



# EBAFOSA

ECOSYSTEM-BASED ADAPTATION FOR FOOD SECURITY ASSEMBLY



**Proposing Subject for Standardisation to the Kenya National Bureau of Standards (KeBS)**

**Proposed standard:** *Affordable mechanical solar dryer for food and agriculture application*

**Applicant:** *United Nations Environment Programme, Ecosystems Based Adaptation for Food Security Assembly (EBAFOSA) initiative.*

## 6<sup>th</sup> MAY 2021

## Context – why a solar dryer standard

Kenya [losses](#) up to 60% of food – equivalent to up to \$500million each year as postharvest losses because of inadequate postharvest value addition. At the same time, the country has one of the [highest](#) prevalence of aflatoxins globally, a direct threat to food safety.

As part of a broader continental drive to enhance uptake of climate action solutions as effective, affordable, and efficient tools for driving safety and productivity of food systems across Africa, the United Nations Environment Programme, through the EBAFOSA<sup>1</sup> initiative, is working with national standards bodies across the continent to enhance uptake of these climate action solutions. Mechanical solar dryers are among key solutions that country stakeholders are being guided to take up to reverse postharvest losses and enhance food safety. Correct use of these dryers has been shown to be not only affordable, but effective method of dehydrating food appropriately to [reduce](#) aflatoxins by up to 53%. And with this, increase premiums earned by farmers by up to 50% for crop that conformed to food safety national standards three months after harvesting.

This proposal is for development of “an affordable solar dryer specification”. Such a standard is timely to standardize the development of quality solar dryers that are urgently needed as accessible and effective tools to drive value addition, combat both food losses and food safety risks.

UNEP-EBAFOSA and the Kenya Bureau of Standards (KeBS) have already established a work programme, approved by KeBS management that to this end, that is underway.

Through this collaboration, the solar dryer standard will enhance affordability of compliance to key food safety standards by the KeBS by majority of stakeholders especially in the informal sector which already creates employment for up to 80% of the population and produce most of the food consumed.

In addition, considering that the solar dryer is an environmental & climate friendly technology, this standard by enhancing uptake of solar dryers, will also be contributing towards enhancing Kenya’s environmental compliance. In its [revised Nationally Determined Contribution \(NDC\) submission](#) to the United Nations Framework Convention on Climate Change (UNFCCC), Kenya aims to reduce its carbon footprint by developing in a low emission, climate resilient pathway and clean energy for productive use is one of the actions to this end.

This will also contribute to implementing the KeBS National Standardisation Plan (2019 – 2022) responsible for ensuring that standards processes respond to Kenya’s socioeconomic development priorities, including the BIG 4, as well as strategic environment and development priorities such as the Sustainable Development Goals (SDGs).

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<sup>1</sup> EBAFOSA- Ecosystems Based Adaptation for Security Assembly [www.ebafosa.org](http://www.ebafosa.org)



Agriculture is the mainstay of the economy. This standard will also contribute to realisation of key sectorial policies – such as the climate smart agriculture strategy where value addition and postharvest losses reduction is a key deliverable.

Youth are the leading population in Kenya – at about 70%, while agriculture is the mainstay of the economy – employing over 60% on average. Through this standard, youth will be structurally guided to be critical implementers, by integrating development of KeBS compliant solar dryers into their ongoing enterprises and deploying these for use by agro-value chain actors across the country. This will provide a practical route by which the \$500million in annual postharvest losses can be recouped through value addition. This will in turn enhance industrial integration between energy and agriculture. It will also create income opportunities for youth trained and structurally guided in developing these dryers and decentralising them to agro-value chain actors who increase their incomes by enhancing the shelf life and marketability of their perishables.

Considering stringent food safety requirements for accessing export markets, this standard will be timely to catalyse development of an affordable and accessible tool of compliance – in the mechanical solar dryer. This will in turn enhance compliance to stringent food safety benchmarks by majority producers in Kenya's informal sector to also enhance their chances of qualifying for export markets.

The youth constituency as drivers of implementation is critical not only to drive uptake of the standard, but also drive implementation of the strategic plan while unlocking critical income opportunities for these youth – a critical benefit to Kenya's jobs for youth drive.

### **Proof of concept: case data on solar dryer efficacy and applicability**

As proof of concept, the solar dryer is already being used to help farmers achieve compliance in food safety. Farmers engaged in several value chains, including cassava, pumpkin, banana, arrowroots cucumber and rice have used the solar dryers with positive results in achieving compliance to other KEBS food standards. Particularly, cassava value chain actors have gone used the solar dryer as part of a means to process raw cassava into cassava flour certified under KS EAS 740:2010.

In these tests, the solar dryer enabled cassava samples to pass particulars of food safety, hygiene, moisture content, and all without losing the nutritional quality.

Accordingly, tested samples recorded the following results:

- Yeast and Moulds was recorded at 640 colony-forming units per gram (cfu/g) against a set threshold of a maximum of 1000 cfu/g,



- Moisture content was recorded at 10.66%, against a set threshold of 12% maximum. And this level was achieved 48 times faster than the traditional open sun / air drying that the farmers applied before,
- Acid insoluble ash was recorded at 0.00% against a threshold of maximum of 0.35%,
- Crude Ash Content was recorded at a 0.13% against a maximum of 3%,
- The food sampled did not lose their starch content Starch which was recorded at 68.43% against a minimum value of 60%,
- E.coli and Salmonella were not detected, underscoring the hygiene environment in which the samples were dehydrated in the dryer.

With these results, a KEBS permit for certification under standard **KS EAS 740:2010** (specification for cassava flour standard) was issued to enable the manufacture and trade in pure cassava flour. Through this, the solar dryer was applied as an affordable tool for both value addition and achieving food safety, while unlocking enhanced income opportunities.

Cassava is not the only value chain that is benefiting from solar dryer services. Farmers are using the dryers to dehydrate several other value chains, increase shelf-life, cut their postharvest losses, and recoup their earnings.

Accordingly, pumpkin has been successfully dehydrated to 7% for storage. Banana has been dehydrated to 9.6%; arrowroots to 8.7%; cucumber to 8.7%; and rice to 10%.

With this affordable, yet effective preservation solution, farmers have reported up to 100% income increases, from recouping much of their perishables that were previously being lost for lack of effective dehydration to increase shelf life.

With these results, the popularity of the solar dryers has increased and is gathering steam among large scale rice farmers who have expressed interest for over 14 tonnes worth of solar dryer capacity for their rice farms. Considering the standard size for maximum efficiency and ergonomic of a mechanical solar dryer is about 400kgs, this is a market for 35 dryers in one location alone and for one value chain only. Based on projections, this demand for dryers will expand, as positive reviews of its efficacy and applicability across diverse value chains continues to grow.

Beyond rice, there is also emerging application towards enabling compliance with composite cassava flour. Here, the solar dryer is being applied to dehydrate diverse ingredients needed to make these composite flours in line with KEBS standard KS EAS 782:2019.



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This data has been packaged and used to develop a manual for developing these affordable solar dryers that are working effectively at the community level. The manual is attached as an annex of this submission.

Through this proposition, the technical procedures, data and lessons being gathered in design, fabrication, and deployment of these dryers for use across diverse value chains, will be packaged into a standard to enhance standardised propagation of this solution to fill a growing market gap across the country.

**Annex 1:** Solar dryer for agri-food applications manual (attached). Click word icon below

