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# Innovative eco-friendly packaging technology to reduce FLW

Workshop on Reducing Food Loss and Waste through Packaging Innovations  
and Progress Review of FLW in the APEC Region, 05.06.25 Taiwan

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Source : Korean Environment Corporation



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## **Causes of food waste generation**

## Definition of Food waste

Food waste consists of leftover food and the waste generated during the production, distribution, processing, cooking, storage, and consumption of food

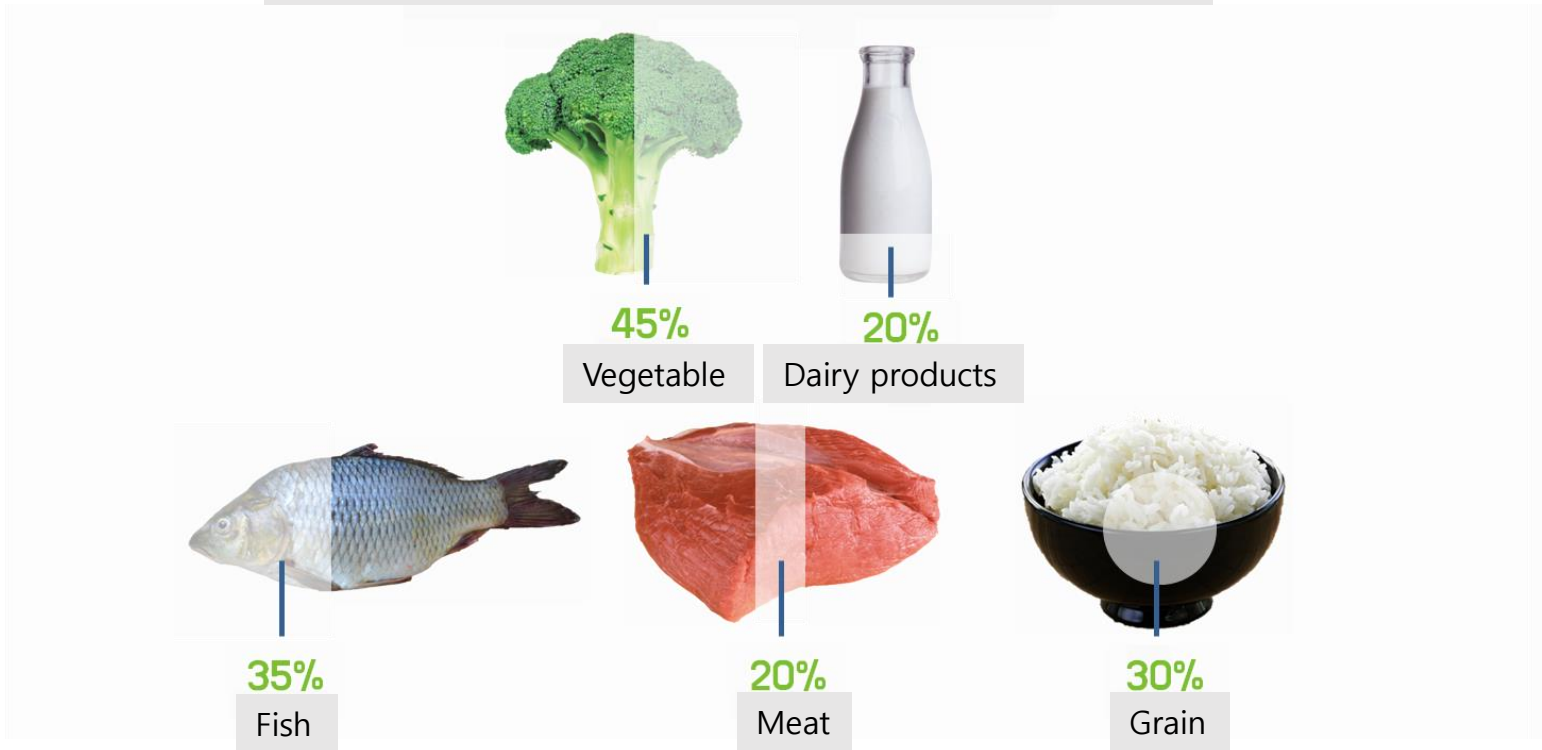


## Food Waste



Food Waste 1.3 billion tons(t)/year,  
about 30% of the world's food, 1 trillion USD

## Amount of waste by food type



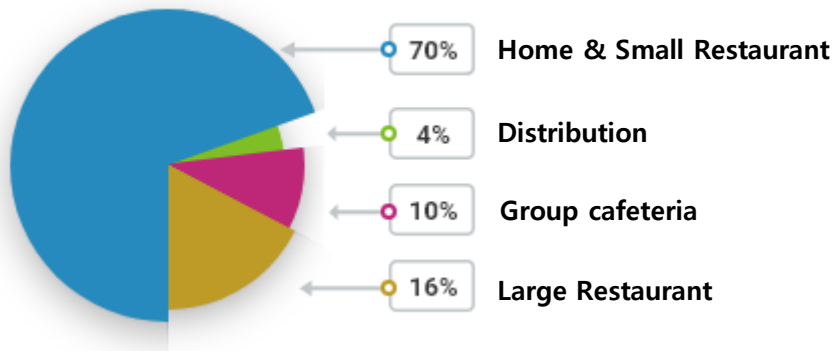


## Food Waste Generation

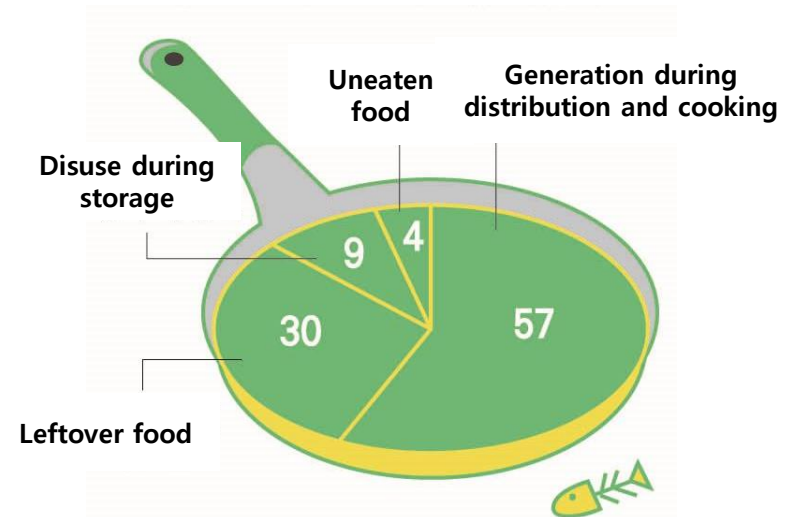
**More than 70% of food waste comes from households and small restaurants**

**About 87% of food waste was generated during distribution and cooking**

### Occurrence Place



### Types of food waste generation in Korea



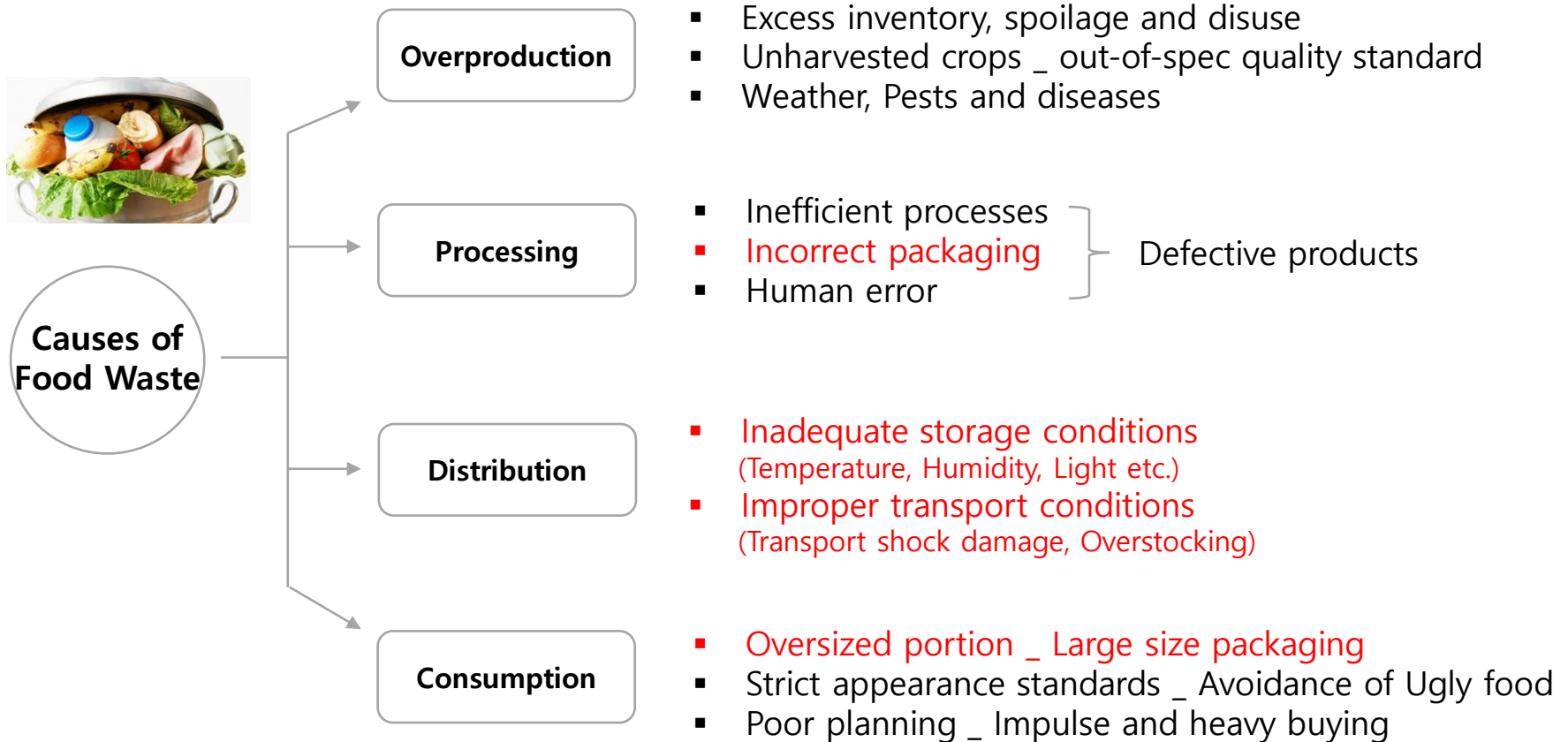
## Main causes of food waste

**Production and Supply chain, Retail, Household consumption**

## Causes of food waste in food industry

There are various caused that contribute to food waste generation in the food industry

The red marked phrase is related to packaging





02














## **Food Packaging for Waste Reduction**



# Undesirable changes in packaged foods

## The quality of food change during storage due to oxygen, moisture and temperature

Through proper packaging of food, we can prevent quality loss and extend its shelf life

Food Type		Food Spoilage		Key Factor
		Oxidation, Rancidification, Microorganism, Browning etc.		Oxygen, Temperature, Light etc.
		Microorganism, Oxidation, Moisture loss, Color change		Oxygen, Temperature, Light, Humidity
		Starch aging, Microorganism, Rancidification		Oxygen, Temperature, Humidity
		Sugar crystallization, Fat crystallization, Oxidation		Oxygen, Temperature, Humidity
		Oxidation, Aroma loss		Oxygen, Light, Humidity

## How packaging can reduce food waste !!!

Innovative packaging solutions have the potential to significantly mitigate food waste in the industry



### Active Packaging

- Incorporation of antimicrobial agent into packaging materials
- Oxygen and ethylene scavenger, moisture regulators
- Shelf life extend, reduce spoilage

### Intelligent Packaging

- Gas sensor and Freshness indicators  
(We can check the condition of food without opening the package)
- Better inventory control, preventing spoilage

## Smart Packaging

### Small Portion Packaging

- Minimized food waste  
(Packaging size that allows consumption of only the optimal amount needed)
- Improved convenience

### High Barrier

- Oxygen and moisture control in package
- Inhibit undesirable changes in food \_ extend shelf life
- Food waste reduction

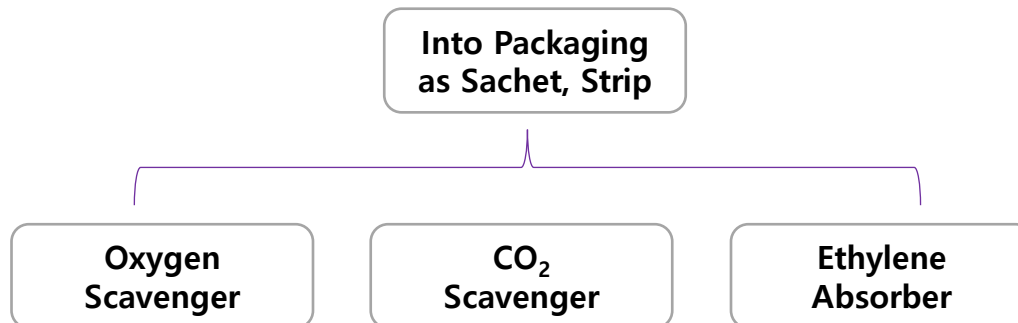
### Reclosable Packaging

- Maintaining the freshness of opened food for multiple uses
- In order to maintain product freshness
- In order to prevent spoilage

Packaging solution for Food Waste reduction

# Smart Packaging \_ Active Packaging

**Smart packaging can reduce food waste**  
**Actively modifying the environment within the package to protect the product**



## Oxygen scavenger

- Inhibition of aerobic microbial growth
- Inhibition of oxidation
- Inhibition of off-flavor and off-taste
- Extension of shelf life



## CO<sub>2</sub> scavenger

- Inhibition of packaging expansion
- To maintain freshness of permeation food
- Extension of shelf life



## Ethylene scavenger

- Inhibition of ripening and spoilage
- To help maintain the freshness of fruit and vegetables
- Reduce food loss



# Smart Packaging \_ Intelligent Packaging

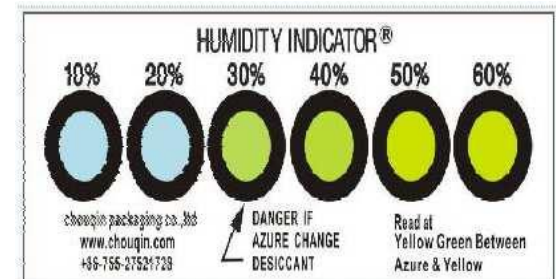
## Communicable packaging with consumers by indicating some information

Quality of food is changed by time, temperature, humidity and etc.

### Temperature Indicator



Seafood Temperature Indicator



Humidity Indicating Cards

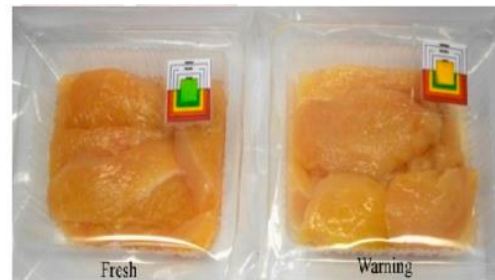
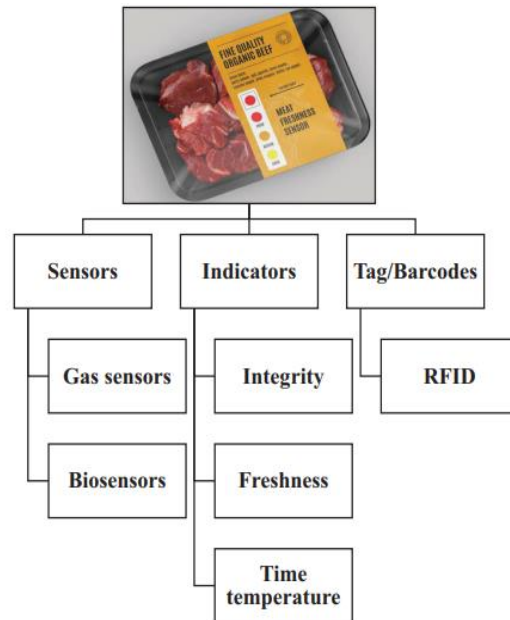


Humidity Indicator Plugs

# Smart Packaging \_ Intelligent packaging

## Monitoring and communication information about the product's condition

Using sensors, indicators and barcodes, We can check the condition and distribution history of food without opening the package



### Indicators

- Freshness can be confirmed without complex inspection
- Cold chain compliance can be verified





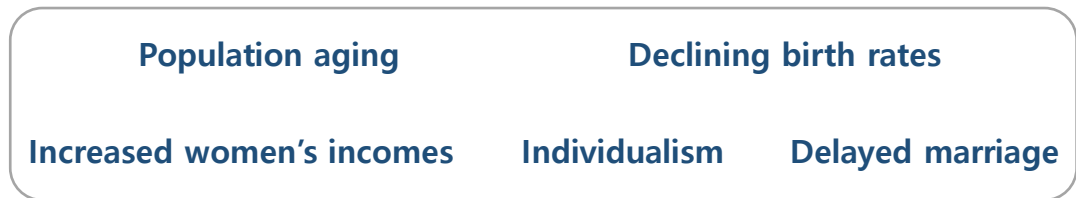
## Optimization of packaging size

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Due to the increase in single-person households, people prefer convenience foods and small-sized packages that can be consumed at one time



About 40% in Korea



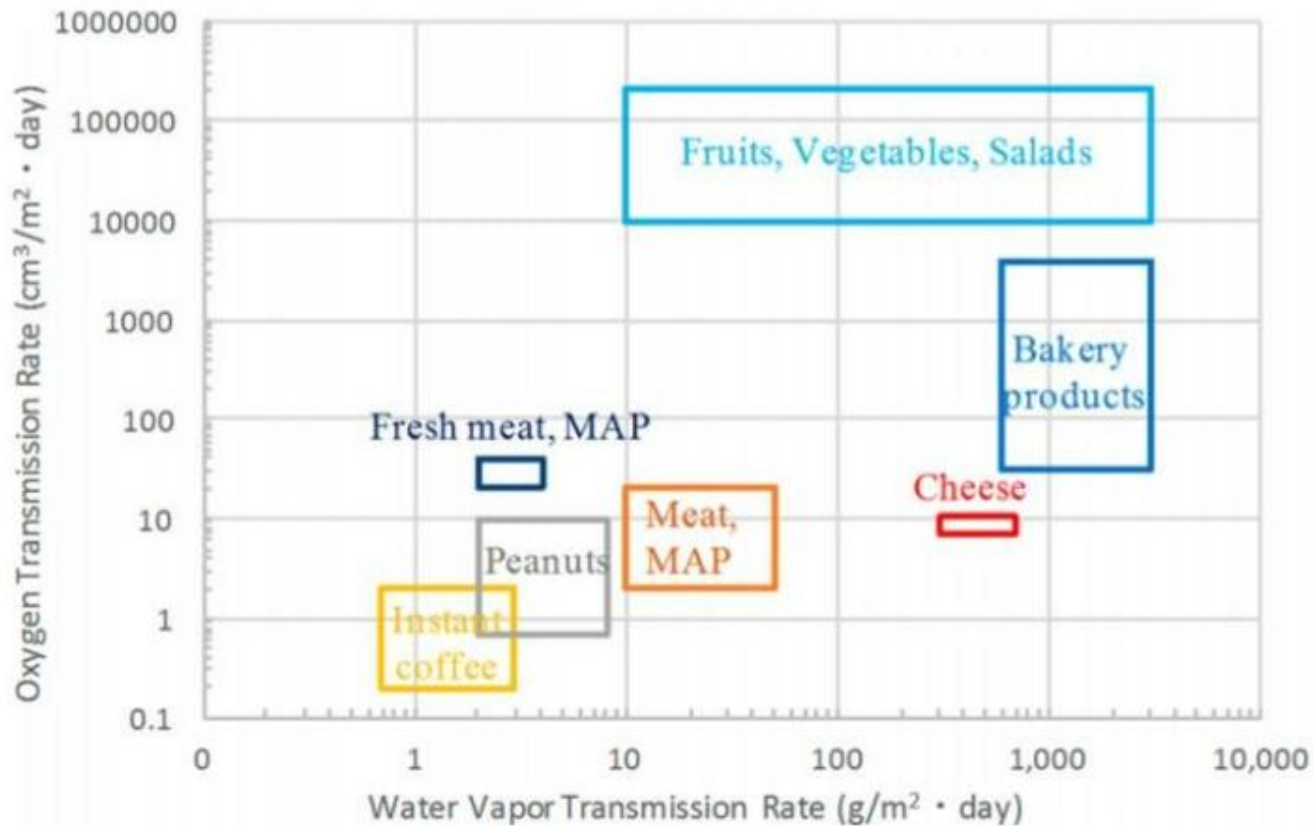
**Increase in single-person households**



**In order to reduce food waste at home, small packages that can be consumed at one time are effective**

## High barrier packaging to extend shelf-life

Depending on the food, the required oxygen and moisture barrier properties are different, and the most efficient and reasonable packaging must be designed considering the shelf life and distribution conditions.



# High barrier packaging to extend shelf-life

Most of the barrier materials have problems with recyclability and safety or high price

**빈틈없는 4중 차단 필름**

Printing layer  
Strength reinforcement layer  
**Oxygen barrier layer**  
Sealant layer

**EVOH(Oxygen barrier)**

- Certain companies dominate 85% of the Global market
- High price \_ continuous price increases
- Unstable supply and demand
- Poor recyclability

**Oxygen barrier layer**

Strength reinforcement layer

**\* Problems of high barrier materials**  
**: Environment, Safety, Price**



**Aluminum(Foil, VM)**



**Inorganic deposition  
(AlOx, SiOx)**



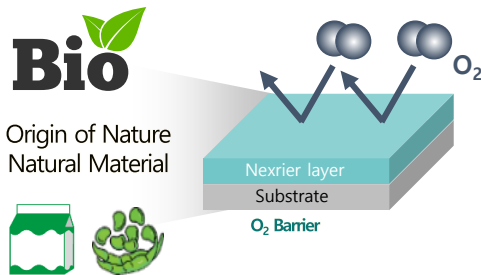
**PVDC**

# High barrier packaging to extend shelf-life

**Protein-based barrier coating material** made from natural by-products and is a key material that can respond to mandatory recycling policies

Creating value using  
natural by-products

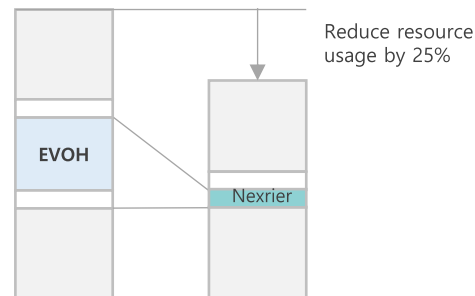
Reuse



Reducing resource usage /  
carbon reduction effect

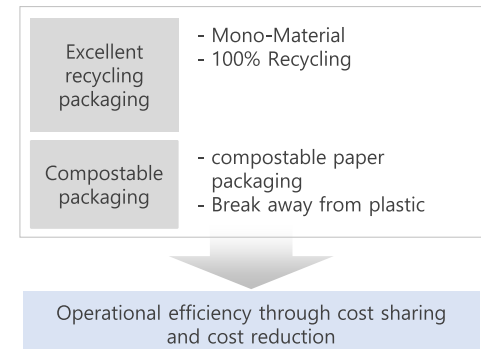
ESG

Reduce



Improves recyclability

Recycle



Barrier Coating  
Solutions



Food packaging



Cosmetic packaging



Pharmaceutical  
packaging



\* Note: Nexrier is Next Barrier which refers to the next generation eco-friendly, high-blocking performance

## Re-sealable or re-closable Packaging

**The shelf-life of opened food can be extended by re-closing**



**Re-sealable packaging**



**Zipper bag**



**Twist ties**



**Re-closable container**



**Re-closable container**



**Re-sealable packaging**



**Re-closable clip**



## Transparent of packaging

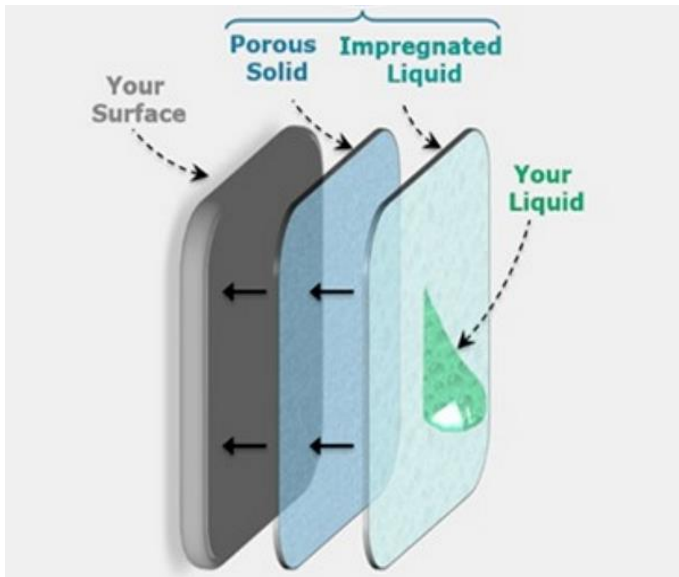
**Depending on the food, transparent packaging can help reduce food waste**

Transparent packaging is very useful for checking the freshness of the product inside. At home, it can be consumed fresh. At the retail level, it can increase consumer's willingness to purchase



## Non-stick Packaging

**Packaging surface modification technology that minimizes leftover contents within the packaging**



**The reason why the contents can slide on the surface of “LiquiGlide” without sticking is nanocoating technology**

- ① There are microscopic porous protrusions formed on the surface of the material
- ② Nanocoating is a technology that permanently fills the tiny holes or gaps formed inside a container with a special substance(slippery liquid).



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## **Global Case Studies**

## Japan: Portion Packaging in Convenience Store

**Reducing food waste via small-portion packaging, gas-flushed and resealable packaging for salad**



**Shelf life extended by 1+ day in salas products**

**Waste reduction rate(store level) : estimated 15 ~ 30%**



## Kenya: the Mango Project by SAVE FOOD

in southern Africa alone some 50% of the fruit and vegetables grown perish during production, storage, transport or processing and therefore never end up on the market.

Approximately 300,000 tons of the mangoes grown in Kenya never make it to market.



Processing(dry) → Packaging → Extend Shelf Life



**Mango waste rate reduces from 64% to 19%**



Mimica Touch is a tactile smart label that turns bumpy as food spoils

Up to 63% reduction in household food waste



Photo courtesy of Mimica Labs.



04

## **APEC Collaboration Opportunities**

# Packaging can be a key to reducing food waste

- 1. Share policies and technologies among member economies**
- 2. Development of packaging standards and guidelines**
- 3. Promote joint research and pilot project**

Thank you for your attention



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