Reforesting Kenya has never been so sustainable

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Credit: Pine forest, Kenya. Creative Commons

Kenya is pioneering a newly developed 100% solar energy-driven drying system for forest pine tree seeds in its bid to tackle the country's decades-long deforestation crisis.

Logging and drought have caused severe deforestation, leaving only 7%

of land covered by forest, and like many African countries, Kenya has set itself a tall target—to raise that to 10% by 2023.

Kenya Forestry Research Institute (KEFRI) asked Brunel University London to streamline the way it dries pine seed pods from the forest floor under electric heaters or the sun until their seeds pop out.

Solar energy seed-drying puts greening goal on a whole new playing field

In August 2021, the team installed a prototype custom-designed 100% solar-powered heat generator and heat storage unit at the government agency's Muguga plant, 30 km north of the capital, Nairobi.

After 6 months it proved its potential to ramp up seed production from eight metric tons a year to 90—enough to plant the annual two billion saplings needed to hit the lofty government goal.

"We've not only increased production for KEFRI, but reduced the energy cost to zero," said renewable energy engineer, Dr. Harjit Singh. "So that means the seeds that they produce are 100% green, zero carbon and they are using the most advanced technology to produce them."

Credit: SoFTS' innovative nanomaterial-enhanced heat storage

Dr. Singh's system also slashes seed drying time from 6 weeks to three or four days and "importantly, it doesn't use electricity. Until now 60% of the cost of producing seeds went on energy."

The fossil fuel-based grid electricity that produces most seeds in Kenya is worth about £1m a year. The new SoFTS (Solar Heat Storage for Drying Forest Tree Seeds) system can save 80% of this cost by using solar heat. KEFRI now plans to install SoFTS at its nine seed plants nationwide. It will be a gamechanger for Kenya's 2030 aim of 10% forest cover and 5,100,000 hectares of wastelands reforested.

"The project has introduced a new technology in forestry," said KEFRI's Dr. Jane Njuguna. "Solar drying of forest tree seeds had not been done in Kenya and this raises our international visibility as a center of excellence in solar tree seed drying technologies. It has reduced our energy bills and made pine seeds quickly available in the right quantities, helping us achieve the country's goal to reduce emissions."

SoFTS' innovative nanomaterial-enhanced heat storage uses only locally available materials to store 60-80 °C heat generated by a non-tracking low concentrating solar thermal collectors. Automatic sensors detect the seed pods' temperature and store surplus heat overnight, so even in cloudy climates, it can provide heat for at least 1.5 days. In KEFRI's other seed plants without the system, and in Kenya's other four large-scale scale private sector plants, seeds can only be dried during hours of sunlight.

About 30,000 people work in Kenya's seed industry, which is forecast to grow to increase to 180,000 by 2030. Once reluctant to back the industry because of the cost of power, investors now can afford to be upbeat and are now talking about exporting seeds. Other Sub-Saharan and East African countries such as Uganda, Tanzania and South Africa could use the system for drying their seeds.

"It demonstrates our research capacity here at Brunel," said Dr. Singh. "We're looking now for backing to do more of this type of project. The biggest thing is to understand the need of the end user correctly and match it with the sort of energy resource they have in that country. It is a completely bespoke system that is something that we are very proud of and it is based on the Brunel team's expertise that allows us to build any system for any scale."

Provided by Brunel University