

THE MAKING OF CLIMATE-SMART TEA IN KENYA

High energy costs, fuelwood shortage, water scarcity, and the need to reduce greenhouse gases have pushed Kenyan tea factories to re-think their production methods. Several of them have now teamed up with the WE4F East Africa Regional Innovation Hub (EA RIH) and Dedan Kimathi University to pilot an intelligent energy and water management system with the aim of making tea processing more climate-smart and resource efficient.

Background

Kenya is currently ranked as the third-largest producer and exporter of black tea in the world. Boasting a production capacity of nearly 350,000 tons per year, the country's tea industry is one of the major contributors to national income and employment.

Nevertheless, climate change has started to negatively impact the Kenyan tea sector. Changing weather patterns affect the tea production process and increase the vulnerability of the tea sector's farmers, workers, and producers. Improving energy efficiency can not only help in reducing greenhouse gas emissions but can also significantly lower operating costs during production and processing. In Kenya, where farmers are often part of cooperative-owned tea factories, improving energy efficiency can directly lead to more money reaching farmers' pockets. Energy, as well as water efficiency, can also have wider environmental benefits - reducing soil erosion, drought risks, and deforestation in areas where factories are reliant on unsustainably sourced fuelwood.

WE4F EA RIH and the Centre for Biomass Energy Studies (CBES) of Dedan Kimathi University of Technology teamed up to implement a two-year project to support water- and energy-efficient measures in selected tea factories, and at the same time, circular economy models for tea processing.

Project Description

The project aims to reduce water and energy use during tea processing. Ultimately conserving forests – considered one of the greatest defenses against climate change – and reducing costs and greenhouse gas emissions. To achieve this, the project will make use of inexpensive, low-tech energy- and water-management solutions and Internet of Things (IoT)-integrated technology which will be combined with training measures.

- Seasoning Shade Technology:** A greenhouse tunnel seasoning shade will be operationalized to produce optimal wood fuel for the factory boilers.
- Smart Metering and Assessment of Water Consumption:** A metering technology will be deployed to capture real-time data on water and energy consumption. The data will be the basis of critical analysis between the traditional and the new seasoning techniques. Additionally, a sector-wide water mapping activity will be conducted at the outset to help understand utilization and performance.
- Capacity and Knowledge Management:** Targeted trainings on the operations of the greenhouse seasoning technique and metering will be administered to the factory operators. Project impact and experiences will be documented and broadly disseminated for adoption by other stakeholders within the industry.

FACTS

- Withering uses about 40% of a factory's total electricity and over 50% of thermal energy consumption.
- Factories have established wood fuel plantations but can still not demand.



Tea picking in one the KTDA Factory farms. Photo credit: ©GIZ/ Boethling

Adoption of Innovations	Number of processing companies that have introduced climate-friendly, energy and/or water efficient innovations
Capacity Development	Multipliers that are informed about potentials of climate friendly, energy and/or water efficient innovations
Climate Change	Total energy and water saved in the food value chain Quantity of reduced or avoided greenhouse gas emissions
Knowledge Management	Number of instrument for disseminating climate-friendly, energy and/or water efficient innovations (e.g. universally applicable training tools, web-based knowledge transfer instruments, innovation fairs)
Demo Measures	Number of demo measures that show end users and multipliers the potential of climate-friendly, energy- and/or water-efficient innovations for productivity and income increases

Anticipated Impact

By integrating tunnel type greenhouse seasoning shades with smart metering technology, the targeted tea processing factories will experience reduced energy and water consumption that will ultimately result into lower production cost hence higher profits.

What has been achieved so far?

CBES is engaging Kenyan tea factories to develop innovative management approaches that will ultimately make water and energy use more efficient in tea production. A Memorandum of understanding has been signed between CBES and Iriani Tea Factory, an independent tea factory under the management of the Kenya Tea Development Agency (KTDA). The partnership will entail the development of a pilot tea withering research station with a capacity to season approximately 200 m3 wood per batch and a total of 1000 m3 during the project period (to end by December 2022). A similar structure is currently in development at the Dedan Kimathi University and this one will be accessible by other factories and researchers for training purposes. Additionally, the selection process for the factories that will undergo a water mapping study is currently ongoing. The design and procurement of smart meters for this activity has also begun.

Looking Forward

This 2-year project is expected to lead to:

1. Operationalization of low-tech wood seasoning shades for production of optimal wood fuel will result in reduction of energy consumption during withering. **This will most likely create a ripple effect in bringing down the cost of production which currently stands at 25%.**
2. Deployment of a smart metering technology to capture real time data on water-energy consumption creates a culture of beneficial **use of real-time data to make informed decisions** on the operations of the factories.
3. As operators become equipped with **essential knowledge and skills** on water-energy management. It will help them take steps towards resource efficiency best practices thus contributing to mitigating the impacts of climate change.
4. Documentation and dissemination of impact evidence to broaden uptake of water-energy efficiency **best practices** in other factories across the region as well as to help develop knowledge management products.

Wood fuel at Iriani Tea Factory/Photo credit: CBES



OUR TARGETS AT A GLANCE

- Two demo measures: a tunnel type greenhouse for wood fuel seasoning and IoT-based smart factory water and energy management system.
- 20 factory workers trained in the use of these technologies.
- Presentation of evidence of impact at specialist events.

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More about the global initiative Water and Energy for Food (WE4F) Grand Challenge: <https://we4f.org/>

Further information about the project: <https://we4f.org/>

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