



Discarded Shrimp Shells Reborn

For the Environment and Our Health

Shizuoka Prefectural Mishimakita High School



We cannot do without frozen shrimps.

Frozen shrimps are so useful and Japanese people love them. Actually, most of them are imported from Vietnam, where mangrove forests are well suited for shrimp farming.



Team:Mai

Shrimp Supply in Japan:
Imported vs. Domestic

Imported: 92%

Indonesia 20.4%

Share of Shrimp Imports to Japan by Country

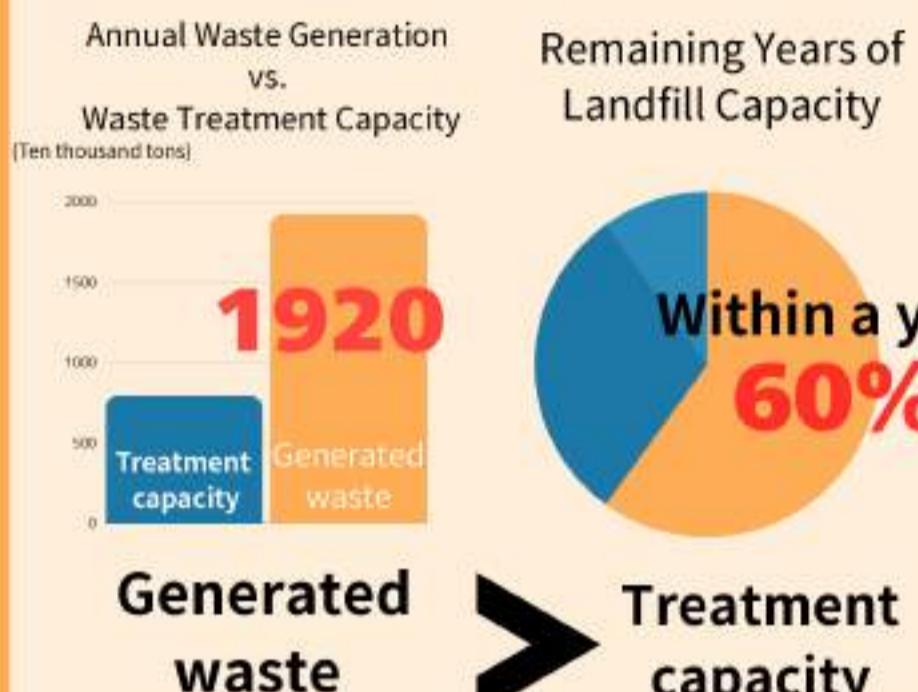
India 32.7%

Vietnam 25.1%



Problems

Vietnam's Waste Issues



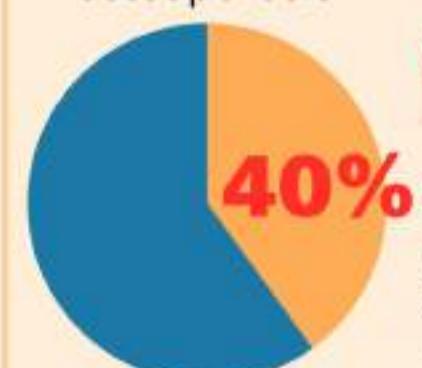
▲Litter scattered on the streets of Ho Chi Minh City (photographed during the study trip)

Polluted farmlands and Environmental destruction &

The process of producing peeled shrimp generates a large amount of discarded shells, which contributes to an increase in waste generation.

Calcium deficiency

Rate of osteoporosis



Women over 60 in Vietnam:

About 40 % have osteoporosis!

In Vietnam, there are few consumption habits of dairy products, and only about half of the calcium needed in the general diet is met.

→Decreased motor function, bone deterioration

Solution

We aimed to develop products made from shrimp shells as a solution to the problem of large-scale shell waste, focusing especially on processing them into food products.

– Shrimp-shell chips

– Pho noodles made with shrimp-shell powder

1 Easing the Waste Issue

Putting shrimp shells to use gives discarded materials a new purpose and helps cut down the amount thrown away.

2 Promotion of the health

In addition to reducing osteoporosis by taking calcium, the effects of obesity prevention and intestinal conditioning effects such as chitin lead to the improvement of lifestyle diseases in Vietnam, where obesity and diabetes are increasing.

3 Promotion of the SDGs actions

By printing the SDGs logo and our analysis on the package so that many people can know and buy them, SDGs activities can become familiar and promoted.

Reduce CO₂

Global Shrimp Production Volume in 2023



CO₂ Emissions from Burning Shrimp Shell Waste

The shells = 35% of the total weight of a shrimp
 $400,000 \text{ tons} \times 0.35 = 150,000 \text{ tons}$
150,000 tons of shells (moisture 50%) → 75,000 tons dry
Main component: Chitin (C₈H₁₃O₅N)
44.4% carbon → 33,300 tons of C
CO₂ factor: 3.67 (CO₂ = 44/12 = 3.67)
CO₂ emitted: $33,300 \times 3.67 = 122,000 \text{ tons}$

122,000 tons of CO₂ is emitted!

Packaging design idea



SDGs logo

Analysis and health promotion messages

Prototype development

Marusen Fisheries Corporation and Toyo Refrigeration Corporation kindly gave us shrimp shells that were scheduled to be discarded. We made two prototype food products.

Good Points

- Shrimp flavor
- Easy to intake lot of calcium



▲Pho with shrimp shell powder

▲Shrimp shell chips

Bad Points

- Hard shrimp texture
- Cooking oil is not good for health...?

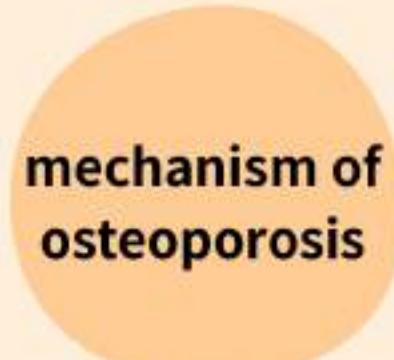
Estimated Calcium Content

- Pho 3420mg in 114g
- Shrimp shell chips 300mg in 10g

※Assuming that there is no change in the amount of calcium due to the cooking process.

- Even 10g of shrimp chips alone can supplement about half of the target amount of calcium (600-800mg) taken per adult per day.

Expected effect



Normal bone



Osteoporosis



Bones always use calcium for bone absorption and bone formation. The imbalance due to calcium deficiency can cause osteoporosis, and the bones are easy to break. Our products, which contain a lot of calcium, are very helpful in preventing osteoporosis.

References

2018 data from the Sea Surface Fisheries Production Statistics Survey (Ministry of Agriculture, Forestry and Fisheries) and Ministry of Finance Trade Statistics (Imports) From FAOFO ishstart, <https://fundinno.com/projects/990>

Data on world shrimp exports

https://www.suikaku.co.jp/single?news_code=OK0000025092600701_03&feature_id=310

Data on eggshell calcium and bone mass

NIN. General Nutrition Survey 2009-2010 and Hien VTT et al., Am J Epidemiol. 2005;161:824-830. A twist

Data on Japan's shrimp import rate and its import destination

NIN. General Nutrition Survey 2009-2010 and Hien VTT et al., Am J Epidemiol. 2005;161:824-830.

Data on Vietnam's garbage emissions and garbage disposal status

<https://www.vietnam.vn/ja/rac-thai-sinh-hoat-tang-nan-giai-bai-toan-xu-ly>