

# TopSector Agri&Food Seed Money Project

## Turning Food Waste in Singapore into Animal Feed

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# Table of contents

- Project overview
  - Where we started
  - Purpose of the project
  - Conclusions
- What is happening in Singapore
  - SG food strategies & regulations
  - Our decisions
- First visit to Singapore
  - Major findings
  - Our decisions
- Co-design workshops in Singapore
  - Pre-workshop with RP
  - Co-design workshop
- New Developments
  - Singapore food Agency
  - Requests from COFCO
  - New opportunities



# Project overview



# Where we started

- In Singapore:
  - Singapore: high food dependency (**90% imported**).
  - Feed import prices can count to **40%-50%** of total production cost in Singapore.
  - In 2018, **636,900 tons** out of 763,100 tons of food waste are disposed.
- In Malaysia:
  - **90%** of bio-mass from palm oil industry are considered as “waste”.
  - Opportunities of turning into animal feed through technologies.
- In Japan:
  - Has succeeded to include SWILL (food waste from restaurants and out of home kitchens) in the recycling from human food waste into feed.
- In the Netherlands:
  - **Wageningen University & Research and Wageningen MFC:**
    - Have been elaborating the concept of Metropolitan Food Clusters (MFC) in Singapore.
    - Have built a considerable network with local entrepreneurs, government and knowledge institutes in agri and food in Singapore and Malaysia.
    - Have successfully applied for Seed Money project and have executed prime research.
  - **Nijsen/Granico (N/G):**
    - Uses waste streams from human food processing chains for animal feed (mainly pigs and chicken).
    - Look into opportunities to expand business in South-East Asia.



# Purpose of the project

- On the basis of quantitative information, to determine the technical and juridical feasibility and business opportunities of producing animal feed by recycling rest- and by-products from the human food chain, including SWILL and by-products from Palm Oil industry and to sell these products within the Singaporean as well as the Southeast Asian market.
- To develop a business proposal for Nijsen/Granico and local enterprises (Citizen Farm) and discuss it for support with Temasek, the Singaporean government and other relevant stakeholders such as Singapore Agri Food Enterprises Federation (SAFEF).

# Preliminary conclusions based on preparative desk studies executed in spring 2019

1. There is insufficient demand for animal feed in Singapore to start the profitable processing of palm-oil rest- and by-products and SWILL streams into animal feed.
2. Moreover current legislation forbids the recycling of these co-products, that are considered as waste, into the human food chain.
3. However the opportunities will keep on existing as the demand for animal feed within Singapore and in South-East Asia will grow in the forthcoming years.

# What is happening in Singapore

Before August



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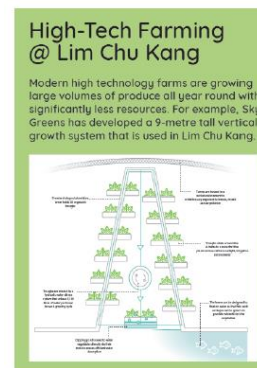


# SG food strategies & regulations (1)

- Singapore's food security strategy has formulated the 30 by 30 goal:
  - Singapore aims to produce 30% of the demand for fish, alternative proteins, eggs, fruits and vegetables within the country by 2030.
- To that end it is developing the Northern agri-tech and food corridor:

- Allocated North Singapore.
- Agri-Food Innovation Park (AFIP) as the first phase.

## NORTHERN AGRI-TECH AND FOOD CORRIDOR





# SG food strategies & regulations (2)

## ■ Agri-Food Innovation Park (AFIP):

- Start of the Northern Agri-Tech and Food Corridor.
- Pilot cluster, 18ha.
- High-tech urban farming, R&D.
- To attract agri-tech companies, R&D talent and investment to Singapore.



## ■ Government maintains strict regulations on turning human food waste into animal feed through Black Soldier Fly:

- Only one company has the license to produce for fish feed.
- As a consequence there is limited opportunity for N/G to start business in SG converting palm oil waste and SWILL into animal feed.
- Feed for ornamental fish can be a start.

# So we decided...

- To look into the opportunities from the SG government's food strategies:
  - How far is the development?
  - What role can be played by Dutch knowledge institutes and technology providers?
- To keep looking into short term business opportunities of turning "waste streams" to animal feed:
  - N/G as technology provider?
  - N/G as knowledge provider?
- To take these questions as starting point for the co-design workshop with Singaporean stakeholders from **K**nowledge institutes, **E**ntrepreneurs, **N**on-governmental and **G**overnmental organizations that together implement system innovations (KENGi).



# First visit to Singapore

In August



# Major findings

- There is **no overarching elaborated plan** for SG government to realize their food security strategy:
  - Look for knowledge and solutions.
  - Look for cooperation with knowledge partners and entrepreneurs from outside.
  - Investment power is sufficient.
- Relevant education & training (**E&T**) has started:
  - Temasek Polytechnic has implemented E&T on aqua production since 2015.
  - Republic Polytechnic (RP) has been assigned to develop E&T on high-tech greenhouse.
  - RP offered to partner in and to house the co-design workshop.

# So we decided...

- Consider this as an **opportunity** of helping SG government to shape their food security strategies, together with Nijsen/Granico:
  - Shape N/G's business environment from the beginning.
  - Include industrial ecology as a strategic starting point.
  - Integrate it in detail into the existing food security strategies from the SG government.
- In this way, shaping SG's food security strategy as the **theme** of the co-design workshop:
  - In October 8<sup>th</sup>-9<sup>th</sup>.
  - With the invitation to KENGi parties to participate.

# Co-design workshops in Singapore

In October



# Pre-workshop with RP - Scope calculation

We assumed that in 2030, about 100 million consumers in SEA would have a comparable food demand as Singaporean consumers and have the purchasing power to buy that food.

This means South-East Asia would need:

	Food demand (x 1000kg)	Net area needed if produced with high- tech facilities (ha)	Amount of high- and mid- skilled people (FTE)
Chicken	3,400,000	8,635	43,454
Fish	2,200,000	2,822	20,622
Vegetables	96,000,000	43,088	<b>43,088</b>

And Singapore would needs for its 5.7 mln inhabitants:

Chicken	193,800	492	2,477
Fish	125,400	161	1,175
Vegetables	547,200	2,456	<b>2,456</b>

# Pre-workshop with RP – Concluded

- The demand within SG for highly-skilled workers in Agri-food, based on the 30-30 strategy is too small to support a viable business case for the E&T sector.
- The South-East Asian demand for high skilled workers in agri-food should be taken as the unique selling point for SG and the **business opportunity** for its education sector:
- The shift from SG to South-East Asia has as a consequence a shift from training the students to **train the trainers**.
- The business case can be expanded from South East-Asia to East Asia.

# Pre-workshop with RP – Business case

- Highly-skilled students and their knowledge and service become the main “**products**”.
- Production facilities on **commercial scale** are needed:
  - Students must have real commercial environment for training.
  - In this perspective, food becomes a “by-products”.



# Co-design workshop - Overview

- 15 different organizations participated, e.g.:
  - **Knowledge:**
    - Republic Polytechnic
    - Nanyang Technological University
    - Temasek Polytechnic
  - **Entrepreneurs:**
    - Singapore Agro-Food Enterprises Federation Limited
    - Capitaland
  - **Non-Government organizations:**
    - Forum for the Future
    - Urban Farming Partners
  - **Government:**
    - Dutch Embassy in Singapore
    - Singapore Food Agency
    - Economic Development Board
    - Urban Redevelopment Authority
- Co-design practices:
  - Problem definition
  - Silent wall
  - Open space
  - Action planning

# Co-design workshop – Concluded (1)

- To progress the **combination** of **Dutch** agriculture knowledge and technology with **Singaporean** E&T capacity and its role model in South-East Asia and East Asia has high potential.
- Singapore can take a strong position in agri-food sector in its surround region **though E&T:**
  - SG as the **hub** for modern sustainable food production in South-East Asia.
  - South-East Asia has the space and resources to **scale up** the production that has been tested and proved in SG and to produce the materials for processing in SG and other SEA metropolises.

# Co-design workshop – Concluded (2)

- SG needs **collaboration** for a common goal (food security and independency):
  - Not only within the country, not only among involved parties,
  - But also within an international framework: with knowledge and technology providers, with other countries in SEA as well as in the rest of the world.
- SG needs a **road map** for the development trajectory to guide actions and collaborations:
  - Prime responsibility for this is with Singapore government as a combined action of SFA, URA and EDB.
  - Meanwhile, elaborating the actions points above into a road map is making a move further.



# Overall conclusions of the project

1. There is insufficient demand for animal feed in Singapore for N/G to start their business in Singapore at this moment. For the same reason it is too early to start the processing of palm-oil waste and SWILL waste streams into animal feed. However:
  - The opportunities will keep on existing as the demand for animal feed within Singapore and in SEA will grow in the forthcoming years.
  - Pro-active support from government is needed.
2. To progress the combination of Dutch agriculture knowledge and technology with Singaporean E&T capacity and its role model in South-East Asia and East Asia has high potential.
3. Singapore's unique selling point is the capacity for Education & Training. It should target the demand for highly skilled workers in the whole regions of Southeast and East Asia:
  - Train the trainers.
  - Role model in South-East Asia and East Asia.
4. SG Polytechnics should be the prime investor to start the high-tech agrifood business because they need practice training space for E&T.

# New developments

From October till now



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# Elaboration of E&T strategy

- Cooperation with RP to set up the Education & Training program as a start of the business model.
  - RP is planning to visit the Netherlands in March 2020.
- New TopSector Seed Money project to build up a strong consortium.



# Development of 30-30 strategy into concrete planning

- Two delegations from Singapore government visited Nijsen/Granico:
  - In October delegates from URA and JTC.
  - In November the Minister of State for Environment and Water Resources.
- The CEO of Singapore Food Agency announced that a master plan to integrate the current farms and agriculture clusters together is needed.
- One representative of SAFEF and Mr. Darren Ho have **teamed up** and are arranging a follow-up meeting with the CEO of Singapore Food Agency.

# Requests from large Chinese company

- One of the the biggest state-owned food companies in China has requested SAFEF from SG to assist in establishing **modern broiler production** in China by arranging and integrating:
  - **Technology** and supply chain integration from the Netherlands:
    - Nijssen/Granico
    - Kuijpers Kip
    - Jansen Poultry Equipment
    - Vencomatic
  - **Education & Training** input from Singapore.

# Thank you!



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