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GUIDELINES

POSTHARVEST TECHNOLOGY INTERVENTION for POSTHARVEST LOSSES REDUCTION OF CHILI

PILOT ACTIVITIES
OF
REDUCTION OF POSTHARVEST LOSSES (PHL)
CASE OF INDONESIA: Red Curly Chili

PT AGRO INDO MANDIRI

IDENTIFICATION OF CRITICAL POINTS OF POSTHARVEST LOSSES

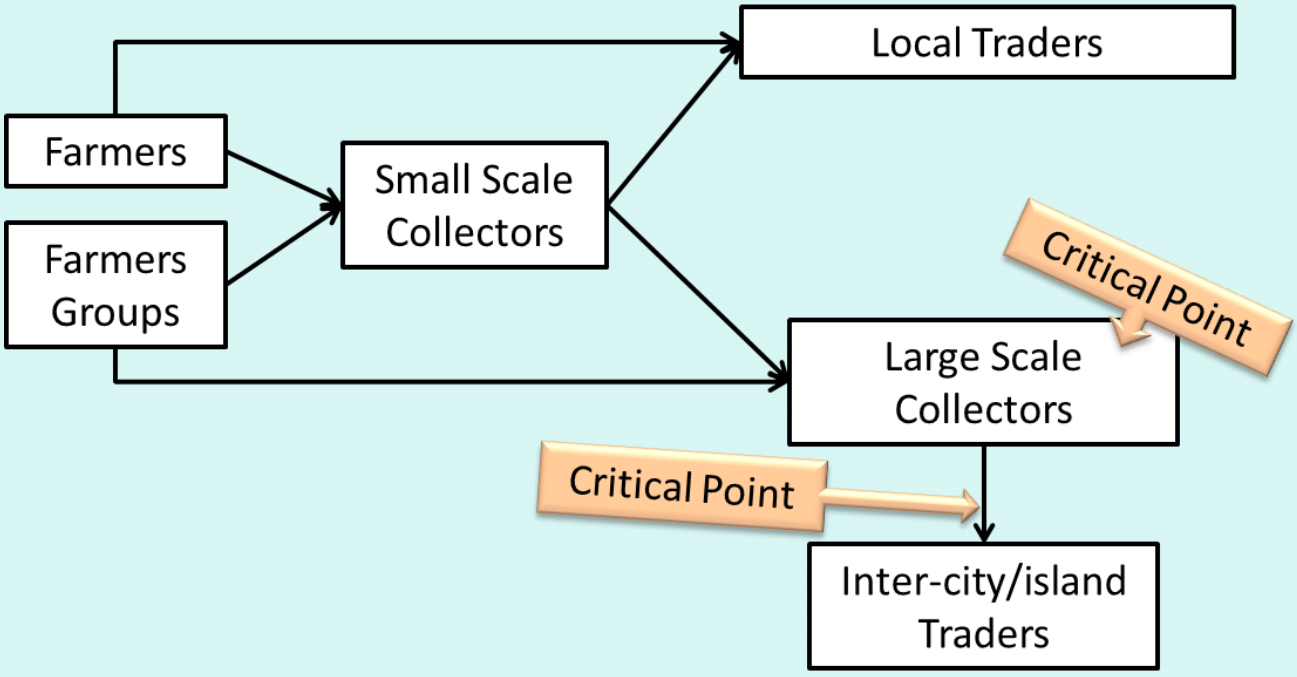
Prior to implementation of Postharvest Technology (PHT) to reduce Postharvest Losses (PHL) of chili, critical points needed to be determined.

Critical points of postharvest losses occurrence in supply chain may vary in different countries and different areas. However, it was found that **the longer and complicated a supply chain is, the higher PHL occurs**.

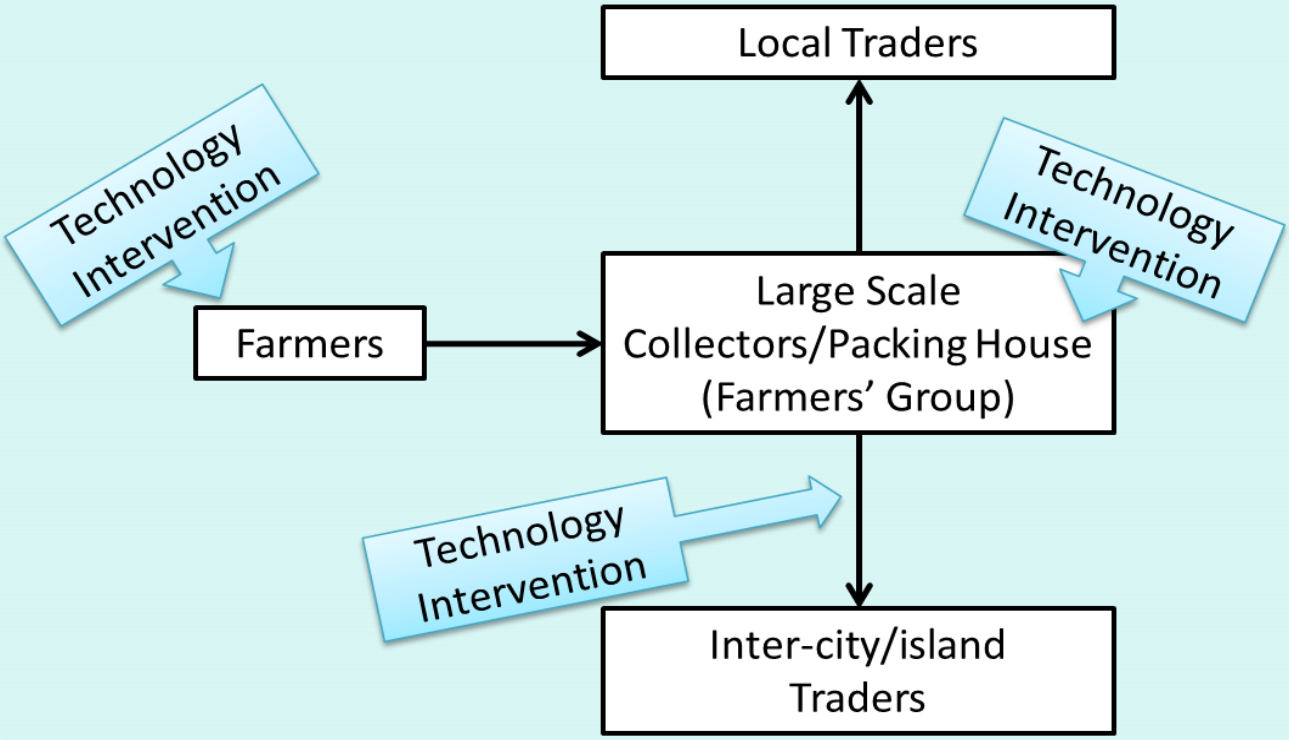
To determine critical points, see **Guidelines of Postharvest Losses Determination Standard**.

This Guideline was prepared based on the case of Red Curly Chili in Indonesia.

CRITICAL POINTS IN SUPPLY CHAIN



SUPPLY CHAIN SIMPLIFICATION AND TECHNOLOGY INTERVENTION SITES



EXISTING HANDLING PRACTICE

HARVEST

Harvest is carried out by farmers by choosing a reddish chilli without seeing the size both diameter and length. Sortation by separating the chili physically. Chili is stuffed in sacks randomly and overloaded, causing physical damage. Physical damage included broken, wounded, loose stalks and changes in shape.

chilli plantation

harvest chilli with basket

Chilli put in sack

Chilli in used sack

Chili Harvesting Activities

Transportation from field to collector using motorcycle. More physical damage occurred, and physiological damage due to overheating

RETAIL

Large traders collect chili from farmers and farmer groups or small scale collectors in sacks. Activities undertaken were sorting, grading and packing.

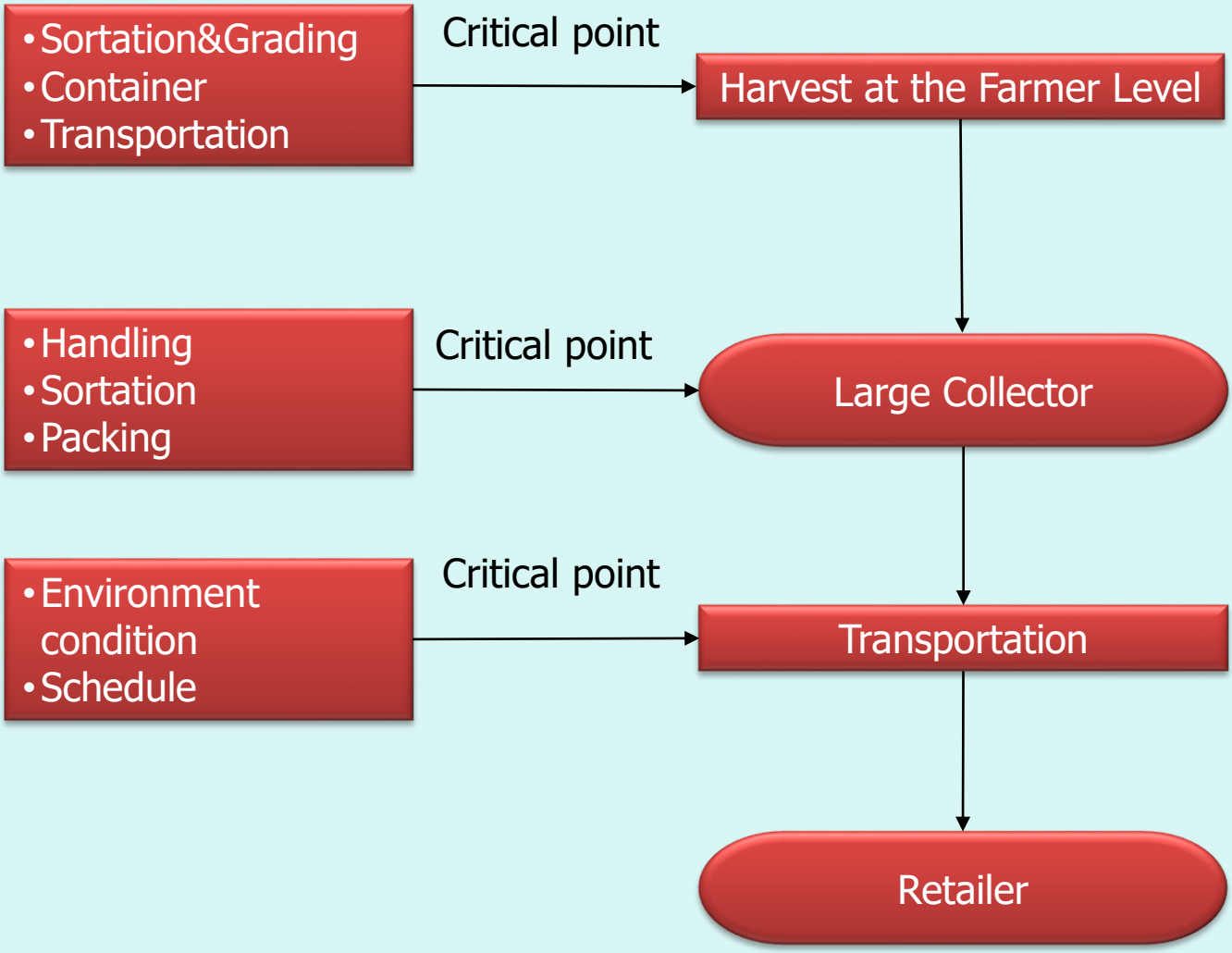
Chili in used sack

Sorting and grading chili

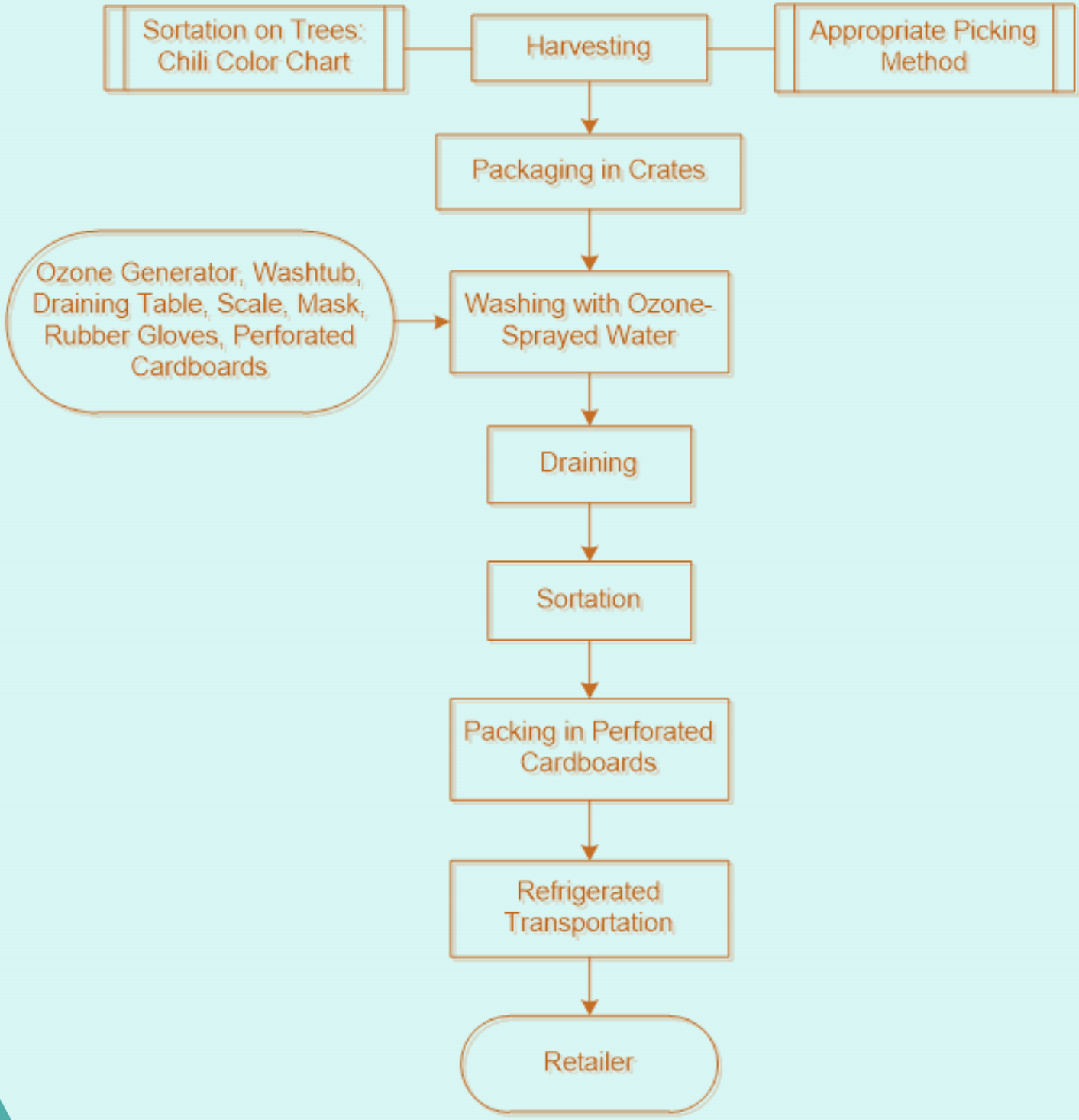
Chili in cardboard

Packing cardboard

TECHNOLOGY INTERVENTION


•Sortation&Grading
•Container
•Transportation
Critical point
Harvest at the Farmer Level
•Handling
•Sortation
•Packing
Critical point
Large Collector
•Environment condition
•Schedule
Critical point
Transportation
Retailer

CHILI POSTHARVEST HANDLING TECHNOLOGY



HARVESTING

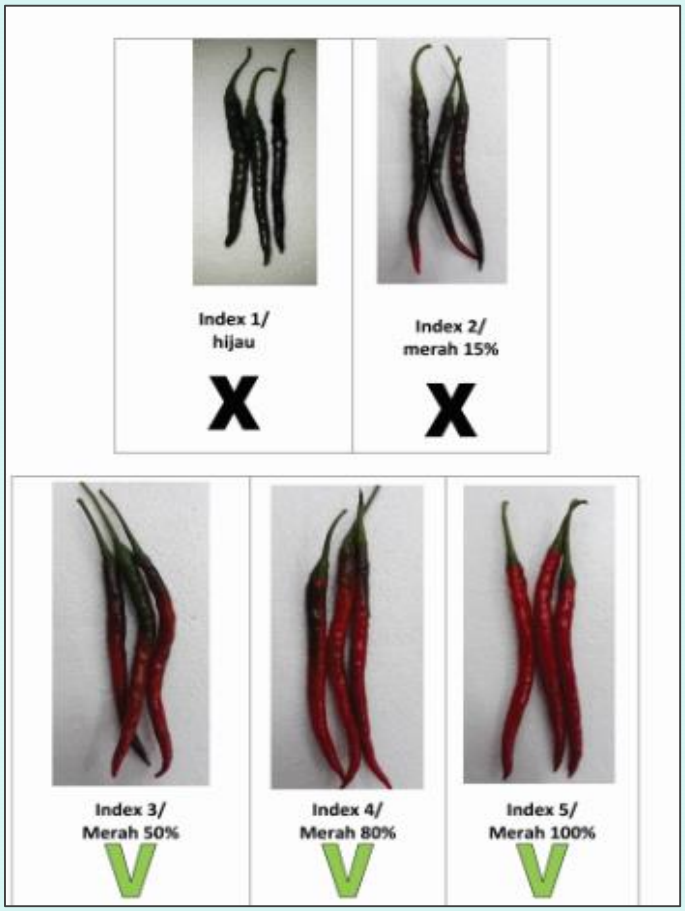
Harvest is the activity of picking the fruit on appropriate physiological age. Harvesting should be done in the morning after the dew on the chili is gone, when the weather is bright and dry. Harvest should not be conducted in the rain and after rain. The activity is carried out by including the fruit stalk and is kept so as not to damage the twigs and branching of the plants. Chili is harvested with minimum 50% red color with age of 80-85 HST (days after planting), 12-17 cm long and 1.3-1.5 cm in diameter.

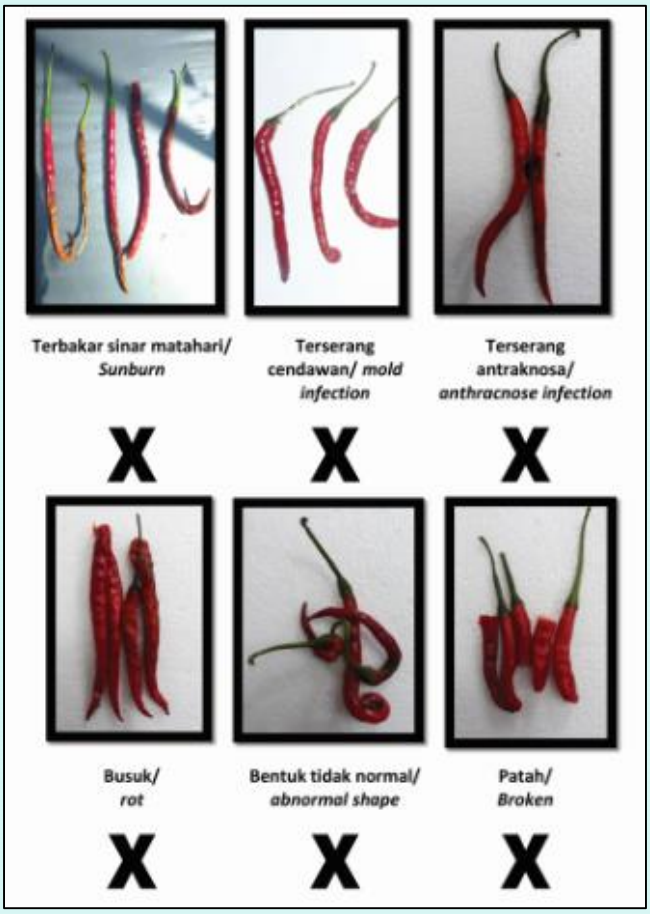
Harvest by including stems

Sortation is executed to separate healthy chilli, not defective / intact with defective / defective chili according to criteria of damaged and rejected chili. Chili can be damaged due to physical, mechanical, pest / disease. The harvested chili are then put into crates, to be transported to the Packing House in 30-40 kg packaging.

Picking Method

Leaves chili stalks, avoid causing wound by plucking the stalk off





Chili Color Chart

Rejected Chili

Transportation container (crates) and transportation vehicle

POSTHARVEST HANDLING IN PACKING HOUSE

OZONE TREATMENT

Equipment: ozone generator, washing tank, draining tables/trays, scales, perforated cardboards

Personnel apparel: protective masks, rubber gloves

1. PREPARATION
   - Take off footwear before entering the treatment room
   - Fill 2/3 of the washing tank with clean water
   - Ensure operators are wearing rubber gloves and protective masks
   - Turn on the ozone generator for 1.5 hours
   - Set the adjust button to the number 75. The ozone concentration is about 3 ppm as measured by the ozone meter.
   - Weigh 20 kg of chili and put in crates

Ozone Generator
Press power and rotate to 75

Ozone flows to the wash basin
(± 1.5 hours)

2. WASHING CHILI WITH OZONE WATER

- Put the chili into the washing tank, soak for 15 minutes
- Ensure that all chilies are soaked perfectly and evenly

Chili in crates that are arranged
in the washing tank

Soak for 15 minutes

3. DRAINING

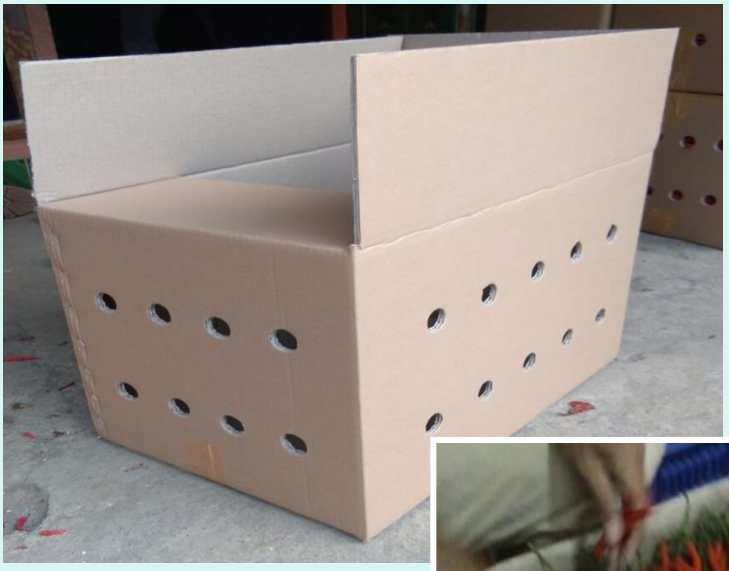
- Take chili out of washing tank and put on the draining tables/trays
- Do sortation while packing chili into perforated cardboards
- Transport chili by refrigerated and non-refrigerated vehicles

SORTATION

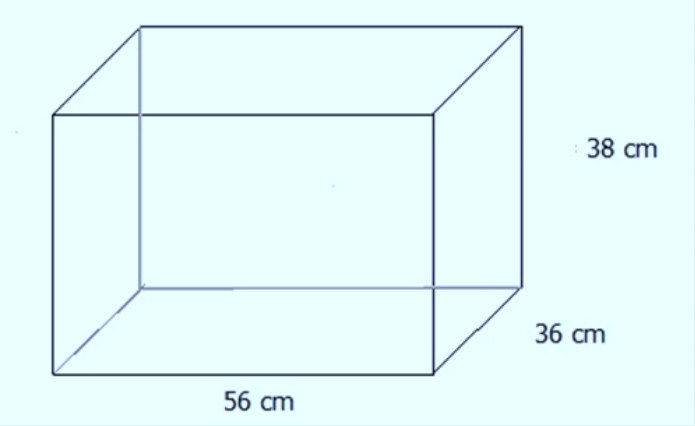
Drained chili should be sorted before packed into perforated cardboards.

PACKAGING

- Prepare perforated cardboards with a capacity of 20-30 kg
- Place the chili in cardboard with uniform position (stalks facing out)
- Seal the cardboard with duct tape



PERFORATION CALCULATION



Holes were put on four sides of the cardboards (front, back, right and left). Surface area for holes placement:

1). 2 x (length x height) = 2 x (56 x 38) cm^2 = 4.256 cm^2

2). 2 x (width x height) = 2 x (36 x 38) cm^2 = 2.736 cm^2

Total area of four sides cardboard = 6.992 cm^2

Perforation (circle-shaped holes) diameter (d) = 2,5 cm

Therefore, area of perforation holes:

= 3,14 x $(2,5/2)^2$ cm^2 = 4,91 cm^2

Perforation of chili pepper by 2.5% (Dondy et al., 2017), then:

2,5% x total area of the cardboard sides

= 2,5% x 6.992 cm^2 = 174,8 cm^2

Number of holes that need to be made on the four sides of the cardboard: 174,8 cm^2 : 4,91 cm^2 = 35,6 holes ≈ 36 holes

Perforation holes are made uniformly distributed on four dimensionally packed cardboard sides.

TRANSPORTATION

Chilies transport to retail is done by refrigerated cars thereby reducing damage during transportation process

The arrangement of cardboards in a refrigerated vehicle

Refrigerated Car

Standard Operation Procedure

Handling Procedure	Existing Practice	Illustration	Improved Practice	Illustration
Harvest maturity	Ununiform		Uniform	
• Harvest in the morning, not during/after raining, pick with the stem attached, and pick one fruit at a time • Separate rotten/decayed/damaged fruit (only keep the fresh and healthy ones)				
Temporary Collecting	Used fertilizer plastic sacks		Crates	
• Avoid heat and rain in the field • Put cover on the ground, avoid harvested chili from touching the ground • Collecting near the harvesting location, easier to deliver				
Ozone treatment	Not done	-	Done	
• Turn on ozone generator for 60-90 minutes, let ozone sprayed into the water in washing tank • Soak chili in washing tank for 15 minutes • Drain on the draining tables				
Packaging	Non-refrigerated, stack according market tonnage	 	Refrigerated (controlled temperature), perforated cardboards, weighed 20-25 kg