

Agricultural Innovations in Sierra Leone

SNAPSHOT : LION MOUNTAINS' FLATBED DRYER



Introduction to Lion Mountains

Located in Bo, Lion Mountains is one of the leading rice processing businesses in Sierra Leone and the leading rice processing company in the South-East of the country. Purchasing paddy rice from farmers across the south-eastern part of the country, they provide reliable market access to thousands of small farmers. In late 2015, Lion Mountains purchased a rice mill with a milling capacity of 700kg of rice per hour, improving quality and production efficiency by producing greater quantities in less amount of time. However, insufficient volumes of dried rice limited output and the process of sun drying the rice strained processing capacity.

The Challenge

Traditionally, farmers and processors such as Lion Mountains have relied on sun drying their paddy rice for processing and storage, typically the only means of drying available to farmers in Sierra Leone. Using this method, Lion Mountains was only able to dry around 30 bags of husk rice on dry floor at any given time. They suffered monetary losses because they were unable to supply large amounts of milled rice to key establishments.

Moreover, this method presented additional consequences:

- Sun drying is not suitable for large volumes of harvested grain. Improper drying leads to rot and wastage.
- Clean space/floor to dry paddy is limited.
- Sun drying is very labour intensive and requires manual steering for grains to dry uniformly.
- Unpredictable weather can result in grain germination before farmers can dry them.
- Delayed, incomplete and ineffective drying of paddy is a reason for the deterioration of rice seed in paddy grains.

These drying challenges and their costly implications serve as a deterrent to large-scale rice production and commercial processing.

“The moisture content of rice is preferable at 13%. The husk rice comes at a moisture content of 14-15% and the parboiled at 20-21%. Higher than 13 % moisture content in storage can lead to grain discoloration, encourage the development of moulds, and increase the chance of attack from insects. It is ideal to dry rice grain as soon as possible after harvesting— if possible within 24 hours. Delays in drying, incomplete drying or ineffective drying will reduce grain quality and result in losses,” said Mr Mike Gericke, Managing Director for Lion Mountains.

The Solution- The Reversible Flatbed Dryer

To tackle these challenges, [Sierra Leone Opportunities for Business Action \(SOBA\)](#) connected Lion Mountains with Formel Industry & National Industrialization Centre (FINIC), a local light manufacturing company of agricultural machines, and introduced the concept of the reversible flatbed dryer.

A reversible flatbed dryer is a machine that removes the water from wet grains by forcing heated air through the grain bulk. Using this process, the same quantity of grain is kept stationary in a holding bin until drying is complete.

“This flatbed dryer is a reliable and necessary addition to Lion Mountains given the arbitrary and variable nature of sun drying,” said Mr Gericke.

FINIC designed a dryer that has the following features:

- Capacity of five tonnes
- Easy to operate
- Equipped with temperature gauges to monitor drying temperature
- Gave better quality grain compared with sun drying
- Simple design allows local production and ensures easy maintenance and repair
- Can be operated with an engine if electricity is not available or is very expensive

The Flatbed Process: an environmental and health safety alternative

A significant benefit of the reversible flatbed dryer is its positive environmental and health impacts. The dryer itself can be heated by the combustion of rice husk and recycled engine oil. Rice husk is a byproduct of the rice milling process, and can be transformed into charcoal briquettes that can be used for the parboiling process. This eliminates the need to use wood fire for drying, reducing deforestation as well as harmful smoke inhalation for the operators.

Moreover, the dryer operates on recycled fuel, solving a problem faced by companies in disposing oil in an environmentally responsible manner. Lion Mountains relieves companies of this burden, as the flatbed dryer burns the oil and uses it until it burns out completely.

Sun dried rice is often exposed to moulds which produce aflatoxins, a poisonous and cancer-causing toxin produced by certain fungi found on agricultural crops. The reversible flatbed dryer's rapid and efficient process also greatly reduces this health risk.

Increased productivity and the bottom line

In July 2017, the new dryer was installed and made operational with great success. **In just over a year Lion Mountain's total revenue grew more than 300%.** They increased production outputs and quality efficiency by lowering the rice moisture content to appropriate levels at a faster rate. The dryer can dry five tonnes of rice per single batch in 12 hours.

"The flatbed has given flexibility to consistently arrive at the appropriate moisture content (13%) during rainy and dry season," said Mr Gericke.

The Lion Mountains factory can now be operational year-round since drying is now possible during the rainy season, thereby avoiding costly seasonal factory shutdowns.

"We can now supply establishments like the Family Kingdom and The Sierra Leone Correctional Centre through Sierra Leone Produce and Marketing Co (SLPMC)," said Mr Aruna Samai, Lion Mountains Purchasing and Marketing Manager.



Beyond Lion Mountain: The value of the flatbed dryer to the industry and SL

The reversible flatbed dryer is currently one of only two in the country. Its success is based on its ability to operate despite the challenges posed by high fuel prices and long rainy seasons. Wider adoption of this method can have very positive implications for the country such as reductions in imported rice through improved processing, market-wide improvement in rice quality, and growth of the manufacturing sector. Lion Mountain's flatbed dryer can be adapted to fit a variety of sizes and production needs. Initial manufacturing costs can be counteracted by the gains of increased productivity.



Rice in Sierra Leone

Annual paddy rice production in Sierra Leone sits at 200,000 metric tonnes, with milled rice production estimated to be around 700,000 metric tonnes. The country still imports over 100,000 metric tonnes of rice to complement local production in meeting the demand for rice. Hence there is massive room for expanding production through improvement in processing.



A. Abdelrasoul, A. Childs, J. Clerisme, E. Dzakuma, B. Pittman, E. Sogut (2013) "Pioneering High-Yield Rice Production in Sierra Leone: Recommendations for an Outgrower Model", p2 <http://www.indexmundi.com/agriculture/?country=sl&commodity=milled-rice&graph=production> file:///C:/Users/admin/Downloads/Large-Scale-Rice-Production-Project-in-Sierra-Leone---Brief-Information.pdf