

What is the Solar Bubble Dryer?

The Solar Bubble Dryer (SBD) is the latest low-cost drying technology that aims to provide a simple and flexible alternative to sun drying. The SBD is mobile and completely independent of fuel or the power grid, and is therefore very cheap to operate. It comes in different sizes, with current models having a 0.5- or 1-ton batch capacity.

Difference to other drying systems

The SBD improves the traditional sun-drying process and eliminates all losses due to spillage, animals, the weather, and vehicles running over the grains.



Compared to a mechanical dryer, the SBD is more flexible, requires lower investment, and does not need fuel for heating the air or for running the blower.

Major partnerships

The SBD was developed with funding from the BMZ, IRRI, and GrainPro, Inc. through a consortium of the following:

- **GrainPro, Inc.** worked on technical development and prototyping.
- The **University of Hohenheim** conducted basic research and computer simulation of the drying process in the solar tunnel.
- **IRRI** provided the rice know-how and facilitated the testing and verification of the dryer and its components.

Sites

The SBD is currently being tested on rice by IRRI's national partners in the Philippines, Cambodia, Myanmar, Vietnam, Indonesia, Thailand, and Nicaragua through the *Closing rice yield gaps in Asia with reduced environmental footprint* (CORIGAP) project and other IRRI projects. GrainPro, Inc. is also working with other projects and companies to test the SBD on other crops in Africa, Asia, and South America.

Major activities and milestones

- Testing of the first prototype with a chimney (2012)
- Development of the inflated bubble concept, with testing done over four rice harvest seasons at IRRI (2013)
- Launch of a commercial SBD with 1-ton capacity (2014)
- Development of a SBD unit with 0.5-ton capacity (2015)

Outcomes and impact as of 2016

- The SBD is currently included in many development projects for verification.
- In 2015, a total of 60 units of the 0.5- and 1-ton-capacity SBDs have been sold.

How does it work?



The Solar Bubble Dryer uses solar energy from the sun in two ways. First, the drying tunnel serves as a solar collector to convert energy from the sun's rays (entering through the transparent top of the drying tunnel) to heat, therefore increasing the temperature of the air for faster drying. Second, the SBD is equipped with a photovoltaic system that consists of solar panels for generating electricity - a rechargeable deep-cycle battery for use at night and one or two small blowers to inflate the drying tunnel and move air through it. The air also removes water evaporating from the grains inside the tunnel. A simple roller with ropes attached to both of its ends is periodically dragged underneath to mix the grains without the need to open the tunnel. A rake for internal mixing is also available.

Performance

During sunny days, the drying time is comparable to that of sun drying. Usually, a batch can be dried within a day. During cloudy days or when it rains, drying time might take up to two days. The typical average drying rate is 0.5% moisture reduction per hour. Experiments conducted at IRRI showed that, since germination rate is maintained, the SBD is ideal for drying seeds. With sun drying, grain quality is seriously reduced during bad weather, whereas with the SBD, grain quality is preserved.

Initial assessment of benefits

A cost-benefit analysis done on the SBD in five Southeast Asian countries shows that a breakeven point can be reached if it is used by individual farmers with two ha of rice field and two crops per year. A precondition for this is that farmers should get a better price for better quality paddy; however, this is not the case in many local rice markets. Therefore, introducing the SBD to farmers should go hand-in-hand with linking them to markets with quality price incentives. Using the SBD to provide a drying contract service to farmers can improve its economic performance.

Further support needed

We are currently looking for funding to optimize the energy use of the SBD with the objective of reducing its price. A reduced price would provide a bigger incentive for farmers to adopt the SBD and thus support widespread adoption.

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For more information, visit the Rice Knowledge Bank online at rkb.irri.org or contact the Postharvest team at postharvest@irri.org



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