Packaging; Package design and materials

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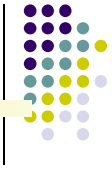
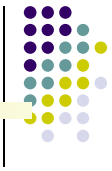
Function of Packaging



- Protection: against damage during distribution and must maintain their shape
- Preserve: keep qualities for long period
- Promotion: give an information, attractive to the consumer

Packages for horticultural crops are sized to be convenient units for marketing and distributing horticultural products.

Product Protection

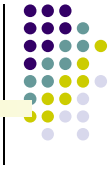


Avoid mechanical injuries

Avoid water loss

Provide temperature maintenance

Packaging Considerations

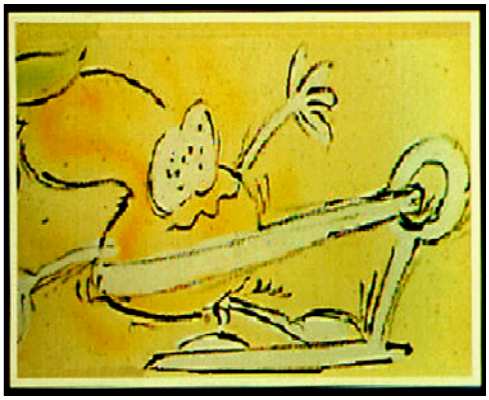


- Mechanical injury
- Temperature management
- Water loss
- Special requirements
- Package selection
- Package management

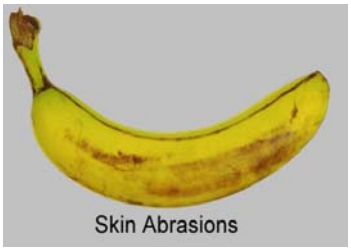
Mechanical Injury

- Vibration or abrasion damage
- Impact bruising
- Compression bruising

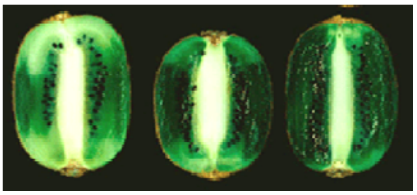
Vibration



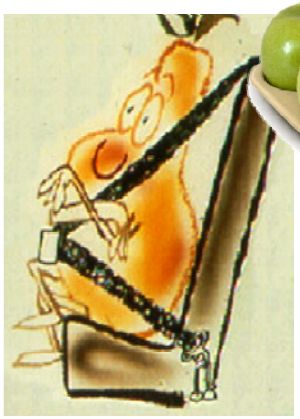
Skin Abrasions



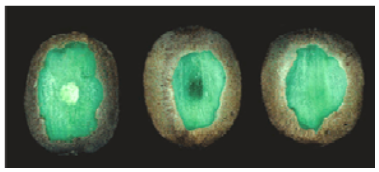
Vibration Bruising

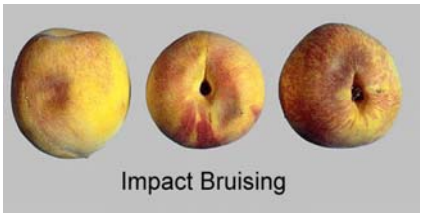


Immobilize Product

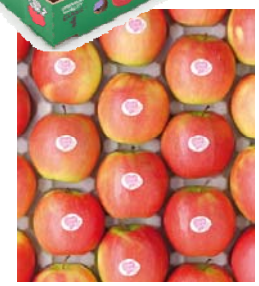


Impact Bruising

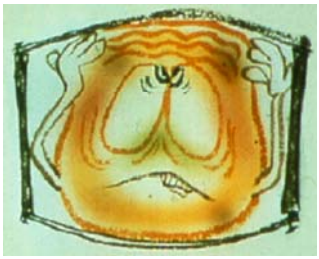


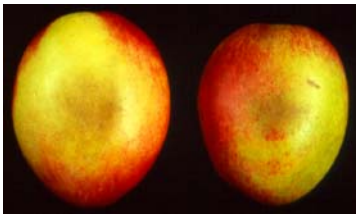


Cushion Product



Compression Bruising





Avoid Compression

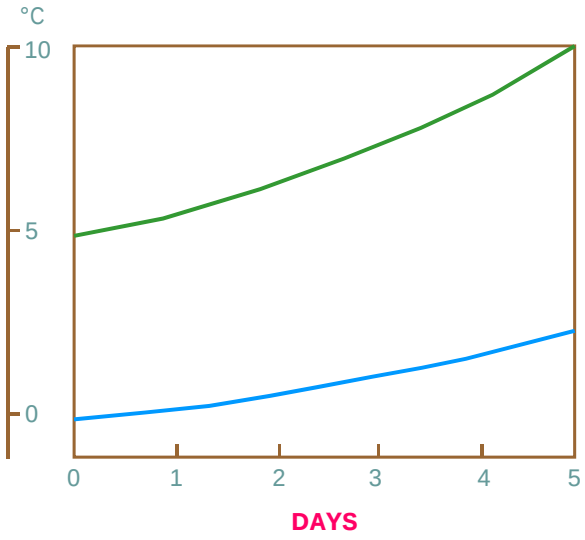
Do not overfill

Use strong packages

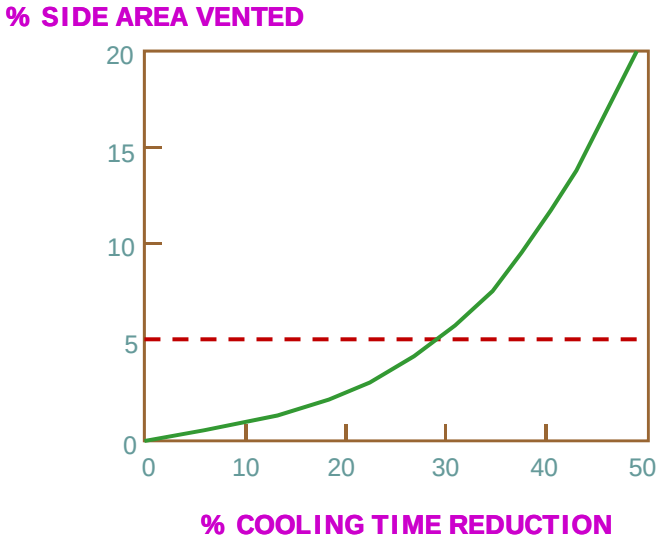
Do not compress product

TEMPERATURE MANAGEMENT

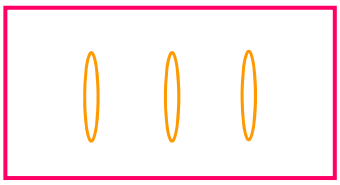
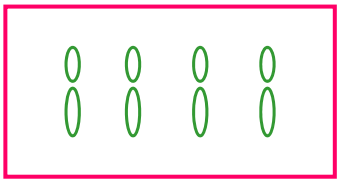
Poor Air Circulation of Cherries in Transit



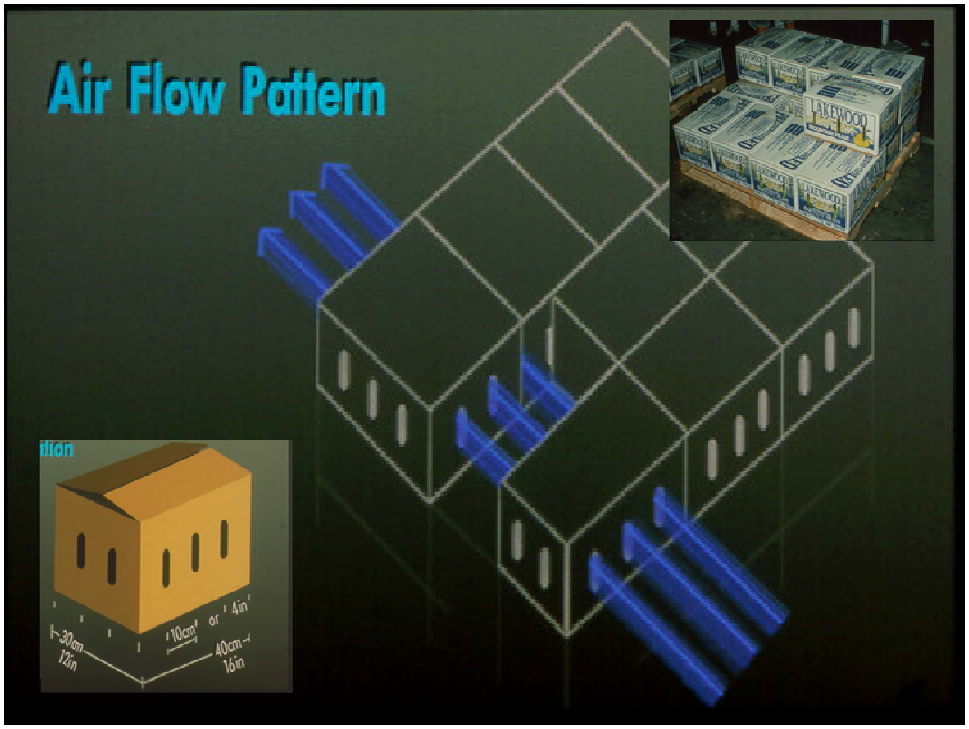
Area vented & Cooling



Area vented & Cooling

%Venting		Hours to Cool
5.9		14.5
5.8		20.0

A few large vents perform better than many small vents.



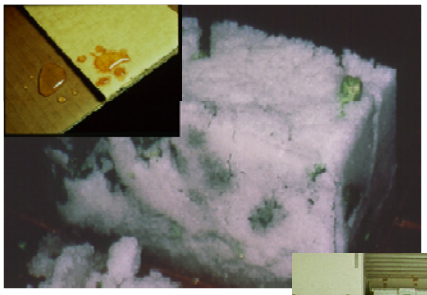
WATER LOSS

Reduce Water Loss

Too tightly closed
must be adequately vented

High CO_2, low O_2 injury

SPECIAL REQUIREMENTS



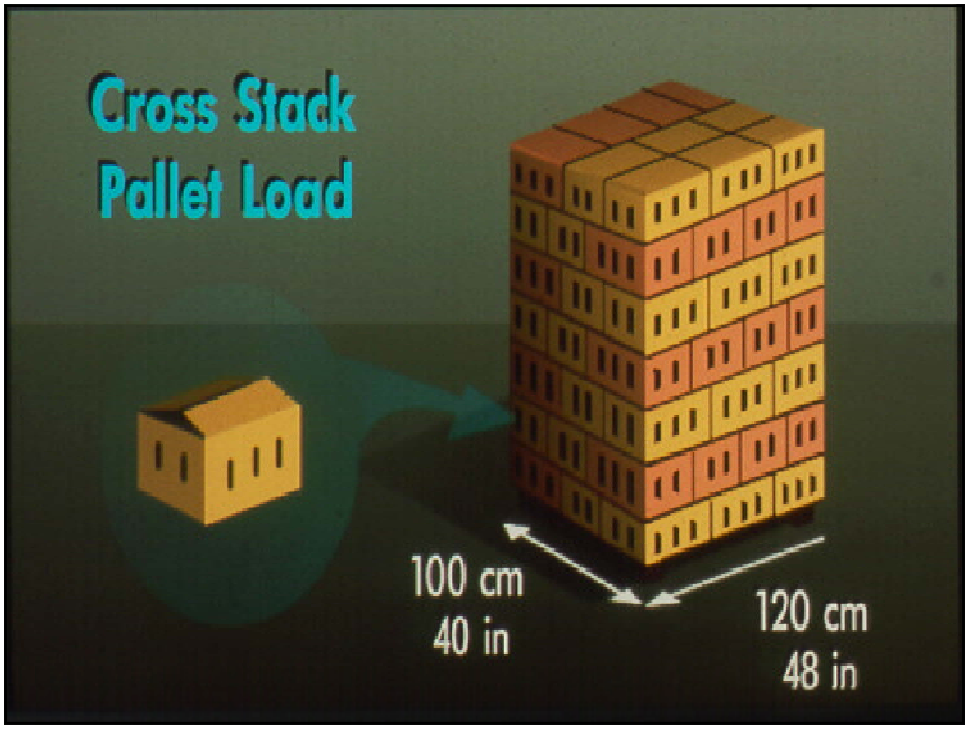
SO_2 Fumigation

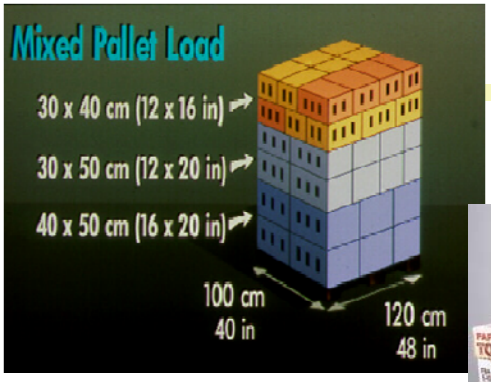
Fruit Ripening

After Quarantine Treatment

PACKAGE SELECTION

Stacking column or
Columnar stacking





After The Common Footprint

PACKAGE MANAGEMENT

Proper forming & closure

Stack for columnar strength

Avoid excess stack height

A Standard in U.S.

A Standard in Europe

A sidewall overhang of 2.5 cm (1 in) on a pallet reduces stacking strength by 14 to 34%.

Stacking





Package Design Consider

- Adequate stacking strength
- Moisture resistance in package
- Moisture barrier for product
- Proper ventilation

Package Aid Marketing

Maintain appearance & shape

Facilitate product protection

Adapt to handling system

Type of Packaging

Consumer units

Transport packaging

Receiver packaging

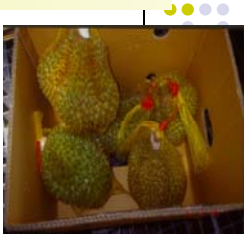
Consumer Packaging

- weight 300 g – 1.5 kg
- polystyrene trays
- plastic film
- plastic or paper bags
- mesh bag (onions, potatoes 3-5 kg)

Improving appearance and attractive

Consumer Packaging






Transport Packaging

- weight 5 – 20 kg
- fiberboard or wooden or bag
- must be easy to handle, stackable
- dimensions fit to transport vehicles



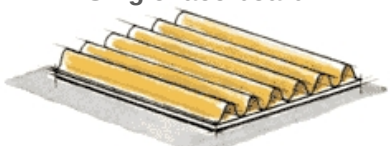
Receiver Packaging




Packaging Materials

- Wood/ Bamboo wood
- Corrugated Fiberboard
- Paper and Mesh Bags
- Plastic Bags
- Shrink Wrap/ Film Plastic
- Rigid Plastic Packages

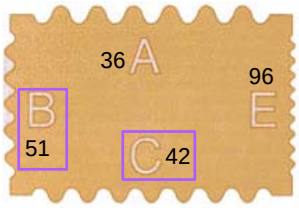
Single face board

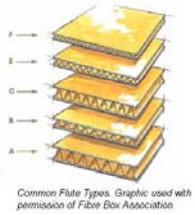


Corrugated Fiberboard

Four Flute Types

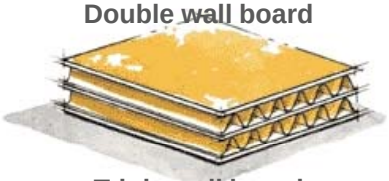
Single wall / Double face board

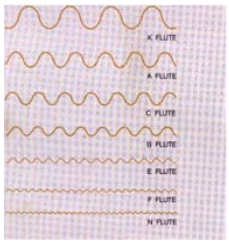




Common Flute Types. Graphic used with permission of Fibre Box Association

Double wall board

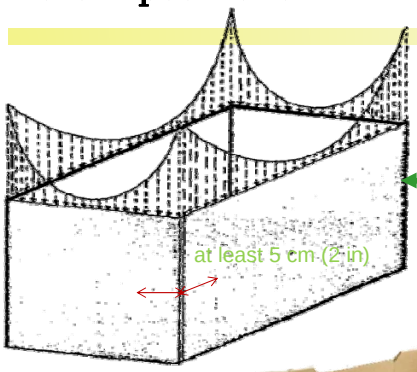




Triple wall board

Perishables are usually packed in boxes made with B-flute.

Vertical loading capacity of carton box at different positions



Load capacity

Corrugated paper box

at least 5 cm (2 in)

Most of the strength in a corrugated box is near the corners.

The American Society for Testing and Materials (ASTM)
The International Safe Transit Association (ISTA)

Success or Failure Corrugated Package

Amount & kind of fiber

Moisture resistance treatment

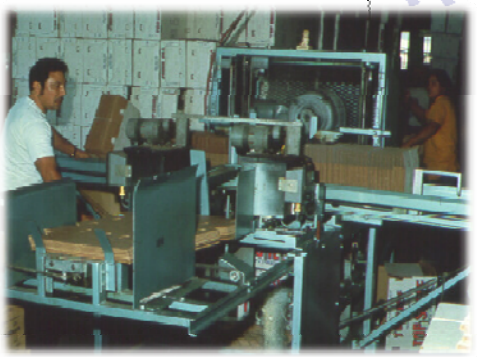
Vent size & location

Stacking for strength

Total load on package

Corrugated Package

Corrugated Package



Corrugated Package

Paper and Mesh Bag






Some Types of Plastic

Polyethylene (PE)

Polypropylene (PP)

Polystyrene

Poly (vinyl chloride)

The properties of some plastic films (Paine and Paine, 1992 and Peleg, 1985)

Film name	Specific gravity approx.	Tensile strength kg/cm^2	Approx. elongation unit failure, %	Approx. heat shrink, %	Heat Shrink tunnel temp. range, C	Typical thickness range, mm	Water vapor transmission 38C, 90%RH g/m^2.d (25μm)	O_2 tranmission 23/25C, 50%RH cm^3/m^2.d (25 μm)	Transparency
Polyethylene low density	0.90-0.93	100-150	200-600	20-50	150-230	0.025-0.050	16-24	7,100-7,800	Poor-fair
Polyethylene high density	0.945-0.965	200-500	20-400	-	-	0.010-0.015	4.7	2,100-2,900	Poor
Polypropylene	0.90-0.910	400-600	150-600	50-70	170-230	0.013-0.040	11	2,400-3,800	Fair
Polystyrene	1.04-1.07	600-850	10-70	40-70	130-160	0.025-0.040	110-160	3,900-5,500	Excellent
Polyvinyl chloride	1.16-1.40	300-1,000	10-500	50-70	120-170	0.010-0.035	80-500	80-9,000	Fair-good

Plastic Bag / Plastic Film

Rigid Plastic



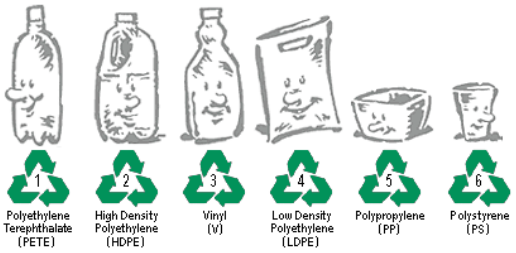




Advantage of Plastic

- well vented
- good ventilation


Recycle codes



http://www.projectgreenbag.com/recycling-codes-on-plastics/

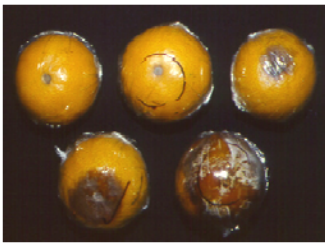
Foam Box

Packing

Pad Packing

Tight-Fill Packing

Individual Packing



Automated Packing

Potato packing

http://www.youtube.com/watch?v=3BH-6nS-jzg&feature=related

http://www.youtube.com/watch?v=vdyPEBpRGcY

Romance lettuce packing

http://www.youtube.com/watch?v=Eiefo9ILJ-s&feature=related

http://www.youtube.com/watch?v=jNq4oQiac-8&feature=related

http://www.youtube.com/watch?v=62nJzuKjUBc&feature=related

http://www.youtube.com/watch?v=2jpwZjRBahs&feature=related

Individual Handling

Vegetable Market in Taiwan

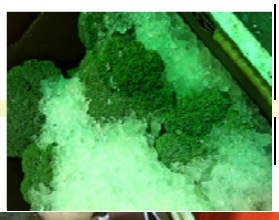


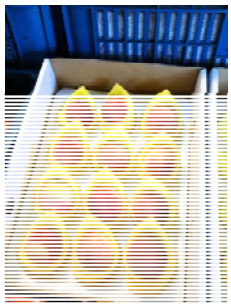






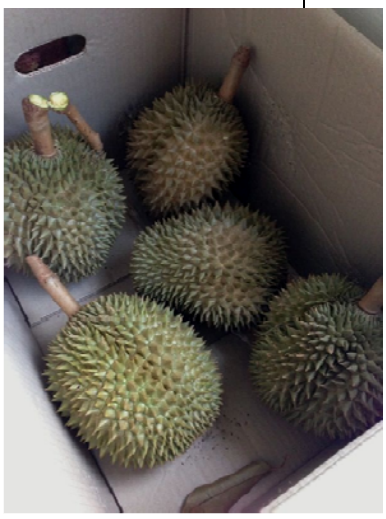




Farmer market in USA

Packaging for local transportation

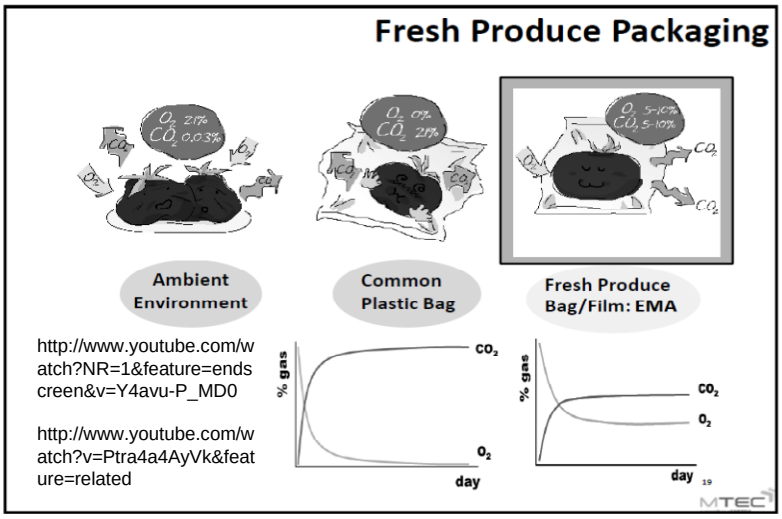


Active Packaging

- Oxygen absorber
- Carbon dioxide absorber
- Ethylene absorber
- Humidity control

http://www.youtube.com/watch?v=fkntg-L1AmA&feature=related

Modified Atmosphere Packaging (MAP)



http://www.youtube.com/watch?NR=1&feature=endscreen&v=Y4avu-P_MD0

http://www.youtube.com/watch?v=Ptra4a4AyVk&feature=related

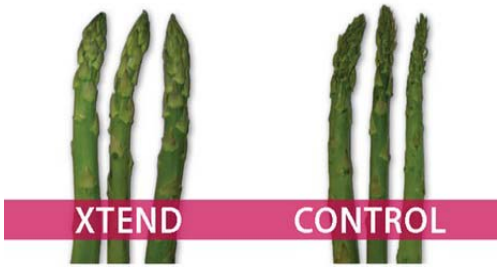
MAP

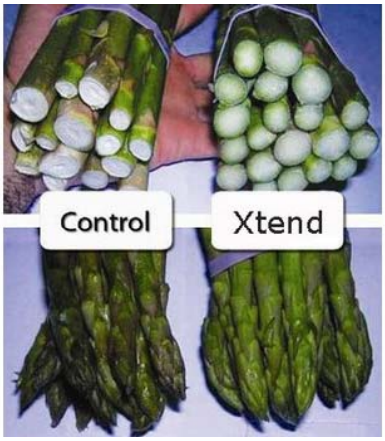
TPBI manufactures film for equilibrium modified atmosphere packaging (EMAP), which can extend the shelf life of produce such as fresh fruit and vegetables.

MAP

http://www.youtube.com/watch?v=xaNq7kLbgBo#at=14

MAP





Packing of asparagus in StePac's Xtend Modified Atmosphere/Modified Humidity Packaging is advantageous in that the modified atmosphere that develops within the packaging alleviates most of the physiological disorders indicated above including decay development. With Xtend MA/MH packaging the shelf life of green and white asparagus can be extended up to 33 and 45 days, respectively (28 and 40 days in transit at 0-2ºC + 5 days shelf life at 10ºC, respectively). StePac's Xtend MA/MH Packaging for asparagus includes various formats for white and for green Asparagus. Each format is tailor-made to provide the asparagus spears with the optimum conditions for prolonged storage and shipment.

http://www.freshplaza.com/news_detail.asp?id=106362

Smart Packaging

Interactive packaging

Bio-degradable Packaging

polylactic acid (PLA)

Corn starch, sugarcane

Bio-degradable Packaging

Bio-degradable Packaging

Carbon Footprint

Traceability: Barcode

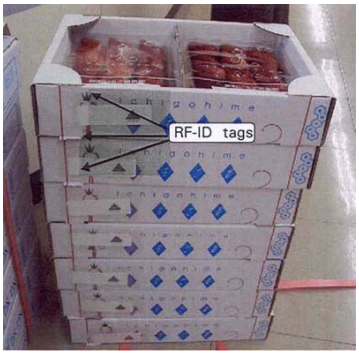
QR-code

two-dimensional bar code (2D bar code)

By Denso-Wave

QR = Quick Response

Traceability: RFID



THANK YOU

REDUCE
REUSE
RECYCLE

Recycle Reuse Reduce