Policy Partnership on Food Security Plenary Meeting - Day One

Agenda Item [V] –PPFS Working Group One
Working Group Updates on PPFS Activities – March 2025

Presented By

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Chair – WG1
Sustainable Development in Agriculture and Fishery Sectors

Associate Professor – Engineering
Singapore Institute of Technology

Agenda

1. Update on Conferences Participation in 2025
2. New Technologies Pipeline - 2025
3. Ongoing Work Plans 2025
4. WG1 and GEN AI APIP Project
5. Others

1. Update on Conferences Participation in 2025

APEC 2025 KOREA

Participation in relevant conferences

Canada-in-Asia Conference 2025

- Theme - Advancing Agri-food & Aquaculture Systems Through AI
- Organized by **Asia Pacific Foundation of Canada**
- Date - 19th to 21st February 2025.
- WG1 Chair - Panel Speaker
- Extension of invitation to collaborate with WG1 & PPFS

1. Update on Conferences Participation in 2025

Participation in relevant conferences - Industry Talk @SIT

- Theme - An Overview of the Aquaculture Industry plus actual studies of technology implementation
- Organized by **Singapore Institute of Technology**
- Date - 27th February 2025.
- WG1 Chair - Speaker
- New Agritech and Aquaculture Specialization will be introduced in Sustainable Built Environment (SBE) programme to train the workforce needed in the rapidly developing agri-food sector.

1. Update on Conferences Participation in 2025

1. Training for the rapidly developing agri-food sector.

2. Specialization in Agritech and Aquaculture in Bachelor of Engineering Honours in Sustainable Built Environment (SBE)

3. New possible training partner for PPFS WG1

Six Modules
Under Agritech and Aquaculture Specialization

1. Agri (Crop/Plant) Science – *Applied Crop Science and Urban Farming*

2. Aqua Science – *Applied Aquaculture Science and Principles*

3. Agri (Crop/Plant) Engineering Components – *Sustainable Agriculture Engineering*

4. Aqua Engineering Components – *Aquaculture System Engineering*

5. Integrated System and Agriculture Value Chain – *Integrated System & Agribusiness*

6. Applied AI – *Applied AI and Technopreneurship*

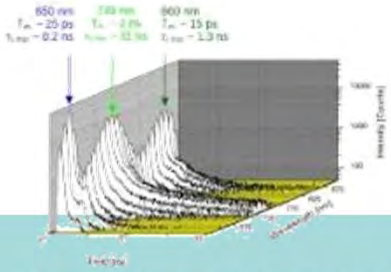
Full Fledge Feed to Fish Research Facility

Novel Ingredient QuickScan

The in-vitro digestive model enables rapid preliminary screening of novel, valorized food waste components.

Enhanced Pilot Production

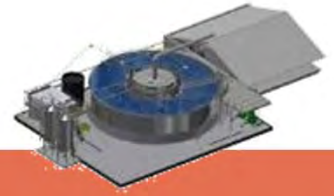
The enhanced pilot feed manufacturing enables IHLs and industry partners to pilot their innovative formulations



Feed Characterisation

(Palatability + Attractability)

The automated in-vivo digestive and palatability systems will thoroughly analyze the produced feed to verify its actual performance and provide a comprehensive characterization.



On-growing Facility

The facility can serve as a testbed for pioneering farming methods and feed research, examining how innovative feeds impact growth and feed conversion efficiency.

1. Update on Conferences Participation in 2025

Participation in relevant conferences

Sustainability Week Asia 2025 – Bangkok

- Harvesting tomorrow: making food production sustainable
- Organized by **Economist Impact Group**
- Date - 25th to 26th March 2025
- WG1 Chair - Speaker
- Extension of invitation to collaborate with WG1 & PPFS

Complimentary Registration for APEC Officials

APEC 2025 KOREA

Sustainability Week Asia 2025

Venue : Bangkok

Date - 25th to 26th March 2025

Note : Complimentary Invitation extended to all APEC PPFS delegates and Officials.

Pls register using the attached QR code and discount code **Comp100**

1. Update on Conferences Participation in 2025

Participation in relevant conferences

ESG Impact Summit 2025

- Theme - ESG Impact on the Future of Agri Food Innovation
- Organized by **Falcon Business Research**
- Date - 3rd April 2025 @ Marina Bay Sands.
- WG1 Chair - Speaker
- Extension of invitation to collaborate with WG1 & PPFS

1. Update on Conferences Participation in 2025

5th INTERNATIONAL CONFERENCE ON SOCIAL AND ECONOMIC DEVELOPMENT (5th ICSED 2025)

- Theme : “Navigating the Blue Economy: Sustainability for Present and Future Generations”
- Date : 8th and 9th September 2025
- Venue - Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia.
- WG1 Chair - Speaker

2. New Technologies Pipeline - 2025

2. New Technologies Pipeline - 2025

1. **Food Loss Waste Technology - Developed by Institute For Functional and Intelligent Materials @ NUS.**

- The technology enables safe, edible, biodegradable, coating approaches for post-harvest treatments; benefitting the entire supply chain with validated results starting with Avocado, Mango and Papaya.
- APEC economies are major fruit producers globally and Asia-Pacific fresh fruit market is valued at over $339 billion and is growing at an estimated 7% annually (Statista, 2024).
- Post-Harvest Losses in Developing Economies - Up to 30%.

Tropical Fruits - US$9B+ Loss Globally

30-40% of tropical fruits never reach consumers due to post-harvest losses

$9b+ lost globally

Adverse microbial contamination increasingly rampant, from farm to consumer

Existing shelf- life increase approaches not designed for this

Increasing reliance on environment unfriendly packaging at every stage

Over 33% of plastic pollutants from food packaging

Increasing reliance on cold storage and air freight with relatively under-developed supply chains and organized farming in Asia-

Over 40% of food losses

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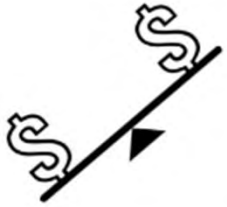


- Lower income across supply chain

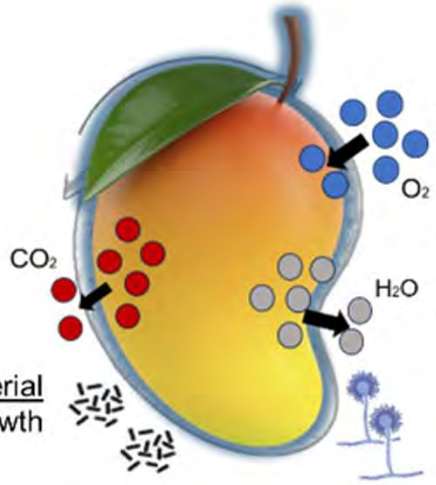
- Limited availability of fresh fruits
- Increasing carbon foot-print

- Constrained to nearby suppliers
- Continued economic losses
- High costs across supply chain

The Solution – FruitGuard Coating

Extension of Fruit shelf life:

Limiting CO_2 release and maintaining a high concentration inhibits natural physiological processes and extend shelf life



Inhibiting O_2 penetration helps to drastically reduce the rate of browning and respiration

Limiting the moisture loss helps to minimize loss of desirable appearance

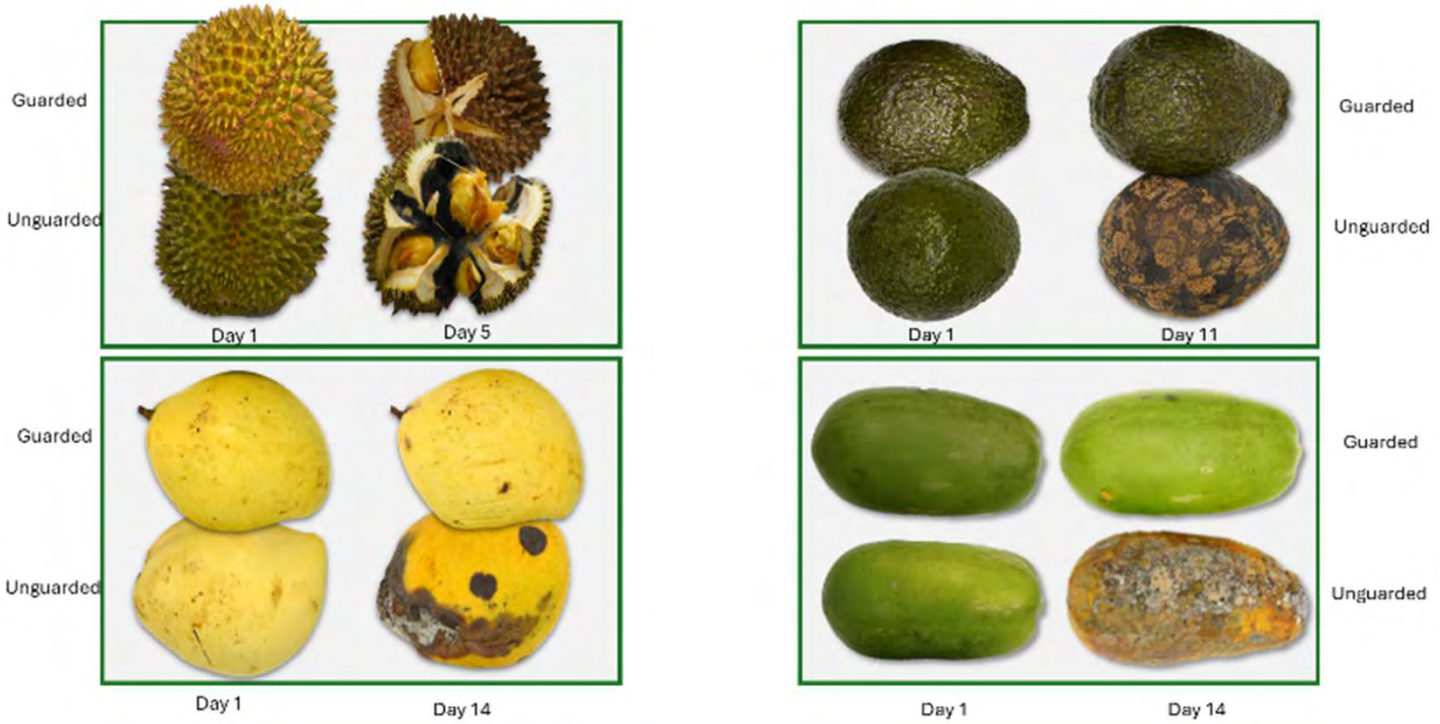
Barrier against bacterial penetration and growth

Barrier against fungal penetration and growth

Control		PROTECT			CUSTOMIZE
Control oxygenation ✓	Inhibit CO_2 release ✓	Moisture retention ✓	Anti-bacterial ✓	Anti-fungal ✓	Tailorable protection formulation ✓

Leveraging proprietary genomic insights to map microbial ecosystems on fruits and tailor innovative edible coatings that tackle spoilage and reduce post-harvest loss.

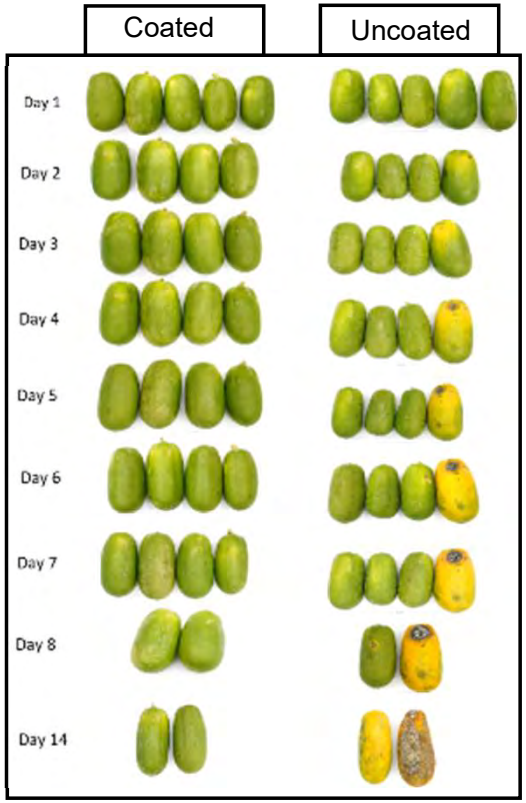
Technology Validation



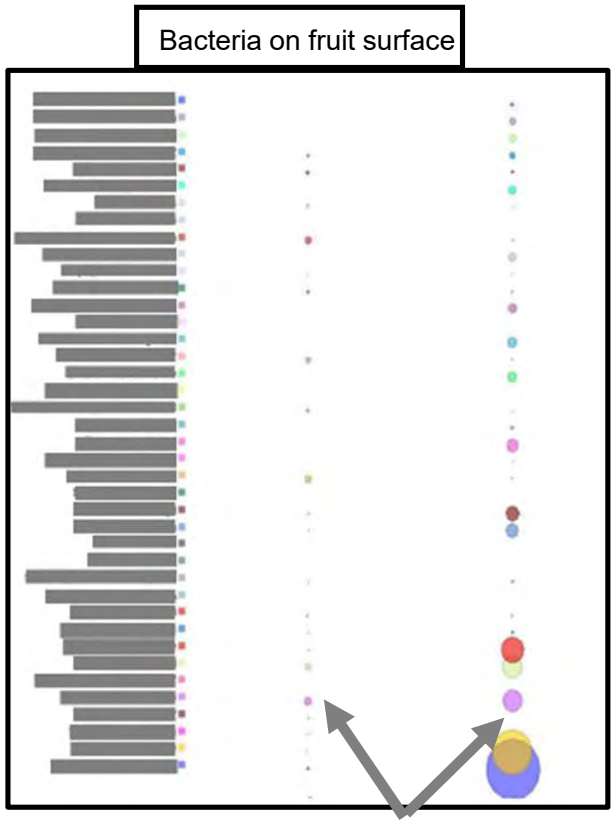
- Analysis of over 1000's of bacteria, fungi unique to fruit families on farms in Asia
- Uniquely designed formulation tailored per fruit family sourced from specific farm locations
- Proprietary microbiome database with AI powered microbial identification from DNA sequencing
- Increasing demand from retailers, growers, domestic suppliers, exporters and strategic domestic interests

The Game changer – Novel approach

Field results - Papaya



Shelf-life extension



Decrease the abundance of bacteria

Decrease the abundance of fungi infecting the skin

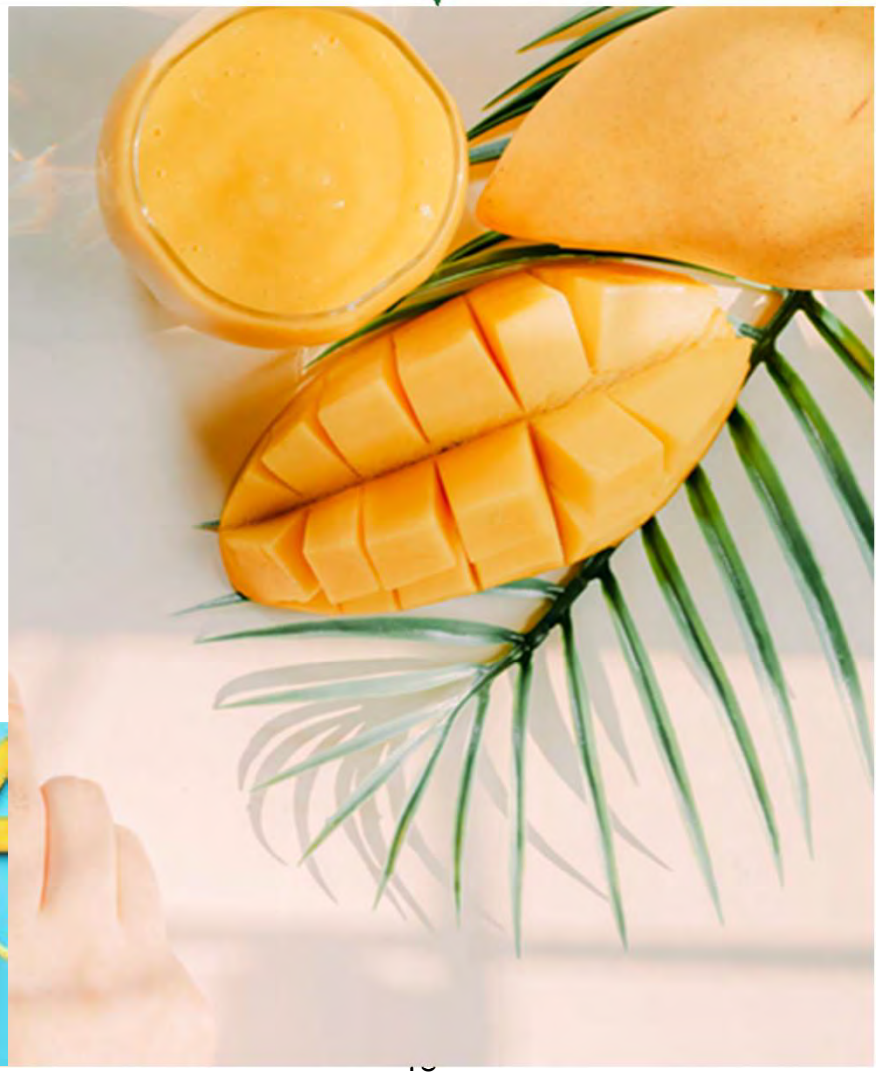
A Private Sector Initiative

About NUS I-FIM:

I-FIM is Singapore's 6th Research center of excellence (RCE), helmed by Nobel laureate Sir Prof. Konstantin Novoselov. Focused on advanced material research, I-FIM boasts world class researchers and cutting-edge labs, hosted in the National University of Singapore.

About FruitGuard

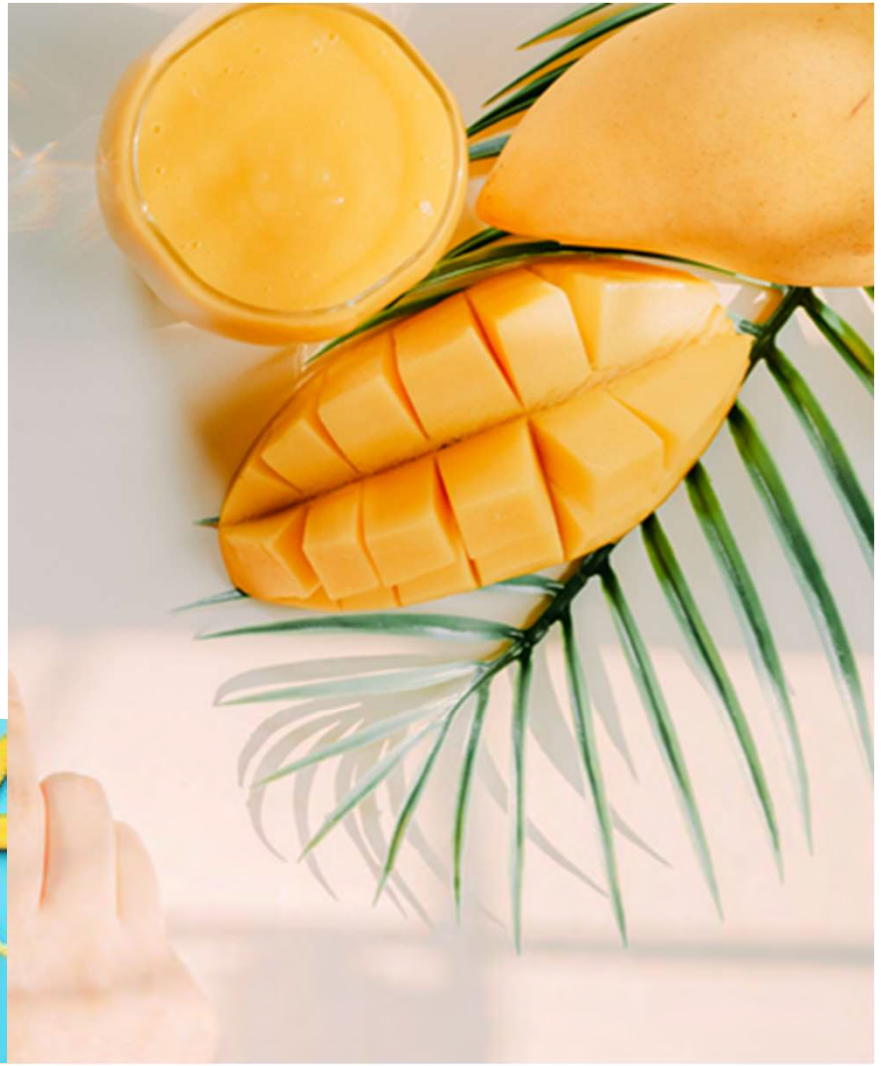
FruitGuard innovation, guided by world renowned scientist Prof. Guillermo Bazan, has pioneered next generation coating solution for enabling healthier, fresher and tastier tropical fruits.



A Private Sector Initiative

Collaboration Opportunities with Interested Economies

1. Pilots and deployments
2. Strategic collaborations
3. Investments – dilutive and non-dilutive
4. Joining/partnering the team



2. New Technologies Pipeline - 2025

3. Disease Detection Kit for Shrimp Farmers - Forte Biotech Pte Ltd

- Background
  - In 2020, APEC economies produced approximately 4.5 million tonnes of shrimp - 70% of the world's total shrimp production (FAO)
  - Estimated Global market value of USD 60.29 billion in 2024
  - However, disease outbreaks have led to 50-70% losses in shrimp production in some Asian economies,

Forte Biotech

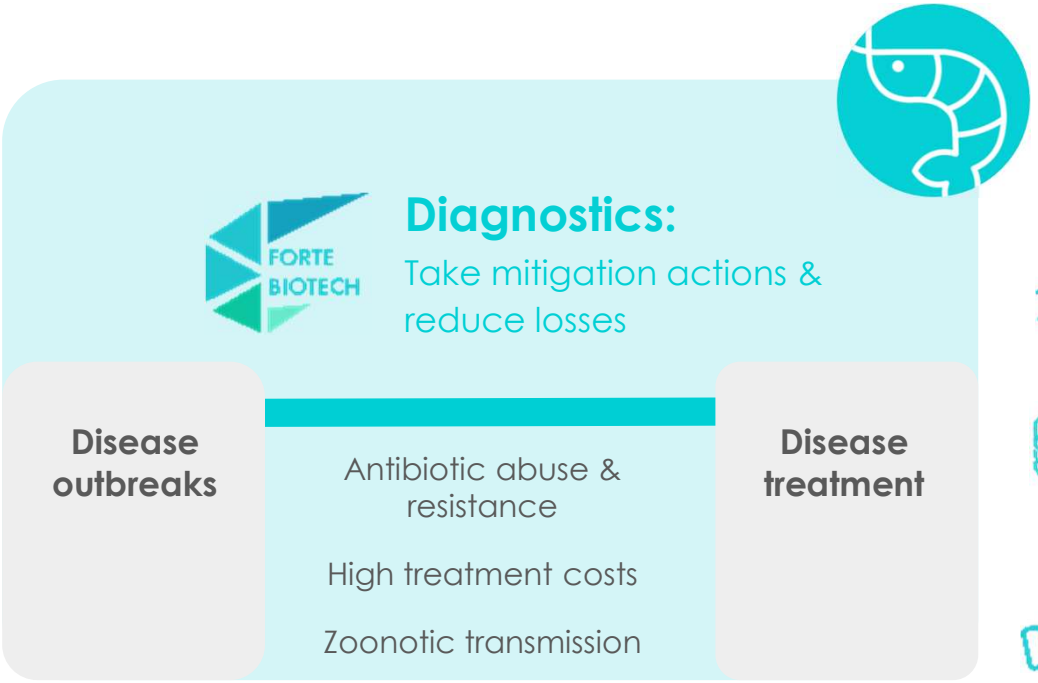
Easy On-Site Disease Testing: Bridging the Gap from Diseases to Treatment

An **Introduction**

February 2025

Why RAPID?

Bridging the gap with **point-of-care** diagnostics



	Traditional PCR test	RAPID
	> 24 hours	< 1 hour
	US$60	US$13
	Unusable; too late	Reduce losses

With **Forte Biotech's easy & affordable** tests, Farmers can **test weekly** = **Early detection** of diseases

Our Solution

RAPID

PATENTED

NUS National University of Singapore

Results in **1 hour**

Easy-to-use,
on-site

92% accuracy
compared to **qPCR**

$500 for RAPID Devices
$7.80/test,
$2.80 per subsequent disease

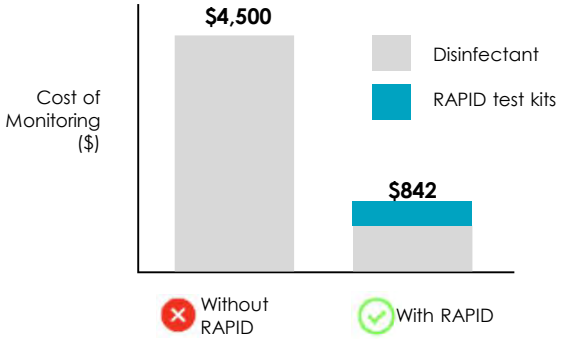
Test **frequently,**
detect diseases **earlier**

Case Study 1: Mr Phuoc (Viet Nam)

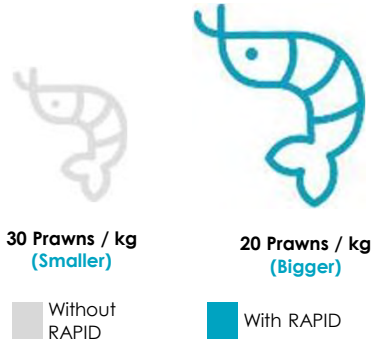
Pond disinfection cycles
reduced from 36 to 5

Harvested 15 tons of shrimps
before disease outbreak

Reduced antibiotic usage



Increased prawn size



In numbers

80%
Savings on antibiotics

1.5x
Increase in prawn size

2x
Harvest yield

2x
Profit earned

180x
ROI

Case Study 2: JALA (Indonesia)

JALA uses our **RAPID test kits** for **surveillance** to help them **detect pathogens <u>before</u>** their regularly scheduled PCR

PCR	RAPID		RT A	RT B	RT C
Date	**29 Dec**	**30 Dec**	31 Dec	31 Dec	**7 Jan**
A1	**WSSV**	**WSSV**	Neg	Neg	**AHPND/ WSSV**
A2	**EHP**	**AHPND/ EHP/WSSV**	Neg	Neg	**AHPND/ WSSV**

Disease detected **8 days prior** to PCR detection

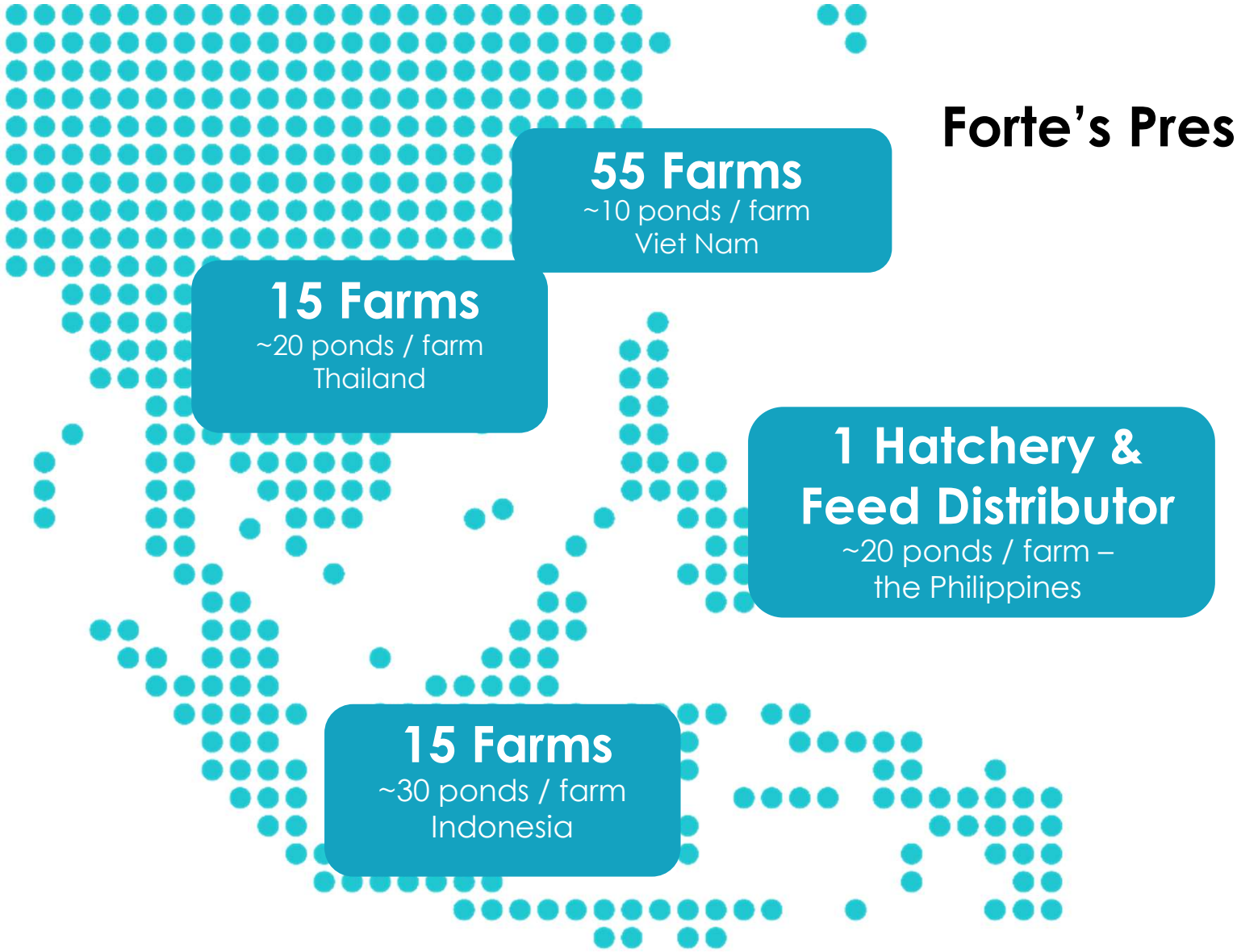
Facts

99% Mortality in 48 hours of symptoms appearing

450 tons of feed saved per pond

1350 tons of CO_2 emissions reduced

Forte's Presence South East Asia



Observe strong demand in varying farm scales in **Viet Nam** **Indonesia**, and **Thailand**.

The Philippines is part of our Phase 2 Expansion.

FORTE BIOTECH

Why RAPID?

Animal Health Enabler

- Expanding diagnostic solutions across all livestock sectors
- Bridging the gap between disease and treatment
- Frequent testing for early detection – enabling timely, data-driven decisions
- Minimizing production losses

Scalable diagnostic capabilities

Fish

Poultry

Porcine

Bovine

2. New Technologies Pipeline - 2025

2. Mobile Aquaculture Production System for Open Ocean Aquaculture

- **Plant & Food Research New Zealand**

Plant & Food Research
Rangahau Ahumāra Kai

Reimagining Aquaculture

Plant & Food Research

Current OOA system approaches

- Large, robust sea cages
- Deep water moorings
- Typically static
- Fish endure local conditions year round
- Environmental concerns
- Huge capital outlay


Salmar – *Ocean Farm 1*


Nordlaks Oppdrett – *Havfarm*

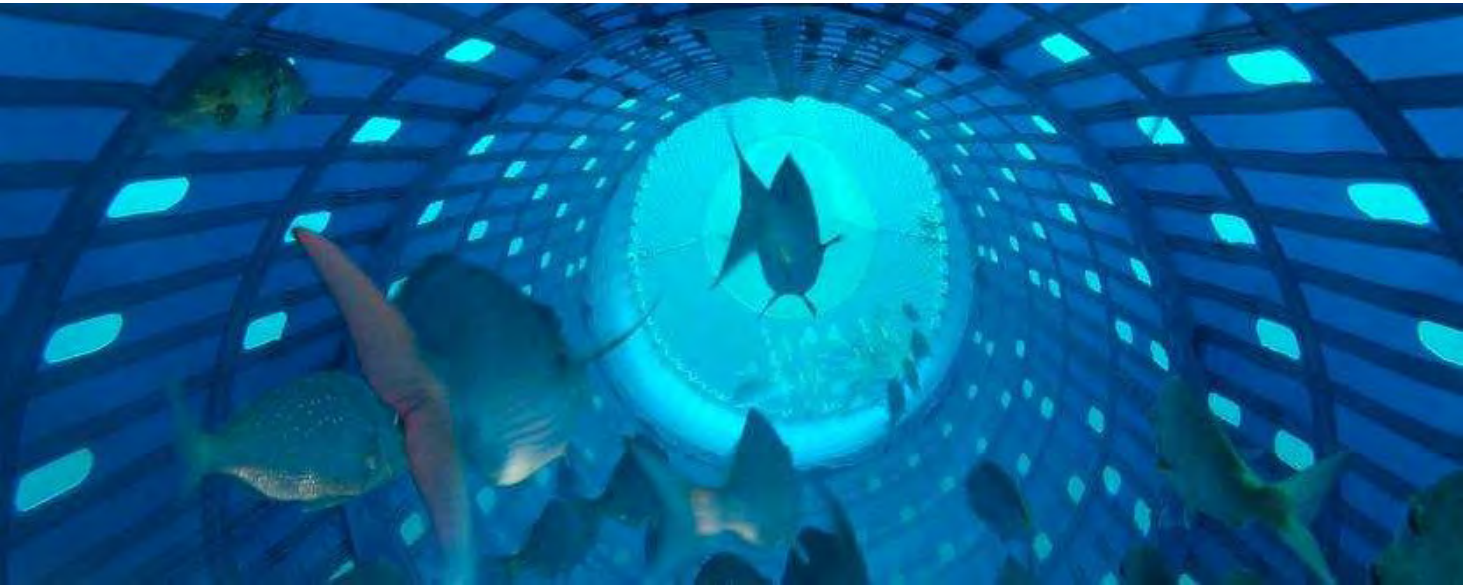

Cermaq – *iFarm*

Revolutionary approach to OOA

- Mobile and/or static
- Optimal conditions year-round
- Towed or moored
- Ultra-scalable flexible inflated structures
- Scalable capital outlay

History of delivered projects with ‘fish-centric’ approach

- Eliminating damage, exercise, stress and fatigue during harvest
  - Opportunity to return live fish
  - Improve post-harvest quality and consistency



AQUI-S®

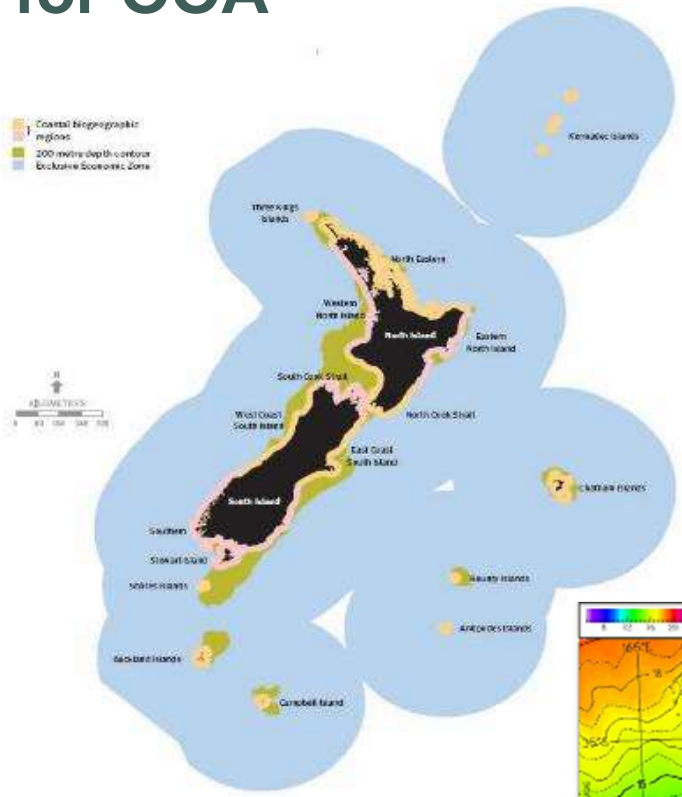
https://www.aqui-s.com

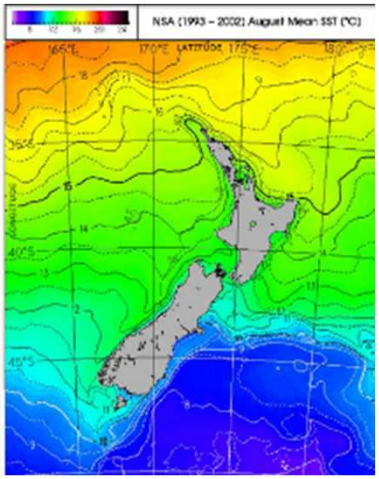
FloMo® A Better Way To Fish

https://www.flomo.co.nz

Mobile production - the ‘Pacific Way’ for OOA

- Specifically designed to support biological needs of fish
- Plays to New Zealand’s geographic and oceanographic strengths
- Alleviates existing issues:
  - Social licence – coastal occupation
  - Environmental footprints – e.g. waste, benthic impact
  - Biological – optimal conditions year-round
  - Resilience – climate change, species diversification





Research programme: Reimagining Aquaculture
(Whakapōhewa ki ahumoana)

Objective: take seafood production beyond wild capture and traditional static intensive aquaculture into a new era of mobile production systems

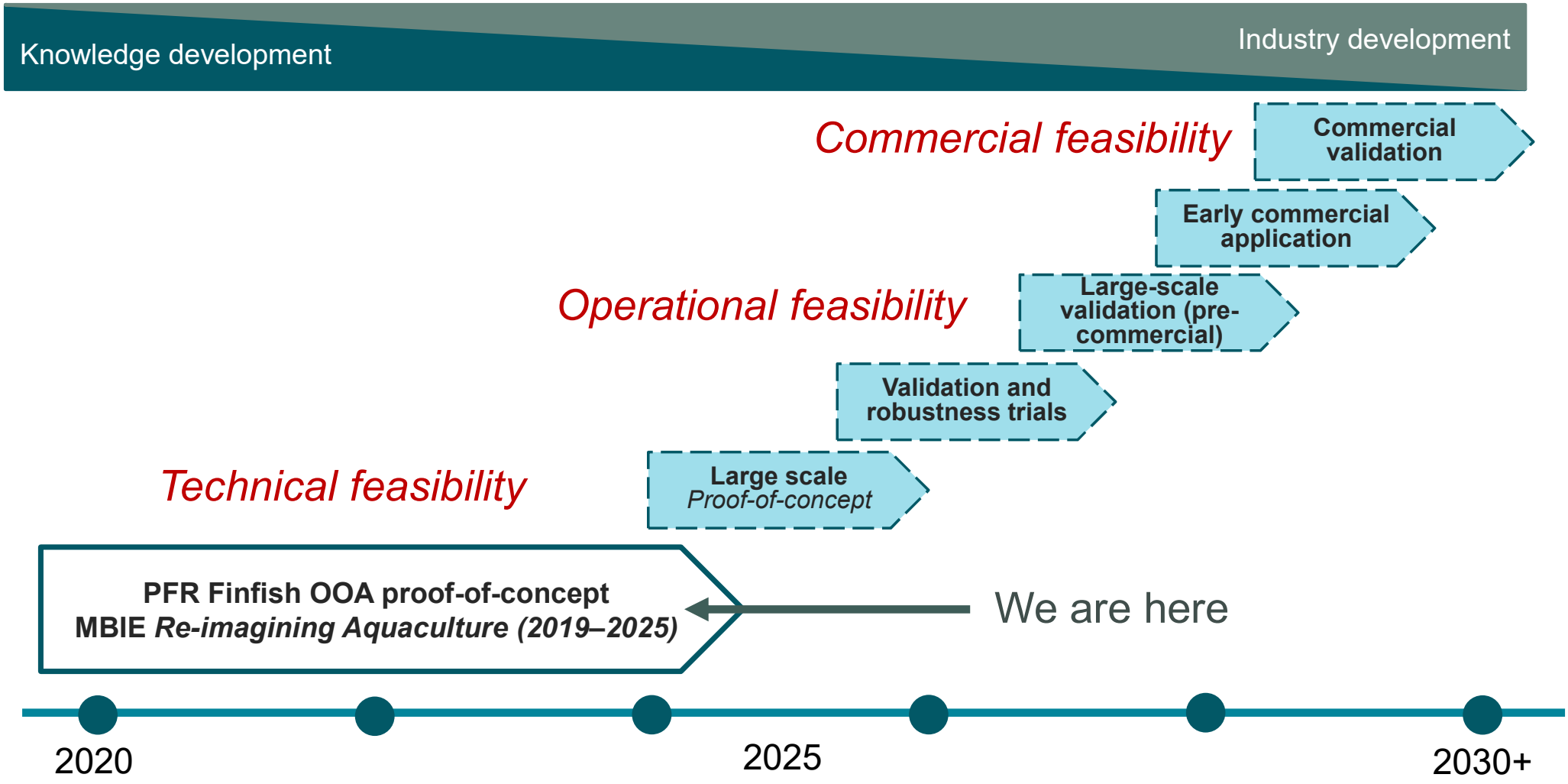
- 6-year programme NZ$18.75M
- Started 1 October 2019

Our Technological Challenges

Developing a production system that is:

- **Fish centric:** *Specifically designed to support biological needs of the fish*
- **Environmentally compliant:** *Soft engineered to harness and utilise the hydrodynamic forces*
- **Mobile:** *To optimise conditions year round*

Invitation for feedback & possible collaboration



2. New Technologies Pipeline - 2025

2. Alternative Protein Development - Lab Grown Unagi

- Forsea Foods Ltd
- Setup of Pilot Manufacturing Plant in Japan

Forsea has unlocked the science of affordable cultivated seafood

- The only cultivated seafood company using embryonic stem cells to form a tissue
- One bioreactor for proliferation and differentiation – leads to lower CAPEX
- Continuous growth and harvesting process leading to higher yield
- No scaffolding simplifies the process
- Minimal usage of growth factors leading to lower OPEX
- Media that supports transition from 2D to 3D simplifies our scale ups

Implications of our success

On track to cost parity within 24 months

Potential upside on lower CAPEX and Unit of Economics

Strong conviction to start building the pilot facility

Platform technology to develop any type of fish and seafood

Singapore will be the first country to launch the product in order to quickly establish presence in Asia

- **Ease of doing business-** Singapore is widely regarded as one of the easiest places to do business globally
- **Established and supportive regulatory environment:** a clear regulatory pathway that could take 6-12 months
- **Consumer receptiveness**: Singaporeans are known for being open to new and innovative food products and they have already experienced the sale of cultured meat products
- **Tasting events** are allowed prior to the commercial launch – this will facilitate better consumer acceptance
- **Sustainability**: With a strong national focus on sustainability Singaporeans are likely to embrace cultivated meat as a solution to environmental challenges
- **Forsea has already established relationships** in this market (SAKAE SUSHI), and is working to expand its relationships

Production location Kyoto

Designing and building Forsea's 1000L perfusion skid systems

Operational partnership discussions

Collaborations with local engineering & construction companies

SKID planning

Local subsidies from the government

3. Ongoing Work Plans for 2025

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1. Training (Ongoing)

- Part time Diploma (Aquaculture) with APEC Centre @ Temasek Poly – Singapore

2. Private sector collaboration - Singapore, Malaysia, Australia and USA.

- Singapore Crawfish - Large scale Fresh water Crawfish hatchery
- Current farming operations/ activities - Singapore, Australia, Indonesia & Malaysia

3. Private sector collaboration – Singapore & Malaysia

- GK Aqua – CRiPE Project - Carbon Reduction Insular Protein Economy
- All male prawn Biotechnology Project

3. Ongoing Work Plans for 2025

4. Private sector collaboration – Singapore & Malaysia

- Sento Biotech - Carbon Neutral Feed Project

5. Private sector collaboration – Food Loss Waste

- Kosmode Health Project – Up-Valuing Food Processing Waste for Human Nutrition

6. Social Impact Engagement - Small Farmers and Women Farmers

- Planet Net Zero : Biochar – Rice Husk project

4. WG1 and GEN AI APIP Project

1. Singapore submitted concept note on GEN AI APIP Project – Co sponsored by Japan
2. Study the potential use and integration of GEN AI in enhancing APIP info Platform on Food Security
3. Objective - Enhancing and attracting private sector engagement in PPFS
4. Potential of including an interactive feature to facilitate exchange of information between the private and public sectors.

5. Others – Summary of Activities for WG1

1. Projects in Progress (private sector) - 9
2. Projects Completed/ Ceased (mostly private sector) - 24
3. Economies Participation – 10
    - Malaysia, Brunei Darussalam, United States, Indonesia, China, Australia, the Philippines, Chile, Japan & Singapore.
4. Technology/ Best Practice sharing – 10
5. Participation in International Conference and Workshop – 26
6. Appointment of Technology Partners – 8
7. Setup of APEC Centre for Sustainable Development in Agriculture & Fishery Centre in 2017

The End