections amounting to Rs. 184,952 from January to May 2012 without banking them daily or at earliest possible opportunity.
- No. 371(2)(c)	(i) Advances amounting to 1,511,719 had not been settled as per instructions immediately after the completion of the purpose for which it was given. (ii) Cash advances amounting to Rs.15,267 at St Coombs Factory had not been settled for more than 05 years.
- No. 570	Deposits made with outside parties amounting to Rs.43,600 had not been recovered for more than 5 years.
(c)Public Enterprises Circular No PED/12 of 02 June 2003 Paragraph 6:5:1	The draft Annual Report for 2012 had not been furnished to the Auditor General within 60 days after the closure of the financial year

- (d) Treasury Circular 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.
- (e) Public Administration Circular No 41/90 of 10 October 1990 Fuel consumption of motor vehicles had not been tested as per circular instructions.

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. 28.7 million as compared with the corresponding net deficit of Rs.26.8 million for the preceding year, thus indicating further deterioration of Rs.1.9 million in the financial results. This was mainly due to the increase of operational expenses.

3:2 Operating Results of the Estates

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

	St. Coombs Estate (Including Lamilier Section)		St. Joachim Estate	
	<u>2012</u>	<u>2011</u>	<u>2012</u>	<u>2011</u>
<u>Tea Sales</u>				
Quantity (Kilograms)	376,712	344,131	283,065	396,287
Sales Value (Rs.'000)	173,875	141,490	111,773	144,697
Other Income (Rs.'000)	2,356	1,643	15,524	8,005
Total Income (Rs.'000)	176,231	143,133	127,297	152,702
<u>Less :</u>				
Total Expenditure (Rs.'000)	153,263	140,942	135,021	168,726
Operating Profit /(Loss) (Rs.'000)	22,968	2,189	(7,724)	(16,024)
Prior year adjustments (Rs.'000)	(335)	(15,112)	(1,141)	(1526)
Net Profit/(Loss) (Rs.'000)	22,633	(12,923)	(8,865)	(17,550)
	=====	=====	=====	=====
Cost of Production per Kilogram of Tea (Rs)	411.49	413.43	405.25	395.24
Yield per Hectare (Kilograms)	2,293	2,444	774	1,002
Net Sales Average (Rs.. per Kilogram)	455.29	405.78	388.37	359.31

Following observations are made in this connection.

- a) The sales quantity of St.Coombs Estate had increased by 32,581 kilograms in the year under review as compared with the preceding year and the operating profit had also increased by Rs.20.78 million. This was mainly due to the increase of sales by Rs.32.38 million and decrease of general charges by Rs.11.73 million.
- b) Although the sales quantity of St.Jochim Estate had decreased by 113,222 kilograms as compared with the previous year and the operating loss had decreased by Rs.8.3 million as compared with the previous year.
- According to the factory accounts, it was observed that a loss had been occurred consisting of Rs.7.25 million from tea estate and Rs.3.96 million from the tea factory during the year under review. Further, it was observed that a profit amounting to Rs. 2.1 million had been earned from rubber estate but no any income had been earned from paddy lands belonging to the estate.
- (c) According to the information made available, the capacity of the machines at St.Coombs and St. Jochim factories are 10,000 kgs and 15,000 kgs respectively of green leaf per day. However, it was observed that the actual average utilization of those machineries were 6250 kgs per day (62.5%) and 3,500kgs per day (23.33%) respectively.

4. **Performance Review**
4:1 **Functions of the Board**

The major functions of the Tea Research Board are;

- * To conduct, assist and encourage scientific and technological researches and investigations relating to all problems and matters affecting the production and processing of tea including the prevention and control of pests and diseases, improvement of the quality of processed tea as well as diversification of production 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 programs, seminars or symposia, with foreign and local research institutions.

Following observations are made

(a) Corporate plan

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.

(b) Action Plan and Procurement Plan

(i) Action plan had been prepared only for financial targets not for the physical targets of the Board. Therefore, the achievement of physical targets could not be ascertained in audit.

(ii) According to the information made available, the financial performance of the Board as at the end of the year under review are given below.

Programme	Allocation for the year			Utilization			Utilization as a percentage
	Recurrent	Capital	Total	Recurrent	Capital	Total	%
	Rs. Mn	Rs. Mn	Rs. Mn	Rs. Mn	Rs. Mn	Rs. Mn	
Crop Improvement	13.49	10.57	24.06	11.75	06.91	18.66	78
Land Productivity Improvement	16.99	10.72	27.71	21.58	04.42	26.00	94
Climatic Change Impact Assessment	01.66	01.84	3.50	01.84	0.09	1.93	55
Mechanization of Field Practices	01.63	0.09	1.72	1.80	-	1.8	105
Crop Management	09.39	07.23	16.62	10.74	02.27	13.01	78
Alternative Energy Sources for Tea							
Drying	01.23	0.04	1.27	01.40	0.02	1.42	112
Tea Processing Technology	08.06	04.45	12.51	08.03	02.36	10.39	83
Made Tea Quality	01.56	0.87	2.43	01.37	0.12	1.49	61
Value Added Tea Products	04.05	04.20	8.25	04.96	02.19	7.15	87
Resource Planning	05.11	0.75	5.86	03.19	0.14	3.33	57
Service to Stakeholders	23.82	04.70	28.52	20.04	02.12	22.16	78
Internal Services and Maintenance	169.60	34.95	204.55	165.40	19.75	185.15	91
Research Management	14.02	10.60	24.62	13.73	04.98	18.71	76
Total	270.61	91.01	361.62	265.83	45.37	311.20	86

- (iii) The 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.
- (iv) Following items had not been procured during the year under review as planned.

	Rs.
Osmo meter	800,000
Fume hood	500,000
Flam Photometer	1,500,000

	4,000,000
	=====

The Chairman of the Board has stated that due to reduction of capital funds by the Treasury, these items could not be purchased.

- (v) According to the procurement plan, a sum of Rs. 1,200,000 had been allocated for Replanting – Hantana, but this activity had not been conducted during the year under review.

The Chairman of the Board has stated that the initial payment of Rs.180,000 were made in the year 2012 and the balance payment were transferred to the budget of 2013.

4:2 Assets Management

Following observations are made.

- (a) According to the information made available, a sum of Rs.27,090,600 had not been recovered from 10 officers who had obtained study leave with full pay and failed to serve the compulsory period of service. Further, the recovery of this amount is in doubtful due to the officers are not in the service for a long period.
- (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 purchased under the Project 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 2013.
- (d) According to the decision of a committee appointed by the Board in 2011, action had not been taken to dispose the scientific stock valued at Rs.302.893 shown in the books since 2005.

The Chairman of the Board has stated that since quantities of Hazardous chemicals are included in this stock and unable to destroy and discard. Therefore, this matter has been written to ITI for assistance.

- (e) 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. 902,000 had been paid to the private lawyers up to the end of the year under review. However, the case had been withdrawn by the Board in February 2013 and agreed to pay such increments to the employees who were appealed.
- (f) It was observed in audit that the following residential quarters were idling as at the date of audit on 15 March 2013.

Category	No of Quarters which were idling
-----	-----
A	01
B	03
C	03
D	22

	29
	====

- (g) The land and the factory belonging to the Lamilier Estate of the Board had been leased to a private party on 16 July 2003 for a period of 50 years for an annual rental of Rs.600,000 and according to the lease agreement the lease rental should be amended in every 05 years under an assessment of Government Assessor. However, action had not been taken to amend the lease rental up to the end of the year under review.
- The Chairman of the Board has stated that there is a court case for non payment of rent and for the evacuation of present tenant instead of amending the rent.
- (h) Although the cash imprest given to Walahanduwa Extension Centre was Rs.50,000, the balance of the cash imprest as at 31 December 2012 was Rs.73,059. Therefore, it was observed that the imprest had been exceeded by Rs. 23,059 without any approval.
- (i) Funds received from Methyl Bromide (MeBr) Project for soil research activities amounted to Rs.1,692,750 and Rs. 6,950,302 in 2007 and 2008 respectively. Although the service contract period was over as at 30 March 2010 and Rs.2,992,170 had remained as at 31 December 2012. no evidence were made available for the achievement of the project objectives.

4:3 Human Resource Management

Following observations are made.

According to the letter dated 24 August 2011 of the Department of Management Services, the approved new cadre position of the Board was 443 staff and the cadre position of the Board as at 31 December 2012 as per the reports submitted by the Board is given below.

Grade	Approved Cadre	Actual Cadre	Vacancies	Excess
-----	-----	-----	-----	-----
Senior Level	43	13	30	-
Secondary Level	120	76	51	07
Tertiary Level	130	56	74	-
Primary Level	150	78	72	-
	443	223	227	07
	=====	=====	=====	=====

According to the above information, there were 227 vacancies including 30 senior level officers and action had not been taken by the Board to fill those vacancies.

4:4 Utilization of Motor Vehicles

The Board had 117 vehicles in its fleet including cars, buses, vans, jeeps, three wheelers, lorries, tractors and motor bicycles. Following observations are made in this regard.

- (a) Action had not been taken to repair eight motor vehicles which were idling without repairing for more than one year.
- (b) A motor vehicle which was under running condition was idling without including to the vehicles fleet.
- (c) A sum of Rs. 1,650,000 had been paid to a private garage on 30 May 2011 to re fix a new body and an engine to a vehicle of the Board . However it was observed in audit that the Board approval to re fix the new body and prior approval from the Commissioner of the Motor Traffic for the replacement of the engine had not been obtained. The repairs made were not in a satisfactory condition as this vehicle was again idling in the premises of the Board from 19 January 2012 up to the date of audit on 13 March 2013.

4:5 Investment of Gratuity Provision

Gratuity provision amounting to Rs.142,640,318 had not been invested separately by the Board to face future liability as prescribed in Sri Lanka Accounting Standards (LKAS 19).

The Chairman of the Board has stated that this was not possible due to inadequate release of funds from Treasury for day to day activities during the years 2009, 2010 and 2011. Action will be taken to invest the correct sum of money in due course when funds would be available.

5. Systems and Controls

Special attention is needed in respect of the following areas of control.

- (a) Accounting
- (b) Settlement of Advances
- (c) Assets management
- (d) Receivables and payables
- (e) Factory management


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