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Solar food processing by drying in an off-grid system in Kenya

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Abstract

In coastal Kenya, lack of cold storage facilities and appropriate technologies result in losses of harvested and fresh products. Coastal fishermen as well as farmers suffer from this situation as they are forced to sell their produce as soon as possible fresh, to dealers or at uneconomical prices. The warm weather in the region also hastens spoilage, especially of fish. Sun drying on open grounds is prone to contamination and produce poor quality fish that cannot gain access to high value markets.

The project SolCoolDry, supported by the Federal Ministry of Food and Agriculture (BMEL), aims to support the fisherman and farmers by the development and set-up of a 100 % solar powered, off-grid system for drying beside the production of ice. The system using solar thermal energy designed to provide a 24-hour operation of the solar tunnel dryer. Degradation processes of the material to be dried during night hours can therewith be avoided. The overall system consists of a sea container shaded by a roof of PV-modules and solar thermal collectors. All additional electric components to power the ice machine are installed in the container. Next to it, two solar tunnel driers have been set up – one with solar thermal support for optimised night operation and the other as simple stand-alone solar dryer. Using a monitoring system allows the partners to keep an eye from remote at the operation behaviour and to support the local operators.

For test and demonstration of the capacity as well as for training purposes different tests of the driers were conducted. With both dryers, excellent product quality could be achieved for various types of fish and several fruits and vegetables, while drying time was significantly reduced compared to conventional methods. By means of a novel concept of loading, the capacity of the installed dryers can be increased up to double, which also allows larger drying batches. In the test runs, it was shown that the overnight heat supply is effective: the heat was transferred to the product and the drying process could be continued throughout the night at 5–10 Kelvin above ambient temperature.

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