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"Competing pathways for equitable food systems transformation: Trade-offs and synergies"

Empowering jua-kali to combat mycotoxins in Kenya's maize supplies: A participatory design approach with transdisciplinary knowledge integration

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Abstract

Kenya is overburdened by the high prevalence of mycotoxins that contaminate maize supplies. With a tropical climate favorable for fungal growth, these toxins compound health problems and erode progress to eradicate poverty and hunger. Technological deficiencies and the mishandling of harvests under wet weather conditions account together for losses of up to 30 % in annual crop yields, threatening the livelihoods of already impoverished communities. Despite advances in mechanized drying globally, these technologies are unavailable locally and hence are mostly imported to the detriment of local microenterprise, specifically to those involved in manufacturing – such as the Jua Kali in Kenya. This project sought therefore to co-create a homegrown mechanized drying solution, tapping into the creativity of local artisans, but with collaborative learning through knowledge infusion from farmers, engineers, scientists, and other societal stakeholders. Design of a novel encased-air cobbed maize dryer was premised on the findings of a successfully concluded DAAD sponsored PhD thesis at the University of Kassel, Section of Agriculture and Biosystems Engineering, with Jua Kali artisans involved in prototyping as part of the collaborative learning process. An iterative / continuous engagement was established between the researchers on the team and the artisans, generating ideas and testing to settle on a working prototype. A novel one hundred cob-bag (approx. 10 ton capacity) encased-air dryer was developed and tested successfully. The new system integrates solar heating and a Top-Lit Upward Draft (TLUD) biomass stove for continuous day/night operation using readily available crop residues (like maize cobs /stover) to dry the grain, ensuring low operating costs. Thermo-hygrometric sensors were integrated to facilitate remote monitoring of drying from mobile phones, to ensure sufficient dehydration. A growth in the confidence of the artisans engaging in problem solving was observed as a consequence of the collaborative learning engagements. The project was sponsored by the Volkswagen Foundation under the "Knowledge for Tomorrow – Cooperative Research Projects in sub-Saharan Africa" and the German Federal Ministry for Education & Research under the first German African Innovation Incentive Award (GAIIA).

Keywords: Aflatoxins, co-design, cob drying, maize

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