

# Climate Change and Tea in Kenya: Impact Assessment and Policy Response



## Kenya's TEA sector and climate change challenge

Changing weather patterns in Eastern Africa are increasingly being felt within agricultural systems not only by policy levels but also small farmers. In Kenya, there is a particular concern over tea – a critically important sector for the economy, but which is also highly sensitive to climate change. Given its economic importance, tea in Kenya is facing challenges under climate change threats, raising concerns over the long run its viability. Already tea producers are facing reduced and erratic rainfalls, higher rate of hail or frost episodes as well as increasing temperatures that heavily affect yields and productivity levels. Over 500,000 smallholder tea producers are facing increased uncertainty about future livelihood. The Kenyan government has acknowledged climate change as a real threat to the country's development agenda and has formulated a framework for intervention.

At the Inter-Governmental Group (IGG) on Tea meeting in New Delhi in 2010, the major tea producing countries raised their concerns about the potential negative impact of climate change on the future of tea sector during a special session on climate change. FAO was asked to provide technical support and carry out a climate change impact assessment on tea and provide policy support in formulating climate-compatible tea sector in Kenya.

## THE FAO PROJECT

### Project objectives

The Food and Agriculture Organization of the United Nations (FAO) initiated a two year technical assistance project on *Climate change Impact assessment and Tea Policy Response*.

The project started with an inception workshop held in Nakuru, Kenya 7-8 February 2012 to take stock of current status of knowledge on climate change in Kenya, identify gaps in current knowledge and evaluate the national research and analytical capacity as well as institutional arrangements and mandates. Involving national stakeholders in the formulation of the project priorities was paramount to this FAO project. Following the workshop, bilateral consultations with Ministry staff and tea researchers helped refine the scope and the requirements for the project concept document. Upon approval by the Permanent Secretary of Agriculture, the project went into implementation in the field.



## Project approach

This two-year FAO project on climate change and tea in Kenya articulated two broad objectives:

- i) *Generate evidence of climate change impacts on tea production in Kenya, through a series of biophysical and socio-economic analyses;*
- ii) *Provide policy support to the Government specific to climate change for tea as a template for a broader climate-smart agriculture development strategy and climate change policy more generally.*

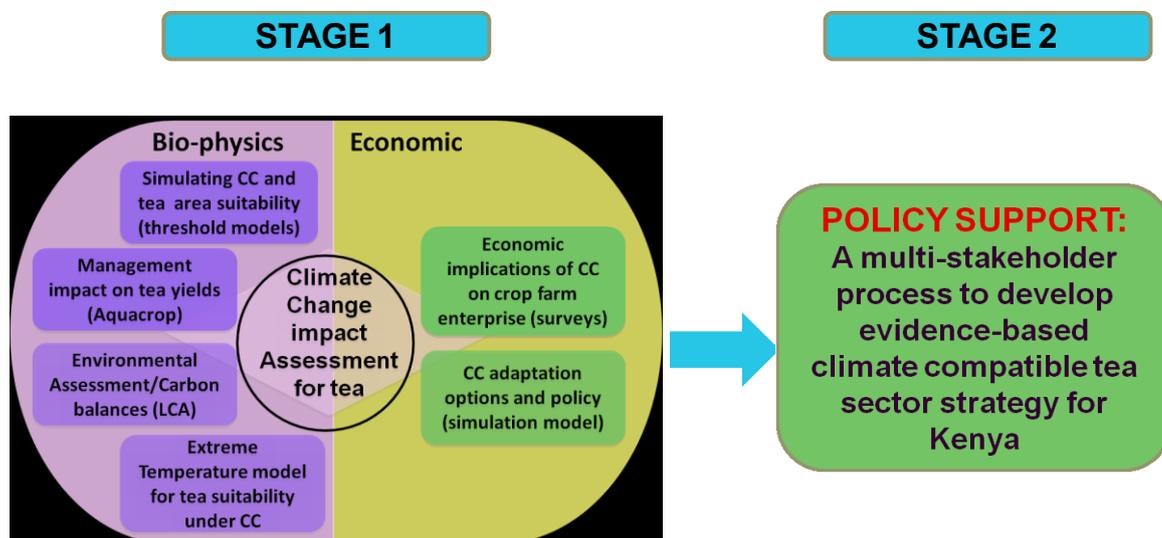


Because of the complexity of climate change and the multifaceted impacts, the FAO project follows an innovative approach based on three core principals:

- demand-driven based on priority needs and feeding the project within the current programmes and initiatives on climate change,
- evidence-based assessments (biophysical and socio-economic) of climate change impacts
- active engagement of relevant stakeholders in project planning and implementation.

## Project stages

The project follows a two stage process. During the project initial phase, a series of analyses and assessments (biophysical, socio-economic) were carried out by national and international experts, to establish the linkages between climate change and tea production in Kenya and to simulate future tea production trends and tea area suitability under different climate change scenarios. International experts were mobilised to support the national researchers and to help build national analytical capacity. During the second stage, FAO experts will apply the findings from climate change assessment to facilitate a multi-stakeholder process to develop a climate-compatible strategy for tea in Kenya. This should serve as a model for other agricultural sectors and should feed into the planned climate change policy for Kenya.



## STAGE 1: Climate change impact assessments for tea

### Biophysical assessment

*Analysing the links between climate variables and tea production.* Under the FAO project, researchers at the Tea Research Foundation of Kenya carried out a statistical analysis linking climate variables (air temperature, radiation, rainfall and soil water deficits) to tea production in the recent past using data from three sites: Kericho, Sotik and Kirinyaga. Temperatures have been rising annually by  $0.02\text{ }^{\circ}\text{C}\text{y}^{-1}$ .



A positive significant relationship between tea yield and rising temperature as long as soil moisture is not limiting. Temperature and radiation are key weather parameters likely to influence tea production patterns.

A Geographic Information System (GIS) approach was carried out to predict the impact of progressive climate change on tea suitability in Kenya from 2000 to the year 2075. The implications are that the distribution of suitability's within the current tea-growing areas in Kenya would decrease not because of rainfall amounts but its distribution and rise in mean air temperatures beyond the threshold of 23.5 °C. Preliminary results suggest that that suitability of tea growing areas is expected to increase of 8% by 2025, but drop by 22.5% by the year 2075. However, suitability research is continuing.

### ***Tea crop model Aquacrop: Simulation of tea yield changes under climate change;***

A crop simulation model developed by FAO (Aquacrop) was adapted for tea in Kenya under the project. AquaCrop was calibrated with data from Timbilil estate and subsequently validated by simulating the tea yield in the farmers fields of the estate. AquaCrop was then applied to generate some projections of the likely impact of climate change on tea production. It is expected that in future years due to climate change the CO<sub>2</sub> concentration will strongly rise which will result in an increase of the biomass water productivity (WP\*). Also, with temperature rises (reducing cold stress) and as average rainfall continue to increase, water stress affecting tea yield is likely to be reduced while tea yields will increase due to also to the CO<sub>2</sub> fertilization. Under this scenario, tea biomass production could increase by up to 20 to 25% by 2050, at least for the Timbilil estate (assuming current management practices). However, more sensitivity analysis need to be carried out on these preliminary results.



### ***Life Cycle Analysis of Tea in Kenya;***

A life cycle analysis for tea in Kenya was carried out to estimate the carbon footprint of tea production and consumption from 'cradle to grave'. The study has considered two value chains: small- and large-scale tea production systems in Kenya. Data was collected from 11 small- and three large-scale producers in Kericho, while the consumption of tea is assumed in the UK, one of Kenya's largest tea-export markets. Two units of analysis were considered: production and consumption of 1 kg of dry tea and production and consumption of one cup of tea. The results suggest that the total carbon footprint of tea from 'cradle to grave' is around 12 kg CO<sub>2</sub> eq./kg of dry tea. Expressed per cup of tea, this is equivalent to around 24 g CO<sub>2</sub> eq./cup. The largest contribution to the carbon footprint is from tea preparation by the consumer which is responsible for 75% of the impact. Tea cultivation and production account for around 20% while transport adds 4% of the total carbon footprint.



## **Socio-economic assessment**

### ***A socio-economic assessment climate change impact on small scale tea producers;***

A socio-economic study was carried out to assess tea producers perceptions to climate change, measure the impact on farm enterprise composition, and identify coping mechanisms. A total of 700 surveys were carried from all 7 tea growing regions. The main crops are tea, maize, and bananas in the West and tea, maize, sweet potatoes, and bananas in the East of Rift. Farmers observed changes in rainfall patterns, distribution, and reduced yield of tea were tied to climate change. Most notable were changes in rainy and dry seasons which led to shifts in planting season (43.1% of respondents) and frost (35.6%) followed by drought (34.6%). Tea producers may lose up to 30% in cash earnings due to climate variability. The main coping mechanisms employed by the farmers were growing drought resistant varieties, crop diversification, and planting trees.



A follow up survey focused on the relationship between climate change, food security and nutrition in tea producing areas of Kenya. Tea farmers, pickers and factory workers utilize good proportion of cash from tea to improve nutrition status of their households. New crops have been introduced in areas of study, e.g. bananas in parts of Makomboki, sweet potatoes and beans in Momul. This was attributed to increased temperatures and rainfall variability. Results show direct relationship between amount of tea picked by women on daily basis with their nutrition status. The mean kilograms picked increased from 9.2 among 3 severely malnourished women to 21.1 among 14 moderately malnourished women to 29.8 among 334 women with normal nutrition status.

## STAGE 2: ARTICULATING CLIMATE-COMPATIBLE STRATEGY FOR TEA SECTOR IN KENYA: A MULTI-STAKEHOLDER PROCESS

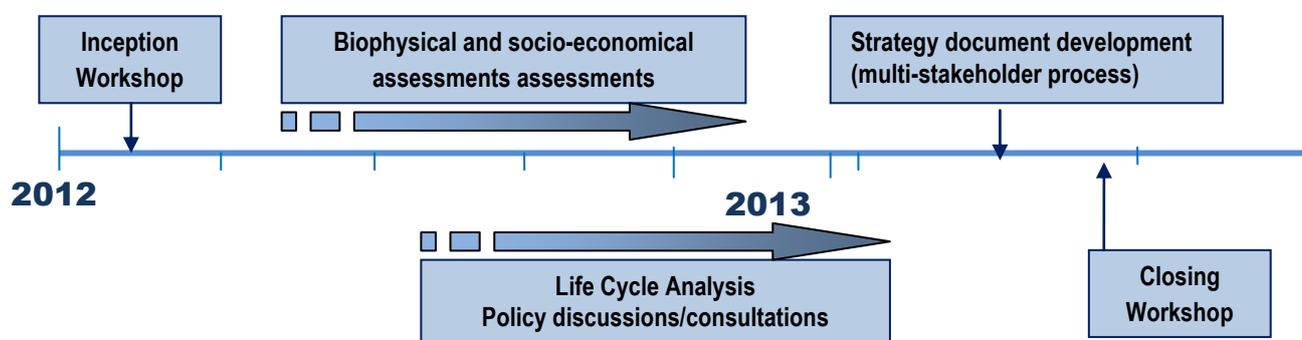
A climate-compatible agriculture sector is one that sustainably increases productivity, resilience (adaptation), reduces greenhouse gas emission (mitigation) while enhancing the achievement of national food security and the countries development goals (FAO, 2012). In the case of tea, the development of the climate-compatible strategy for tea sector follows a multi-step approach. During stage one, a draft zero document was prepared as background for review and evaluation by the multi-stakeholder policy working group. The draft zero describes the

current status of the tea sector in Kenya, summarizes the current stage of knowledge on climate change in Kenya, and review available developments on Kenya's national and agricultural development strategies and climate change initiatives, strategies and related processes. The aim is to ensure that the new climate-compatible tea strategy



must be fully anchored into existing national frameworks. The draft 0 strategy document also included the national stakeholders positions on climate change needs and assessments. Stage two consist of a collective drafting of the required elements to be included in the new tea climate-compatible strategy to be developed during a working workshop. The multi-stakeholders involved in the process include: the Ministry of Agriculture/Climate Change Unit, Ministry of Environment/Climate change secretariat, NEMA, tea Board of Kenya, Tea Research Foundation of Kenya, KTDA, representatives of large tea plantations members of KTGA, Kenya Meteorological Department and KIPPRA among others.

### Project Milestones



For more information on the project, please check the following FAO web page:

<http://www.fao.org/economic/est/issues/est-climatechange/>

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