

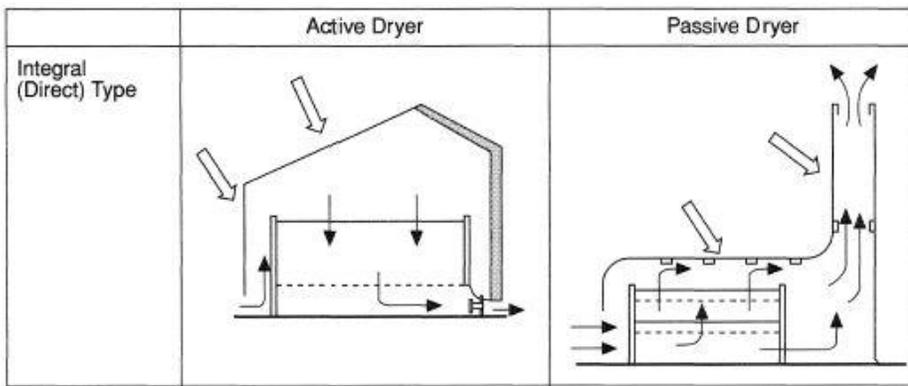
SOLAR DRYERS – inexpensive direct models

Introduction

Horticultural produce can be dried using direct or indirect solar radiation. The simplest method for solar drying is to lay produce directly upon a flat black surface and allow the sun and wind to dry the crop. Nuts in their shells can be dried effectively in this way. Lifting the produce off the ground so that air can pass over and below the produce will speed the drying process and reduce losses due to overheating. Covering the produce with cloth, plastic or glass will protect fruits and vegetables from insects and dust during the drying process.

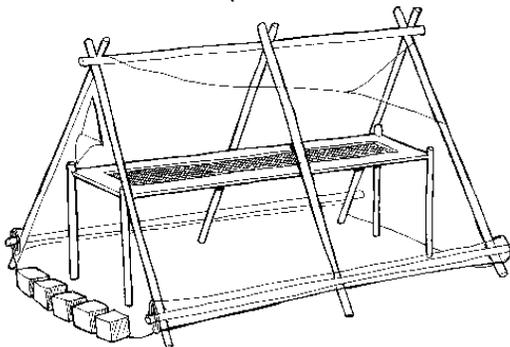
Design Options & Materials Needed

An active solar dryer uses an electric fan to pull air through the sun warmed chamber. A passive solar dryer has a chimney or vent that allows warmed air to rise toward the top of the chamber, up and out of the dryer.



Source: www.thermopedia.com

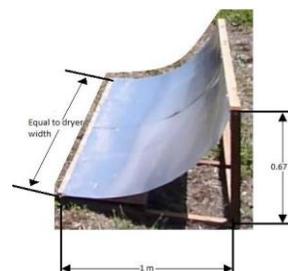
Tent style solar dryer: a simple plastic tent with a vent hole on one end. (Source of illustration: ITP/CTA 1992)



Box style solar dryer: More complex models of solar driers have glass, polycarbonate or clear plastic windows that cover the produce, providing protection from insects and dust while capturing more of the heat of the sun. A concentrator made of reflective metal sheeting mounted in a curved frame can be added to reflect more sunlight toward the solar drying box.



Indirect box style solar dryer



Concentrator (Ringelsen, 2012)

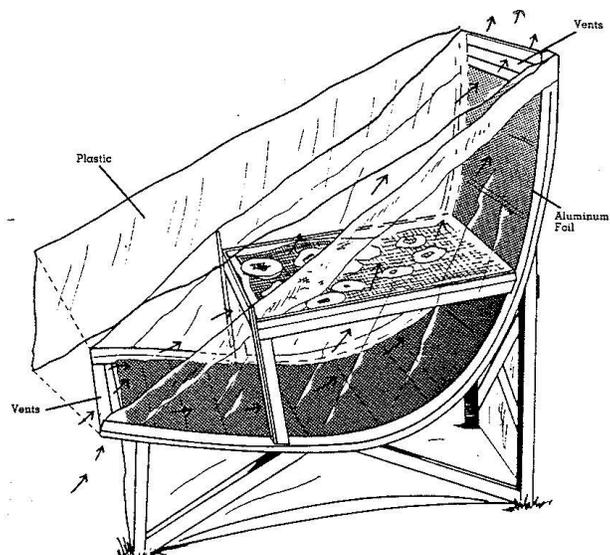
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Cradle style solar dryer: Aluminum foil or sheet metal can be utilized to concentrate and reflect the sun directly onto the drying trays. The example shown below also uses a plastic sheet to trap heat and speed drying time.



Improved Solar Drying Principles:

Changing the colors of the plastic sheeting or the wooden sides on dryers to modify heat load (ex: black absorbs more heat)
Adjusting air flow dynamics to move moist air out faster and speed drying (add top vents or a chimney)
Moderate temperatures for better quality (too hot is not better since excess heat can cause color and texture problems)
Pre-treatments (such as uniform slicing, blanching, sulfuring or salting) can improve quality and color retention
Processed product will also need simple, low cost packaging to protect from insects, light, oxygen (ex: zip-lock bags, metal foil pouches or jars with lids that fit well)

Source of illustration: ITP 1987

Costs & Benefits

Direct models of solar dryers can be self-constructed using simple materials and therefore very inexpensive. The financial benefits will depend upon the value of the fresh F&V that are saved from being wasted and the market value of the dried products. Using solar drying to process surplus F&V that cannot be marketed or eaten before their shelf life is expended can enhance food security. Drying valuable perishable crops for later sale or use can be an inexpensive way to extend the storage potential and marketing period of these food products.

References cited

Ringeisen, Harold Blake (2012) MS Thesis, UC Davis, Biological Systems Engineering
ITP, 1987. Post-harvest Crop Processing: Some tools for agriculture. Intermediate Technology Publications. London, England. 29 pp.

For further information

Illustrations of a variety of solar dryer models <http://www.thermopedia.com/content/1136/>
Small-scale postharvest handling practices: A manual for horticultural crops (Chapter 10; 5th edition 2015) http://ucanr.edu/sites/Postharvest_Technology_Center_/files/231952.pdf
Postharvest Technology Center (UC Davis) <http://postharvest.ucdavis.edu>
The Postharvest Education Foundation <http://www.postharvest.org>
Postharvest Innovations LLC <http://www.postharvestinnovations.com>

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