



# Annual International Training Course (AITC) 2023

**The application of a parabolic greenhouse solar dryer together with raw material preparation techniques to extend shelf-life and enhance quality of agricultural products**

**24 April – 5 May 2023**





AITC course 2023 : The application of a parabolic greenhouse solar dryer together with raw material preparation techniques to extend shelf-life and enhance quality of agricultural products

## Lecture 1\_24 April 2023

# Postharvest losses and deteriorations of fresh agricultural produces related to their shelf-life (Part 1)

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## POSTHARVEST LOSSES - definition

- Losses are a measurable reduction in foodstuffs and may affect either quantity or quality" (Tyler and Gilman, 1979)
- Losses make their uses impossible





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## POSTHARVEST LOSSES - definition

- Any change in
  - availability (quantity)
  - edibility
  - wholesomeness
  - value-giving ingredients
  - nutritive, biological, technological and sensorial properties of the food between harvest and consumption
- A measurable quantitative and qualitative loss in a given product
- Losses include contamination by pathogenic or toxic components
- Qualitative losses include product deterioration leading to a downgrading of the product



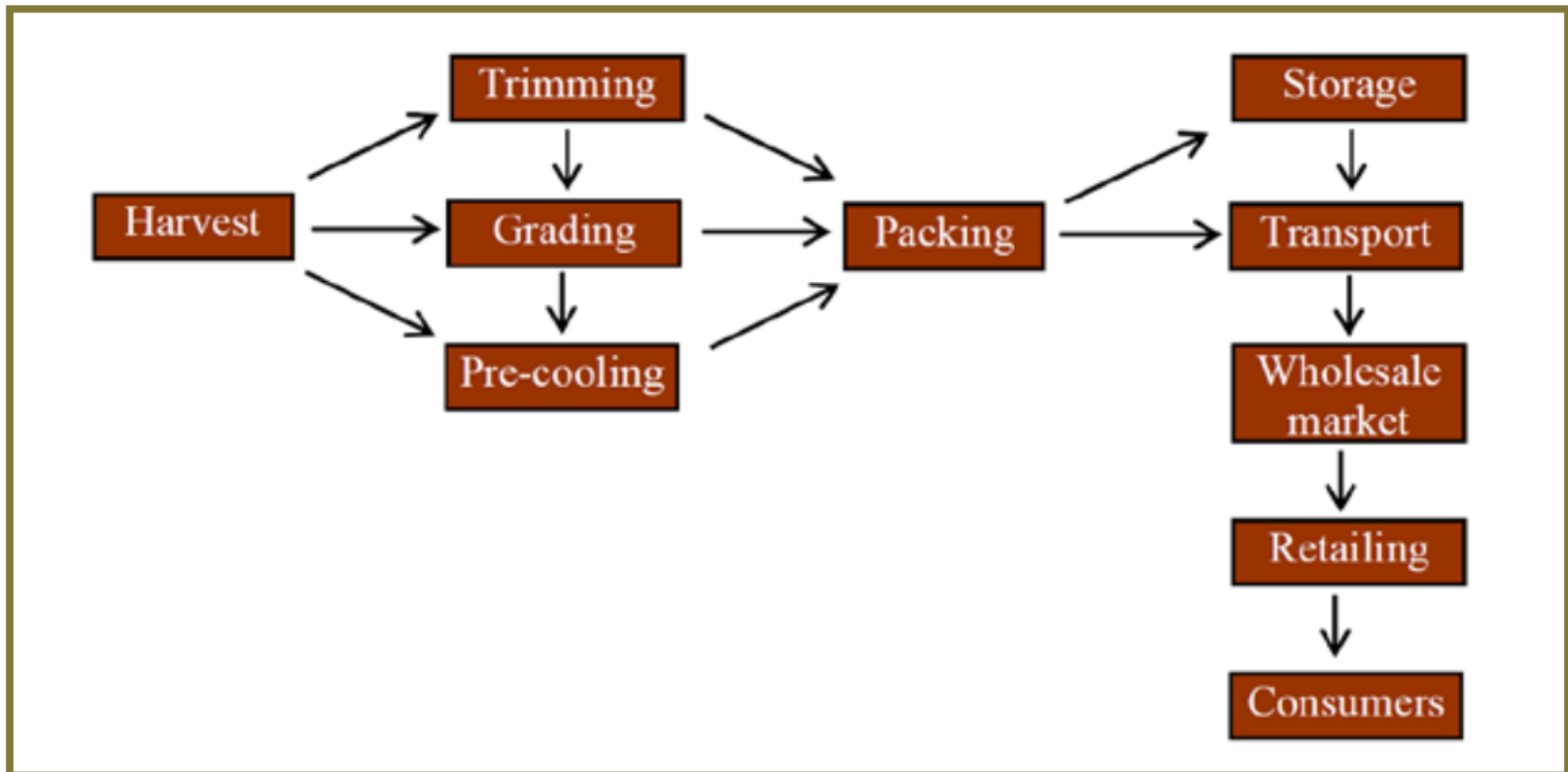
**TICA**  
Thailand International  
Cooperation Agency



**80<sup>th</sup> Anniversary**  
SILPAKORN UNIVERSITY

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## POSTHARVEST CHAIN\_horticultural products



Source: Hassan, Chowdhury & Akhter, 2010.



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# POSTHARVEST CHAIN\_banana in Thailand

## 1. From Farm in Petchaburi Province



ปลูกกล้วยหอมทองส่งขายประเทศญี่ปุ่น  
มาตั้งแต่ปีสองพันห้าร้อยสามสิบเก้า



Banana cv. Hom Thong

\*Source: <https://fb.watch/chnARL1oXa/>



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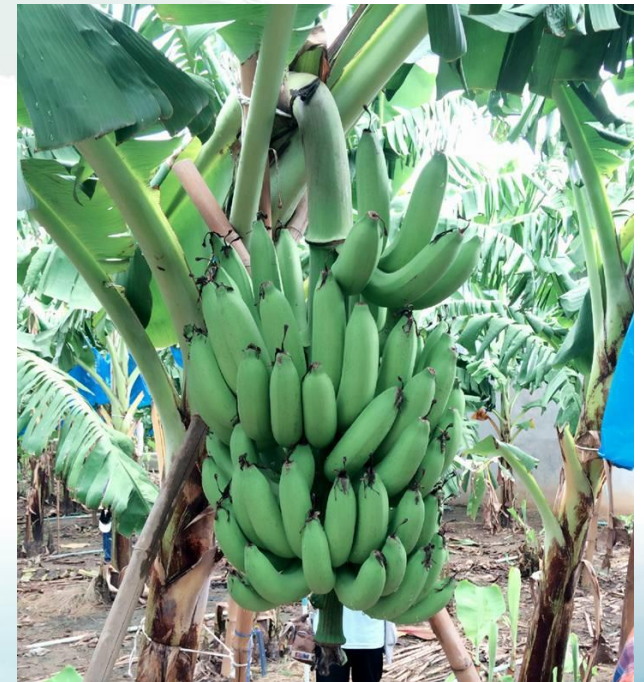
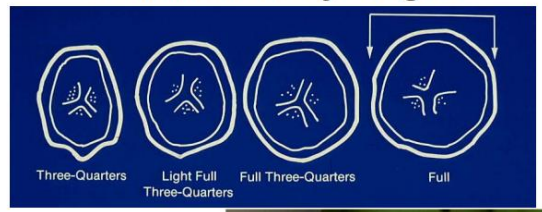
# POSTHARVEST CHAIN\_banana in Thailand

## 1. From Farm in Petchaburi Province



70% mature for export to Japan

### Banana Maturity Stages



100% mature for domestic market

Maturity index: Degree of fullness of the fingers



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# POSTHARVEST CHAIN\_banana in Thailand

## 1. From Farm in Petchaburi Province



Harvest: Manual

\*Source: <https://fb.watch/chnARL1oXa/>





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# POSTHARVEST CHAIN\_banana in Thailand

## 2. At Packing House



Transportation to packing house



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## POSTHARVEST CHAIN\_banana in Thailand

### 2. At Packing House



Unloading : Manually



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## POSTHARVEST CHAIN\_banana in Thailand

### 2. At Packing House



Postharvest operations: Sorting, Quality inspection, Washing, Packing, Storage, Transportation



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# POSTHARVEST CHAIN\_banana in Thailand

## 2. At Packing House



Postharvest operations: Sorting, Quality inspection, Washing, Packing, Storage, Transportation



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# POSTHARVEST CHAIN\_banana in Thailand

## 2. At Packing House



Postharvest operations: Sorting, Quality inspection, Washing, Packing, Storage, Transportation



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# POSTHARVEST CHAIN\_banana in Thailand

## 2. At Packing House



Local Wholesale Market



Export to Japan



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## POSTHARVEST CHAIN\_banana in Thailand

### 3. At Market\_Japan\_Retail market





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## POSTHARVEST CHAIN\_banana in Thailand

### 3. At Market\_Domestic market



Wholesale Market





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## POSTHARVEST CHAIN\_banana in Thailand

### 3. At Market\_Domestic market



Modern trade in Bangkok



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## POSTHARVEST CHAIN\_banana in Thailand

### 3. At Market\_Domestic market



Retail Market



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# POSTHARVEST CHAIN\_mango in Thailand

## At Farm Level



Harvesting, Sorting, Grading, Packing, Transportation



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# POSTHARVEST CHAIN\_mango in Thailand

## At Domestic Market



Ripening, Packing with cushioning materials

Wholesale market



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# POSTHARVEST CHAIN\_mango in Thailand

## At Domestic Market



Retail market

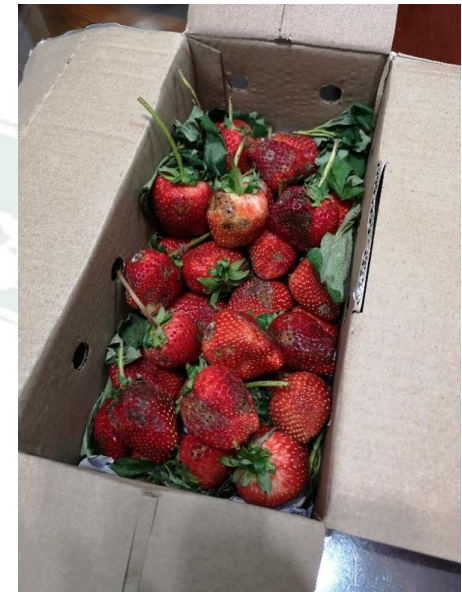


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## POSTHARVEST LOSSES – Where can they occur?



- In fields or orchards
- During harvesting and transport
- During the handling at packing house
- In distribution and marketing
- At home

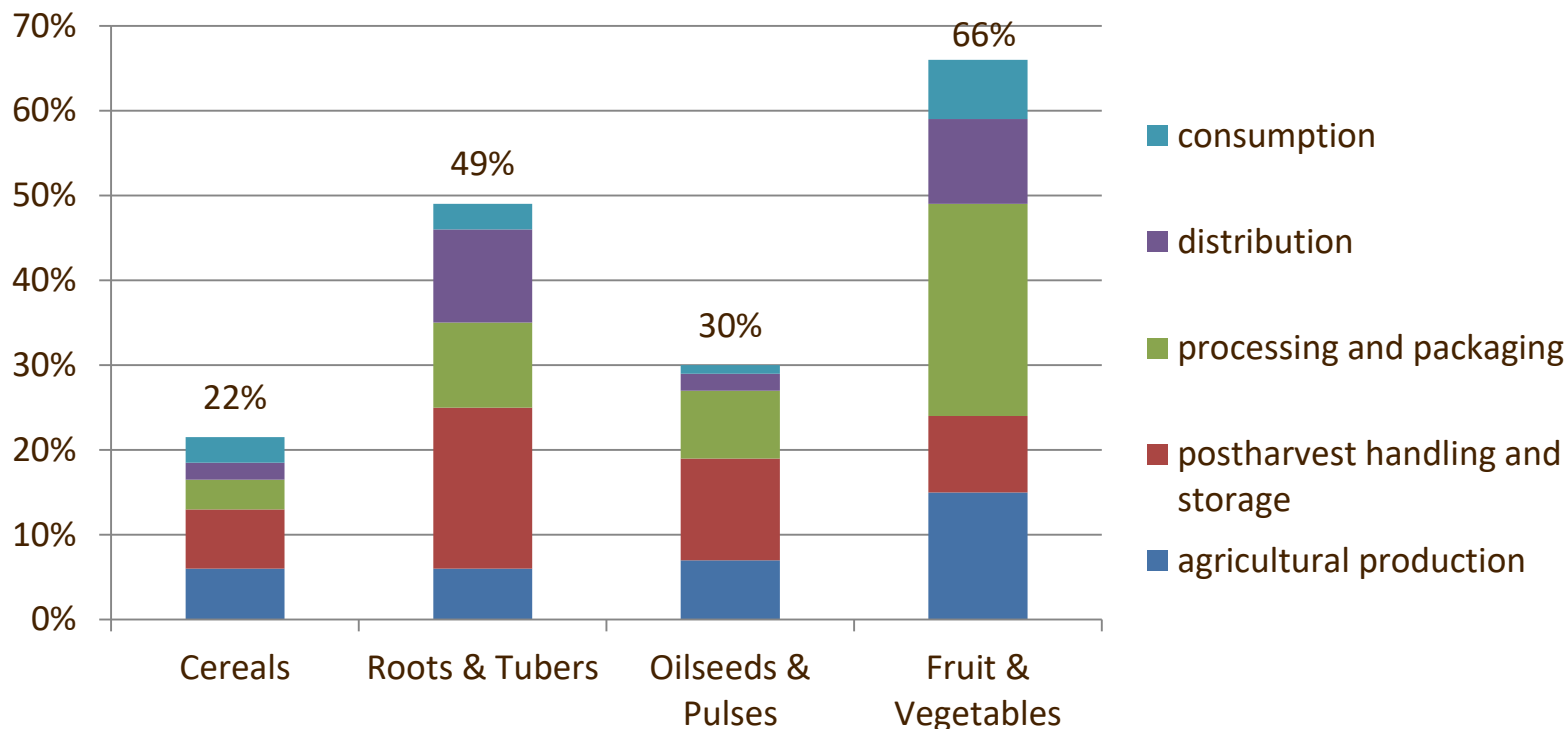




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## POSTHARVEST LOSSES – estimation

### Post-harvest loss estimates in South & Southeast Asia



Source: Steve Sonka, 2012. Postharvest losses and sustainable development.



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## POSTHARVEST LOSSES - TYPES

### 1. Quantitative losses

#### Losses in Weight - Direct Losses

- Weight losses (loss of water) can occur due to
  - respiration or transpiration
- Weight losses
  - leakage or spoilage during postharvest operations







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## POSTHARVEST LOSSES - TYPES

### 2. Qualitative losses

#### Losses in Quality - Indirect Losses

- Changes in flavour, taste, texture, appearance and colour
- Negative effects on processing properties
- Contamination with insects, microorganisms, mycotoxins, heavy metals, impurities
- Reduction of germination



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# POSTHARVEST LOSSES - TYPES

## 2. Qualitative losses



- Losses due to microorganism growth
- Losses due to animals, rodents and birds
- Contamination with insects
- Losses due to climatic conditions (rain)





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# POSTHARVEST LOSSES - TYPES

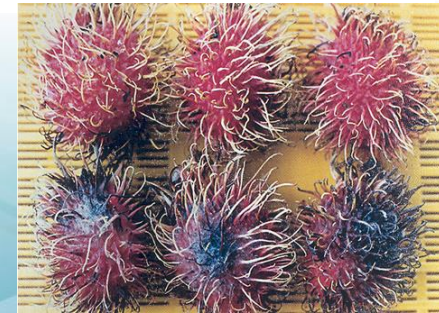
## 2. Qualitative losses

Microbiological causes

- Bacteria
- Mold
- Yeast
- Toxins (aflatoxin)

Physical damages

Loss in chemical and sensory qualities





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## POSTHARVEST LOSSES - TYPES

### 2. Qualitative losses





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## POSTHARVEST LOSSES - TYPES

### 3. Economic losses

- Reduction of quantity or quality corresponds to commercial loss

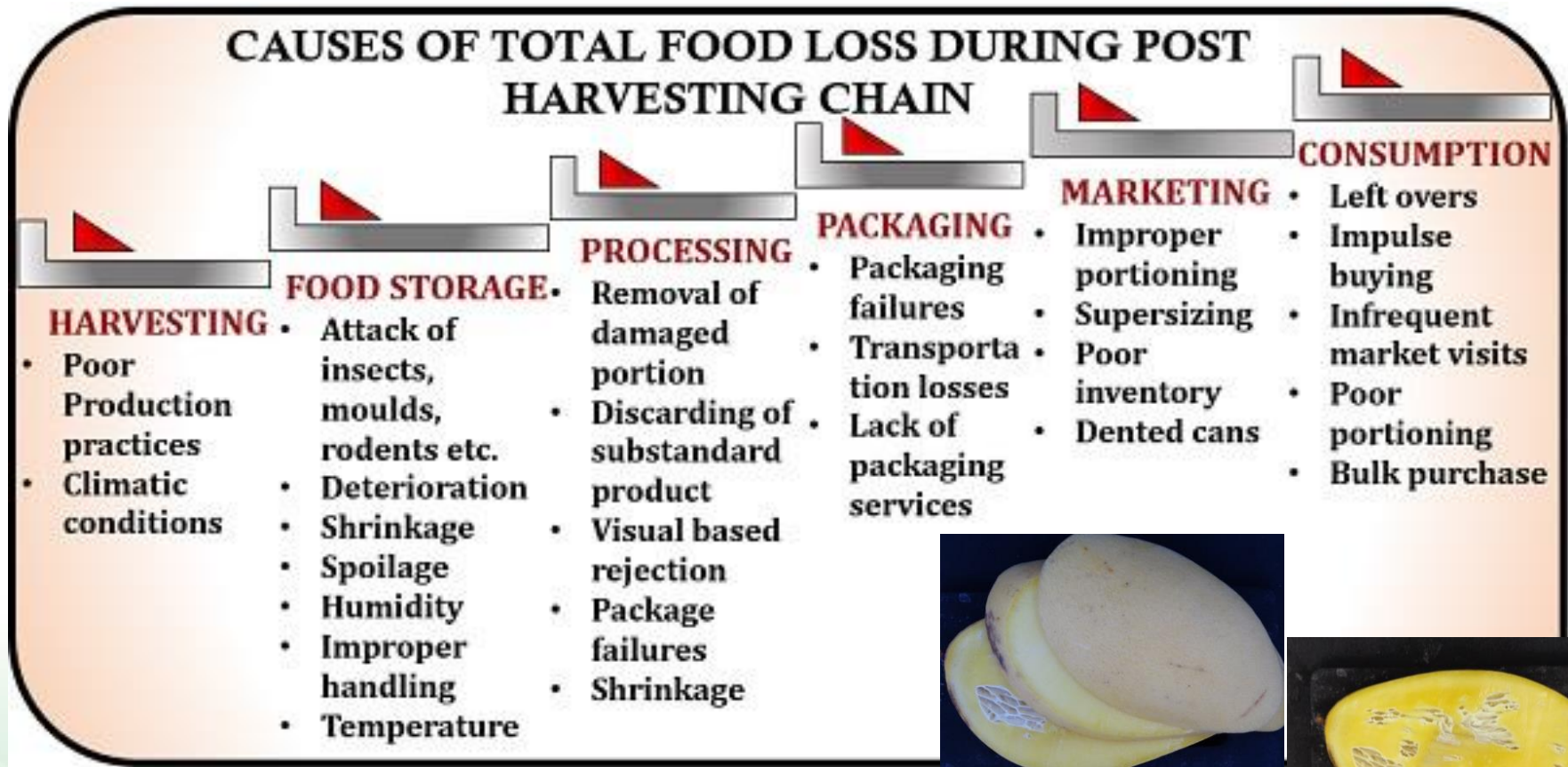


1 Euro  $\approx$  38 Baht (Thai Currency)



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## POSTHARVEST LOSSES - CAUSES





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## REDUCTION OF PH LOSSES\_banana in Thailand



SOURCE: <https://youtu.be/rnHwkiCA-dA>



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## REDUCTION OF PH LOSSES\_banana in Thailand







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## REDUCTION OF PH LOSSES\_banana in Thailand

Apply an appropriate and simple technology



Sun drying



Solar drying



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## REDUCTION OF PH LOSSES\_banana in Thailand



Banana Powder





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# REDUCTION OF PH LOSSES\_banana in Thailand



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## REDUCTION OF PH LOSSES\_mango in Thailand

Apply an appropriate and simple technology





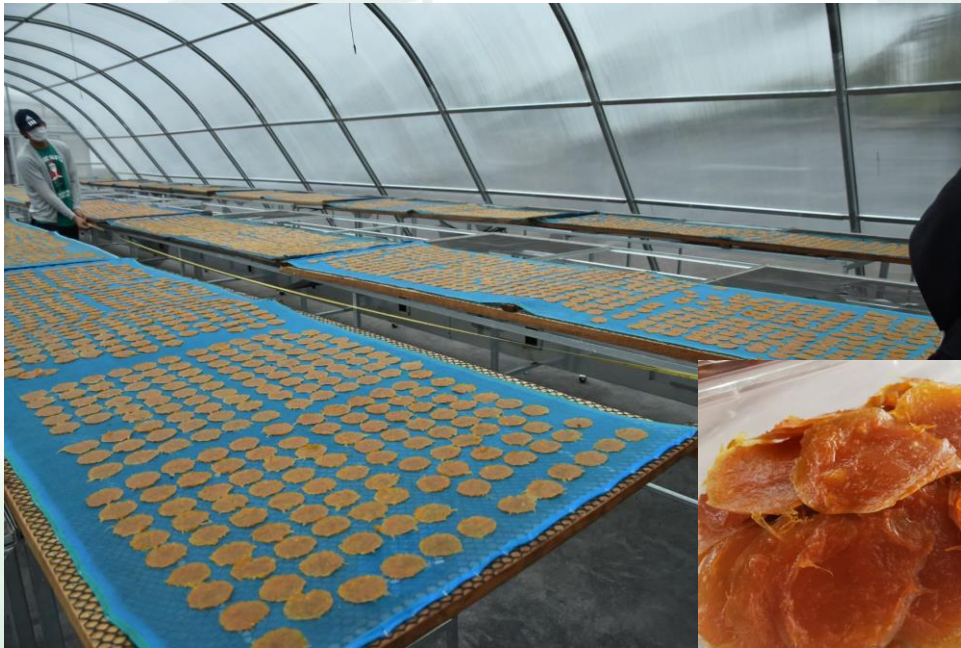
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# REDUCTION OF PH LOSSES\_mango in Thailand

Apply an appropriate and simple technology



Mango Leather



Solar drying





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## REFERENCES

<https://www.youtube.com/watch?v=o6rv2P9fwMg&t=226s>

Indika Fernando, Jiangang Fei, Roger Stanley, Hossein Enshaei and Alieta Eyles. (2019). Quality deterioration in bananas in the post-harvest supply chain – an empirical study. Modern Supply Chain Research and Applications. Vol. 1(2), 135-154.

<https://youtu.be/rnHwkiCA-dA>

Hassan, M.K., Lal Das Chowdhury, B. & Akhter, N. 2010. Post-Harvest Loss Assessment: A Study to Formulate Policy for Loss Reduction of Fruits and Vegetables and Socioeconomic Uplift of the Stakeholders. Bangladesh Agricultural University Publication: Mymensingh, Bangladesh.



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THANK YOU FOR YOUR ATTENTION

