# Concentrated Solar Drying of Mangoes and Tomatoes: Design for Tanzania

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## Statement of Problem

In Tanzania, 50–80% of mangoes and tomatoes currently go to waste during production periods due to their perishability and an inability to adequately preserve them with local technologies.

**We propose to develop a solar food dryer that will use concentrated solar power to quickly and safely dry fresh food, particularly fruits and vegetables, in hazy environments. The unit will be constructed with locally available materials and technology.**

## Goal

Develop (design, build and test) a solar food dryer that will use concentrated solar power to quickly and safely dry fresh fruit in partially cloudy, hazy environments.

## Horticulture CRSP Objectives Addressed

### Innovative Technology

Concentrated solar power (CSP) has never been applied to drying of nutritious horticultural crops. The addition of reflective surfaces to existing solar dryers will increase the temperature delivered to the drying platform, which should result in improved product quality.

### Information Accessibility

Only 1% of the horticultural crop produced in Tanzania is currently processed, due to lack of food processing facilities and expertise. This novel dryer will build local scientific and technical capacity.

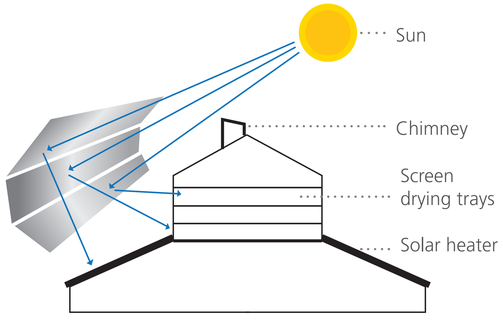
### Gender Equity

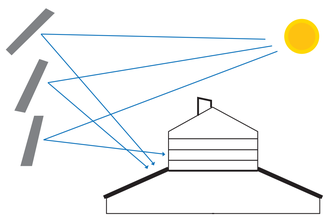
Producers of horticultural crops in Tanzania and other developing countries are predominantly women. Development of the CSP dryer involves two female PIs.

## Design Concept

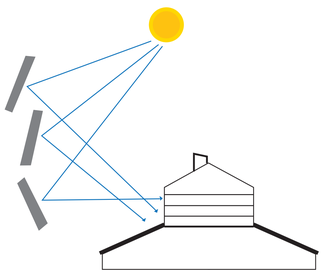
Foil covered panels with adjustable orientation, each panel is as long as the solar heating platform.

Screen drying trays allow radiation to heat from underneath, as UV resistant polyethylene sheeting covers the drying area.



Low Sun Angle



Mid-day Sun

### Collaboration with D–Lab II

Students participating in the UC Davis D–Lab, a program designed to develop innovative approaches to energy issues in developing countries will be constructing and testing prototypes of the design over the next ten weeks.

### Design Considerations

Our dryer design will utilize both direct and indirect drying methods, as well as CSP technologies. Air is heated at the base and flows by natural convection up over the fruit for a more consistent product and faster drying time. The design incorporates solar heater plains on three sides of the dryer in order to maximize surface area and heat. Reflective panels will concentrate solar radiation, heating the air that will dry the fruit indirectly, as well as the fruit in the upper cabinet. The panels will be adjustable so they can be positioned according to the sun's strength and movement, but the convection effect of the indirect dryer will offset excessive sun and prohibit over-drying.