



**Assessment of the Impacts of and Adaptations to Climate Change in
the Plantation Sector, with particular reference to Coconut and Tea,
in Sri Lanka.**

Project No. AS-12

**Progress Report for the period
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**Third World Academy of Sciences
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and

**AIACC Project Office
START Secretariat
Washington, USA**

by

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1. Project Summary

1.1 Title

Assessment of the Impacts of and Adaptations to Climate Change in the Plantation Sector, with particular reference to Coconut and Tea, in Sri Lanka.

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PROGRESS REPORT**A. Brief Summary**

Work on the development of climate change scenarios for Sri Lanka using the new version of SDSM software was continued, with a view to develop climate scenarios applicable at a given site. The meteorological parameters, both daily and monthly, collected previously were processed for use with SDSM software. Time series analysis of data was also completed. Spatial interpolation of rainfall data was completed for use with coconut and tea sector analysis.

In the coconut sector, trend analyses were completed on annual and seasonal basis for each Agro-Ecological region using spatially aggregated data. Stochastic models were developed to predict annual and monthly T_{MAX} and T_{MIN} in Low Country Wet-Intermediate Region. A crop model was developed to predict national coconut production using NE Monsoon and SW Monsoon rainfall. The changes in rainy spells and peak were identified by analyzing weekly rainfall using peak detector defined for coconut. The physical, chemical and water retention properties of coconut growing soils and the plant physiological data of coconut palm were collected for developing crop growth models. The socio-economic data was analysed to determine the correlation between rainfall and crop productivity, socio-economic impact indicators sensitive to climate change and the impact of climate change/variability on cost of living. Studies on CO_2 elevation were also commenced.

In the tea sector, a detailed trend analysis of crop productivity with temperature and rainfall was carried out and yield and weather relationships were established for the regions under study. It was revealed that productivity depends more on rainfall than on other parameters such temperature or solar radiation or CO_2 elevation. A stakeholder survey was carried out to collect information on their awareness of the problem, current practices adopted by planters, and market trends. A cost-benefit analysis of various adaptation techniques already practiced by some of the planters to mitigate adverse impacts of drought conditions was carried out.

Quality control exercises were used to build a precise set of temperature data (mean, maximum and minimum) for a period of 100 years for mean temperature data and 75 years for the minimum and maximum temperature data. All the missing data were in-filled based on statistical relations with neighbouring stations. Stark divergences were identified in trend estimation with and without Quality Control.

B. Tasks performed and outputs

1. General

1.1 Progress Review Meetings

The study teams met three times during the period under review, on January 07th, March 03rd and May 12th in order to:

- Review the progress in the previous month/s and plan the work for the ensuing months,
- Brief by the participating members to non-participating members on the knowledge and information gathered at the Bangkok and other meetings attended by the members,
- Discuss the follow up activities and future plans for the second phase of the Integrated Assessment Modeling to be carried out with IGCI, NZ during the course of the year.
- Review the results of the data analysis and quality control exercise carried out by the 4 participating institutes.

All meetings were well attended.

1.2 Participation in Meetings

Dr Janaka Ratnasiri, Dr M A Wijeratne, Dr Neil Fernando and Dr Senaka Basnayake attended the AIACC Workshop held in Bangkok during March 24th -27th.

1.3 Training Programmes Attended

Dr S B Basnayake, Mr. J C Vithanage (RA) and Mr W S B Ariyapala (RA) followed a training course on GIS from the University of Colombo, which will be useful to spatially interpolate the climate variables in order to generate input data for the SriLankaClim software.

Mr. J C Vithanage (RA) successfully completed a training course on LINUX, UNIX and C programming. These trainings will also be useful to execute some models and to write small programmes for data transferring

2. Data Collection

2.1 Meteorological Data

Meteorological parameters collected previously in daily basis and also in monthly basis were converted to a format which was compatible with the SDSM software. This has been done with a C programme. Station data were arranged in to a single column in order to compatible with the SDSM software, with the help of C programming. This process was performed at each and every

station. A detailed trend analysis of temperature data was carried out to assess any variations between the two periods, 1931-1960 and 1961-1990.

2.2 Coconut Sector

2.2.1 Climate data

All the relevant information of climate data on daily basis with respect to Rainfall (RF), Maximum Temperature (T_{MAX}) and Minimum Temperature (T_{MIN}) in 8 Agro-ecological regions (AER) were computerized along with annual crop yield data.

2.2.2 Soil physical parameters:

The collection of data on soil physical and water retention properties of five land suitability classes (S1-S5) was continued (see previous report for a description of land classification). Application of organic manure is one of the major adaptation options to improve soil physical conditions that could enhance soil moisture and nutrient retention and mitigate adverse affects of climate change (longer dry periods) in coconut plantations. Therefore, the quantified data on improvement of plant available water content by organic manuring was collected for S2 and S4 land suitability classes.

2.2.3. Soil and yield data for crop models

The collection of data on duration of dry periods and coconut extent under different Agro Ecological Region (AER) and potential yield of coconut in the soils of five land suitability classes (S1-S5) was continued.

2.2.4. Plant Physiological data

The data on mean rate of evapo-transpiration (E_T) of coconut plantations in three Agro-Climatic Zones (ACZ) over the year were collected. The rates of transpiration and photosynthesis (net assimilation) of coconut palms during wet (with adequate soil moisture) and dry periods (with soil moisture stress) were also collected for developing crop models.

2.2.5 Socio-Economic Parameters

The collection of socio-economic data in the coconut sector that was commenced in the previous year was completed. However, there were many gaps in the data. The details are given in the website paper by Dr Neil Fernando

2.2.6 Data on CO₂ enhancement on productivity of coconut:

An experiment was started to determine the impact of CO₂ enhancement on the leaf area development, rate of leaf production, dry matter assimilation and partitioning in to shoot and roots of coconut seedlings. Two open top chambers (4.3 m diameter x 2.8 m height, covered with UV treated polythene) were constructed at Bandirippuwa Estate, Coconut Research Institute and coconut seedlings were exposed to either (a) enhanced CO₂ (550-600 ppm) or (b) ambient CO₂ (350-360 ppm). Twelve seedlings of nursery stage were placed in each chamber and the data

collection was started from June 2003. This study has shown that about 20-40% yield improvement was possible with enhanced CO₂.

A plant house experiment was conducted with tall and hybrid coconut seedlings grown under two soil moisture regimes (field capacity and moderate water stress) to develop CO₂ response curves. Variation in net assimilation with increasing CO₂ concentration (50-1000 ppm) was measured and the regression models were developed. These data will be used for developing crop models on productivity of coconut under different scenarios of climate change.

2.3 Tea Sector

2.3.1 Crop Yield and Socio-economic data

Collection of field data on crop productivity and on socio-economics that was commenced in the previous year was completed.

2.3.2 Data on CO₂ elevation studies on Tea

Field studies on the effect of enhanced CO₂ on yield of tea in the low and high elevation were continued. Shoot growth rate and yield were monitored. This study has shown that about 20-40% yield improvement in during January -June 2003. The corresponding results in the previous year were 38% increase in the yield for the low elevation and 25% increase for the high elevation.

2.4 Quality Control of Data

- **Quality Control of the Maximum and Minimum Temperature and Infilling of the Missing Data:** Analysis of monthly data for 18 Meteorology stations for all the available years following the protocols used in the Global Historical Climatology Network procedures was completed. Trend analysis for the same data has finished.
- **Quality Control and of the Maximum and Minimum data for 19 Agriculture Department stations and Infilling of the Missing Data:** Since there was inadequate coverage especially in the area of plantation crops by the existing Department of Meteorology stations, we have worked to improve the coverage by incorporating the data from the Department of Agriculture which was obtained for another project. The available weekly data has been converted to monthly data and the analysis of monthly data for 19 Agriculture Department stations for the period 1975 - 1996 is completed. This shall allow the improved mapping of temperature fields. A draft report has been prepared on this.
- **Mapping of Rainfall Data:** Available surface data were used to prepare good quality maps of rainfall at annual and monthly time scales so that it avoids errors reported in previous work.
- **Mapping of Temperature Data:** Spatial Maps combining the Dept of Meteorology and Agriculture temperature data using linear inverse method interpolation was carried out. While this work, has improved the previous mapping of temperature, there were still

shortcomings in representing temperature particularly in the hills. To overcome this, algorithms due to Willmott and Matsuura (Journal of Applied Meteorology, December 1995) is being implemented for Sri Lanka. These algorithms take account of topography and any available climatic information. Work is progressing well in the interpretation of this.

3. Data Analysis

The detailed findings of the following will be posted in the project website.

3.1 Coconut Sector

3.1.1 Climatology Aspects of Coconut Growing Areas

Trend analysis for rainfall and temperature in the agro-ecological regions in coconut growing areas, with respect to the classical rainfall seasons, were completed. As reported in previous reports for annual variables, significantly useful trends were also not identified for seasonal rainfall in some regions confirming that linear models are not suitable for prediction of climate change. Statistically decreasing trend for Rain Fall can be seen only for the First Inter-Monsoon (FIM) in IL1, IL3 and WL4 and for North-East Monsoon (NEM) in IL3 and WL4.

Significant linear trends for temperature (maximum, minimum and diurnal) were not found for IL1 region except for during NEM for maximum temperature. A major part of the national coconut production is contributed from this region (Peiris & Piyasiri, 2002). The rate of T_{MAX} is higher than that of T_{MIN} or diurnal temperature (TDIF) in all the regions and all seasons. The highest rate of T_{MAX} was observed in WL4 during First Inter Monsoon and North-East Monsoon period. The rate of temperature increase is higher in Wet regions than Dry or Intermediate regions. It is interesting to note that there is no significant trend in seasonal temperature for diurnal temperature except in DL5. It increases during the first three rainy seasons in DL5. The variation of diurnal temperature is closely related to changes in cloudiness (Climate Change 2001, IPCC report). These results confirmed that the impact of climate change on coconut should be studied separately for agro-ecological regional basis.

Markov type models were developed to predict future T_{MAX} and T_{MIN} on annual basis and monthly basis and the predicted values up to 2011. The robust of this model with other commonly used models using various statistical indicators.

3.1.2 Production Scenarios and Crop x Climate Model for Coconut

Four production scenarios were identified based on past annual coconut production and the comparison of climatology of these scenarios would be useful. The relationships between national yield and the seasonal rainfall in different ecological regions were established. Based on those relationships, a crop model was developed to predict future national coconut production using NE Monsoon and SW Monsoon rainfall. In addition to climate effect an addition component of technology effect was included in to the model.

3.1.3 Change of rainy spells and peaks

Weekly rainfall in IL1 and WL3 were analyzed with the aid of peak detector to identify the rainy spells and peaks. It was found that rainy spells and peaks are not consistent between years

suggesting the necessity of development of statistical models to develop a cropping calendar for coconut growers. The results can be compared with the outputs of RGCM.

The findings of the rainfall and yield analysis are summarized below.

- No substantial decreasing or increasing trend in the seasonal rainfall with respect to the four classical rainy periods (FIM - March/April; SWM - May/Sept; SIM - Nov/Dec and NEM – Dec/Feb).
- Rainfall during SWM in all the AERs and NEM in Wet and Intermediate regions are significantly influential to increase the national coconut production. Of those rainfall parameters, the most useful parameters to project future national yield are SWM rainfall in WL2 and IL3 and NEM rainfall in WL3.
- A moval approach was developed to predict national coconut yield using the model such that $\text{Yield} = \text{technical effect} + \text{climate effect} + \text{error}$. There was a strong correlation between observed and predicted values using the this model.
- Markov Chain type models were developed to predict future annual T_{MAX} and T_{MIN} and monthly T_{MAX} and T_{MIN} in IL1. The results can be composed with regional GCM once we developed our own models.
- The pattern of the distribution of weekly rainfall through out the year is not consistent between years as well as between regions. The time of start of rain has also been changed due to global climate change
- As distribution of rainy periods is not random, modeling approach can be used to develop a cropping calendar to the coconut growers.

The details of the analysis will be posted in the project website.

3.1.4. Analysis of Socio-economic data

The socio-economic data collected in the previous year were further analyzed and the following results were obtained.

- **Correlation studies of rainfall and crop productivity**

The correlation coefficient (r) between annual average rainfall in the coconut triangle and the national coconut production was determined using data from 1970 to 2001. The association was however found to be weak which may be attributed to the following reasons.

- (i) Use of spatially aggregated rainfall data
- (ii) Correlating the rainfall of the coconut triangle to the national coconut production, rather than to the coconut production of the coconut triangle itself (because of the non availability of district-wise coconut production data)

- **Socioeconomic impact indicators sensitive to climate change**

Coconut production and export performance of kernal products in drought years have been compared with that of the average of normal years from 1971 to 2001. The results indicate that the cultivation, manufacturing and export sectors were negatively affected by the drought. The degree of effect was different in three sectors. The effect is pronouncedly reflected in exports followed by manufacturing sectors, than in cultivation sector.

- **Impact of Climate Change/variability on Cost of Living**

Coconuts constitute an integral component of the diet of Sri Lankans by providing a significant proportion of the daily per capita calorie intake (22%) and fat, being second only to rice, the staple food in Sri Lanka. It is also an integral ingredient in the preparation of many food items of Sri Lankans, which further necessitates considering coconut as an essential food item. Per capita consumption of coconuts is estimated to be 8 nuts per month, as revealed by two Consumer Finance Surveys, 1986/87 and 1996/97.

As culinary coconuts being the third most expendable food item of an average Sri Lankan consumer, increase of consumer price of coconuts significantly contributes to raise the cost of living (COL) of consumers. The foregoing results uncover some important implications of climate change on consumer welfare.

3.1.5. Development of crop-growth models for coconut

There is a strong positive correlation between increase in CO₂ concentration and net assimilation rate ($r^2 = 99.5\%$) of coconut palms. However, this increase is highly dependant on the soil moisture status, wet or dry ($p < 0.01$).

3.2 Tea Sector

3.2.1. Empirical Models on Yield

Baseline data from tea estates and TRI experiments were processed for analysis. Relationships between rainfall and temperature and yield data were being explored. Relationship between rainfall and productivity showed that the tea yield depends mainly on the rainfall. Change in one mm of rainfall could change the productivity by 0.1 -9.9 kg of made tea ha⁻¹ during the dry months (January-April). The highest response to rainfall was seen in the up-country intermediate zone where soil fertility and the amount of solar radiation were higher compared to other regions. The lowest response was seen in the low-country wet zone with less fertile soil. The lowest response was seen in the low-country wet zone with less fertile soil.

There was no strong correlation between temperature and productivity as that found with rainfall. A change in temperature of 1°C could change the yield by 6-64 kg ha⁻¹ during wet months (May-December). Increase in temperature found to increase yield in the high lands (up-country intermediate and wet zone) where the ambient temperature is less than 25°C. Temperatures in mid and low grown tea estates were mostly above 25°C. Increase in temperature above 25°C reduced productivity in some of the low and mid grown estates. However, some estates recorded a marginal increase in productivity or constant productivity with increase in temperature above 25°C. In order to study the past trend of seasonal tea production, monthly production data for last three decades were computed. In the high grown area “up country seasonal quality tea” is produced in the quality season of December to February period each year. In the mid country “Uva quality season” is in the months of July August and September.

3.3.3 Analysis of Scio-Economic data and Development of S-E Scenarios

Relationships among various indicators, such agricultural and sectoral indicators were identified. These include the following:

Agriculture Indicators – land use in tea, land productivity, quantity of agro chemicals used, use of irrigation water, type of tea produced - main and off grade percentages in the final product and the refuse tea percentage.

Sectoral Indicators – price of tea, seasonal variation in quantity production and price, seasonal variation in profitability.

Preliminary data analysis was done by fitting trend lines for rainfall pattern and land productivity of each location that data is collected. Similar analysis has to be done to develop storylines and to undertake necessary quantitative analysis for development of socio economic scenarios. Quantitative relationships among the selected indicators in order to estimated the changes of the same indicators with climate change impacts. Total national tea production and production in different elevations, production of seasonal quality tea, use of agro-chemicals, production of different tea grades, tea prices and profitability of tea are the major sectors were considered for developing socio- economic scenarios.

3.3.4 Cost Benefit Analysis of Adaptation Techniques

A preliminary assessment of cost-benefit analysis was undertaken on various adaptation strategies that could be adopted as mitigation measures to minimize any adverse impacts of climate change. These includes the following

- Irrigation of young tea to prevent plant losses at the early year of planting. Saving of about 6% of the plant density would break even the cost of irrigation in young tea.
- Cost Benefit of Irrigation/Fertigation which is applicable to mature tea, in order to overcome the problem of drought and it has been observed that 50 – 100 % yield increments could be achieved with a capital saving of preventing dying of mature tea bushes during drought.
- Application of potassium sulphate to mitigate drought effect has shown to save about 43% more casualties than the control treatment of application of water.
- Cost benefit of inter-cropping tea with rubber will enhance the land productivity and profitability by having income from both crops. . Moreover, shade requirement of tea is given by rubber trees.
- Reforestation of marginal lands with suitable tree species such as eucalyptus and harvesting them on rotation for fuel wood is the most beneficial option for tea plantations.

4. Follow up on the Training Workshop on Integrated Assessment of Climate Change Impacts

The above training workshop conducted by 3 visiting scientists from the International Global Change Institute, University of Waikato, New Zealand during December 15-20 at Colombo, provided an opportunity for the study team to familiarize themselves in the integrated assessment modeling techniques. During the workshop, a prototype “shell” for an Integrated Assessment Model, referred to as *SriLankaCLIM* was developed.

SlimClim software, which integrates the assessment models, was demonstrated in the IAM workshop and some steps were taken in developing SriLankaClim, which is a prototype version of the SlimClim, which we are planning to use in integrated assessments in this project. Some training opportunities were also exposed on SDSM software with Dr. Xianfu Lu, who is the consultant in the AIACC projects. The SDSM will be used to downscale the future climate variables in our project. A decision was also made not to use MAGIC/SENGEN software for downscaling the future variables due to unavailability of the latest version (3.0), which comprises the SRES future climates proposed by the TAR of IPCC.

It was decided to get the NCEP/GCM data from the Canadian Institute for Climate Studies from its website (<http://www.cics.uvic.ca/scenarios/sdsm/>), This will be used with the SDSM to downscale the future climate variables into selected sites. CICS has been requested to host these NCEP/GCM data (i.e. future variables in 2050, 2080 etc), which relevant to south Asia, on their web site. However they haven't yet put these data on their web. This question was raised at the Bangkok meeting, which was held in March 2003 and a suggestion was made to make an official request to CICS by the AIACC.

C. Difficulties Encountered

1. Climate data analysis and Development of Scenarios

1.1 Selection of rainfall stations,

To extract the rainfall stations which are located in Tea and Coconut growing areas within the Agro-Ecological zones, some techniques were used by overlapping the Agro-Ecological map and meteorological station map. This was because of the stations are given by the coordinates of latitude and longitude and not by the station list within Agro-Ecological zones.

1.2 Selection of meteorological data from the station network.

All most all main meteorological station data (about 19 stations) are possessed the 30 year period of baseline. Temperatures are measured only at the main meteorological stations and at the Agro-meteorological stations. Since the climate variables are spatially interpolated, an effort has been made to include relevant Agro-meteorological stations into the database to increase the density of the network. Since all most all Agro-meteorological stations were commenced after 1975 some technique was employed to overcome this problem.

1.3 NCEP re-analysis data and GCM outputs

Since a decision was made to proceed with the SDSM software to downscale the future climate variables to a given site, NCEP re-analysis data as well as GCM results for the future (i.e. 2050, 2080etc.) are really needed. However as mentioned in the Part B in this report, these data are not yet available in the CICS web site. This matter was brought up with Dr. Xianfu Lu, the Scenario consultant of AIACC projects and also with AIACC Secretariat during the Bangkok meeting in March 2003.

2. Coconut Sector

2.1 Non-availability of district-wise coconut production data precluded the investigation of correlation between rainfalls in the coconut triangle with the coconut production of the same triangle. Instead, the national coconut production had to be correlated with the rainfall of the coconut triangle.

2.2 Inaccessibility to the expert support to construct a rigorous economic impact model employing a classical approach (e.g. Ricardian approach) traditionally used by climate economists

2.3 Construction of the Open Top Chambers to study CO₂ elevation took longer time than planned.

2.4 Unavailability of data on some soil physical and chemical parameters.

3. Tea Sector

3.1. Non availability of complete past records on productivity and rainfall in all the estates selected.

3.2. Productivity variations with age of bushes not accounted for by climate or management.

3.3. Management difficulties in establishing experiment on the impact of enhanced CO₂ on productivity of tea in all the agro-ecological regions.

3.4. Temperature data at 200m x 200m grid is not available due to a few agro-met stations available in tea growing areas. Better interpolation techniques are to be used to overcome the problem.

3.5 Qualitative and quantitative approach is to be followed in developing socio-economic scenarios for tea sector. Appropriate quantitative techniques are to be identified.

D. Tasks within the next 8 months

1. Climate Scenarios including Quality Control of data

1.1 Down-scaling of GCM Data

- Expected to get further training on SDSM new version (version 2.3.3) and SriLankaClim software, which will be used in downscaling and integrated assessments modeling in the project.

- Expected to develop future climate scenarios using SDSM software with NCEP and GCM data.
- Interpolation of baseline temperature data using Arc GIS software with an elevation dependency feature.
- Interpolation of future climate scenarios (Rainfall and temperature), which develop by SDSM, using Arc GIS.
- Analysis of relationships between quality controlled data and global scale data as a contribution to downscaling work by Department of Meteorology.
- Attempt to downscaling IPCC predictions: Already downscaling of GCM output is being undertaken using the SDSM methods as provided in the Norwich training course. An attempt will also be made to use alternative methods. The feasibility of downscaling GCM output to station data in Sri Lanka will be tried out. Preliminary results show that this is feasible for the ECHAM5.4 GCM for the October to December period rainfall for Sri Lanka. Further work is underway to check this for other seasons and to investigate the possibility of downscaling IPCC ECHAM5.4 climate change scenarios to Sri Lanka.
- The Hadly Center of the UK Met Office has offered training programme on a regional climate model PRECIS. We are planning to work with PRECIS to downscale future climate scenarios from GCM.
- Since input data for SDSM is not available as an alternative method, it is planned to use LARS-WG 03 model to downscale future climate variables using GCM monthly values till daily values of GCM data are available in CISI web site to feed SDSM.

1.2 Quality Control of Climate Data

- Using Willmott-Matsura algorithm to improve the temperature climatological mapping for Sri Lanka using the Mean, Minimum and Maximum temperature variations in Sri Lanka using additional data from Agriculture Department.
- Provide quality controlled data sets as required by the group members.
- Contributions in Crop-Climate Studies

2. Coconut Sector

- Continue the data collection on soil physical, chemical and water retention properties of five land suitability classes in different agro-ecological regions and develop correlations with yield.
- Continue the experiment and collection of data to estimate the dry matter accumulation and partitioning in coconut seedlings with increasing atmospheric CO₂ concentration.

- Percentage change in real cost of production (COP) of coconuts in drought-prone years will be compared with that of the average real COP of drought-free years
- Development of a model (Computable General Equilibrium or Input-output or Optimal Control) to analyze the economic impacts of global climate change on coconut sector by working one-on-one basis with a renowned climate economist of the Yale University
- Analyzing the welfare impacts of climate change on coconut sector

3. Tea Sector

- Continuation of the field trial CO₂ on enhancement
- Exploring and establishing empirical relationships between weather data and productivity of different tea growing agro-ecological regions
- Identification of limiting factors/constraints (especially in climatic factors) for tea production in different regions
- Generation of Rainfall and temperature maps of tea growing area at 200m x200m grids scale using GIS
- Using down scaled version of GCM prepare a new maps for tea
- Prediction of tea productivity based on climate or development of crop models compatible with Sri Lanka CLIM.
- Collection of soil data in tea growing areas to be fed to Sri Lanka CLIM and Plant-Grow Model.

E. Anticipated Difficulties within the next 8 months

1. Development of Climate Scenarios

- Availability or accessibility to the GCM outputs and NCEP re-analysis data from the CICS web site. Since SDSM uses daily series of future climate variables, it is required to download daily GCM data and daily NCEP data. Daily series of GCM results are not available in any other web site.
- Spatial interpolations of future climate variables (i.e. 2050, 2080 etc.) are also needed to generate input data for the SriLankaClim. Arc GIS will have to be employed in this exercise. Topography effect will have to be included when interpolating these variables.

2. Coconut Sector

- Only partial funding is available from the AS 12 project for the proposed visit to the Yale University. So, finding the balance funding would be an anticipated difficulty.

- In the process of developing the economic impact model, problems are likely to emerge in relation to data requirements as well as model functioning. This would be a challenging task

3. Tea Sector

- Collecting temperature and socio-economic data from all tea growing areas.
- Developing of small grid size elevation dependent temperature scenarios applicable to the hill country situation.

F. Presentations

The following presentations were made at the Bangkok AIACC Workshop.

- An Overview of the Project on An Assessment of the Impacts of and Adaptations to Climate Change in the Plantation Sector, with particular reference to Coconut and Tea, in Sri Lanka – Janaka Ratnasiri
- Climate Data, Trends and Scenarios in Sri Lanka – Senaka Basnayake
- Socio-economic Data, Trends and Scenarios in the Plantation Sector of Sri Lanka, Neil Fernando and Asoka M Jayakody
- Impact of Climatic Factors and Adaptation Measures On Productivity of Tea Plantations In Sri Lanka – M A Wijeratne

The slides presented at the workshop will be posted in the Project web-site.

