

GREEN TECHNOLOGY

SOLAR DRYERS

Food Drying is one of the oldest methods used for the preservation of food and agricultural products. It aims at reducing the moisture content of a product thus halting the growth and multiplication of microorganisms that thrive in a humid milieu, causing its decay.

TWO MODES OF ACTION EXIST FOR SOLAR DRYERS:

Passive Mode:

It relies on natural circulation of airflow

Active Mode

It includes a forced circulation of hot drying air through a ventilation system

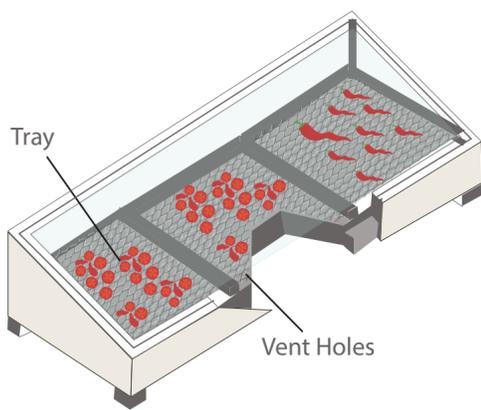
TYPES OF SOLAR DRYERS:

1. Direct Type Solar Dryers:

The dryer consists of an enclosed cabinet having transparent covers that allow the solar radiation to directly heat the product stored inside.

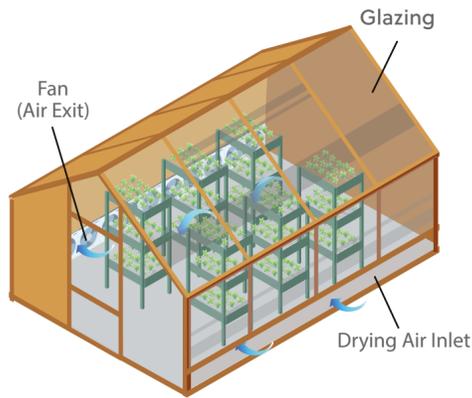
Passive Direct Solar Dryer

Solar Cabinet Dryer



Active Direct Solar Dryer

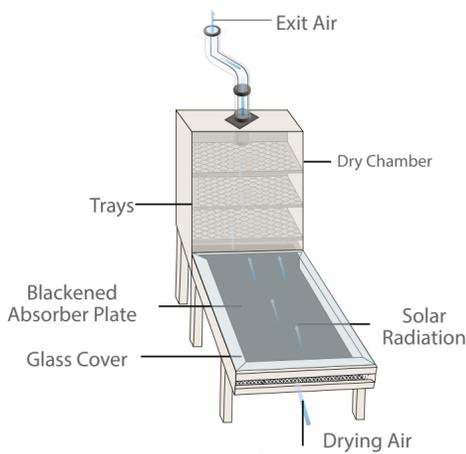
Forced-convection Greenhouse Dryer



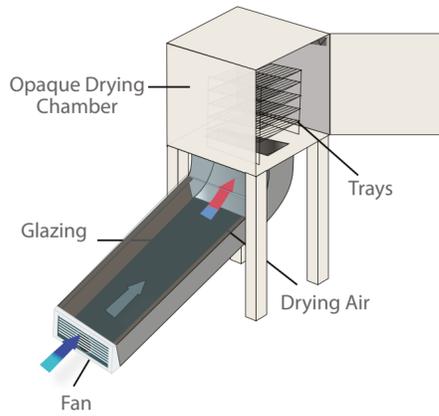
2. Indirect Type Solar Dryers:

Indirect type dryer consists of two main units, the solar collector that collects solar radiation through transparent covers, and the drying cabinet, an opaque compartment, where the product to be dried is placed.

Passive Indirect Solar Dryer



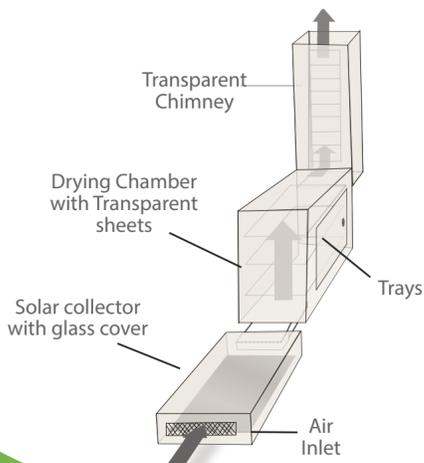
Active Indirect Solar Dryer



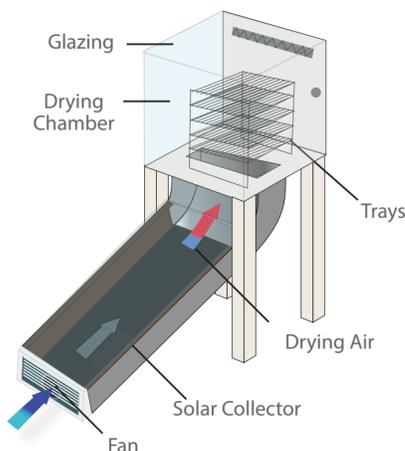
3. Hybrid Type Solar Dryers:

The hybrid solar dryer combines the characteristics of both the direct and the indirect solar dryers where the product is dried by a combined action of direct solar radiation and the air flow pre-heated in a solar collector.

Passive Hybrid Solar Dryer



Active Hybrid Solar Dryer



Dairy Products



Grains



Fish



Vegetables



Herbs



Fruits

- A green technology relying on solar renewable energy.
- Contribute to reducing food loss and waste.
- Suitable for the Arab Region which benefits from long hours of sunlight.
- Easily implemented & operated by rural communities.
- Compared to open sun drying practice, solar dryers are more hygienic, more efficient and can be used for a variety of crops.

Drying Tips for Fruits and Vegetables

General Tips

Optimum drying temperature for fruits and vegetables is around 60°C.

They should be sorted, washed, peeled when needed, sliced uniformly to allow them to dry at the same rate.

They should be placed in the dryer in a single layer and not overlapping.

Dried fruits and vegetables should be completely cooled before packaged in clean and dry tight containers and stored in a cool, dry and dark place.



Tips for Vegetables

Suited crops for drying include carrots, sweet corn, garlic, mushroom, pepper, onions, okra, green beans, beets, green peas, pumpkins, tomatoes...

Blanching, a pre-treatment phase, is necessary for some vegetables before the drying process to preserve color and flavor.

Vegetables should be dried until they are hard or leathery, depending on the vegetable, having around 10% moisture content.

Dried vegetables have a shorter shelf-life than fruits, they can be stored from 4 to 12 months.



Tips for Fruits

Suited fruits for drying include apricot, plum, apple, grape, figs, cherry, banana, pineapple, kiwi, mango...

A pre-treatment phase is necessary for some fruits to avoid their darkening through dipping in sulfite, fruit juice, or honey among other treatments.

Fruits should be dried until leathery but not hard having around 20% moisture content.

Most dried fruits can be stored for 1 year at 16 °C or 6 months at 27 °C.

Advantages of Solar Dryers

- Create a new market for new products taking advantage of a higher price after the end of the season.
- Represent a practical opportunity for small developing businesses, especially in rural areas.
- Offer a variety of designs adaptable to the type, quantity and characteristics of product.
- Can be locally manufactured from available material.
- Have short payback period to recover initial investment cost compared to lifespan of dryer.

Advantages of Solar Dryers

- When designing the dryer, properties of the dried product and characteristics of the installation site are to be considered.
- Skilled personnel might be required for operation and maintenance.
- Solar Dryers can only be used during day time as they directly depend on the availability of sun, unless an auxiliary source of energy/heat is used.
- Caution must be taken with direct type solar dryers as the product is subject to direct solar radiation which might cause discoloration or other undesirable effects.

