FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Post-Harvest Loss Reduction

POST-HARVEST LOSS INNOVATION LAB

Solar Biomass Hybrid Dryer

GHANA

A meso-level intervention to dry and disinfest grain

Maize in Ghana has two growing seasons, major and minor, and rain during the major season often limits solar drying. Insufficient drying can lead to high moisture content and fungal growth. In addition, maize can become contaminated with foreign material while drying.

To address this problem, the PHLIL Ghana team, led by a young engineer at the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi, Ghana, developed the solar biomass hybrid dryer. Based on initial assessments, the team identified the greatest potential for impact at the market and meso level and so designed this dryer to be built at market centers or at larger producers.

The hybrid dryer utilizes biomass (agro-residues, timber scraps, etc.) along with solar drying. Two types of dryers have been developed, portable and stationary. Stationary dryers can dry 3-5MT of maize in 8 hours while the mobile dryer can dry 1MT per batch. A 5MT batch of shelled maize at high moisture content (22% MC_{wb}) when dried with the SBHD will yield approximately 4.4. MT of properly dried maize (12% MC_{wb}).The hybrid dryers reduce drying time by maintaining high temperature and low humidity, resulting in a faster drying rate than solar drying alone and at the same time disinfesting the grain of insect pests. These dryers are being scaled-up, targeting nucleus farmer aggregators, farmer-based organizations, poultry farmers, post-harvest service providers, seed companies and other stakeholders in the maize value chain.

Two solar biomass hybrid dryers have been built so far in Ghana, one for a poultry farmers working with the American Soybean Association's WISHH AMPLIFIES project in Jumasi, Ghana. An additional dryer was built for a maize seed producer who is working with USDA and the Foreign Ag Service in Wenchi, Ghana.

CAPACITY AND COST

Drying capacity: 3-5MT or 1MT (mobile)

5MT shelled maize at 22% MC_{wb}
yields 4.4 MT maize at 12% MC_{wb}

Drying time: ~8 hours

Price: 5MT - US$15,000-20,000*
1MT - US$5,000-10,000

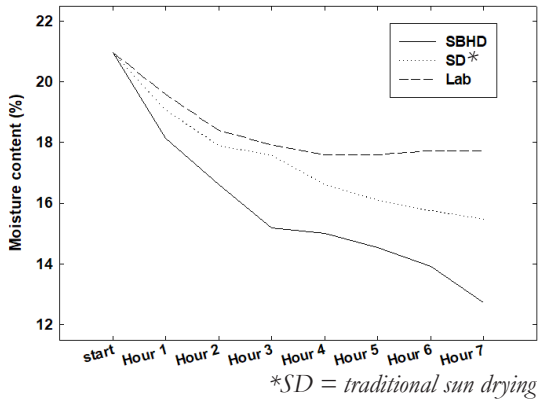
**current owners can access funding via a revolving pay-it-forward model, where money paid back for the dryer is used to finance another dryer for another user*

USAID FROM THE AMERICAN PEOPLE

KANSAS STATE UNIVERSITY

Results:

2018 SBHD Drying Trials



SD = traditional sun drying

Moisture content (%) of maize in SBHD

Start	21.0 ± 1.2
Hour 7	12.7 ± 0.2

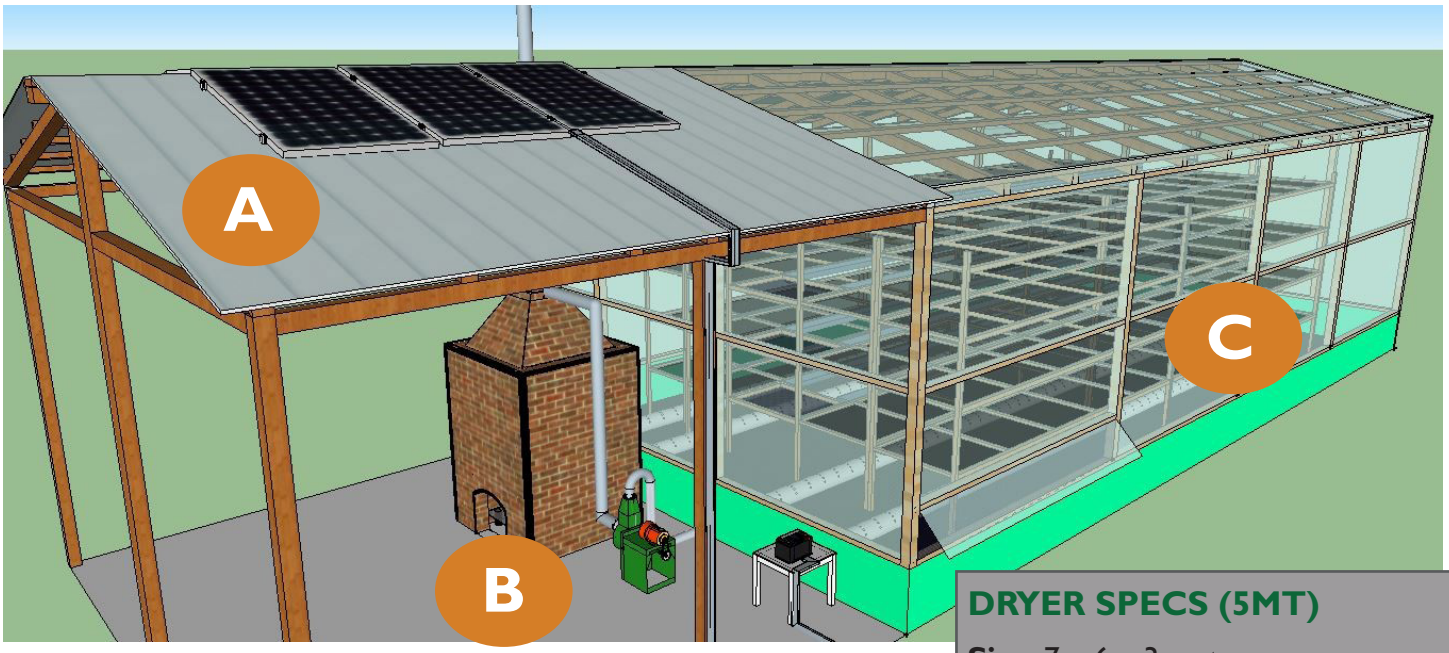
Ambient air condition = 32°C; < 65%
Drying temperature = ≥ 70°C

2018 SBHD Disinfestation Trials

Insect Mortality (%) in SBHD

Maize Weevil	100.0 ± 0.0
Red Flour Beetle	75.0 ± 5.8
Rusty Grain Beetle	98.3 ± 1.7

Schematic of the Solar Biomass Hybrid Dryer



A: Alternate installed Solar PV System for electrical power
B: Biomass furnace with blower and enclosed heat exchanger unit
C: Drying chamber enclosed with acrylic glass

DRYER SPECS (5MT)

Size: 7 x 6 x 3 meters

Drying racks: 8-10 racks per dryer

2.5 x 0.9 x 0.05m rack size

Furnace requirements: estimated corncob consumption of 30kg/hr

POST-HARVEST LOSS
INNOVATION LAB
Kansas State University
105 Waters Hall | Manhattan, KS 66506
785-532-2274
www.k-state.edu/phl

Post-Harvest Loss Reduction

www.feedthefuture.gov