Technologies for Value Addition in Agro-products

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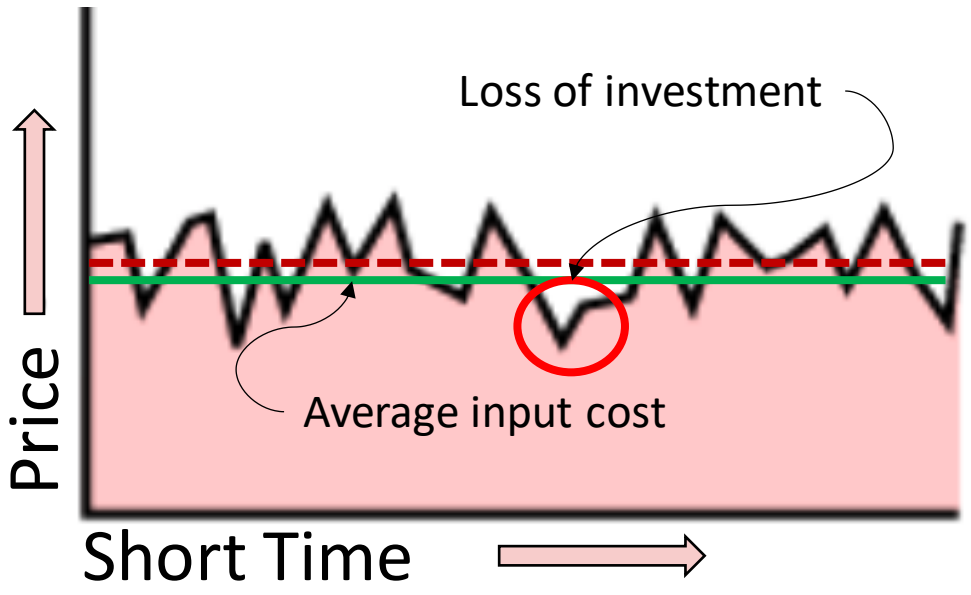
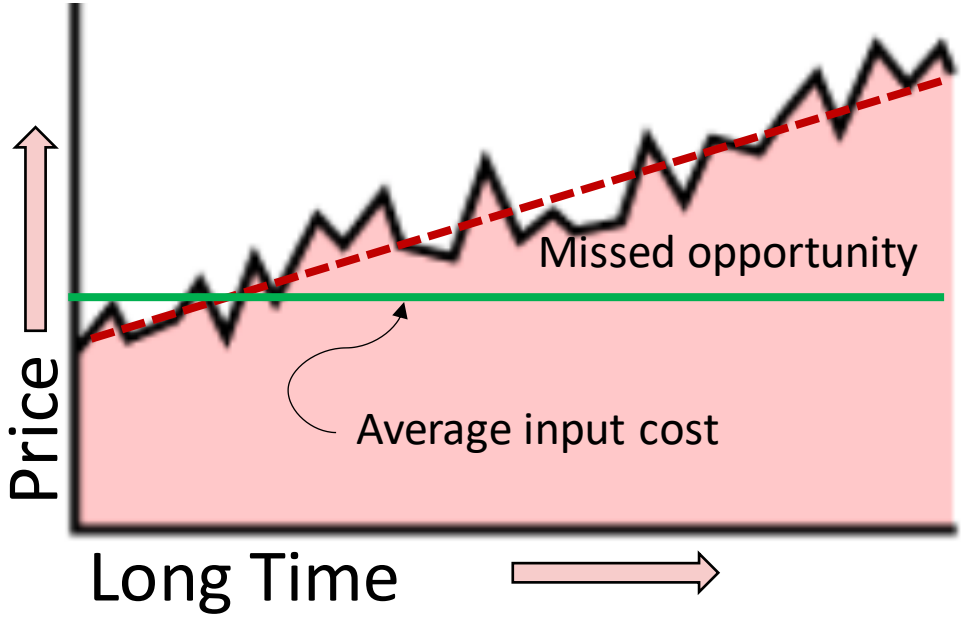
Affordable Innovative Technologies and Solutions for Rural Development
Technologies Facilitating Access to Value Chains and Markets
24th March 2021

Some challenges faced by rural producer?

Random fluctuations



Trend



A Jasmine Grower – Misses the time window

- A Jasmine flower cultivator missed his opportunity to load early in the morning
  - His next opportunity will see his product value significantly reduce
  - What can he do?

Small farmer with spare veggies?

What about Long term?

Simple technologies for post harvest handling of produce

Short term

- Cold storage
  - Micro cold storage

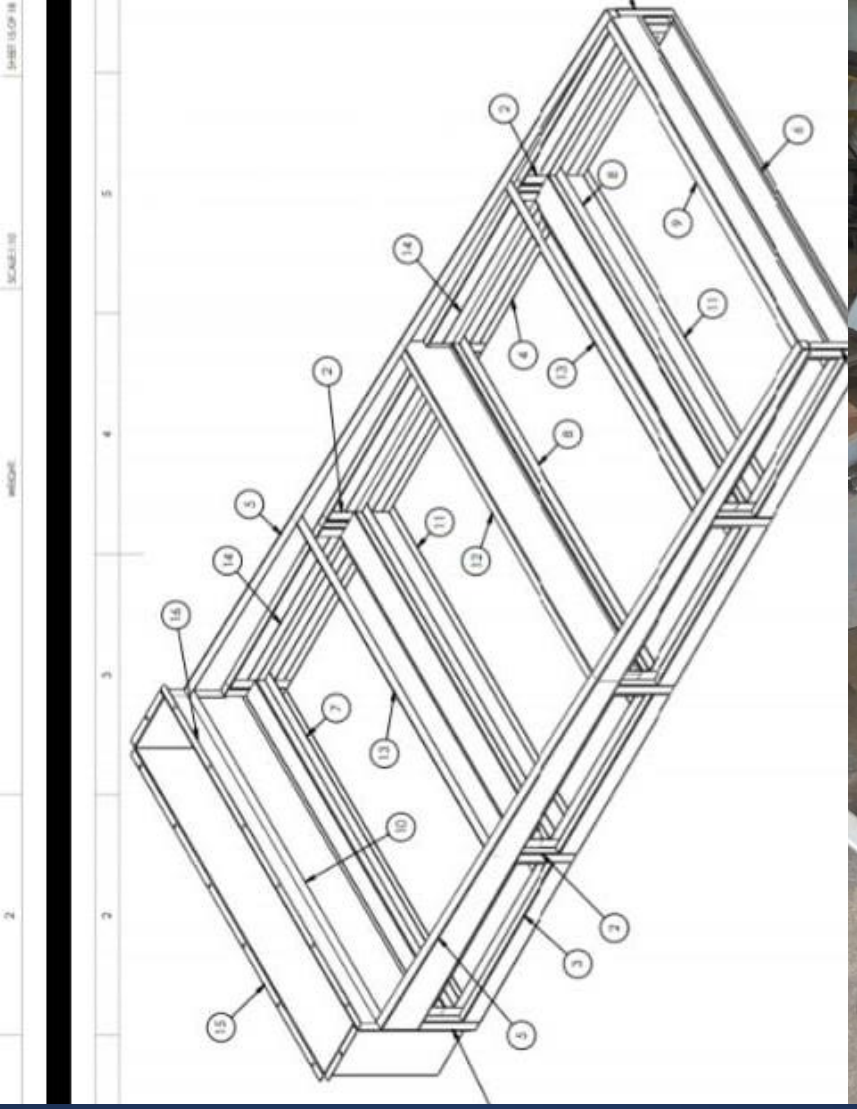
Longer timeframe

- Low value addition
  - Infrastructure cold storage
- Higher value addition
  - Processing
    - Juicers, mixers, grinders
    - Oil extraction
  - Removing moisture
    - Solar dryers
    - Heat pump dryers

Simple technology interventions that has a very significant value addition potential

Gratitude Farms – Solar Drying Project

Sun-dried value-added products



High efficiency solar dryer

Dryer Specifications

Number of drying trays	3
Capacity per tray (Total capacity)	~20 kg (tomatoes) ~ 30 kg (tubular crops)
Average chamber temperature (clear sunny day)	50 to 60 °C
Average chamber temperature (cloudy/overcast day)	40 to 45 °C
Solar air collector area	~2.25 sq.m
Total solar exposed area	~3.50 sq.m
Dryer configuration	Multi-tray design with serpentine flow path
Active mode	Four circulation fans
Power supply	25 W solar panel with 2-hour battery back-up
Average drying time for leaves	2 hours under clear sky condition
Average drying time for tubular crops	7 to 10 hours under clear sky condition
Average drying time for tomatoes	7 to 9 hours under clear sky condition
Manufacturer in Chennai	Aspiration Energy

Products on the Market

	ACD	SCD	New Dryer (Our design)
Drying load	~10 kg	~15 kg	~20 Kg
Heated Air enters drying chamber	Yes	No	Yes
Forced Draft	Yes	No	Yes
Conduction enhanced drying	No	Yes	Yes
Multi Layer drying	No	No	Yes
Drying time	Medium	High	Low
Market Price (approx.)	30,000	35,000	55,000

Technology for efficient drying at cooperative scale

Heat-pump drying

Controlled environment moisture removal and dehydration
High value crops such as cardamom, raisins
24x7 operation and can be integrated with solar as well

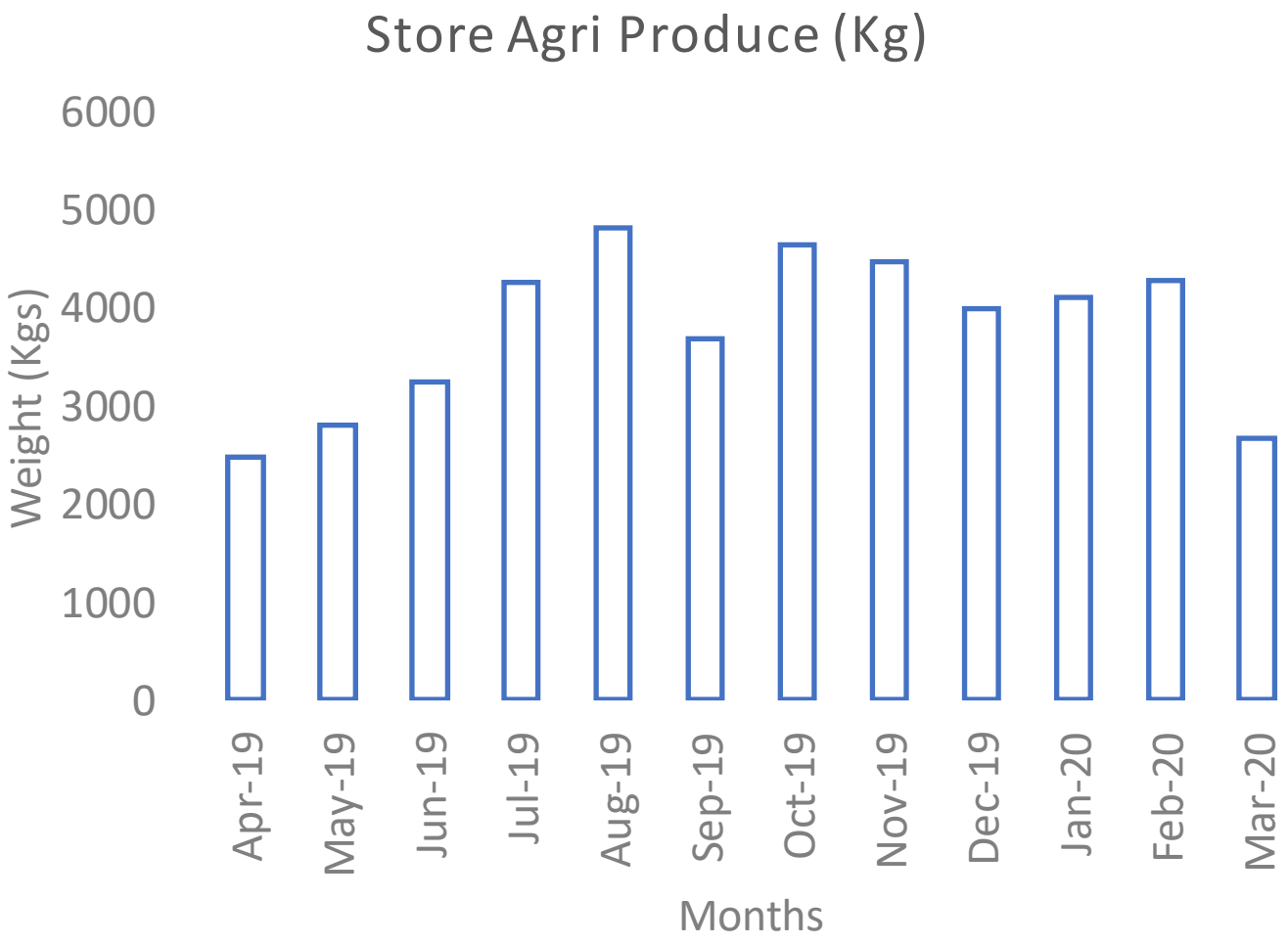
Short-term value addition

- Solar cold storage and Micro-cold storage

First generation solar cold storage

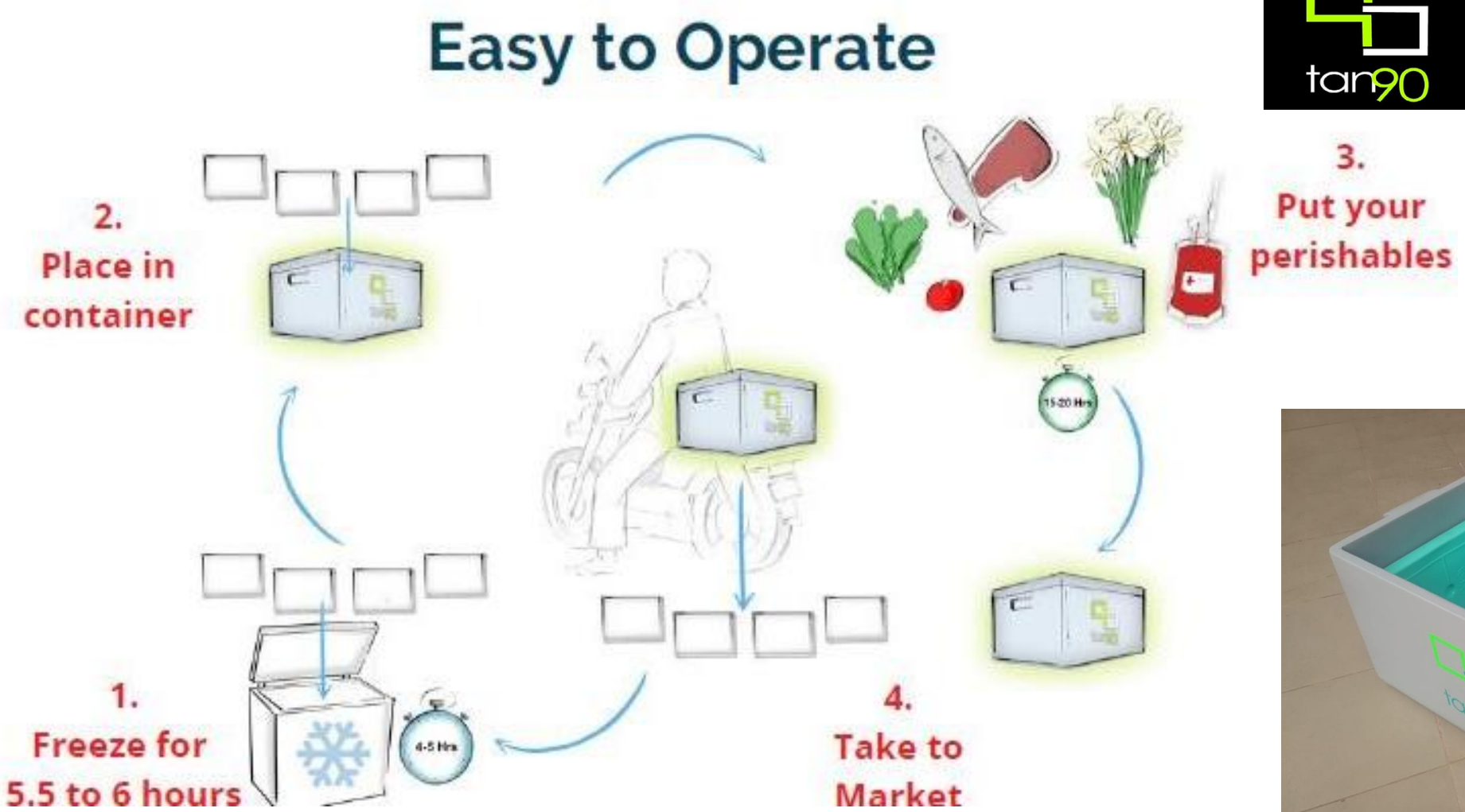
Particulars	Technical parameters
Storage capacity (in kg)	250-300Kg
Size of chiller (in ft)	7 ft L x 3ft B x 5ft H
Power Consumption (MAX) (kW)	2 Kwh.
Insulation	100 mm thick with Puff
Chiller room Temperature range (°C)	8 to 10 °C
Type of thermal battery	PCM based Eutectic Plate (3 nos.)
Thermal storage backup (hrs)	24-30
Power Supply	415 VAC, 35 to 50 Hz
Charging time (hrs)	5 - 6
Type of Compressor	Reciprocating
Model (standalone/integrated)	Prototype model integrated with solar dryer, pump and lights

Experience with solar cold storage..



- Unit installed; farmers not keen – Sell immediately was motive (Sep18 – March 19)
- Awareness created (from April 19) in utilization of solar chiller in that location
- A group of 50 farmers from nearby villages of Chitravadi start using chiller to store veggies and flowers
- **Earn Rs. 2-3 more** for a kg of vegetables
- **Earn Rs.25-30 more** for a Kg of flower
- Understood convenience – sell high

Micro-cold storage



THE ECONOMIC TIMES | Rise
English Edition ▾ | 24 March, 2021, 12:42 PM IST | E-Paper

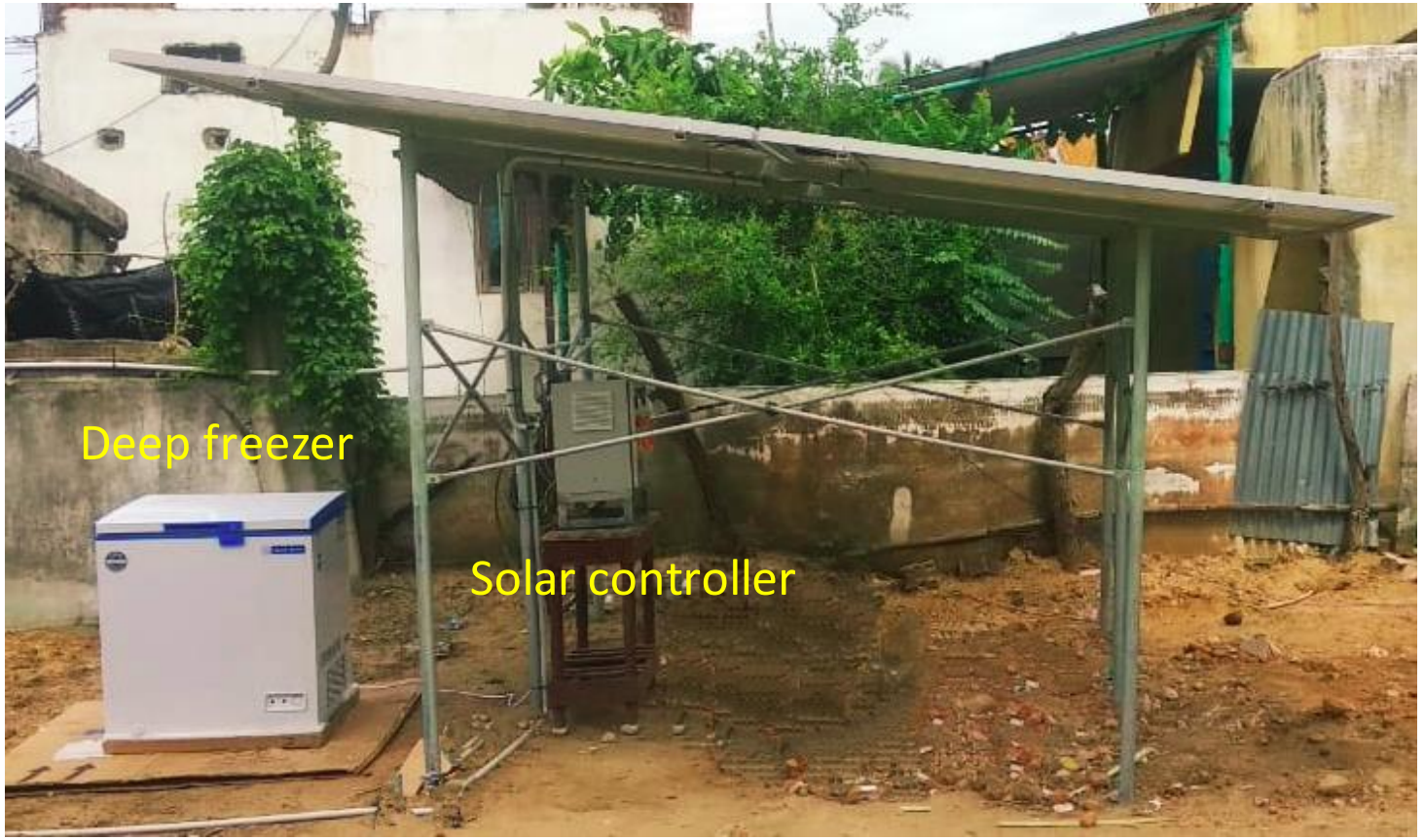
IIT-M startup develops solar-powered cold storage for farmers

Synopsis
In an attempt to cut wastage of agricultural produce, IIT Madras-incubated startup Tan90 has developed a portable, solar-powered cold storage device to preserve farm produce.

Others

CHENNAI: In an attempt to cut wastage of agricultural produce and augment income for farmers, IIT Madras-incubated startup Tan90 has developed a portable, solar-powered cold storage device to preserve farm produce.

The company has worked in collaboration with the Murugappa Chettiar Research Centre, part of the Murugappa Group, on the project.



How is it used??

Details Tan90 cold storage box

Number of thermal batteries	:	3 per box (for flowers& veg.)
Capacity of each cold storage box	:	40 liters
Thermal battery freezing time (-18°C)	:	5-6 hrs
Temperature in the box	:	8-12° C
Time duration (temp. maintain)	:	10-12 hrs (with out opening of lid)

Parameters	Value
Freezing Point	-4 °C
Melting Point	-4 °C
Latent heat	310 Kj/kg
Base Material	Inorganic salts
Flammability	No
Maximum Operating Temperature (°C)	100
Congruent Melting	Yes
Quantity of base materials per plate	1 lit

Tan90 cold box users –Vegetables users

Flowers Users

Milk User

Fish User

MCRC Tan90 Portable cooler users

Mr. Sivaprakash, Laksminathapuram

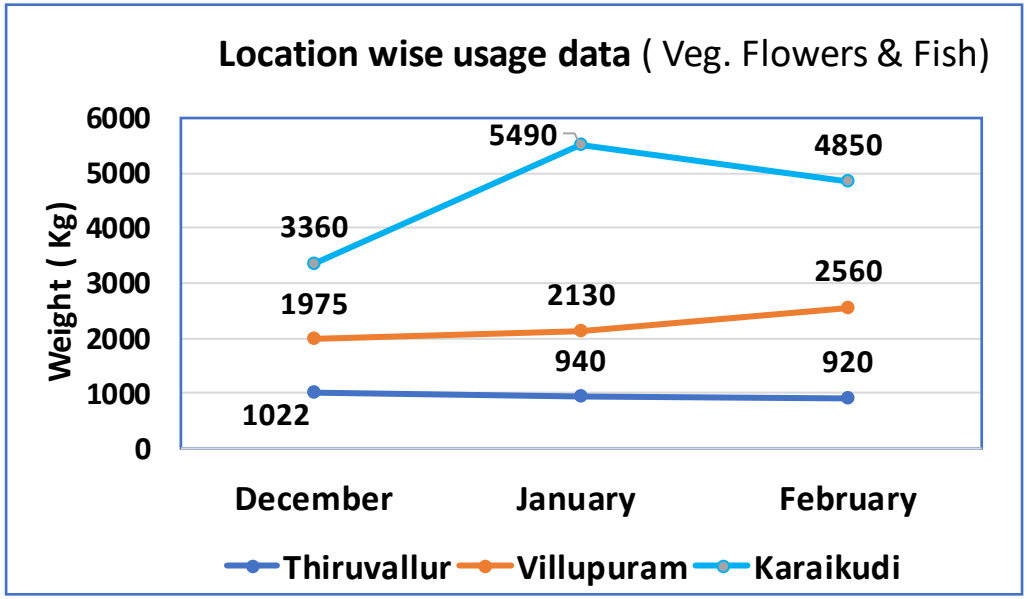
Mr. Somanathan,Gruwayal

Mr. Ramamoorthy, Sethupakkam

Fruits and vegetables

Flowers (Jasmine & Rose)

Tan90 cold storage box usage data and feedback



- 60 boxes kept as a centralized unit. (20 boxes each location). Around 150 farmers are using the Tan90 cold storage box in each locations.
- In Tiruvallur, most of the farmers using Tan90 boxes to store flowers. whereas, in other two locations, majorly it is used to store vegetables.
- In Karaikudi cluster, most of the farmers are direct vendors. They use these cooler box averagely 28 days in a month.

Feedback from users

- ✓ Easy to take it to market using a two-wheeler
- ✓ Keeping vegetables & flowers fresh for longer time
- ✓ Getting extra income by keeping produce fresh

The story does not end..

Torrefaction of Biomass Waste

Torrefied Rice straw at various temperatures of torrefaction at 30 min

100°C 200°C 225°C 250°C 280°C

Torrefied Bagasse at various temperatures of torrefaction at 30 min

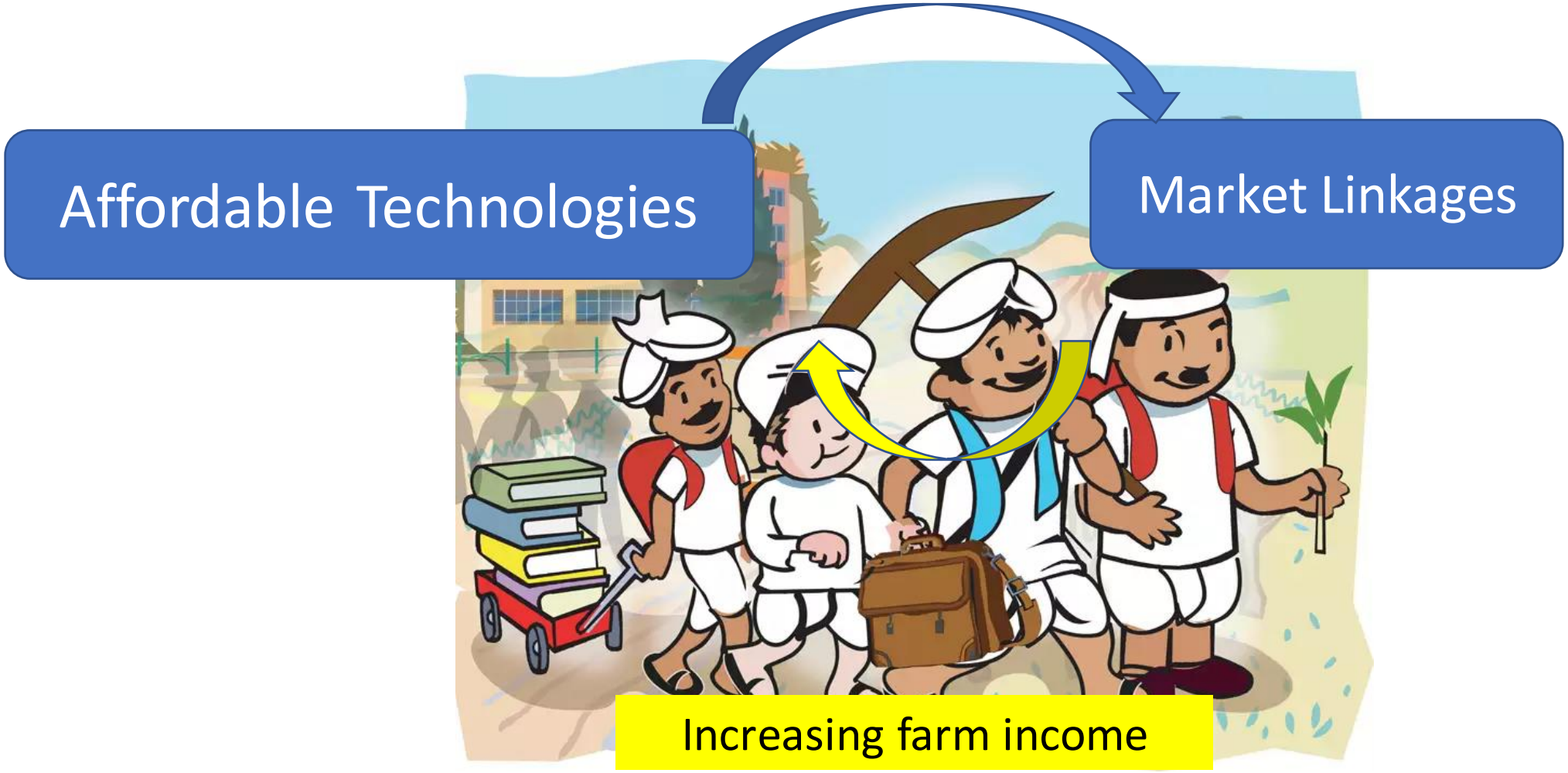
100°C 200°C 225°C 250°C 280°C

Why torrefaction?

- Alternative fuel source
- Non-polluting and renewable
- Smokeless fuel
- Easy to store and transport

- Increased resistance to biological decay
- Most of the smoke and volatiles will be removed, which results in a product
- with lower mass, but higher heating value.
- Improves uniformity in the properties among different biomass types.
- Improves grindability and energy density.

Pelletiser

High quality biofuel

Increasing product value