

Challenges and Implications for Sustainable Food System

Best Practices Sharing on Sustainable Food Upcycling and Waste valorization - Singapore

-

Presented By

A/ Prof Matthew Tan

Chair – WG1

Sustainable Development in Agriculture and Fishery Sectors

APEC Policy Partnership on Food Security

CEO, Asia

Assentoft Aqua Asia Pte Ltd



**Policy Partnership
on Food Security**

Sustainable Food Upcycling and Waste valorization - Singapore

An Overview

1. Food waste accounts for about 12 per cent of the total waste generated in Singapore.
2. The total amount of food waste generated in 2022 was 813,000 tonnes.
3. The recycling rate for food waste was 18 per cent.



Sustainable Food Upcycling and Waste valorization - Singapore

Statistics on the amount of food waste Disposed of, Recycled and Generated in the past 5 years

Year	Food Waste Disposed of ('000 tonnes)	Food Waste Recycled ('000 tonnes)	Total Food Waste Generated ('000 tonnes)	Recycling Rate (%)
2022	667	146	813	18%
2021	663	154	817	19%
2020	539	126	665	19%
2019	607	136	744	18%
2018	637	126	763	17%



**Asia-Pacific
Economic Cooperation**

Sustainable Food Upcycling and Waste valorization - Singapore

Resource Sustainability Act (RSA)

- 1. A landmark Resource Sustainability Act (RSA) was enacted in October 2019 to give legislative effect to new measures to address our priority waste streams.**
- 2. The requirements relating to food waste are:**
 - From 2021: Developers of new large commercial and industrial premises to allocate and set aside space for on-site food waste treatment systems in their design plans.**
 - From 2024: Large commercial and industrial food waste generators will have to segregate their food waste for treatment.**



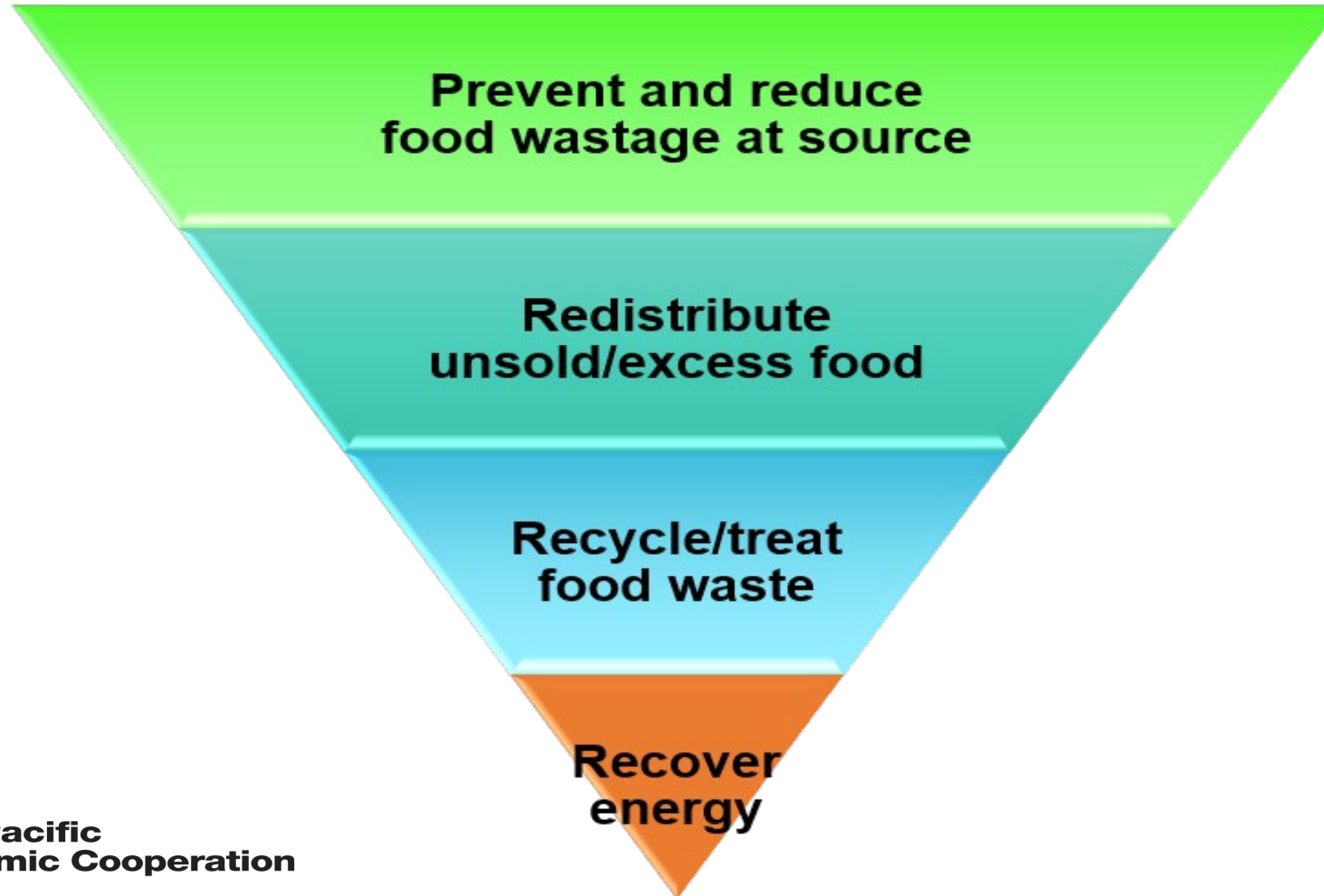
Sustainable Food Upcycling and Waste valorization - Singapore

The types of prescribed premises and corresponding thresholds of the prescribed premises subjected to the mandatory segregation requirements are summarised in the table below.

Types of Premises	Threshold		Exemptions
Shopping Malls	F&B Area	> 3,000 sqm	NA
Hotels	F&B and Function Area	> 3,000 sqm	NA
Single-user Factory (SUFs)	Large Food Manufacturers	Operation area > 750 sqm	Manufacturers of spices, dried foodstuffs, additives, bottled water, high pressure processing
Multi-user Factory (MUFs)	GFA and food tenants	GFA > 20,000 sqm and with > 20 food tenants	NA
	At least one large food manufacturer	Operation area > 750 sqm	Manufacturers of spices, dried foodstuffs, additives, bottled water, high pressure processing

Sustainable Food Upcycling and Waste valorization - Singapore

Singapore Strategic Approaches to Food waste management



**Asia-Pacific
Economic Cooperation**

Sustainable Food Upcycling and Waste valorization - Singapore

Case Study Singapore



**Asia-Pacific
Economic Cooperation**

Sustainable Food Upcycling and Waste valorization - Singapore

Kosmode Health

1. Up-Valuing Food Processing Waste for Human Nutrition
2. Development of new Functional Food from food processing waste



Asia-Pacific
Economic Cooperation



Spent Barley Grain
Protein - 23%



Peanut Meal
Protein - 51%



Canola Meal
Protein - 50%



Okara
Protein - 24%



**Spent Corn from
ethanol production**
Protein - ~30%

**GLOBAL FOOD
PROCESSING WASTE
ESTIMATED TO BE
200 Million TONS PER
YEAR***

* Food Waste Footprint - Impacts on Natural Resources - FAO Summary report Food waste footprint: Impacts on natural resources - Summary report (fao.org)

IMPACT OF INDUSTRIAL AGRICULTURE ON GLOBAL WARMING



The practices of industrial agriculture, moreover, contribute about **25 to 30%** to global greenhouse gas emissions, dramatically accelerating climate change.

CARBON FOOTPRINT OF INDUSTRIAL AGRICULTURE IS EXACERBATED BY DOWNSTREAM WASTAGE

**Global Food
Processing
Waste per year**

~200 million tons*



Canola meal



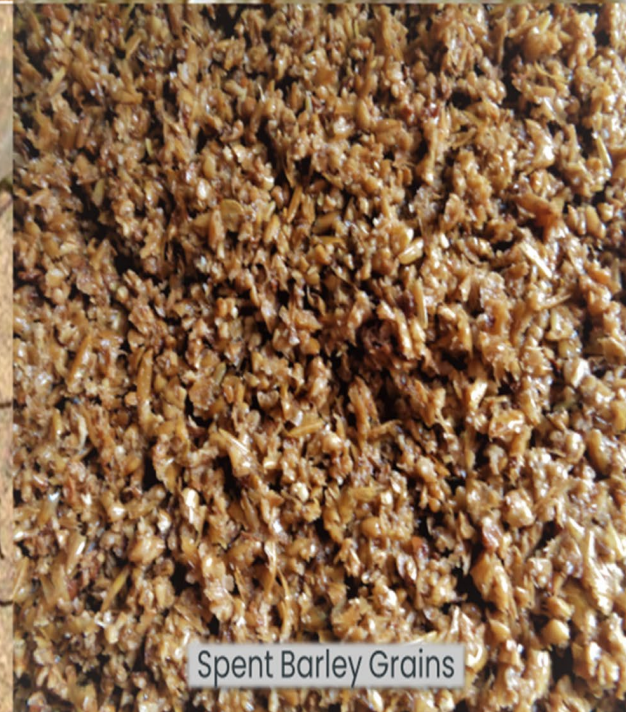
Okara



Spent coffee



Peanut meal



Spent Barley Grains



Distilled Dried Grains

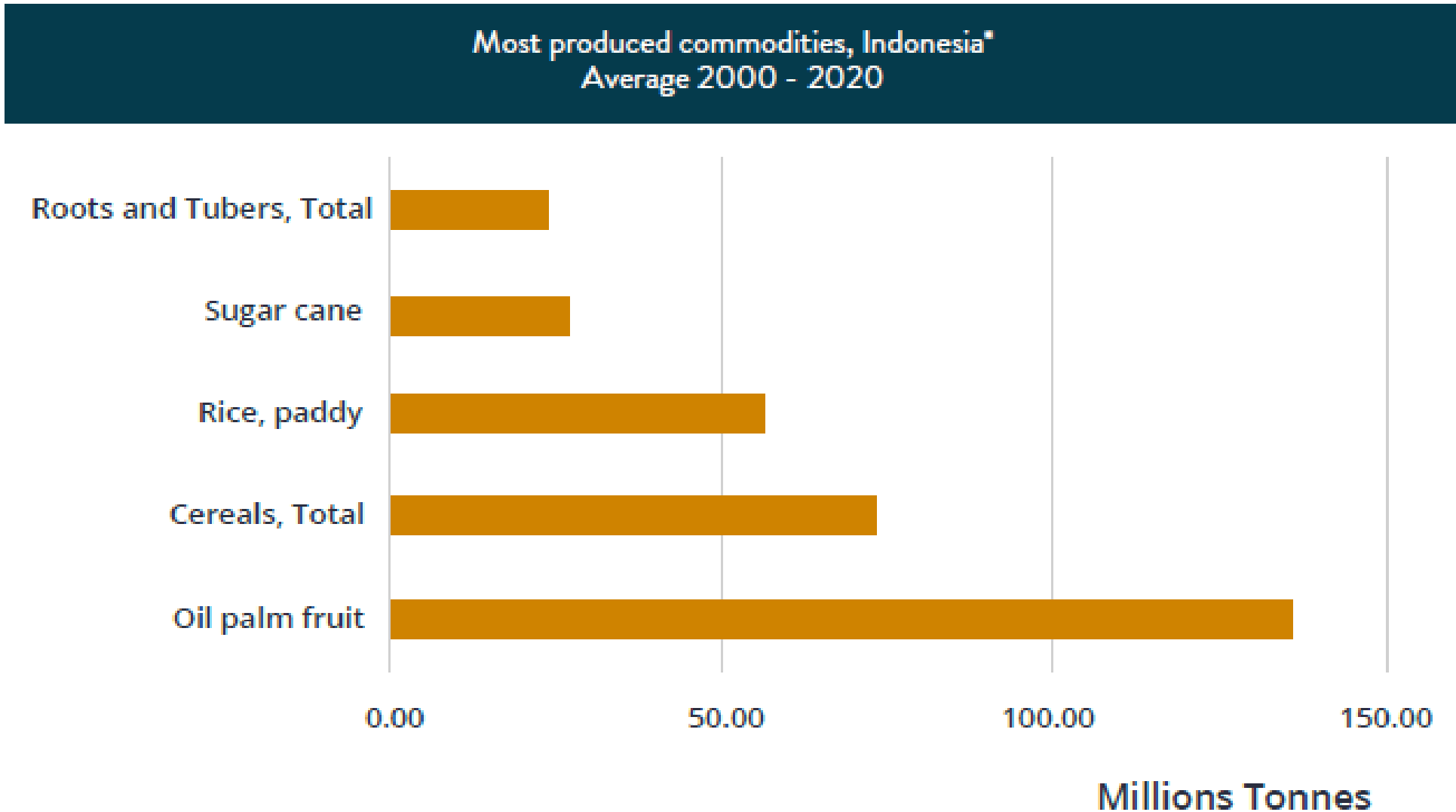
Sustainable Food Upcycling and Waste valorization - Singapore

Takeaway from this workshop



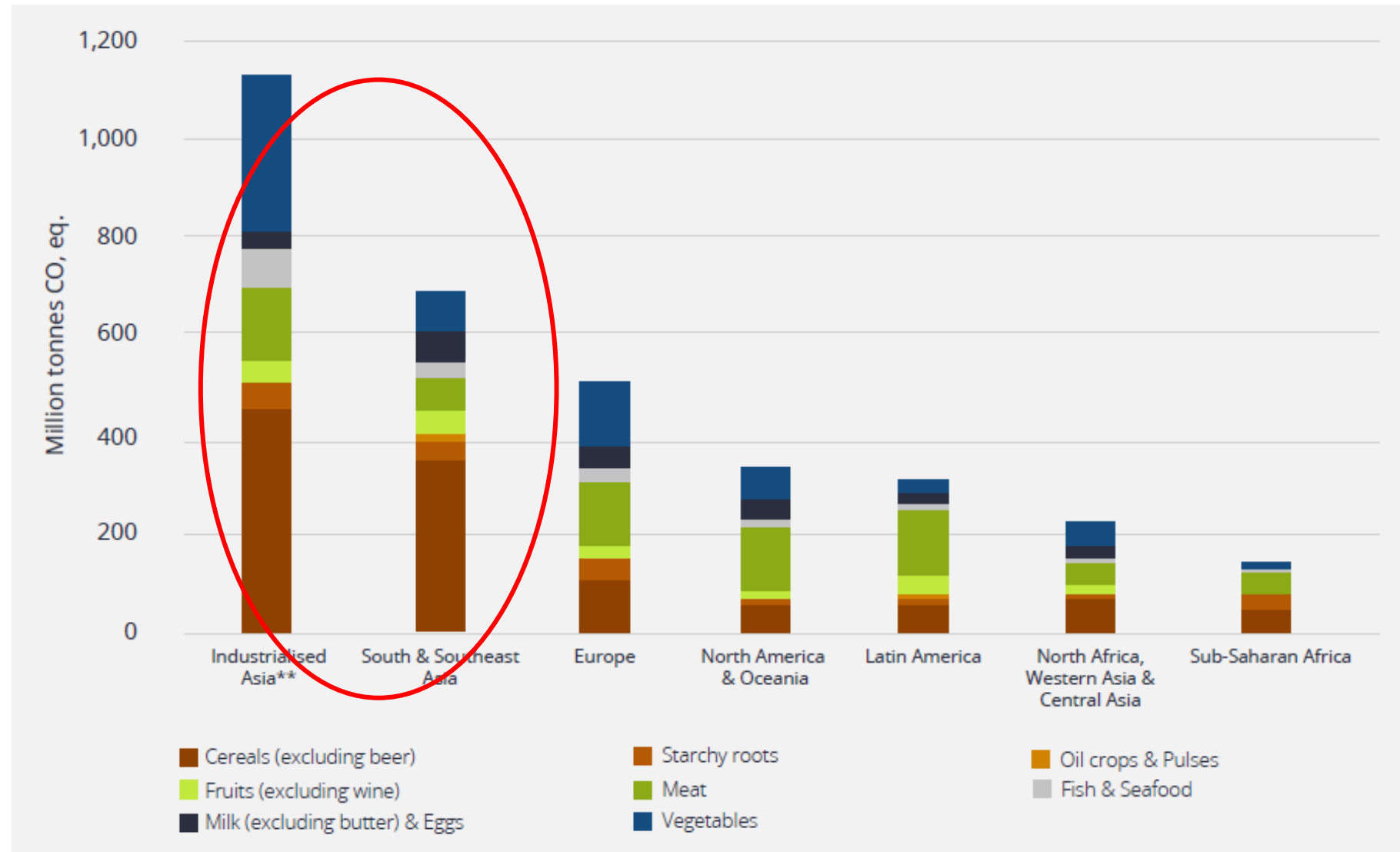
**Asia-Pacific
Economic Cooperation**

UNDERSTANDING EACH ECONOMY'S FOOD COMMODITY FOOTPRINT ASSESSING YOUR SOURCE OF WASTE



*Source: FAOSTAT data

CARBON FOOTPRINT OF FOOD WASTAGE BY REGION AND COMMODITY

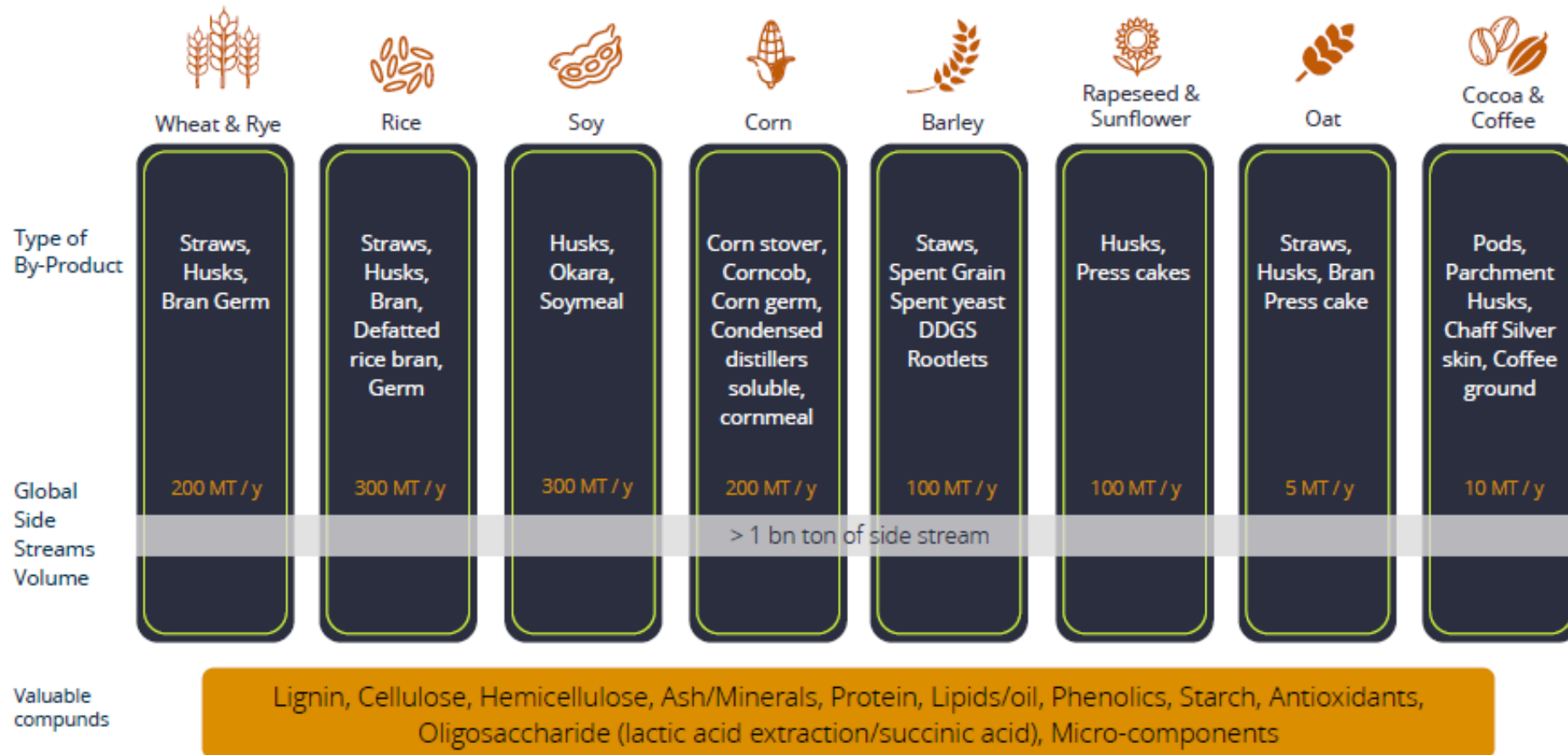


*Source: FAO, Food Waste Footprint, Summary report

** Republic of Korea, China and Japan

VALORISING AGRI FOOD WASTE BRING NEW HOPE TO ADDRESS HUNGER WHILE CREATING BUSINESS OPPORTUNITY

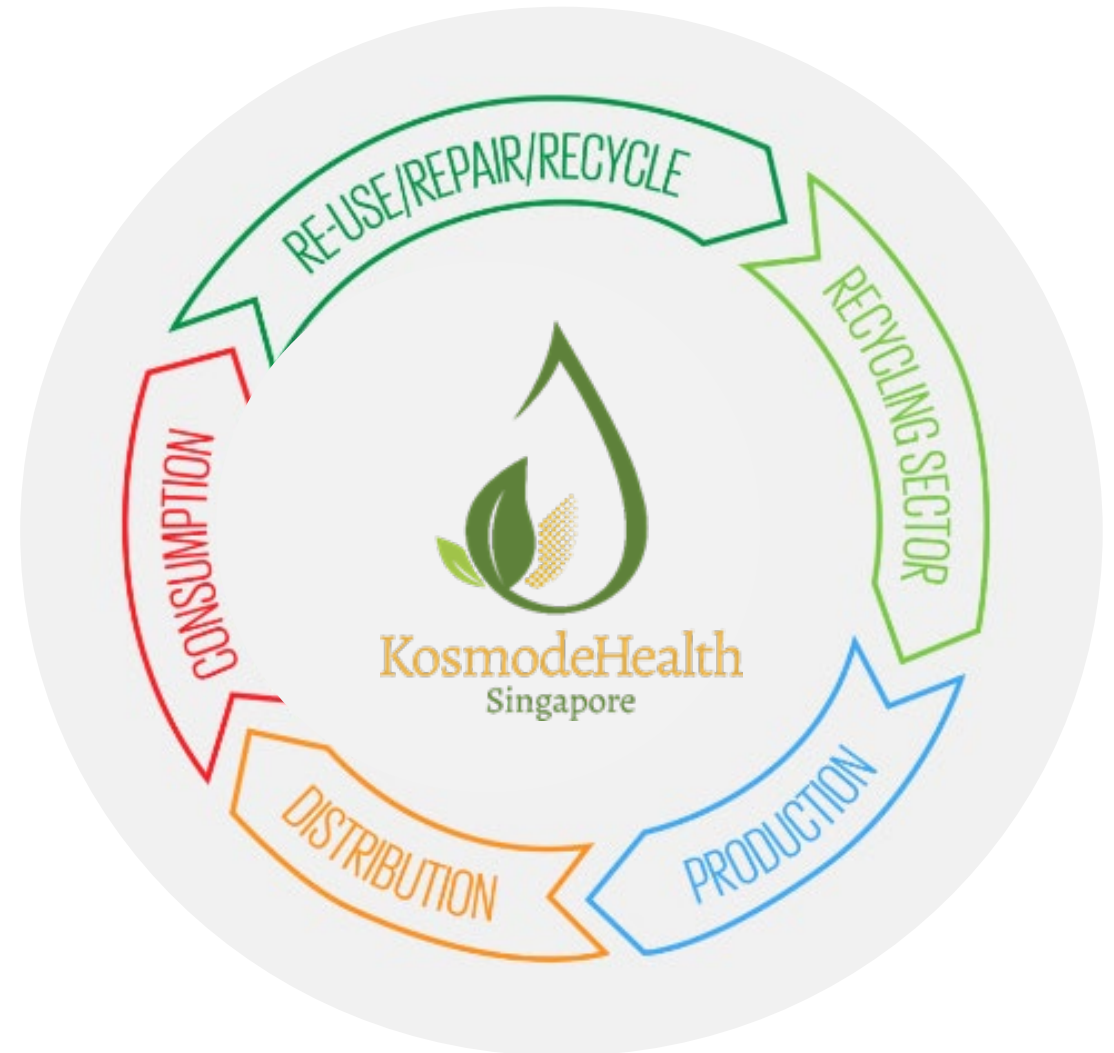
Millions of tons of side streams representing new business opportunities



*Source: Bühler waste to value white paper

KOSMODE HEALTH

1. Up-Valuing Food Processing Waste for Food
2. Extraction of nutritional components of waste to produce a protein-fiber powder for human nutrition.
3. Development of new Functional Food from food processing waste
4. Addresses the Sustainability Challenges.
5. Final Product – A Circular economy product that is as good for our health as it is for the health of our planet.





KosmodeHealth
Singapore

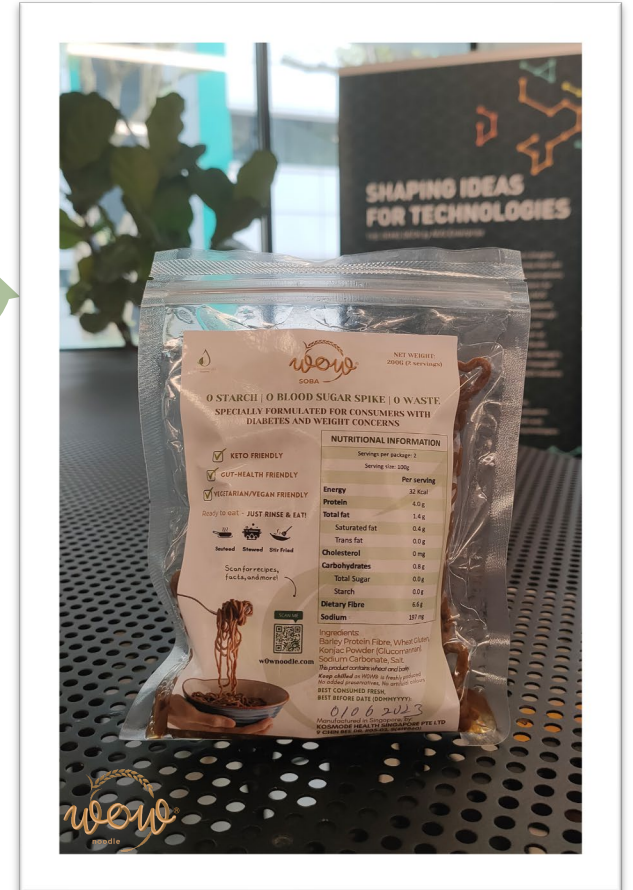
UPVALUING SPENT BARLEY GRAINS FOR HUMAN NUTRITION



Spent Barley Grains
Global: 30million tons pa
Singapore: ~75,000 tons pa



Upcycled Barley
Protein Fiber Powder
Protein - 38%
Fibre -29%



WOW® noodle
A functional staple food

WORLD'S ONLY FUNCTIONAL FOOD WITH ZERO GLYCEMIC RESPONSE



GLYCEMIC RESPONSE STUDY

Shows that WOW® does
not raise blood sugar level

Results of the study confirmed that consumption of WOW® noodles barely caused any blood sugar increase (average being $<0.05\text{mmol/L}$) over a 2-hour duration.

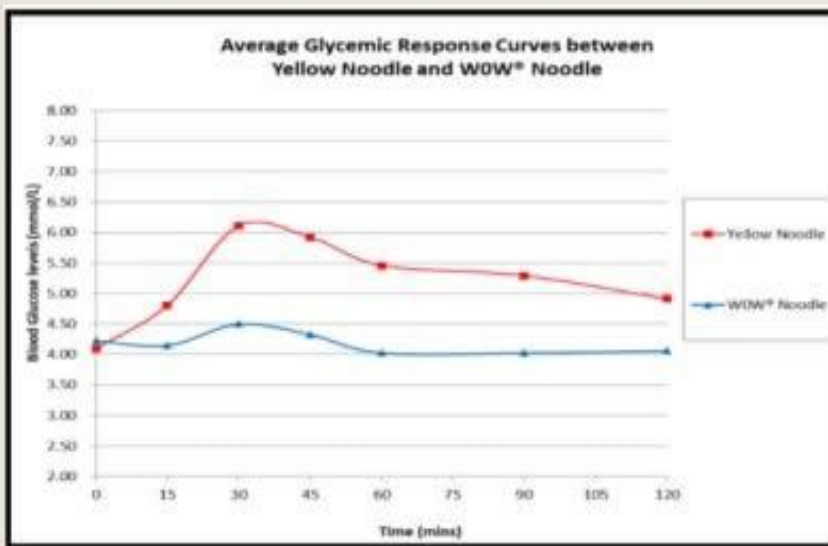


Figure 1. The average blood glucose response curves for Yellow Noodles and WOW® Noodles, shown as the change in blood glucose concentration from the fasting baseline

Nutritional Information

Servings Per Package: 2
Serving Size: 100g

	Per Serving
Energy	59 kcal
Protein	7.9g
Total Fat	2.2g
Saturated Fat	0.6g
Trans Fat	0.0g
Cholesterol	0.0mg
Carbohydrates	1.9g
Total Sugar	0.0g
Starch	1.9g
Dietary Fibre	8.4g
Sodium	332mg

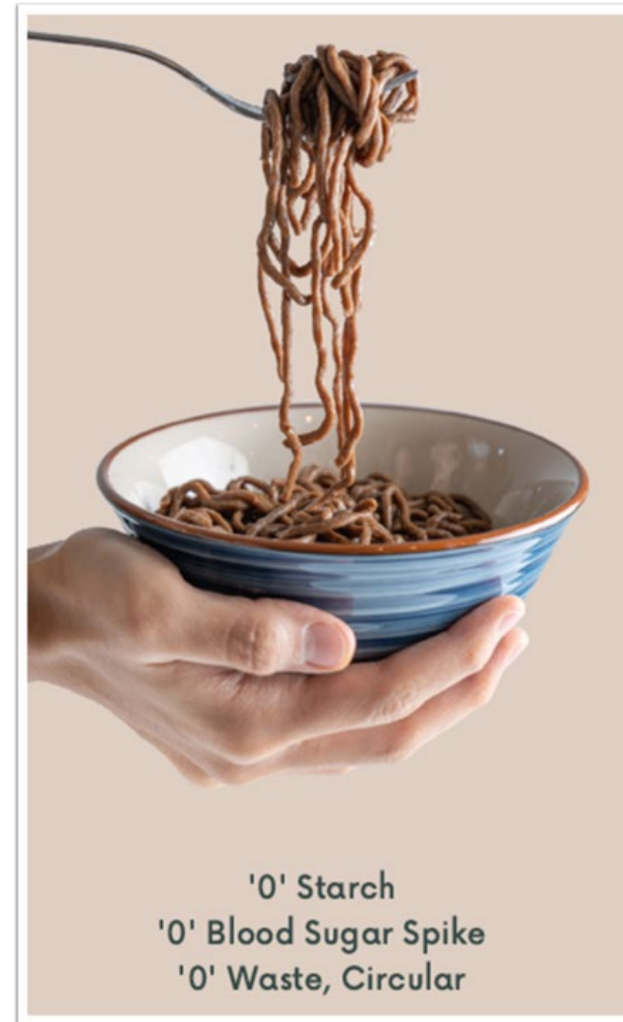


KosmodeHealth
Singapore

NUTRITIOUS FOOD DERIVED FROM WASTE



WOW® noodle
A functional staple food



GOOD FOR THE PEOPLE, GOOD FOR THE EARTH

NUTRITIOUS FOOD DERIVED FROM WASTE

BEYOND WOW® Noodles



High Protein/Fibre
Bread, with ½ the
carbs of
wholemeal bread



High Protein, High
Fibre,
Low Sugar/Carbs
Bread Spread



Protein/fibre
noodle
With 11x less Carbs
than mass market
noodle



High Protein/Fibre
Rice with 6x less
Carbs than brown
rice

BEYOND VALORIZATION OF SPENT BARLEY GRAINS



Corn



Wheat



Sunflower



Sugar Cane



Coconut

Thank You



**Asia-Pacific
Economic Cooperation**