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Socio-economic implications of climate change for tea producing countries



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of climate change
for tea producing countries*

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I. INTRODUCTION

Tea plays a significant role in rural development, poverty reduction and food security in developing countries and is one of the most important cash crops in the world. Climate change is an important environmental issue and impacts greatly tea on growth and production as tea is mainly grown under rain-fed mono-cropping systems and weather conditions determine optimal growth. The effects of climate change on the tea economy and the mitigating measures that should be adopted are not yet well understood.

Tea growing areas of Asia and Africa have reported on declines of tea production mainly caused by changes in climate. Prioritising mitigation and adaptation measures highlighted by the Working Group on Climate Change (WGCC) of the Intergovernmental Group on Tea (IGG/Tea) and an analysing the costs and benefits of implementing them would need to be undertaken. This information would be helpful to countries in formulating appropriate strategies and policy frameworks to deal with the possible effects of climate change on their respective tea sub-sector.

II. IMPLICATION OF CLIMATE CHANGE FOR TEA

Tea is planted in 58 countries in all 5 continents with Asia having the largest area under tea, followed by Africa. The total land under tea cultivation was 3.36 million hectares and production in 2012 was 4.78 million tonnes. Importantly, the size of land required to produce one unit of tea varies across countries. For instance, China produced 1.4 million tonnes of tea in 2011 under an estimated 1 million hectares of land (average yield of 1.4 tonnes per hectare), while India produced 1 million tonnes under 0.5 million hectares (2 tonnes per hectare).

Despite recent growth trends, tea areas have not increased proportionately, except in China, implying an increase in global crop yields. However, there have been evidence of fluctuating yields including several wild swings, particularly in Kenya most likely due to climate change (Figures 1, 2 and 3). An interesting feature in China has been the slower yield growth compared to the rate of area expansion over the last decade (Figure 3). An explanation that has been put forward is that the expansion in area is due to the increase in number of organic tea farms with lower yields compared to conventional tea.

Figure 1. Comparative growth in area and yield in Sri Lanka, 1985-2013

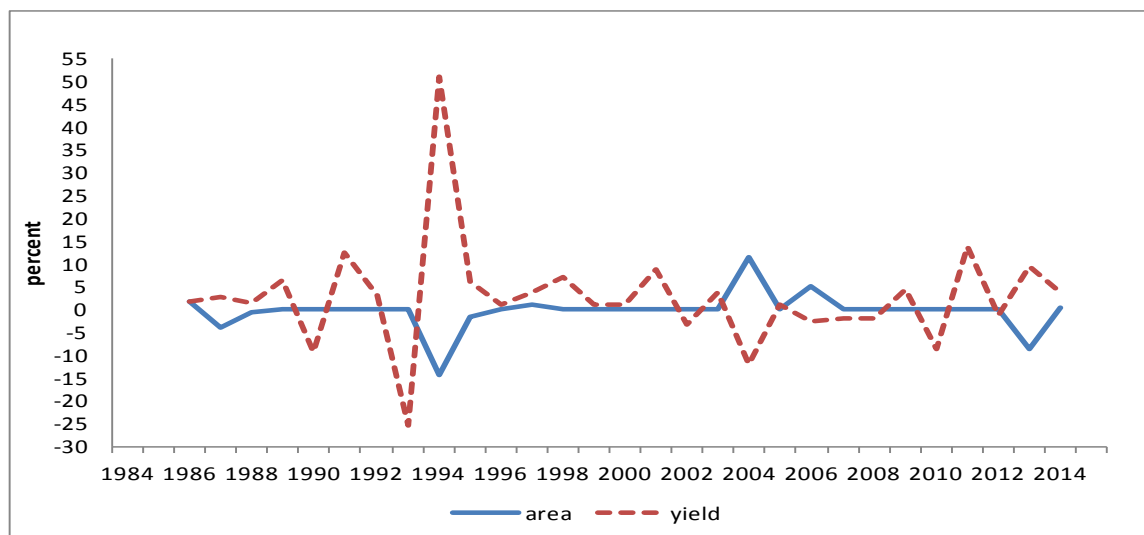


Figure 2. Comparative growth in area and yield in Kenya, 1985-2013

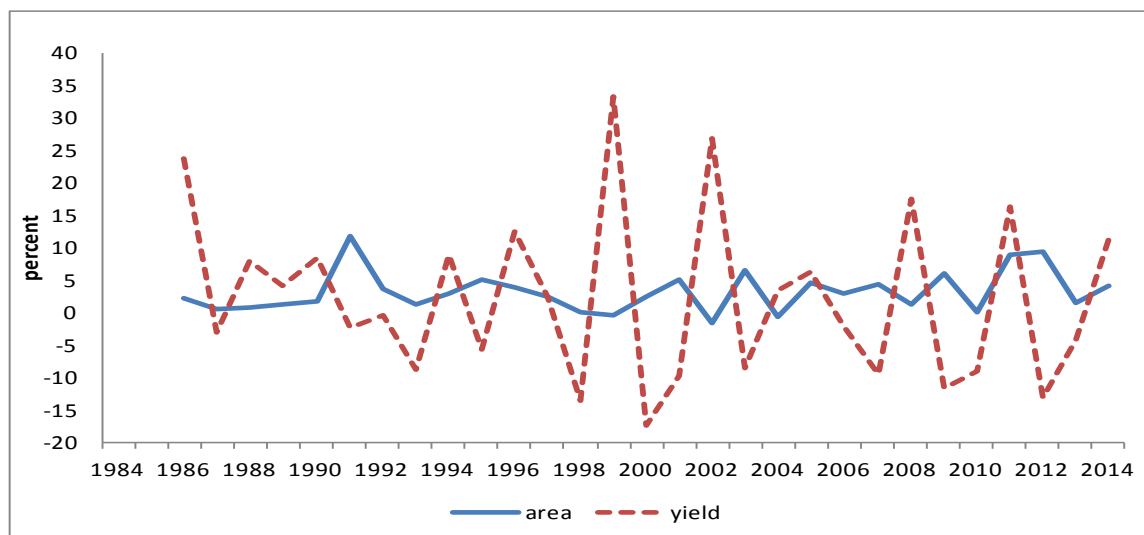
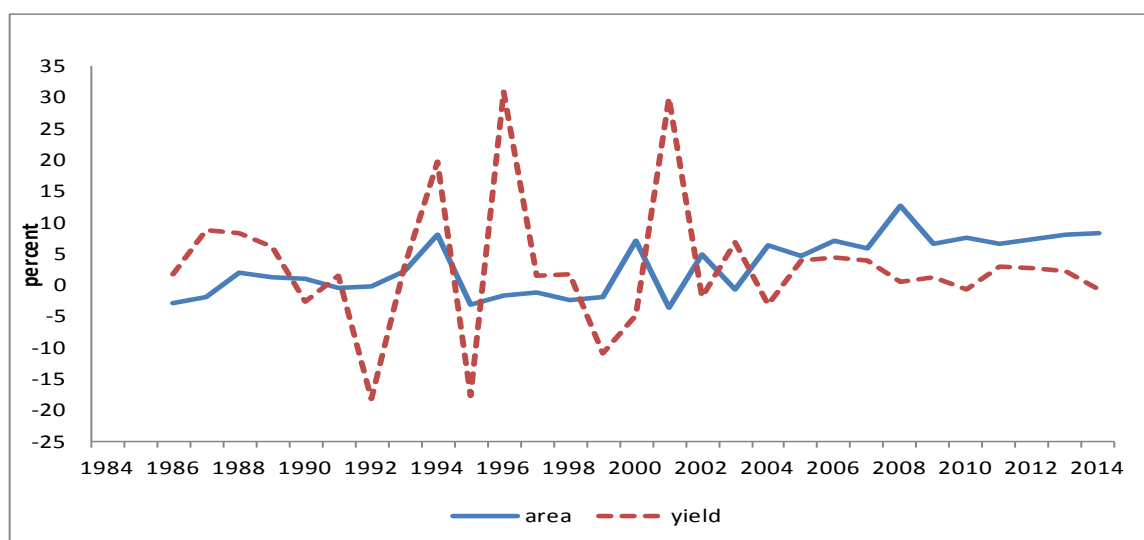


Figure 3. Comparative growth in area and yield in China, 1985-2013



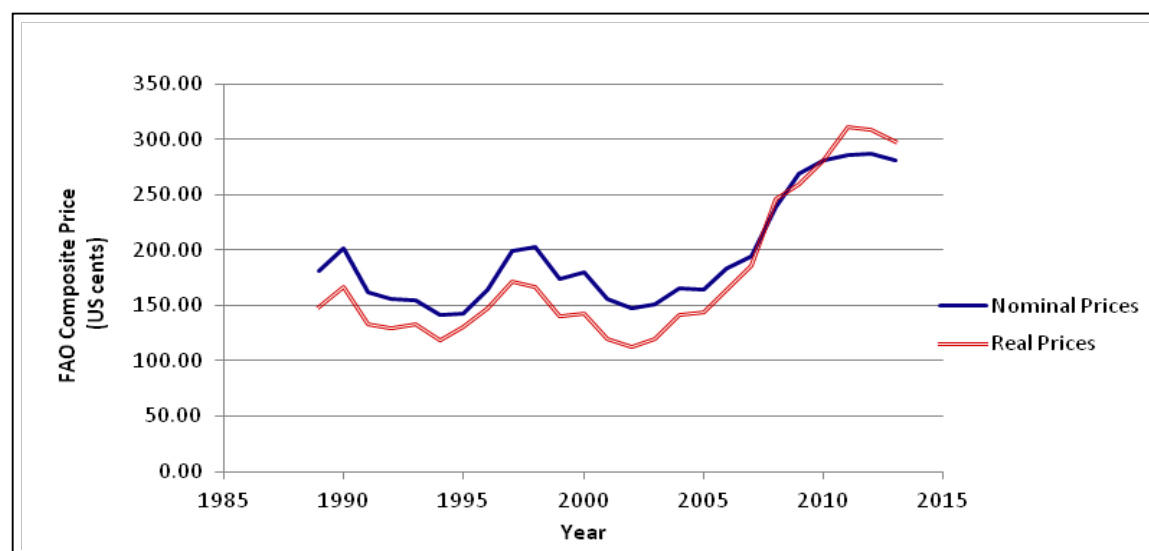
Increased temperatures could cause soils to dry if mulching is not applied and can affect yields. A more serious problem, however, is the increased incidence of new pests and diseases that attack tea bushes. In extreme cases, as temperatures become too high for tea cultivation, new suitable land areas need to be found. As new land is cleared for tea cultivation, more carbon dioxide is released into the atmosphere through deforestation. However, water availability, through reduced or uncertain rainfall patterns, as well as limited ground and river water, is a more constraining factor impacting tea yields.

The environmental footprint of tea production is also considerable. Main issues include: reduced biodiversity and ecosystem function as the result of habitat conversion, high energy consumption (mainly using logged timber) and a high application of pesticides in some countries.

Tea production is labour intensive, and the industry provides jobs, especially in remote, economically depressed rural areas. Tea trade and distribution are dominated by a few international companies that benefit from stable retail prices. Although there have been

periods of price increases in nominal terms for the past three decades to 2008, in real terms, prices have declined significantly. However, the effects of market restructuring measures that were introduced in the early to mid-2000s – which better aligned production with consumption – began to impact in 2008. As a result, prices increased both in nominal and real terms (Figure 4). This recovery is now being threatened by climate change, and if adaptation measures are not implemented effectively, then the livelihoods of plantation workers and smallholders could deteriorate.

Figure 4. Nominal and real prices of tea



III. SOCIO-ECONOMIC IMPLICATIONS - THE ESTATE SECTOR

Changes in climate have socio-economic impacts on the tea estates and plantations themselves as they must deal with meeting additional expenses to maintain production which cannot be addressed by increasing tea prices, if they want to compete in the international tea market. Some of the issues these estates have had to deal with in recent years include:

- erosion of top soil due to uncharacteristic heavy rainfall patterns, which has a negative impact on production;
- increased use of fertilizers to maintain soil fertility;
- increased usage of pesticides, particularly during the dry season, as tea gardens are increasingly being damaged by pests that were dormant in the past; and
- addressing longer dry seasons and heavier rains, some tea estates, especially in India, have begun using irrigation systems to increase yields.

The increased use of fertilizers and pesticides, as well as building and maintaining irrigation systems have significantly increased the cost of production.

In the case of India, legislation¹ obliges employers to provide social services to their workers and their families free of charge within the estate, including free housing, drinking water, medical, education, childcare facilities, canteen and recreational facilities. Firm tea prices in recent years have helped estate owners cope with rising cost of production, but some still

1 The 1951 Plantations Labour Act of India.

find the increase insufficient to totally cover the rising cost. A few of the less efficient estates have had to lay off some of their workers, resulting in rising unemployment and children leaving school as their families move to urban areas in search of work.

The increasing cost of mitigating climate change has begun to impact social facilities in estates raising some serious socio-economic issues related to working conditions on tea plantations that are critical in most producing countries. These include:

- low wages and low-quality housing;
- health and safety;
- declining workforce and part-time child labour;
- regular workers are re-employed on a casual or short-term basis;
- discrimination on gender; and
- diminishing representation of workers.

As the impact of climate change is expected to increase, these socio-economic effects will also grow as tea production declines and pressure to boost crop yields under the potential shortage of available land and agro-climatic resources increase.

IV. SOCIO-ECONOMIC IMPLICATIONS - THE SMALLHOLDER SECTOR

A change in the supply structure in recent decades is the transformation from large plantations to smallholders. In Sri Lanka and Kenya, for example, smallholders are now responsible for about 76 percent and 62 percent of total production, respectively. Tea cultivation is attractive to smallholders because it provides work and income throughout the year, requires relatively little investment, labour is available on a casual basis and the risk of complete crop failure is small. Issues constraining smallholders include low farm gate prices, poor extension services, limited market channels, poor access to credit and low level of farmer organization. Furthermore, because of changes in weather patterns, such as too much or too little rainfall and frequent extreme weather conditions, the incomes of tea smallholders risk being lost as the plucking days decrease (G. Boriah, Tea Board of India), which would impact negatively on food security.

The plantation model in India and Sri Lanka is governed by strict plantation labour laws, which are considered burdensome as they add to costs of production. The costs of production on smallholder tea farms have remained lower than those on the estates, primarily because the opportunity cost of the farm household labour is treated as being close to zero. As a result, smallholder production, as a proportion of total national tea production, has increased significantly, although it faces challenges in terms of lower traceability, quality and lacking involvement in export-oriented supply chains with increasing quality, social and environmental demands.

V. IMPACT OF CLIMATE CHANGE ON THE WORLD TEA MARKET

Tea is often exported in bulk, but the downstream stages such as blending, packing and marketing are the most profitable. This part of the value chain is controlled by a handful of multinational tea packers and brokers, which as a result can considerably influence world prices. Although real prices for tea on the shop shelves have not increased over time, they have done so in nominal terms. However, average real auction prices between 2000-2008 were roughly half those in the 1980s, which led to uneven value distribution in the supply chain. Auction prices have increased somewhat since 2008.

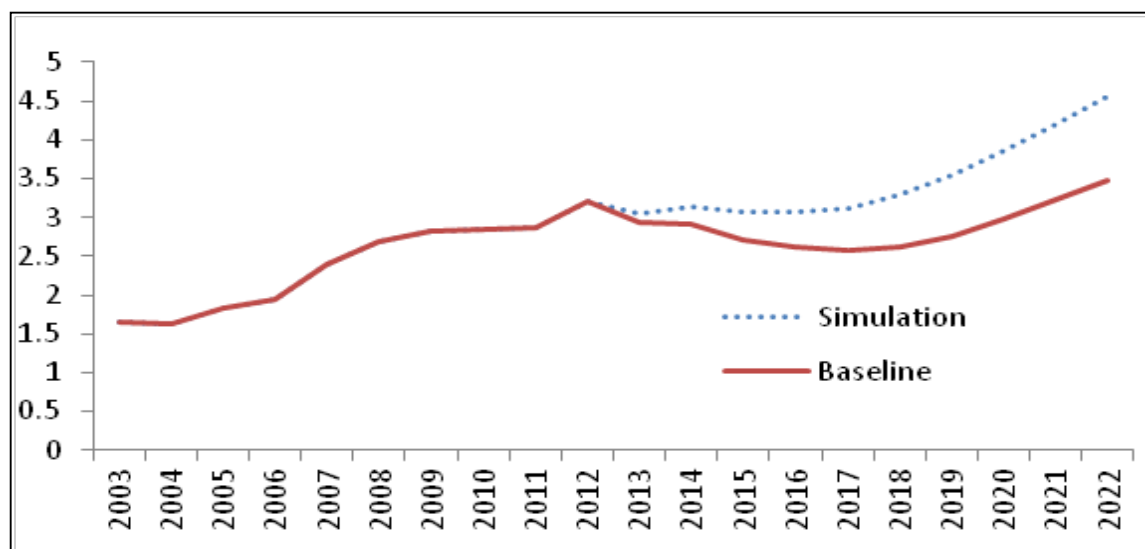
Capturing value addition in tea supply chain and increasing quality present a challenge in most tea producing countries. Since the implementation of food safety standards mostly set in developed countries, such as the Hazard Analysis Critical Control Point (HACCP) and MRL, costs have risen further. Sri Lanka, India and Kenya have been most successful in capturing value addition by exporting tea in tea bags, packets and as instant tea.

In order to gain some preliminary insights into the potential impact of climate change on the world tea market, a stylised simulation was run using the FAO World Tea Model. The scenario was that tea production in India and in Sri Lanka declines gradually over the medium-term as a result of climate change. The rate of decline was based on the projected change in tea production in India and Sri Lanka to 2020, which was generated with the Global Agro-ecological Zones model (GAEZ v3.0) for the IGG in 2012². This scenario has several limitations : it considers only two countries; and the model generates a medium-term outlook, where perhaps a long-term model (adjusted elasticities) would be more suitable. However, the results provide an indication on the direction of changes (prices, production, etc.), and shifts in trade (Table 1 and Figure 5).

Table 1. Climate change scenario impact at the world level

Average percentage change between baseline and simulation	
Price	26.3
Consumption	-3.3
Production	-3.4
Export	2.3

Figure 5. Impact of climate change on the world tea prices (USD/kg)



² Prepared by Géza Tóth, Research Scholar, International Institute for Applied Systems Analysis, Austria. The AEZ methodology follows an environmental approach providing a standardized framework for the characterization of climate, soil and terrain conditions relevant to agricultural production.

The simulation results:

- indicate that international tea prices are likely to increase significantly (more than 26 percent) as a result of a decline in production in key areas;
- suggest that development of agricultural and socio-economic adaptation options and their costing is needed;
- the impact of higher tea prices as a result of climate change on producers depends on the cost of adaptation measures;
- the higher cost of adaptation measures can eat up profit margins and offset gains of price increases;
- comparative studies of agro-climatic conditions, tea crop varieties and their requirements are necessary; and
- the possibility of breeding affordable tea hybrids that cope better with climate change should be given considerable attention.

VI. ADAPTATION MEASURES FOR TEA CULTIVATION

In its deliberation the WG on Climate Change has recommended the following adaptation measures for tea cultivation:

- planting drought and stress tolerant tea cultivars;
- diversifying production, including changing low-yielding tea land from tea to other crops that can thrive in poor soil and in tea-growing areas;
- intercropping tea with other tree crops, such as rubber, and/or other food crops. Shade trees provide the dual benefit of protecting the tea plants. As the tree matures, it can be used for fuel to dry the tea. Food crops, on the other hand, provide food and/or income to the farmer. Soil could also be improved by intercropping with nitrogen-fixing crops, such as beans. Non-nitrogen-fixing crops, such as cassava, however, absorb nutrients from the soil and would contribute to soil deterioration;
- organic cultivation; and
- water conservation through efficient artificial irrigation and drainage systems, as well as water harvesting.

VII. CONCLUSIONS

Evidence suggests that GHGs are causing global warming and climate change. While GHGs occur naturally, direct or indirect human activities have intensified their emission into the atmosphere.

Preliminary assessments showed that climate change will have a significant impact on future tea production, independent from the geographic distribution of the tea crop. Tea is already cultivated on suitable land and as a cash crop is historically the preferred choice for most suitable growing areas such as Assam and the high and low growing areas in Sri Lanka. Importantly, there are several uncertainties due to climate change impacts that are not yet fully understood but which could potentially affect future production levels. These include the frequency of natural disasters; the proliferation of certain pests and diseases and higher infrastructure cost. While the analysis can only be considered initial at this stage and several follow-up studies would be essential to fully understand the likely impacts at a regional level, several policy recommendations can be made:

- agricultural and socio-economic adaptation strategies are required in the short term;

- tea producing areas of the world should be evaluated against climate projections;
- comparative studies of agro-climatic conditions, tea crop varieties and their requirements are necessary;
- the possibility of breeding special tea hybrids that cope better with climate change should be considered; and
- focus on tea production in marine climate zones.

A competitive environment for tea production and processing safeguarded by governments will create socio-economic and environmental sustainability in the long term that will help mitigate the impact of climate change.

