Scaling up the Chimney Solar Dryer

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USAID FROM THE AMERICAN PEOPLE

HORTICULTURE INNOVATION LAB

UC DAVIS UNIVERSITY OF CALIFORNIA





Horticulture Innovation Lab

- Managed by UC Davis since 2009
- Awards grants to U.S. university researchers to conduct research in collaboration with developing country partners
- Seed systems, production practices, postharvest handling and market access
- Emphasis on innovative technologies, nutritious foods and women's empowerment

Solar drying to preserve food – an opportunity for small-holder farmers

- Low market prices during production peaks
- Drying can preserve excess product
- Provides an ‘added value’ product for year-round use or sale
- Open air drying problematic
- Existing ‘cabinet’ dryers are expensive and inefficient

Chimney Solar Dryer

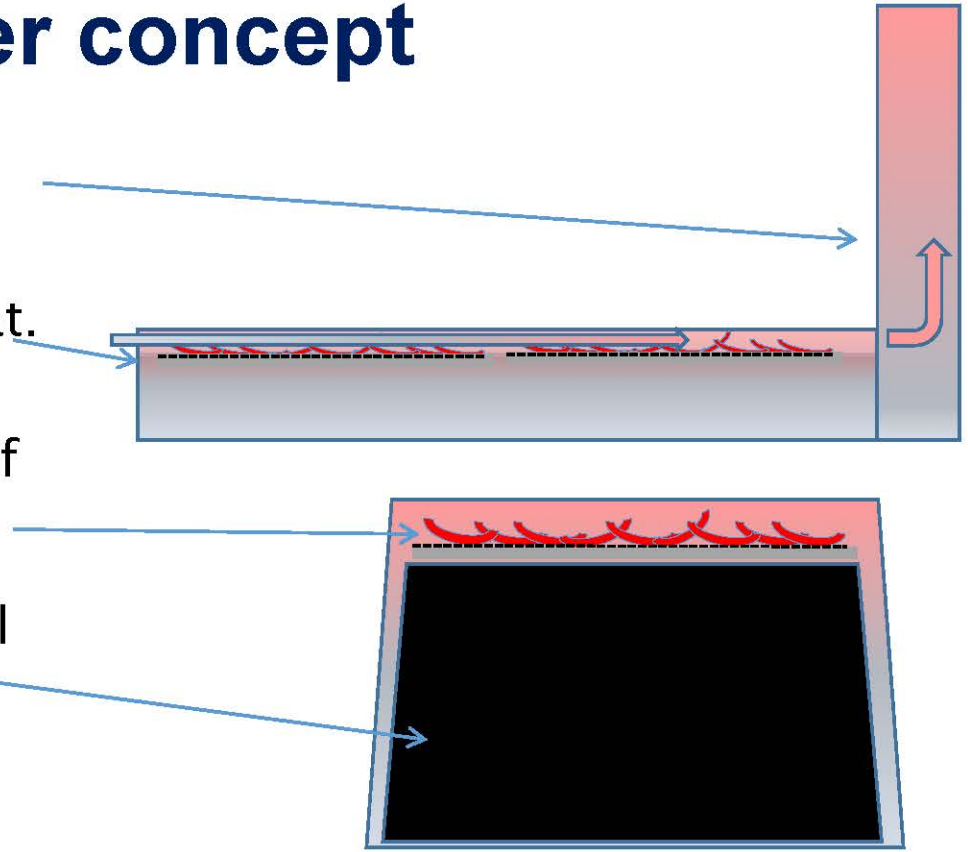
A cost-efficient structure that reduces drying time compared to other solar dryers

Advantages:

- Higher drying speeds
- Works in unfavorable weather conditions
- Portable
- Protects from contamination
- Does not require electricity or expensive tools

The chimney dryer concept

- Use a chimney to draw the air through the tunnel
- Use a clear plastic tunnel to collect solar energy – free heat.
- Place the product at the top of the tunnel, where the warmer air is.
- Fill unused parts of the tunnel to increase air speed past the product.



Chimney Dryer construction timelapse

Chimney Solar Dryer

200	Material costs ($)	58.84
10	Fruit capacity, fresh weight (kg)	5
2	Time to dry fruit to 10% MC (11h days)	5.5
7.27	Cost per drying capacity ($/kg-drying period)	11.77
58.33	Highest air temp. in dryer – ambient (°C)	46.67
0.63	Air velocity (m/s)	0.11

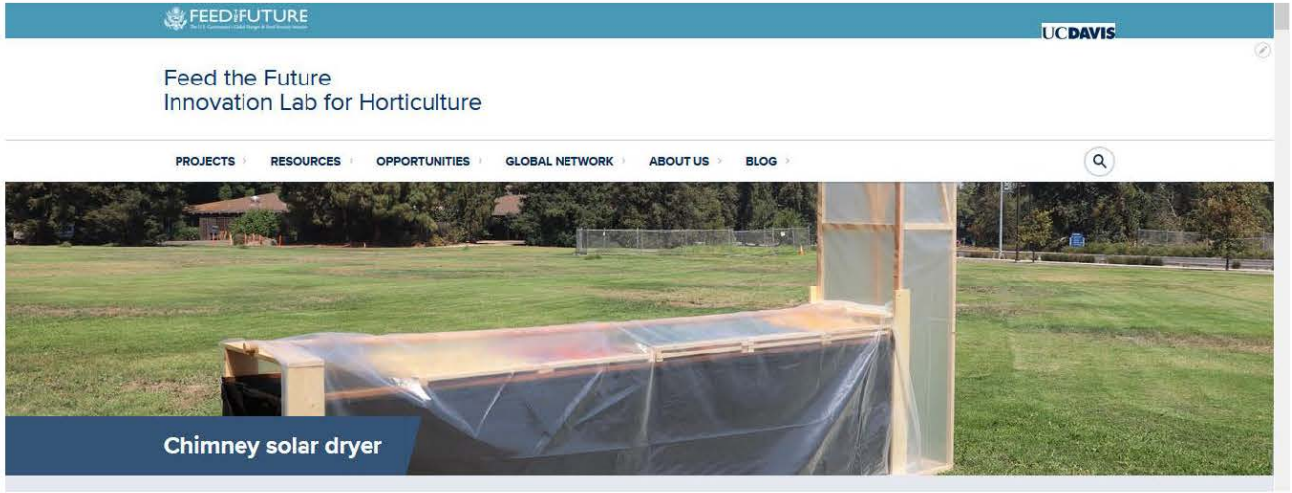
Cabinet Dryer

Scaling the chimney dryer

- Prototypes at Innovation Centers
- Construction at short courses
- Informational materials
  - Videos
  - Fact sheets
  - Construction manual
  - Website

Dissemination/Extension - Regional Centers of Innovation and Service Centers

- Goal is to be a regional resource center for trainings, technology, research, and scaling of technology in order to improve the resilience, nutrition, and income of small-holder farmers with a focus on gender equality
- Improves sustainability of efforts
  - Zamorano University, Honduras
    - Latin America and Caribbean Center
  - Kasetsart University, Thailand
    - Southeast Asia Center
  - Guinea Service Center
  - Rwanda Post-Harvest Handling Centers
  - UC Davis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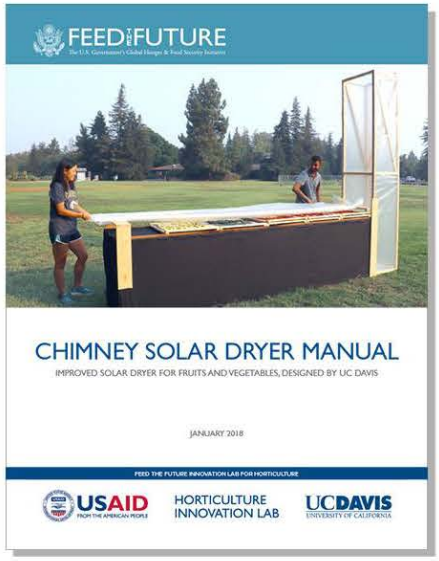
FEED the FUTURE
CHIMNEY SOLAR DRYER MANUAL
IMPROVED SOLAR DRYER FOR FRUITS AND VEGETABLES, DESIGNED BY UC DAVIS
JANUARY 2018
FEED THE FUTURE INNOVATION LAB FOR HORTICULTURE
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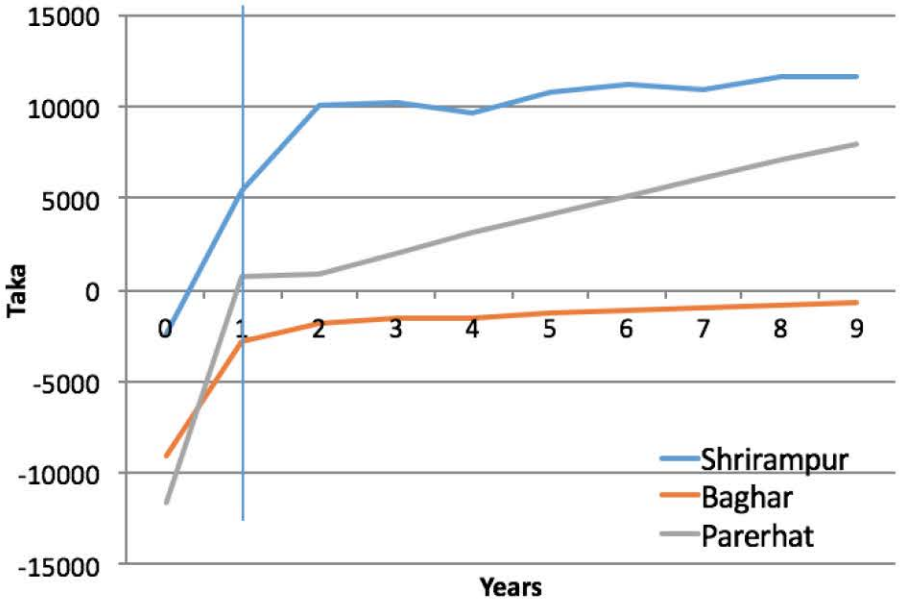
Building a Chimney Solar Dryer
BUILDING A CHIMNEY SOLAR DRYER


Troubleshooting and Tips for the Chimney Sol...
TROUBLESHOOTING AND TIPS


Using the Chimney Solar Dryer
USING THE CHIMNEY SOLAR DRYER

Chimney Solar Dryers in Bangladesh



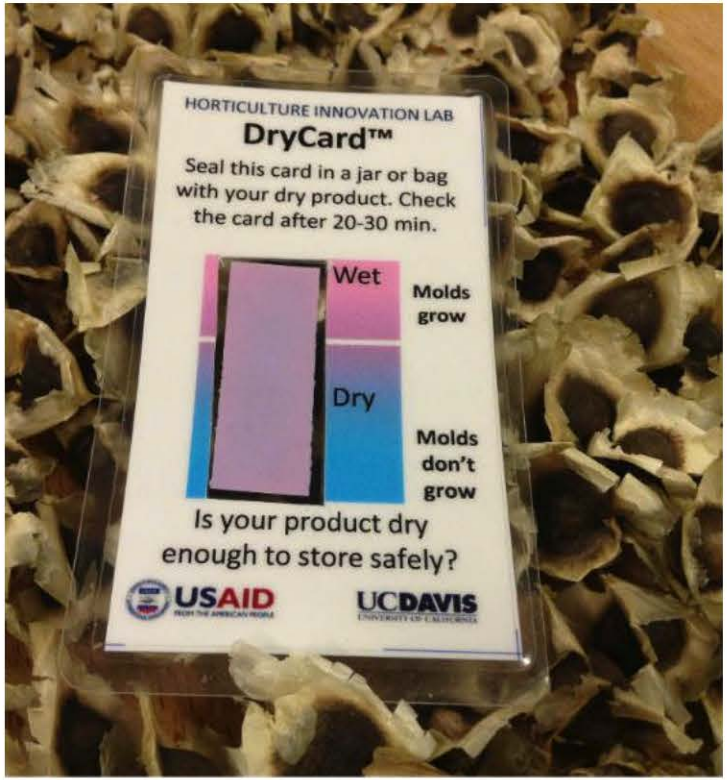
- Early data shows positive net value after one year, and profit margins continue increasing
- Baghar: conservative projection based on lack of local market prices (products have no established commercial value)
- Drying products with high unit price (pulses, fish, mango leather, chilies, groundnuts), helps to promote a positive net present value

Constraints to scaling

- Principles have proven difficult to communicate
- Materials can be difficult to obtain
  - Greenhouse-grade plastic
  - Using PVC clear cover instead of PE
  - Food-grade mesh for trays
  - Low quality of wood
- Lack of market for dried foods

The small-scale entrepreneurial model for scaling

- Pioneered with the DryCard™
- Small-scale and/or new entrepreneurs identified in-country
- We provide a 'start-up' package of needed materials
- They provide tools (printer, laminator) and labor
- We provide quality control, technical advice, brand recognition



Use our DryCard™ entrepreneurs

- Empower them to be agents for 'tools for the dry chain'
  - Dryers (Chimney dryer, pallet dryer)
  - DryCards
  - Drying beads
  - Packaging (PICS bags etc.)
- Sell materials and know-how
- Construct dryers on site and provide operational guidance and technical support

Potential benefits of this scaling strategy

- Ensures local ownership and sustainability
- Allows us to provide on-going technical assistance
- Tests different local marketing strategies
  - Lottery (Uganda)
  - NGO facing (Rwanda)
  - Ag dealership (Ghana)
  - Social enterprise (Thailand)

Potential partnerships and future work

- Identify areas where drying is a challenge
- Identify cultures where dried products are traditionally consumed
- Expand in more countries
- Work with existing PICS bags network