

# PRESENTATION ON ADDING VALUE TO A AGRICULTURE PRODUCE THROUGH SOLAR DRYING: A BUSINESS MODEL THAT WORKS"



Solar Aeration Storage Silos and Grain laboratory and training hall



Solar Balloon dryer

**PENS FOOD BANK**  
DEVELOPING  
TECHNOLOGICAL AND  
ECONOMIC MODELS  
FOR ENERGY  
INTEGRATION ←  
IN FOOD PROCESSING  
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Mechanical dryer



Solar Biomass Hybrid Dryer



I really feel humbled by the invitation to make a presentation before such an august gathering on the topic: “ADDING VALUE TO AGRICULTURE PRODUCE THROUGH SOLAR DRYING – A BUSINESS MODEL THAT WORKS”

My compliments to the Energy Commission!!

Evans Peter Nsiah is the Managing Director of Pens Food Bank – a post - harvest management enterprise at Ejura in the Ashanti Region.

- It is a known fact that the Ejura-Sekyedumase Municipality in the Ashanti Region is the hub of the maize production in Ghana. And that maize has become the traditional diet and the single most important produce to ensure food security since it can stay longer on the shelf, if processed well. Therefore any intervention to improve quality and reduce loss is in the right direction.

- High post-harvest losses have been identified over the years as the major challenge to modernization of Ghana's agriculture and a major threat to food security in the country. Drying is an important first step to protect grain against quality loss. In the tropics 10 - 12% is safe long term storage moisture for most grains and oil seeds. As the moisture increases, mould growth is faster. Each mould species has its own moisture preference

Proper drying is considered one of the biggest challenges in determining whether food crops will be effectively stored without damage.

Unreliability of the traditional open-air or sun drying methods in Ghana has led to several interventions made to help address the issue of food crop drying. Key among them is mechanical drying. However, the major set-back has been in the area of cost and quality of the dried product for both consumption and seed production.

Mechanical drying systems are very expensive for the poor farmer and in most cases are also not readily available due to their reliability on fossil fuel, LPG or electricity

- In some cases, farmers queue for days in order to dry their produce, mostly grains, in mechanical dryers when harvest coincides with the rains.

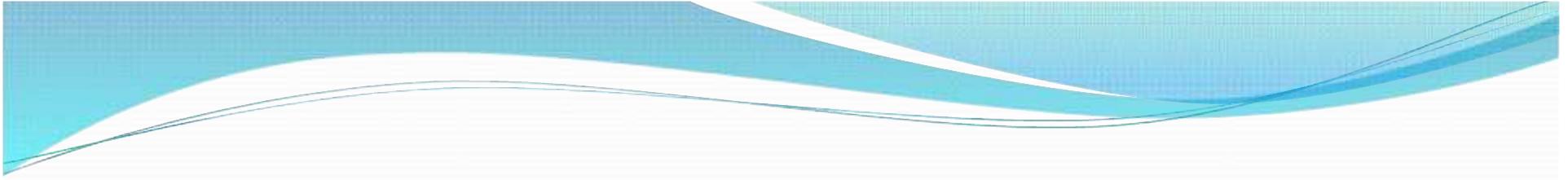
Majority of farmers who cannot afford the mechanical drying system resort to poor and rudimentary drying methods thereby exposing the crops to the mercy of the weather, contamination by animals, dust and microbial infections and improper drying.

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- Mechanical dryers may also impact on the nutritional properties and viability of crops for seed.

Amidst the challenges associated with traditional open air or sun drying, and the cost of mechanical drying systems, a new system known as the Solar Biomass Hybrid (SBH) Dryer has been developed.

- Results collected so far on a prototype system using maize produced during the 2015 minor season maize production in the Ejura Sekyeredumasi municipality in the Ashanti Region of Ghana indicate that, the issue of quality of the final product significantly improved in terms of moisture content and colour since the drying chamber is not exposed to smoke, fumes from burnt diesel and contamination from animals.

Results on germination and potential use of the dryer for disinfestation of insects were also very positive.



The system has numerous advantages over other drying systems as it is green in its operation. It does not run on fossil fuel and the biomass is renewable in nature.

# Comparism of the three known systems are as follows:



Open Air-Sun Drying Method



Mechanical Drying Method



The Solar Biomass Hybrid Dryer



A Solar Balloon Dryer

# 1. Open Air-Sun Drying Method in Ejura

- This method is widely used because it is cheap during both major and minor seasons
- But there are a lot of problems that come with this method. These include:
  - High loss of drying produce
  - Reduction in quality of dried produce
  - It is tedious and weather dependent
  - Lower revenue stream generated due to low quality of final product.



## 2. Mechanical Drying Method in Ejura

- Few installed mechanical drying systems
- Mainly for drying maize and is effective compared to open-sun drying.
- But there are problems that come with this drying method.
  - High installation cost
  - Erratic fuel sources (LPG, diesel and electricity) which is also expensive
  - Places of installation in Municipality not favourable to farmers.
  - Has relatively low net cash flow hence, long payback periods.



# The Solar Biomass Hybrid Dryer and A Solar Balloon Dryer In Ejura

- Developed for drying maize but can also be used to dry other crops.
- Compared to other systems of drying, the SBHD has the following benefits;
  - Relatively low installation and operation cost
  - Dried produce are of high and premium quality
  - Has potential to generate high revenues
  - Economic analysis shows it is economically viable and can be commercialized in the Municipality
  - PENS FOOD BANK is working on a mobile solar dryer that can be towed to the hinterland, even on the farm for drying operations in order to serve farmers within concentrated farming areas.



# THE BUSINESS MODEL'S IMPACT



- Pens food bank Ent. business operation model benefits about 1,500 smallholder farmers and about 50 traders, processors and distributors.
- The type of services the Enterprise renders to its clients are drying of maize and other food crops, storage of produce and training of clients on Post Harvest Management to reduce losses and improve quality to attract market premium.

- In Ghana, 90% of farm holdings are less than 2 hectares.
- On a 2 hectare farm size, about 10-30 bags of maize can be produced.
- Individual smallholder farmers cannot invest in equipment and technologies such as the solar-biomass hybrid dryer.
- In view of this, the availability of solar-biomass hybrid dryer provides them access to paying for affordable drying services within reasonable travel distances to their fields.

- Smallholder farmers used to hiring and paying for labour and services, like ploughing and seeding their fields, weeding, harvesting and threshing their crops
- Solar Biomass Hybrid Dryer is not to be owned and operated by individual smallholder farmers.
- Availability of Solar Biomass Hybrid Dryers provide them access to paying for affordable drying services within reasonable travel distances
- The target market is farmer-based and trader-based organizations in the Municipality

## • VALUE PROPOSITION TO THE TARGET MARKET

- Dry produce at a cheaper price and in situations where the farmers bring biomass (e.g. corncobs) to fuel the dryer furnace, drying will be done at an agreed minimal fee.
- Performance evaluation shows lower losses using the solar biomass hybrid dryer compared to other drying methods.
  - Open-Sun drying – Qualitative and quantitative loss
  - Mechanical drying – Qualitative loss

- Solar Biomass Hybrid Dryer can be located closer to farmer's farm or market place.
- With this, farmers will save the high cost of transporting their produce for drying.
- Drying can be done in any day and any whether condition.
- No need of extra money to buy fuel or pay electricity bills.
- Source of money from other farmers (those who are not in the organization) who come to dry their produce.

## COMPARATIVE PROFITABILITY ANALYSIS OF DRYING SYSTEMS AT EJURA

PARAMETER	SOLAR BIOMASS DRYER	MECHANICAL DRYER	OPEN/SUN
Quantity of maize (bag)	25 Bags	25 Bags	25 Bags
Quantity of maize left after drying to 12%mc (bag) without losses	22 Bags	22 Bags	22 Bags
Losses during drying (%)	0	0	12 %
Quantity left after drying (bags)	22 Bags	22 Bags	19.36 Bags
Cost of drying a bag of maize (GHC)	GHC 5.00	GHC 15.00	GHC 4.00
Total cost of drying maize (GHC)	GHC 125.00	GHC 375.00	¢ 100.00
Selling price of a bag of maize (GHC)	GHC 160.00	GHC 160.00	GHC 130.00
<b>Net cash flow (GHC)</b>	<b>3,395.00</b>	<b>3,145.00</b>	<b>2,760.00</b>

# CONCLUSION

Infact adding value to agriculture produce through solar drying improves the quality of dried crops for local consumption and storage, and for agro-based products that can be exported to generate foreign exchange. Pens Food Bank business module should be given a very serious consideration to reduce losses, improve quality and to ensure food security



Thank  
you

