GIFT GLOBAL INSTITUTE FOR TOMORROW.

REVITALISING MALAYSIA'S AGRI-FOOD INDUSTRY FOR FOOD SECURITY

MALAYSIA STAY & BUILD 2023

Table of Content

GIFT GLOBAL INSTITUTE FOR TOMORROW.

Executive Summary (1/2)

Overview of Challenge

Malaysia grapples with multifaceted challenges in its quest for food security. These include policy limitations that often prioritise industrial cash crops over staple food production, coupled with fragmented policy coordination. Resource constraints arise from diminishing arable land, rising input costs, and limited access to financing and credit facilities. Additionally, an ageing farming workforce, limited youth engagement in agriculture and dependence on migrant workers underscore the need for a holistic approach to revitalise smallholders and fortify the nation's food security endeavours. Farmers' livelihoods are significantly affected, with an average monthly salary of MYR 1,780 in 2021, notably below the B40 threshold of MYR 4,850.

In response to these challenges, Malaysia launched the National Agrofood Policy 2021–2030 (NAP 2.0) with the aim of revitalising the agrifood sector, making it sustainable, competitive, and technologically advanced to drive economic growth. However, national polices are only part of the solution. Innovative development models rooted in local communities, are essential to revitalise smallholders and ultimately improve food security.

Food Security Hub

The proposed Food Security Hub (FSH) stands as a unifying force, bringing together smallholder farmers, government agencies, and investors with the shared goal of enhancing food security, fostering economic stability, and promoting sustainable growth. A pivotal initiative within FSH is the ***"Tanam Banyak, Dapat Banyak"*** (TBDB) **scheme**, designed to incentivise farmers to boost crop production and yield surpluses for **strategic stockpiling**. This distinctive scheme forms the core value proposition of FSH, empowering farmers to become integral members of the hub, while forging collaborative partnership with the government to ensure national stockpiling of staple crops.

Essentially, FSH coordinates cooperatives and smallholder farmers, leveraging on economies of scale to streamline operations, minimise costs and optimise returns. FSH offers a comprehensive suite of services across the agricultural value chain, covering areas such as **group procurement, mechanisation, and post-harvest handling**. Additionally, FSH extends its support to areas such as planting strategy, community and government relations, and implementation of a data system that enable better farm management, crop traceability, and generation of valuable market insights. As major shareholding members, Farmers have a direct stake in the success of FSH.

Executive Summary (2/2)

Growth and Development of FSH

Following the establishment of the pilot project, FSH will undergo continuous refinement and expansion. Phase One involves launching the pilot project, implementing revenue-generating services and optimising operations. This phase is dedicated to fine-tuning the core framework of FSH.

In Phase Two, the focus will shift to replicating the successful model in other regions across Malaysia, forming a network of FSHs. Phase Three will focus on strengthening the FSH network by establishing a centralised data center for effective supply and demand management. This phase will also introduce new services such as crop advisory, and downstream processes to add value and further enhance the livelihoods of smallholders.

With FSH serving as the central hub to coordinate and manage initiatives for food security, the aspiration is to improve livelihoods by creating a reliable source of income for local farmers, generating new job opportunities within the supply chain and ancillary services, attracting the younger generation to participate in agriculture, revitalising the agriculture sector in Malaysia, and ultimately enhancing Malaysia's food security.

Financial Highlights

The establishment of FSH requires an initial seed funding of MYR 126 million. This initial investment will fund the development of processing, packaging, and stockpile storage facilities, as well as the procurement of machinery, farming equipment, and infrastructure enhancements to improve productivity and facilitate inter-crop planting strategies.

Projections indicate that FSH offers investors an attractive internal rate of return (IRR) of 25.1% over a 10-year period. Starting from Year 10, FSH is expected to achieve a Net Present Value (NPV) of MYR 203.1 million, and the anticipated payback period is estimated to be 8.5 years.

Crucially, participation in FSH is projected to substantially improve the annual income of participating farmers, with estimates ranging from 17% to 22%.

Introduction

Malaysia Stay and Build Programme

The **Global Institute For Tomorrow (GIFT)** is an independent pan-Asian think tank, committed to purposeful leadership learning and partnering with clients to help them unlearn conventional wisdom and unleash organisational potential to redesign society.

The **Malaysia Stay and Build (MS&B)** Programme is GIFT's flagship experiential programme designed for young professionals from leading Malaysian organisations to think critically about the drivers of change in the 21st century and build new development models and policies that address the defining challenges for our time.

Supported by project partner, **FGV Holdings Bhd**, a Malaysian-based global agribusiness and food company, this cohort focuses on food security, closely aligning with Malaysia's National Agro-Food Policy 2021-2030. This strategic alignment exemplifies the programme's commitment to addressing issues that directly impact Malaysia's development.

Project Team

During this MS&B, 21 participants from business, government, academia and NGOs convened in Kuala Lumpur over the course of 9 days to undertake classroom sessions, stakeholder meetings, site visits and business plan development sessions. The highlights of this proposal were presented at GIFT's Public Forum on 10 August 2023 at AMARI Kuala Lumpur.

Background and Project Scope

Definition of Food Security (1/2)

The issue of food security looms large as a significant and ongoing global and national concern. Within the context of this report, it is imperative to establish a precise understanding of food security, which United Nations Committee define as follows:

Definition of Food Security (2/2)

Availability

Availability concerns reliable food production to meet a population's nutritional needs. It includes factors such as agricultural productivity, stability of food supplies, and consistent availability of diverse food products. A country excels when it ensures a steady and dependable food supply.

Accessibility

Accessibility involves individuals' ability to get needed food, both physically and economically. It includes factors like income, market access, distribution, transportation, and trade policies. Even available food is not secure if it is unaffordable or hard to access due to logistics.

Utilisation

Utilisation means effectively using available and accessible food. This involves diet variety, nutrition knowledge, safe handling, and sanitation. Access alone is not sufficient; food must be nutritious, safe, and well-utilised for health and well-being.

Stability

Food stability entails ensuring that populations, households, or individuals consistently maintain access to sufficient food without the threat of disruption caused by sudden shocks (e.g., economic downturns or climatic crises) or recurring events like seasonal food insecurity.

Recognising the interdependence of these four dimensions, it's essential to highlight that this report primarily presents a proposal aimed at initially enhancing food AVAILABILITY. The subsequent dimensions will follow at different stages after the successful establishment and scaling of the pilot project.

Source: Food and Agriculture Organisation of the United Nations

Global trends impacting food availability

On a global scale, food availability is underscored by a rapidly rising global population, diminishing arable land, the escalating threat of climate change, and the ever-present spectre of shocks to the global food supply chain.

Rising Population & Limited Arable Land

Rapid global population growth exerts immense pressure on resources, especially in food production and distribution. In just the past decade, there has been a remarkable 56% surge in global food demand.

However, not all available land can be transformed into farmland, and intensive agricultural practices simultaneously deplete soil productivity worldwide, leading to the reduction of fertile arable land. This dual challenge poses a complex dilemma for the future.

Climate Change

Climate change presents a formidable challenge to food production as it triggers a range of adverse effects, including more frequent flooding, prolonged droughts, heatwaves, and erratic weather conditions.

Extreme weather events resulting from shifting weather patterns, like the El Nino Southern Oscillation system have damaged crops to the extent that export bans have been enacted by governments around the world, including India and Indonesia.

Global Supply-Chain Shocks

External factors like armed conflicts and global health crises, such as the COVID-19 pandemic, can disrupt food production, market access, and livelihoods. Border closures and restrictions during the pandemic disrupted labour availability, affecting farming activities and global food production.

The Russia-Ukraine war serves as another example, with its widespread ramifications felt in disrupted trade channels, impacting wheat and fertilisers exports.

The intricate interplay of these factors results in reduced food production, ultimately diminishing food availability and presenting an urgent challenge to global and national food security.

Challenges within a Malaysian context

Within the Malaysian context, the impact of these global trends are palpable. The situation is further exacerbated by factors such as unfavourable policies, diminishing arable land, and an ageing agriculture sector.

Legislation & Policies

- Malaysia's **heavy focus on cash crops**, particularly oil palm, has undermined national food security, as farmers prioritise cash crops over essential food crops.
- **Government subsidies and aid programmes** are predominantly designed to support livelihoods rather than address the core issues of food security.
- **Inadequate coordination among government agencies** hinders a unified approach to food security, evident in the absence of standardised data collection methods, overlapping roles of various agencies, and a disconnect between federal and state.
- Government agencies **lack comprehensive strategies beyond rice** to establish reserves for other essential food items.

Availability & Access to Resources

- Malaysia's **arable land is shrinking** due to urbanisation and industrial expansion, leaving only 26.1% for agriculture. Notably, 70% of this land is dedicated to oil palm cultivation, limiting space for other crops.
- **Limited R&D funding and access to financing and credit facilities** further hinders food production as small-scale farmers struggle to secure funding for modern equipment, technology, and sustainable farming practices.
- **The rising costs of inputs** present an additional challenge for food production in Malaysia. As agricultural inputs become more expensive, farmers face increased financial burdens, negatively impacting their ability to sustain and expand local food production.

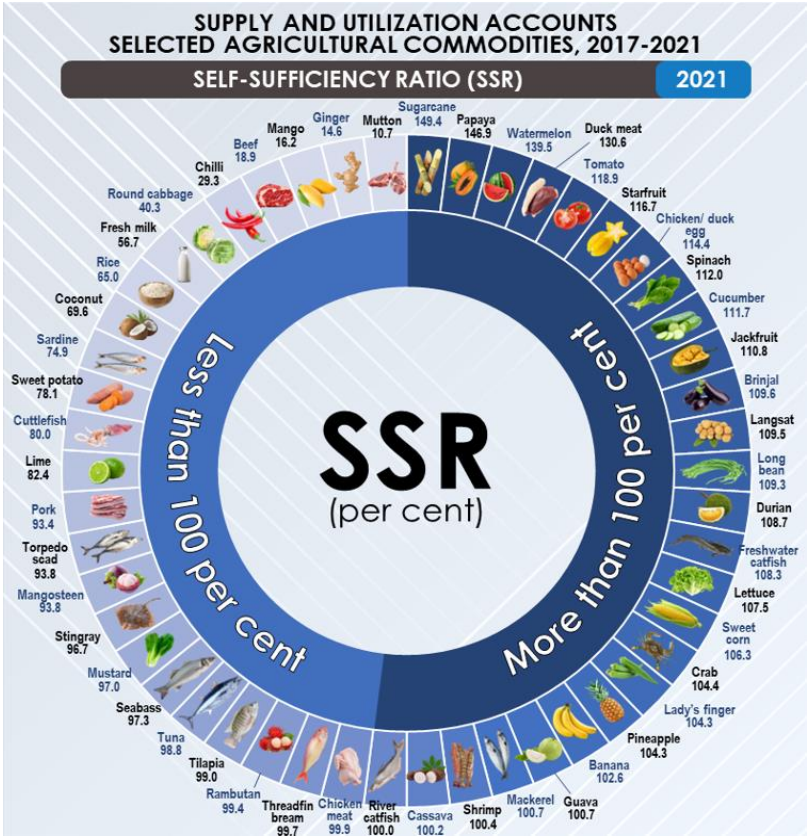
Ageing Workforce & Dependency on Migrant Workers

- The average age of farmers in Malaysia is 60 years. As ageing farmers gradually exit the workforce, there is a **declining workforce in the agriculture sector**.
- With just 4% of tertiary students interested in agricultural careers, younger generations are not inclined to fill this workforce gap.
- Consequently, Malaysia heavily **relies on migrant workers** to meet its agricultural labour needs. However, this dependence exposes Malaysia to vulnerabilities, especially when global labour markets become competitive and strained.

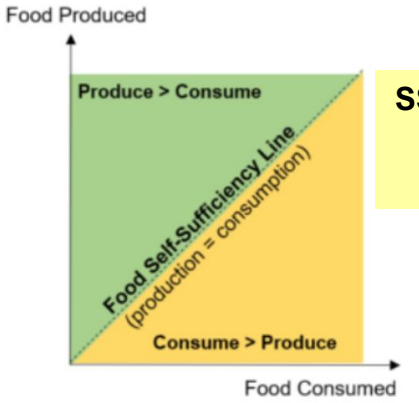
Self-Sufficiency Ratio (SSR)

Recognising the urgency, shaped by global trends and intensified by national challenges, the next step is to address the issue of food availability. In this regard, the **Self-Sufficiency Ratio (SSR)** serves as a critical metric, gauging a nation's capacity to fulfil its food requirements through domestic production. Prioritising domestic production, particularly for essential food items, is vital for achieving self-sufficiency.

Malaysia SSR Breakdown



SSR Calculation



$$SSR = \frac{\text{Production}}{\text{(Production + Imports } \pm \text{ Stock) - Exports}} \times 100\%$$

The higher the ratio, the greater the self-sufficiency.

The SSR reflects the balance between production and domestic consumption. A ratio exceeding 100% signifies that the country's local production exceeds its domestic needs.

Conversely, a ratio below 100% signals a shortfall in food production to meet the population's demand. Thus, import is required to ensure consumer demand is fulfilled.

Project Scope

After considering global and national challenges, as well as the measure for self-sufficiency, the project scope will now be defined for the purpose of this report.

Objectives

- To develop a proposal outlining a pilot project that leverages smallholder farmers, existing resources, and underutilised facilities to demonstrate the viability of enhancing food security in Malaysia.

- To propose recommendations that take into account:
  - ✓ Current challenges encountered by smallholder farmers in growing staple crops and sustaining their livelihoods;
  - ✓ Initiatives, policies and regulations for potential public-private partnerships aimed at ensuring food security;
  - ✓ Key economic activities and support within the value chain that will be crucial for supporting smallholder farmers to improve their livelihoods;
  - ✓ The replicability and scalability of the pilot project across Malaysia.

Methodology

- Site visits, meetings, and focus groups with a diverse array of stakeholders, including project partner, smallholder farmers, cooperatives, agricultural service providers, local government, and agricultural researchers.
- Desktop information gathering and analysis.
- Brainstorm sessions to develop new models, policies as well as financial analysis.

Outcomes

- Development of a pilot project and necessary institutional arrangements, including analysis in areas like Staple Crop Identification, Operating Model, Financial Analysis, and Policy Recommendations & Social Impact.

- Presentation at a public forum on the pilot project plan to the project partner, government officials, NGOs, community representatives and other associated stakeholders in the value chain.

Project Partner & Stakeholders

With the support and facilitation from FGV Holdings Berhad as the project partner, participants gained access to the pilot location and could engage directly with smallholder farmers. Additionally, the cohort interacted with diverse stakeholders throughout the agriculture value chain who hold essential roles in food security and supporting smallholder farmers in Malaysia.

Project Partner:

FGV Holdings Berhad was founded in 2007, initially to oversee investments in upstream and downstream palm oil businesses. FGV is now the world's largest producers of Crude Palm Oil (CPO), operating in 9 countries across North America, Europe and Asia. FGV's core businesses are diversified into four key categories: Plantation, Sugar, Logistics, and New Businesses, which encompass Consumer Products and Integrated Farming.

FGV seeks to be the industry leader in sustainable integrated agri-business while actively supporting Malaysia's national food security goals. In alignment with this vision, FGV supported the programme as the project partner, providing access to their facilities and network to key stakeholders within the agriculture sector.

Given its substantial presence and commitment to sustainability, FGV is also well-positioned to play a pivotal role in driving the proposed model, as will be detailed in the subsequent slides.

Other Stakeholders:

Pilot Project Location

For the purposes of this pilot project, North-West Selangor has been chosen as the implementation site due to its agricultural significance. The region boasts an existing population of farmers primarily cultivating essential food crops, particularly paddy, and possesses the necessary infrastructure. This selection presents a unique opportunity to tackle the challenges outlined in the objectives and represents an excellent starting point for enhancing food security in Malaysia.

North-West Selangor

The Northwest Selangor comprises a total population of nearly 400 thousand, with a demographic makeup of 65% Malay, 22% Chinese, and 13% Indian residents.

The agricultural landscape spans 95,000 hectares: 55,000 hectares for palm oil, 20,000 hectares for coconut, and another 20,000 hectares for paddy. Of 40 thousand farmers in the region, 9 thousand focus on paddy cultivation. The area has just eight major farmer cooperative associations, a notable contrast to Selangor's total registered agricultural cooperatives of 1,799.

The average farm household income falls within the range of approximately MYR1,200 to MYR2,000.

(Source: IADA BLS 2022 Statistics, Socioeconomic Profile of Farmer in Malaysia: Study on Integrated Agricultural Development Area in North-West Selangor)

Identification of Staple Crops

Rationale for Staple Crops (1/2): Rice and Corn

In the pursuit of bolstering food security in Malaysia, a significant challenge emerges – the lack of clear identification of staple and food crops beyond rice. This pilot project begins by identifying the most suitable staple crop for the North-West Selangor region.

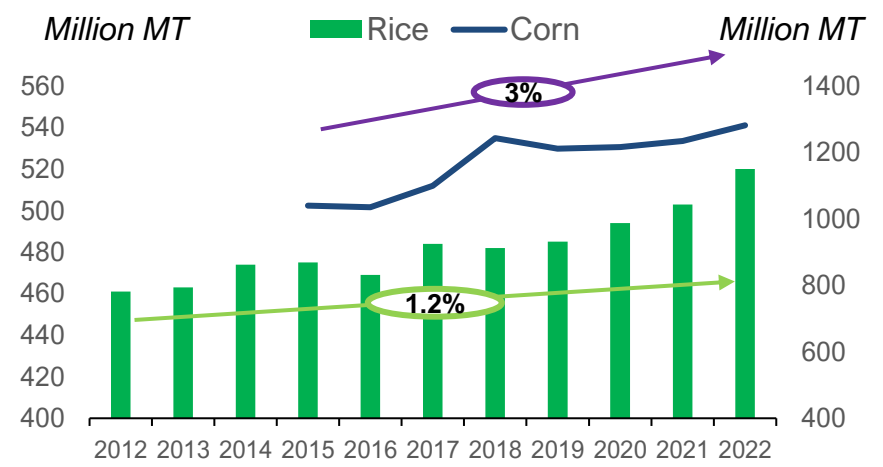
Staple crops play a vital role in a nation's diet, offering essential nutrients and energy. Their popularity varies due to factors like climate, accessibility, trade, and culture. Globally, grains like corn, rice, and wheat are highly favoured.

OECD projections suggest that Malaysia anticipates increased rice consumption due to population growth. Yet, maintaining a consistent paddy acreage might not suffice if yield per hectare fails to keep pace with this burgeoning demand, potentially necessitating heightened imports. A similar concern apply to corn, as Malaysia currently imports nearly 100% of its grain corn and ranked as the 13th largest global importer in 2022, with an import value of USD 1.28 billion.

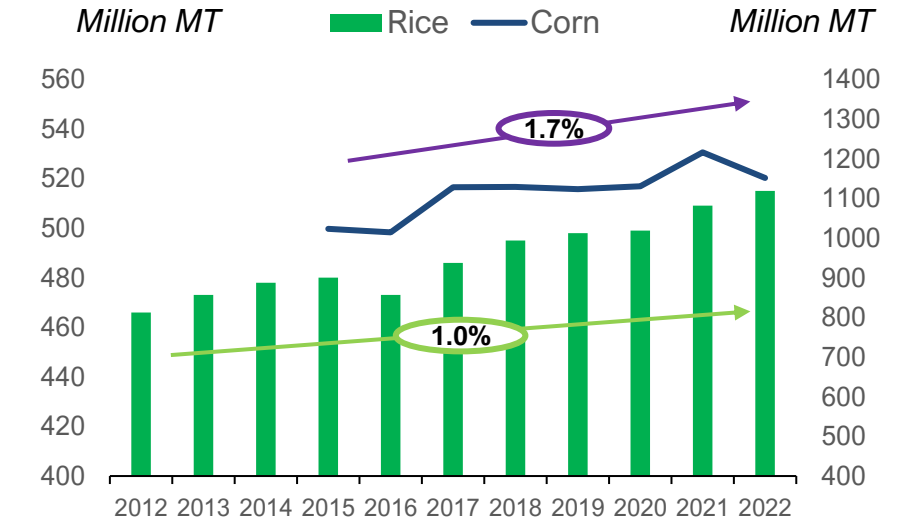
Given Malaysia's reliance on imports, it is crucial to note that globally, consumption of rice and corn surpasses production. This implies heightened competition and potentially higher prices.

Therefore, this proposal underscores the importance of considering rice and corn as staples, presenting a significant opportunity for Malaysia to reduce import dependency, establish reserves for these crops, and safeguard itself from external shocks.

Consumption of Rice and Corn are Increasing Globally



Production for Rice and Corn are also increasing albeit at a slower rate



Rationale for Staple Crops (2/2): Cassava

However, relying solely on rice and corn falls short in ensuring national food security, highlighting the importance of diversifying staple crops.

Cassava, a nutrient-rich tuber, offers a versatile cultivation profile suitable for various soils and climates, making it a compelling alternative as a staple food for Malaysia. Its ease of cultivation, resistance to pests, and drought tolerance have historically made it a local staple.

Furthermore, cassava boasts a wide array of applications encompassing food, beverages, paper production, adhesives, textiles, and fibreboards. In 2022, the global cassava processing market scaled up to nearly 278 million tonnes in volume, with further growth anticipated between 2023 and 2028.

Countries within the Asia region have proactively embraced cassava cultivation, surpassing Malaysia in this endeavour, as illustrated in the table. This compelling trend attests to the resounding demand for cassava, not only at the national level but also within the broader regional and global landscapes.

The adoption of cassava as a staple crop in Malaysia not only harkens to tradition but also signifies a forward-looking strategy. It is a concerted step towards diversifying the nation's agricultural portfolio, bolstering resilience against the capriciousness of climate change and global market fluctuations.

Area, Production and Yields of Cassava in Main Producing Countries of Asia (2019)

Country	Area Harvested (ha)	Production (tonne)	Yield (tonne/ha)
Thailand	1,386,655	31,079,966	22.41
Indonesia	697,384	14,586,693	22.77
Vietnam	519,306	10,105,224	19.46
Cambodia	504,940	13,737,921	27.21
China, Mainland	299,212	4,975,472	16.63
Philiipines	222,441	2,630,800	11.83
India	163,000	4,976,000	30.53
Lao PDR	67,726	2,258,702	33.35
Myanmar	33,067	392,443	11.87
Sri Lanka	20,592	281,075	13.65
Timor-Leste	5,431	21,553	3.96
Malaysia	2,446	42,267	17.28
Total/Average	**3,865,342**	**85,088,096**	**22.01**

Staple Crop Analysis

The table below outlines the critical criteria for analysing the three staple crops in the pilot project: rice, corn, and cassava. These criteria encompass supply and demand data (excluding potential markets, as previously discussed) and suitability for the pilot project's location, including environmental factors like climate and soil.

Criteria	Description	Rice	Grain Corn	Cassava
Self-Sufficiency Ratio (SSR)	Measurement of a country's capability to meet its food demand through domestic production	**70%**	**<1%**	**100%**
Local consumption	Amount consumed by domestic market	Total: **2.5 mil MT** Per capita consumption: **87.9kg/person > world average of 54.6kg/person**	**3.5 mil MT for animal feed** (2022)	**50,508 MT** (2019)
Local production	The total amount produced by local businesses and industries	**2 mil MT**	**79,300 MT** (DOA, 2019)	**48,562 MT** (2019)
Import	Total amount imported from other countries including for the purpose of export	**1.24 mil MT** (2022)	**4 mil MT** (100%)	**1,946 MT** (2022)
Stockpile	Total amount stored for future use	**150,000 MT** (21 days)	Currently there is no stockpile because almost 100% of demand is being imported	Currently there is no stockpile because everything that is produced is being consumed
Climate	Average weather condition in a particular location	**21 - 37 C**	**28 - 35 C**	**21 - 37 C**
Soil	Earth material at a location in which plant grows	Clay or clay loams with good water retention capacity	Well-drained soils with a sandy loam or silty clay loam texture	Well drained sandy clay loams

Operating Model

Creating Food Security Hubs

Rationale

Many smallholder farmers face challenges in optimising their yield due to limited farm size, resources, and lack of access to modern farming techniques, resulting in low productivity and profitability. This situation leaves them vulnerable to predatory pricing strategies employed by middlemen. With low yields, farmers may struggle to generate a profit or break even, which can cause severe poverty issues among smallholders.

Organising smallholder farmers into cooperatives offers the potential to pool resources, benefit from economies of scale, share knowledge and experience, negotiate better prices with buyers and improve market access. However, these advantages often remain unrealised due to the small size and capital of most cooperatives and poor networking between them.

With these challenges in mind, a new **Food Security Hub (FSH)** model is proposed to strengthen existing farmer associations and cooperatives. The FSH empowers farmers to collectively manage production assets and capture more value within the supply chain by addressing mismanagement and inefficiencies.

Though the field studies were conducted in North-West Selangor, the principles outlined in this model hold relevance for other regions in Malaysia, and the aspiration is to establish a network of FSHs across the country.

Introducing the Food Security Hub

FOOD
SECURITY HUB

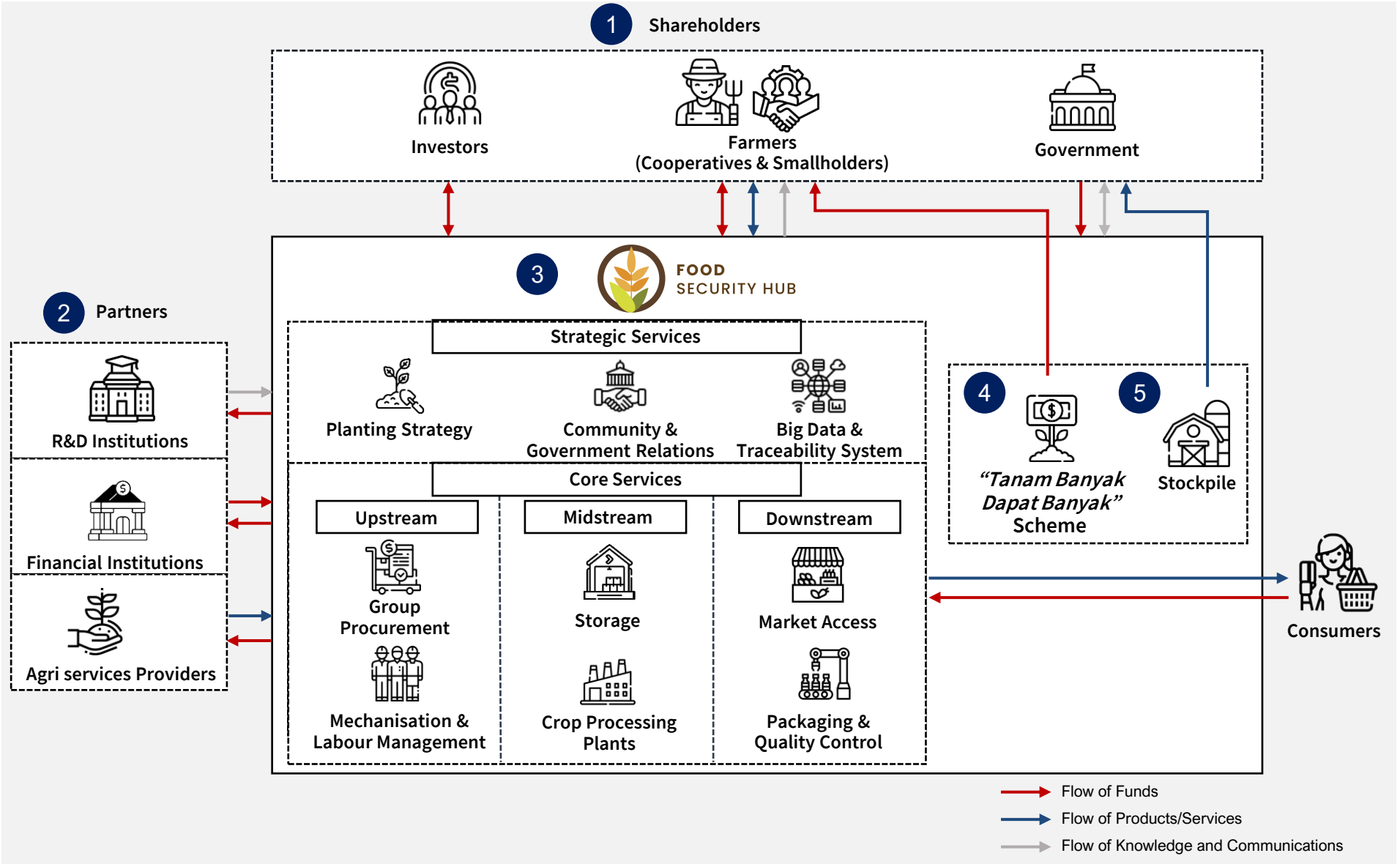
The proposed operating model centers around the establishment of a Food Security Hub (FSH), with a mission to revolutionise the agricultural landscape through the collaboration of farmers, government, and investors to bolster food security, economic prosperity, and sustainable growth.

A pivotal initiative within the FSH framework is the *"Tanam Banyak, Dapat Banyak"* (TBDB) scheme, designed to incentivise farmers to increase crop yields and generate surpluses. This surplus production supports FSH's role as the steward of strategic stockpiles, fostering collaboration between farmers and the government to ensure stockpiling of staple crops.

At its core, the FSH unites smallholder farmers and cooperatives under the collective term "Farmers," leveraging economies of scale to optimise services, enhance profitability, and increase returns for all members. This scalability can be achieved by connecting smaller cooperatives and coordinating activities based on geographic proximity for streamlined operations and management.

The FSH provides a suite of services across the agricultural value chain, supporting Farmers with group procurement, mechanisation, labour management, post-harvesting sorting, packaging and processing. Additional support services include planting strategy, community and government relations, R&D, and technology support. With the implementation of a data and traceability system, FSH takes lead in establishing product standards, further improving agricultural processes and efficiency.

The Food Security Hub



Details of the Food Security Hub

1 Shareholders

The key shareholders of the FSH include farmers, investors, and the government.

- **Farmers**
  Farmers become members and co-owners of FSH via an initial membership fee, which affords them voting rights to ensure FSH addresses members' needs.

- **Investors**
  Investors could include Development Finance Institutions (DFIs), State Agriculture Development Corporations (SADCs), sovereign wealth funds, financial institutions or agricultural service provider companies.

- **Government**
  The government plays a pivotal role in supporting the establishment of FSH. It allocates funds for the construction of stockpile facilities, spearheads the recruitment of farmers into FSH, and formulates policies to promote staple crop farming. These include mandates for DFIs and local financial entities to provide assistance, incentives, and protection for farmers.

2 Partners

FSH collaborates with various partners to support farmers across the value chain.

- **R&D Institutions**
  R&D institutions collaborate with FSH to share innovative farming solutions, leveraging their research findings to benefit farmers. In return, these institutions gain access to real-world testing opportunities to refine and validate their innovations.

- **Financial Institutions**
  Financial institutions can expand their market reach by working with collective groups through FSH, tapping into underserved markets. FSH facilitates resource pooling and access to credit facilities and insurance for Farmers.

- **Agri-services Providers**
  Partnering with service providers enable Farmers to access specialised services, optimising its agricultural processes and improving overall efficiency. For instance, as project partner, FGV can support Farmers in crop processing, quality control and market access. Partners will benefit from consolidated land and orders, instead of attempting to reach individual farmers.

Details of the Food Security Hub

3 **Food Security Hub (FSH)**

FSH ensures food security through its "**Tanam Banyak, Dapat Banyak**" (TBDB) **Scheme** and **Stockpile**, generating and storing surpluses of identified staple crops.

In addition to its central role in food security, FSH also offers agricultural services that facilitate farming processes and generate revenue to sustain its operational costs. These services include group procurement, mechanisation, labour management, sorting, processing, and packaging. FSH connects farmers, leveraging economies of scale to streamline operations. For example, centralising sales reduces input costs, and consolidating nearby land optimises tasks such as seeding, fertilisation, and harvesting.

Through partnerships and the establishment of a comprehensive data platform spanning the entire value chain, FSH is also poised to provide strategic services that include planting strategies, data-driven policy recommendations, market insights for farmers, and food traceability for consumers.

Investors can benefit from profit-sharing, market expansion through FSH, and tapping into rural youth talent, fulfilling social and developmental mandates.

4 ***"Tanam Banyak, Dapat Banyak"*** **(TBDB) Scheme**

The TBDB scheme, which translates to "Grow More Earn More," has been introduced as a compelling incentive to attract farmers to join FSH and to entice farmers to enhance their land productivity. The primary aim is to generate surplus yields that can be strategically utilised for stockpiling purposes. The specifics of the incentive payout under the TBDB scheme will be elaborated upon in the subsequent slides.

5 **Stockpile Management**

A fundamental component of the FSH is the establishment of a national stockpile dedicated to staple crops. The government is committed to furnishing the necessary initial investment for the development of these stockpile facilities, along with a guaranteed buy-back programme for surplus crops from FSH at a fixed rate.

This strategic crop stockpile is poised to reinforce the nation's food security significantly. Moreover, in the event that the government attains its self-sufficiency ratio (SSR) targets for staple crops through the utilisation of this stockpile, it holds the potential to stimulate economic growth by enabling the export of these vital agricultural commodities.

"Tanam Banyak Dapat Banyak" (TBDB) Scheme

The *"Tanam Banyak Dapat Banyak"* (TBDB) Scheme, meaning "Grow More Earn More," serves as the primary incentive structure to encourage farmers to become members of FSH. This initiative not only boosts household income but also strategically secures significant stockpiles of staple crops to meet the country's needs. The scheme operates by offering farmers incentives based on their crop production levels. To illustrate its implementation, below is an example using the paddy fields in North-West Selangor. Table 1 presents the current yield and the target yield set by FSH, while Table 2 outlines the incentives awarded when farmers achieve these set targets.

Table 1

Area	Current Average Yield (tonne/ha)	FSH Target Average Yield (tonne/ha)
Sawah Sempadan	5.87	8.00
Sg. Burong	5.64	8.00
Sekinchan	8.46	11.00
Sg. Leman	6.20	8.00
Pasir Panjang	6.11	8.00
Sg. Nipah	5.36	8.00
Panchang Bedena	3.53	5.65
Bagan Terap	6.31	8.20
Total	5.94	8.10

Table 2

TBDB Scheme	Incentive Rate
Achieve target yield	3%
Every 1 tonne/ha above target	Additional 1% per tonne/ha

Incentive payout calculation:

- Incentive payout =
  Actual Yield x Land Size x Market Rate x Incentive Rate

- For example, Pak Sabu has 5 hectares of land at Sawah Sempadan, and he achieved 10tonne/ha in 2022:

  Market Rate = MYR 1,920/tonne
  Target Yield = 8 tonne/ha
  Actual Yield = 10 tonne/ha (i.e., above target 2 tonne/ha)
  Incentive Rate = Achieved target (3%) + Above Target (2%) = 5%

  Incentive payout =
  (10 tonne/ha x 5 ha x MYR1,920) x 5% = MYR 4,800

Core Services As Revenue Streams

The table below outlines FSH's core services and the corresponding revenue streams spanning the entire agricultural value chain, from upstream to midstream and downstream.

Value Chain	Core Services	Revenue Streams
Upstream	Group Procurement	• Purchase agricultural inputs at wholesale rate, and • Sell inputs to Farmers with a 5 -10% profit margin added to the wholesale rate while Farmers still enjoy purchase below market rate.
	Mechanisation & Labour Management	• Provide a pay-per-use model for renting heavy machinery, equipment, and mechanised services (e.g., sowing, fertilising, applying pesticides and harvesting), presenting a more economical option compared to the existing charging system based on per hectare/tonne. • Offer maintenance service including visits, inspections, and repairs, to support Farmers in upkeeping their machinery. • Create and manage township labour database for freelance labour and skilled technicians to register. Streamline labour requirements and match demand with the most suitable workers, particularly during planting and harvesting season. • Empower Farmers with smart agriculture solutions and provide expert guidance for optimising agricultural technologies to enhance productivity. • Apply a service fee to partners for the services delivered to Farmers.
Midstream	Post-Harvest Processing & Storage	• Provide farmers with value-added processing services and storage support to help them preserve the quality of their produce and secure higher prices in the market. Implement a storage and handling service fee.
Downstream	Market Access, Packaging & Quality Control	• Implement an automated sorting system based on produce grade and provide support for branding, packaging, and traceability to enhance market reach and product value.

Strategic Services

Apart from the core services, FSH also offers strategic services like planting strategy, community and government relations, and big data and traceability systems. These supplementary services offer additional advantages to the farmers who are members of FSH.

Planting Strategy

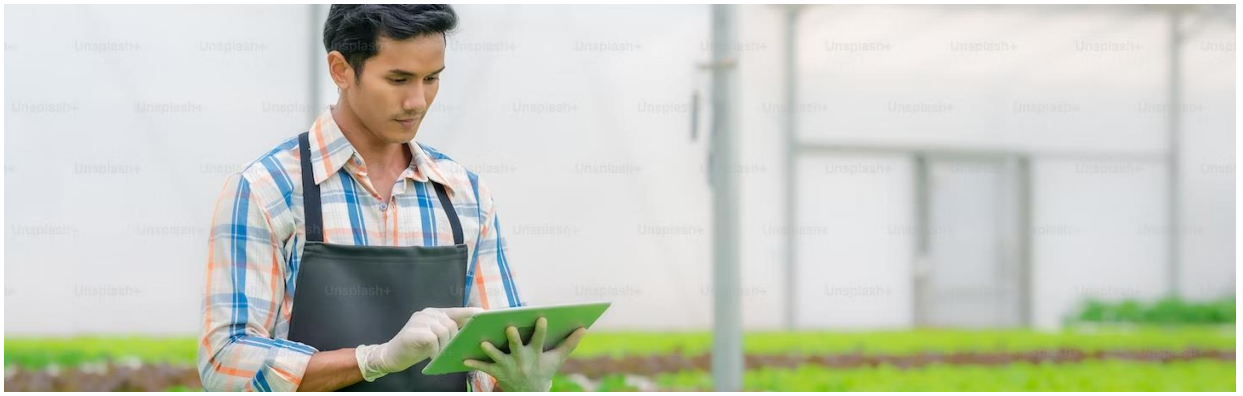
- FSH offers expert guidance on selecting crops that align with local conditions, including climate, soil type, and market demand.
- Utilising its extensive network with R&D institutions, FSH can offer customised planting schedules and techniques for specific crops. This includes guidance on irrigation and water management, spacing, density, fertilisation, and weed control. These measures empower farmers to optimise yields and resource utilisation.
- Through its partners, FSH can also help farmers access high-quality seeds and provide information on seed varieties suitable for the region.
- For a detailed illustration of the proposed planting strategy for the three staple crops in the pilot project, please refer to the Appendix.

Community & Government Relations

- FSH sets up a dedicated unit to collaborate closely with essential government departments and agencies.
- FSH offers data-driven policy recommendations, enabling the government to target subsidies, grants, and price support more effectively. This collaboration also ensures a streamlined buyback process for surpluses, while enabling efficient monitoring of stockpile distribution.

Big Data & Traceability System

- Through the data platform integrating soil data, weather forecasts, farmers' input and output information, FSH offers significant advantages for farm management and productivity enhancement. This data loop can also contribute to research (R&D) efforts, further enhancing agricultural practices.
- Leveraging its network, FSH can create a data platform covering the entire value chain, enabling food traceability for consumers and provide valuable market insights to Farmers.



GIFT GLOBAL INSTITUTE FOR TOMORROW.

Key Benefits to Stakeholders

	Farmers		Partners	Government	Investors
	Access to Services	**Improved Livelihood**	**Business Opportunity**	**National Food Security**	**Investment Opportunity**
Mechanism	• **Economy of Scale:** Leverage bulk purchasing for high-quality inputs with lower costs and consolidated land for streamlined tasks. • **Machinery Leasing & Services:** Access to economical alternative (pay-per-use model) for machinery and services. • **Comprehensive Support:** Access to R&D, technology, experts, and financial aid.	• **TBDB Scheme Rewards:** Yield bonuses dependent on seasonal harvests and profit sharing based on yearly performance, providing farmers with additional incentives. • **Buy back:** Enjoy guaranteed surplus buy back from the government through FSH for stockpiling. • **Revenue growth:** Increase earnings from produce sales and value-added services.	• **Economy of Scale:** Service providers could work directly with FSH to benefit from consolidated land and orders, instead of attempting to reach individual farmers. Banks and financial institutions can extend credit options to member-farmers by aggregating credit demands through FSH. • **Brand image:** Build trust and fosters social cohesion.	• **Stockpiling:** Ensures a stable supply of staple crops. • **Economic growth and rural development:** Higher GDP and tax revenue and promote rural development. Reduce reliance on imports and lessen government's burden to provide livelihood support. • **Informed Policy Making:** Data from FSH can offer insights for better policy making.	• **Return on Investment (ROI):** Gain from profit sharing and extended market reach through FSH. • **Tapping into Emerging Opportunities:** Growing pool of young talent in rural areas provides a potential workforce and diverse investment prospects. • **Social Responsibility:** Fulfill investors' social and developmental mandates, fostering positive community impact.
Outcome	• Lower production cost. • Increased agricultural yield.	• Financial stability. • Increased income and improved livelihood.	• Business growth.	• Food security. • Economic growth and social stability. • Rural revitalisation. • Improve policy.	• Financial gain. • Business growth.

Implementation Timeline

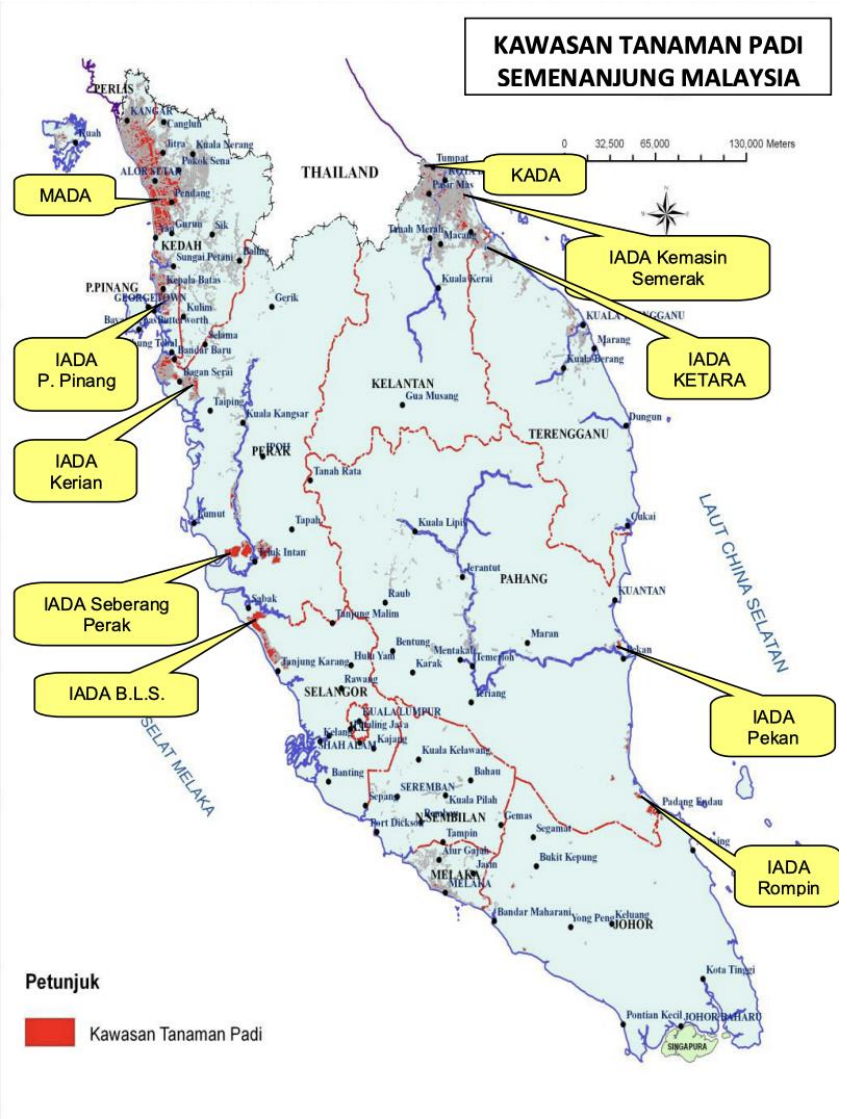
A pilot project in North-West Selangor is proposed to test the FSH operating model. The following outlines the implementation timeline for this pilot project:

Milestones	Year 1				Year 2				Year 3			
Setting Up												
Establish FSH, framework and policies												
Source for investors and partners												
Membership recruitment of Farmers												
Core Functions and Services												
Develop framework for value chain services												
Negotiate and finalise bulk procurement processes for Agri-inputs												
Identify partners for mechanisation, maintenance services, technical support and labour management												
Negotiate and finalise logistics and post-harvest processing (value add)												
Build storage and processing facilities												
Strategic Services												
Government liaison on stockpiling targets and buy-back mechanism												
Build Data Platform												
Consolidate demand data from wholesalers, distributors and production supply data												
Act as broker for financial loans and crop insurance												

Growth of FSH after Pilot

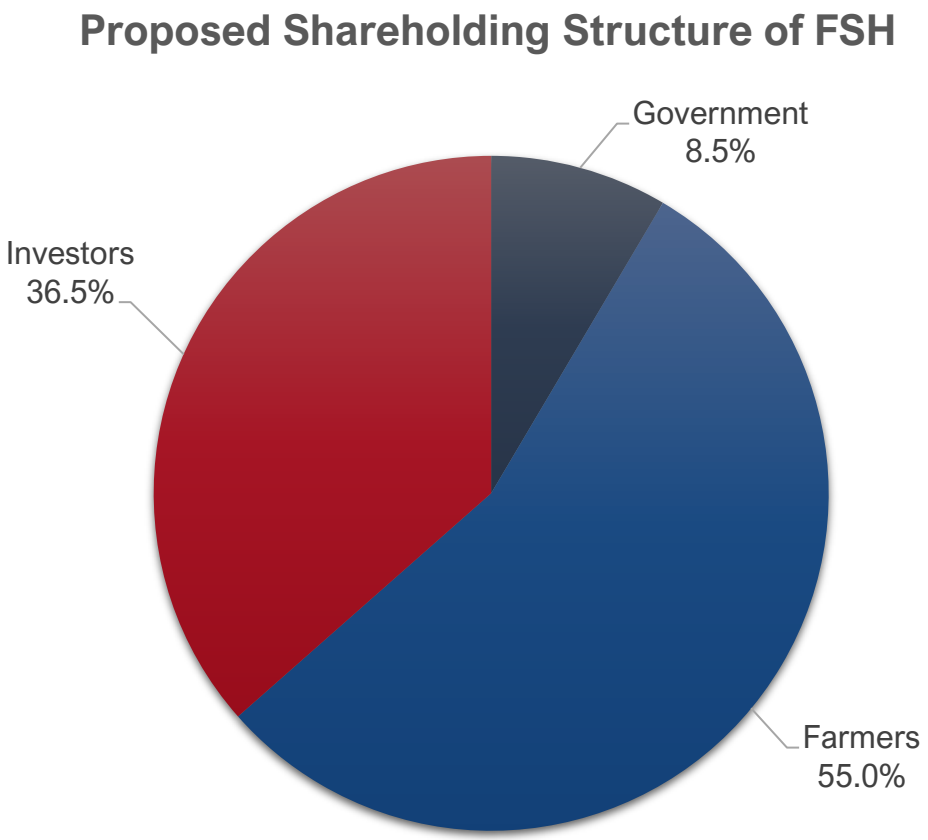
Following the pilot's implementation, the model will undergo continuous refinement to enhance its efficiency. Below are the short to long-term goals for the development of an FSH network over time:

	Strategic Goals
Phase I: Year 1-3	• Establish the pilot project, implementing revenue-generating services and optimising them through the data platform.
Phase II: Year 3-6	• Replicate the model in other regions across Malaysia such as *IADA Seberang Perak, Kerian, Pulau Pinang* to form a robust FSH network.
Phase III: Year 6+	• Strengthen the FSH network with a centralised data center to enable effective supply and demand management in the market. This prevents surplus that could lead to price fluctuations, facilitates planned exports, and ensures stable income for farmers while maintaining an adequate stockpile for food security. • Introduce new services such as advisory for type of crop to plant, and downstream processes to add value and further enhance livelihoods.



Organisational Design and Governance

Ownership Structure of FSH

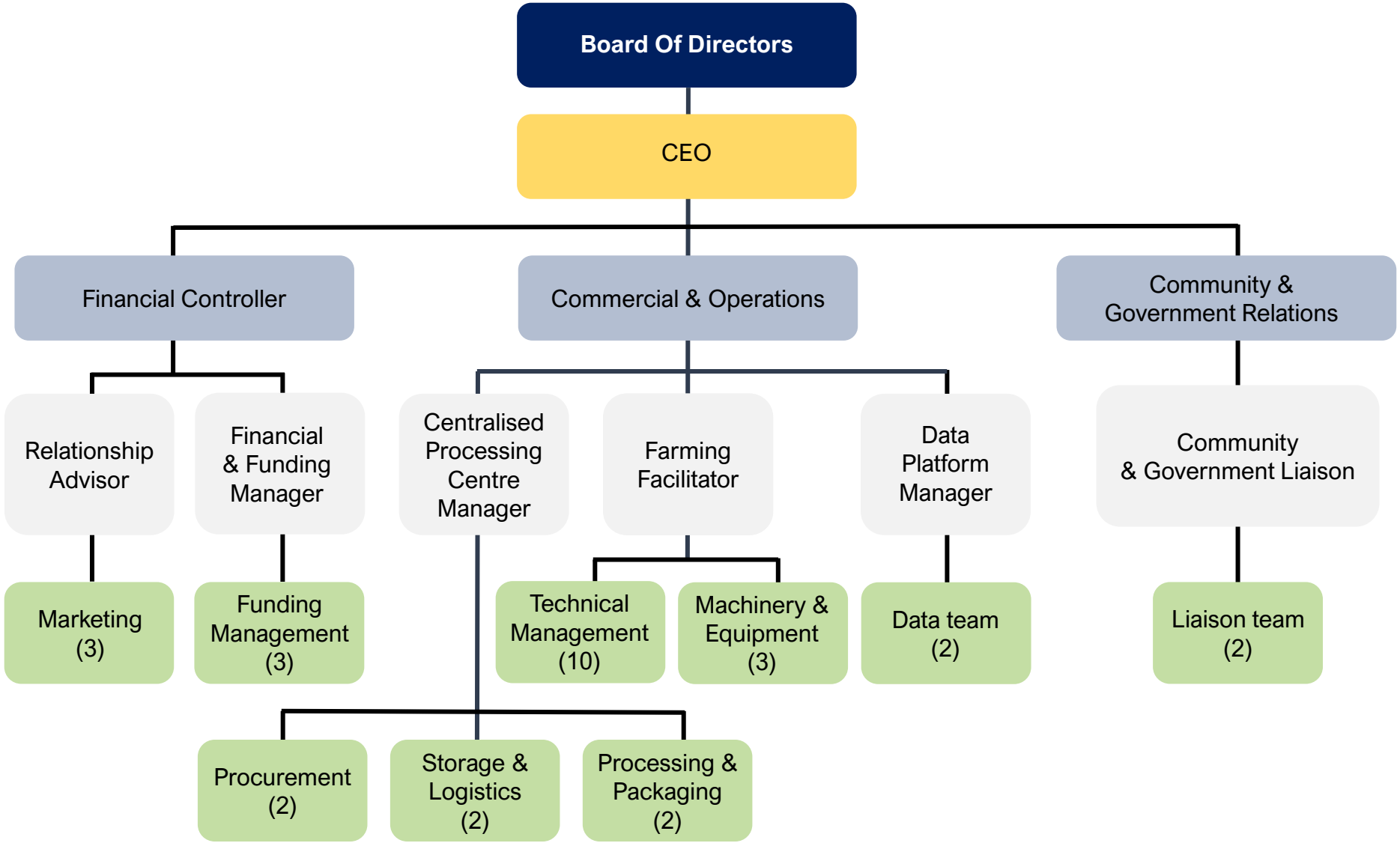


Farmers
Farmers are allocated 55% of the equities, and their eligibility for profit sharing is determined by factors such as land size and their contributions, including their efforts and investments. This ensures that farmers receive a just share of profits commensurate with their roles and contributions, fostering sustainable development for both the community and the business.

Government
The government allocates a total of MYR23.7 million for capital expenditures related to stockpile facilities and transportation infrastructure.

Investors
Investors, including DFIs, service providers, and impact investors, inject MYR102.28 million in capital while maintaining a maximum shareholding of 36.5%.

Organisational Structure of FSH



Key Roles & Responsibilities

Role	Responsibilities
CEO	• Responsible for strategic direction and overall performance of the FSH. • Manage key stakeholders, partner relations and report to the Board of Directors.
Financial Controller	• Responsible for budget preparation, financial management and forecasting. • Create a compliant system for internal controls.
Relationship Advisor	• Build and maintain strong relationships with key stakeholders. • Identify market and generate leads.
Financial & Funding Manager	• Support financial controller in managing FSH's financial operations, seek out funding opportunities, and ensure compliance with financial regulations.
Commercial & Operations	• Responsible for planning and development of overall commercial operations, sales and marketing • Oversee the operations including farm management, community service and data management.
Centralised Processing Centre Manager	• Oversee procurement, processing, warehousing, packaging, and quality control standards. • Plan, manage, and coordinate sourcing, procurement, storage, and logistics activities.
Farming Facilitator	• Manage the agronomy training programme for farmers. • Track farmers' progress and facilitate communication with stakeholders and farmers.
Data Platform Manager	• Establish a data management and analytics ecosystem, including strategic data collection and data forecast model development. • Utilise data to extract actionable insights, facilitating data-driven decision-making processes.
Community & Government Relations	• Cultivate relationships with government agencies and Farmers to enhance engagement. • Develop strategic approaches to garner support and create impact for key stakeholders.
Community & Government Liaison	• Support strategic partnership with local/central government, research institutions and Farmers. • Coordinate community outreach, training programme, and R&D.

Investment and Financial Analysis

Key Assumptions

Revenue Assumptions

These assumptions encompass rental rates for various farming equipment, service fees for technology and marketing services, selling prices for planting materials, and membership fees.

- **Rental Business**
  - Utilisation: For the first half-year, 25 units are used for 30 days each month, increasing to 50 units for 30 days every half-year as FSH grows.
  - Daily Rates:
    - Transplanter : MYR 1100
    - Harvest: MYR 500
    - Ploughing Tractor : MYR 500
    - Drone : MYR 300
    - Other Farming Equipment : MYR 50
- **Technology/IOT Services**
  - Starting with 1000 Farmers on the platform, with a 50% monthly increment.
  - 3% of the subscription fee from service provider (i.e., MYR 9 per user per month).
- **FSH Annual Membership Fee**
  - Year 1: MYR 50
  - Subsequent years: MYR 100

Cost Assumptions

The assumptions include maintenance costs for equipment rentals, labour charges, operating costs for processing centers, storage fees, and general operating expenses.

- **Maintenance costs for machineries**
  - Utilisation: For the first half-year, 25 units are used for 30 days each month, increasing to 50 units for 30 days every half-year as FSH grows.
  - Daily Rates:
    - Transplanter : MYR 200
    - Harvest: MYR 200
    - Ploughing Tractor : MYR 200
    - Drone : MYR 100
    - Other Farming Equipment : MYR 20
  - Labour charges for farming equipment maintenance services: MYR 150 / job, approximately 666 jobs / year.
- **Operating costs for processing and packaging facilities**
  - Rice : MYR 207 per metric tonne
  - Cassava : MYR 180 per metric tonne
  - Corn : MYR 180 per metric tonne
- **Storage charges**
  - MYR 3.3 per metric ton per day

Key Assumptions

Scale of Operations

- The pilot model covers an agricultural service area of 95,000 hectares in North-West Selangor, accommodating a population of 40,300 farmers.
- The pilot encompasses three types of crop production: rice, corn, and cassava. Currently, there are 9,193 existing paddy farmers, while cassava and grain corn farming are absent in the pilot location.
- The model commences with 3,000 farmers in Month 1 and anticipates a monthly increase of approximately 20%. The goal is to involve 18,730 farmers by Year 1 and encompass all farmers by Year 6.
- The targeted achievement is a 38% improvement in paddy yield by 2024, estimated to average 8 tonnes per hectare.

Investment

- The establishment of an Integrated Storage and Processing facility, inclusive of processing and storage facilities such as silos and racking systems, entails an investment of approximately MYR 23.7 million. This facility will cater to the entire pilot area and serve as a stockpile location, with funding provided by the government.
- The remaining portion of the investment, which includes funding for machinery, infrastructure, and technology, will be contributed by investors including but not limited to value chain partners, DFIs, SADCs, sovereign wealth funds, or banks.
- The estimated investment for heavy machinery, equipment, and processing plants to enhance productivity and provide value-added services is MYR 36.28 million. Additionally, the total infrastructure costs amount to MYR 66 million, with MYR 34 million allocated for enhancing irrigation and soil remediation infrastructure, and MYR 32 million dedicated to IoT and IT investments. These investments will enable FSH to effectively manage the pilot location, stockpile, and provide data to farmers and other stakeholders.

Operating Assumptions

- FSH will recruit Farmers with government support.
- Service providers will deliver products and services to Farmers through FSH and Farmers will manage transactions using the FSH's data platform.
- FSH will operate with a lean organisational structure, with only 39 staff members in management and operations.

Investment Summary

- Establishing a pilot FSH project in North-West Selangor requires an investment of MYR 126 million.
- MYR 102.28 million (81% of the total) will be provided by investors.
- MYR 23.7 million (19% of the total) will be sourced from government funding.
- This initial investment will cover the development of processing, packaging and storage facilities, machineries, farming equipment, and infrastructure improvements to enhance productivity and enable inter-crop planting strategies.

CAPEX Item	Investment (MYR)	Category
Cassava processing plant	2,000,000	MYR 6,000,000 Processing Plants (4.8%)
Grain corn processing plant	2,000,000	
Cassava packaging plant	1,000,000	
Grain corn packaging plant	1,000,000	
Warehouse 200k sqft, 25 silos, racking	11,450,000	MYR 23,700,000 Warehouse & Stockpiling (18.8%)
Warehouse Handling Equipment (2 x Forklift, 2 x Power Pallet Truck, 1 x Reach Truck)	250,000	
Warehouse Management System	2,000,000	
Trucks and Trailers - 50 vehicles	10,000,000	
Transplanter - 50 machines	4,250,000	MYR 30,280,000 Mechanisation (24.0%)
Harvester - 50 machines	8,500,000	
Tractor Ploughing - 50 machines	10,000,000	
Drone - 100 units	7,500,000	
Other equipment - 200 units	30,000	
Infrastructure: Irrigation & Drainage, Improvement (incl. Flood Mitigation)	29,000,000	MYR 66,000,000 Infrastructure (52.4%)
Infrastructure: Soil Remediation	5,000,000	
IOT Infrastructure: Enabling Smart Farming	30,000,000	
IT System Development & Roll Out	2,000,000	
TOTAL	125,980,000	MYR 125,980,000

Return on Investment

- The model shows that FSH offers investors an attractive internal rate of return (IRR) of 25.1% over a 10-year timeframe.
- FSH is projected to achieve a Net Present Value of MYR 203.1 million by Year 10, with a payback period of 8.5 years.

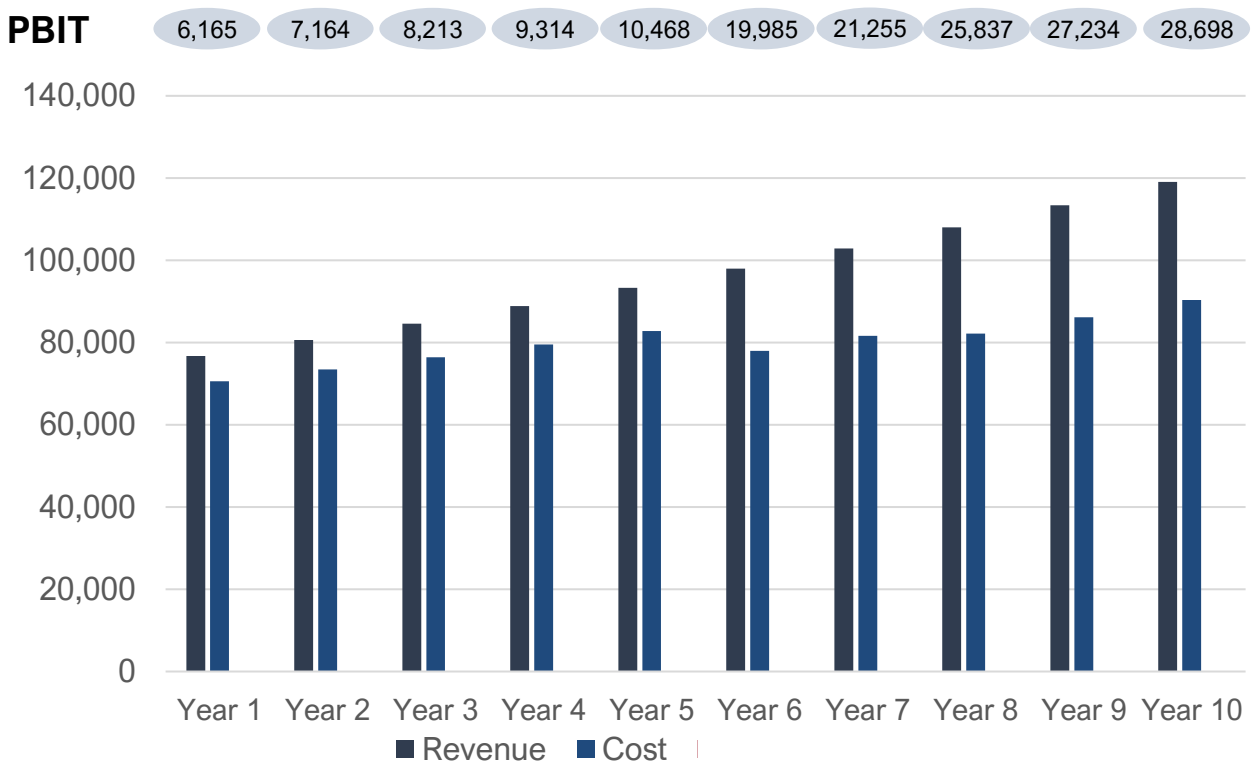
Return on Investment Projection

Assessment Year:	10

Metrics	Results
Total Investment	MYR 126.0 mil
Net Present Value (with Terminal Value)	MYR 203.1 mil
Internal Rate of Return	25.1%
Payback Period	8.5 Years
Avg Gross Margin (%)	30.2%
Avg Net Profit (%)	12.3%
Avg Return on Capital Employed	13.0%
Gearing Ratio	(Cash amount exceeds the debt)

Revenue & PBIT Projection

MYR '000



Financial Projection on Farmers' Livelihood

The following tables illustrate the income of individual smallholder farmers in comparison to those who join FSH. These calculations are based on the assumption of cultivating a single crop (Paddy) on 5 hectares of land, with a focus on farmers who achieve the target yields of 8 tonnes and above.

FAMYRERS' ANNUAL INCOME STATEMENT **Crop: Paddy** **Farm Size: 5 ha**

MYR '000

Yield	8 tonnes/ha		9 tonnes/ha		10 tonnes/ha		Remarks
Scheme	**FSH**	**Individual**	**FSH**	**Individual**	**FSH**	**Individual**	
Revenue	153.6	153.6	172.8	172.8	192.0	192.0	
Less: Cost of Sales	-55.0	-68.7	-61.9	-77.3	-68.7	-85.9	The cost of sales for Farmers under FSH is lower because of bulk discounts on the purchase of planting materials and a reduction in labour cost through mechanisation.
Gross Profit	98.6	84.9	110.9	95.5	123.3	106.1	
Gross Margin	64%	55%	64%	55%	64%	55%	
Add: Tanam Banyak Dapat Banyak (TBDB) Scheme	4.6		6.9		9.6		TBDB scheme: Achieve target yield (3%) Above target (Additional 1% per tonne)
Less: Food Security Hub (FSH) Membership Fee	-0.1		-0.1		-0.1		
Smart Farming	-3.6		-3.6		-3.6		Incremental cost from use of mechanisation and IOT.
Profit Before Interest & Tax	99.6	84.9	114.2	95.5	129.2	106.1	
Incremental Income For Farmers under FSH (%)	=(99.6-84.9)/84.9 =17%		=(114.2-95.5)/95.5 =20%		=(129.2-106.1)/106.1 =22%		

There is improvement to the farmers' annual income, estimated between 17% to 22% through participation in FSH.

Policy Recommendations

Policy Evaluation

Current Efforts	Limitations
In Malaysia, the main agricultural subsidies primarily benefit paddy, palm oil, and rubber, with comparatively less support allocated to other crops like fruits, vegetables, and various commodities.	Subsidies promote short-term support, fostering dependency among farmers and cooperatives. This reliance on subsidies can then impede their access to bank financing, as few banks are willing or equipped to lend based on expected cashflow.
In Malaysia, buy-back and stockpiling systems aim to stabilise agricultural prices, ensure food security, and support farmers by maintaining price stability through surplus purchases during bumper harvests and release during shortages.	Limitations include high stockpile costs, storage needs, and market distortion due to government intervention, mirroring challenges faced by Bernas, Malaysia's main rice agency, with its near-monopoly affecting competition, prices, and rice imports.
Agricultural R&D efforts involve government funding, collaboration with research institutions, technology transfer to farmers, promotion of sustainability, and crop diversification to enhance productivity, improve techniques, and ensure food security.	Agricultural R&D limitations include funding, infrastructure, human resource, coordination, and technology adoption issues. Smallholders also face limited access to R&D innovation, which hinders their ability to adopt sustainable farming practices.
The government updated the TVET curriculum, improved infrastructure and equipment, and fostered industry collaboration, scholarships, and awareness campaigns to promote technology education in agriculture	Limitations encompass funding constraints, teacher quality, industry alignment, social stigma, access equity, and technology adoption challenges in TVET and technology education in agriculture.
The Department of Statistics Malaysia, is the government agency responsible for collecting, analysing, and disseminating official statistics across sectors, including the economy, population, and agriculture, ensuring accurate and up-to-date information.	The data and information on this platform are not real-time, which means it is not constantly updated. Moreover, the data and information are not effectively integrated or consolidated in one place, making it challenging to gather and use them efficiently.

Policy Recommendations (1/5)

i) Funding & Credit Facilities Mandate

Policy Recommendation

Implement a policy mandate that compels DFIs and banks to invest in agriculture and food security related initiatives and enhance access to organised credit for farmers.

Incentives

Government can offer tax breaks and incentives to DFIs and banks investing in approved agricultural projects. These incentives include lower corporate taxes, interest exemptions on agricultural loans, and subsidies for rural infrastructure development.

Monitoring

DFIs and banks must submit periodic reports outlining their agricultural investments and the resulting impact on food security. This mandate guarantees transparency and accountability in fulfilling the required investment commitment.

Credit Facilities

Government can support financial institutions to offer special credit facilities such as agricultural loans with reduced interest rates, extended repayment periods, and flexible collateral requirements.

Potential Value Creation	Stakeholders
• The directive approach empowers FSH and other food security projects to secure essential funding and financial support, thereby enhancing the stability and reliability of food supplies. • Smallholder farmers gain access to cost-effective credit and financial services, enabling them to invest in modern farming equipment, inputs, and infrastructure, ultimately elevating productivity.	• **Government:** Ministry of Agriculture and Food Security (MAFS), in collaboration with other pertinent ministries, responsible for establishing the mandate. • **Financial institutions:** DFIs, SADCs, banks, insurance companies to provide credit facilities and related services. • **FSH:** Plays a coordinating and monitoring role.

Policy Recommendations (2/5)

ii) Buy-back And Stockpiling System

Policy Recommendation
Implement a nationwide buy-back and stockpiling system aimed at maintaining a 90-day supply of diverse food items.

Legislation and Government Support	Malaysia Food Reserves	Strategic Food Selection	Inventory Management
Enact legislation, allocate government funding, and offer tax incentives to establish a nationwide food stockpiling system, ensuring both public and private sector involvement.	Establish strategically located regional food reserves to ensure efficient and equitable nationwide access, fostering collaboration with state governments and NGOs for coordinated emergency distribution efforts.	Identify and prioritise essential food items with extended shelf life that can fulfill nutritional requirements, consulting closely with nutritionists, dietitians, and food experts to guarantee a diverse and health-conscious food stockpile.	Implement an advanced inventory management system for monitoring stock levels, shelf life, and replenishment needs, while ensuring regular assessments and stock rotation to prevent waste and maintain food quality.

Potential Value Creation	Stakeholders
• Foster collaboration between the public and private sectors, creating a robust food stockpiling system that enhances national food security. • Establish regional food reserves that enable efficient and equitable access to food supplies during emergencies, contributing to better disaster response and community resilience. • Implement advanced inventory management systems, ensuring efficient stockpile management, reducing food waste and enhancing the longevity of stored goods.	• **Government:** MAFS, Ministry of Health and Local Authorities and State Governments to coordinate and identify stockpile locations and targets, ensuring effective food security measures. • **FSH:** Coordinating and monitoring the stockpiling efforts and assisting the government with supply and demand data from the market. • **Farmers:** Responsible for food production and meeting the set stockpiling targets.

Policy Recommendations (3/5)

iii) Research and Development

Policy Recommendation
Establish a coordinated agricultural R&D framework that promote collaboration and efficiency to strengthen food security and climate resilience.

National Research Consortium

Establish a national consortium comprising research institutions, universities, industry stakeholders, and government agencies to collaborate on advancing research in food security. This coordinating body should be tasked with identifying research priorities, avoiding duplication of efforts, and ensuring resources are allocated efficiently to address food security challenges.

Cross-Sector Collaboration

Encourage interdisciplinary collaboration by fostering partnerships between agricultural researchers, climate scientists, food technologists, and economists. Promote open-access publication policies and establish a centralised database or platform for sharing agricultural research findings, data, and best practices, ensuring wide accessibility for the benefit of the entire agricultural community.

R&D Investment

Introduce incentives such as grants, tax breaks, and research funding to encourage private sector investment in R&D projects directly related to food security, with a particular emphasis on innovative solutions for food storage and climate-resilient agricultural practices.

Potential Value Creation

- Harness collective expertise and resources, enhancing the efficiency of agricultural R&D to align with food security goals and optimise both public and private investments.
- By consolidating efforts on innovative storage solutions and climate-resilient crops, the policy can boost food production, aid farmers in adapting to climate changes, reduce post-harvest losses, and improve food access.
- Open access facilitates knowledge exchange, speeding up the adoption of best practices, technologies, and insights within the agricultural community, leading to sustainable growth and resilience.

Stakeholders

- **Government (MAFS, Malaysian Agricultural Research and Development Institute i.e., MARDI, Minister of Natural Resources, Environment and Climate Change of Malaysia)**: Establish and oversee the research consortium, allocate funding, and formulate policies that promote collaboration and innovation in agriculture.
- **University, research institutes, agriculture businesses:** Invest in relevant research, actively engage in knowledge exchange, and collaborate to align research efforts with industry needs.
- **FSH:** Facilitate coordination, collect input, and disseminate information to all stakeholders including Farmers.

Policy Recommendations (4/5)

iv) TVET and Technology Education in Agriculture

Policy Recommendation
Integrate agricultural education into the national curriculum, at all levels, from primary schools to higher education institutions.

Curriculum Enhancement

- Develop up-to-date, science-based agricultural curricula that emphasise sustainable farming practices, agribusiness, and technology adoption. Foster interdisciplinary learning by connecting agriculture with subjects like science, technology, engineering, and mathematics.

Hands-On Learning with Technology

Set up smart agriculture labs and school gardens, where students can gain practical experience in farming, agribusiness, and agricultural technology. Encourage experiential learning by allowing students to work with drones, remote sensing technologies, and automated farm machinery.

Government Support and Funding

Allocate funding for modernising Technical and Vocational Education and Training (TVET) infrastructure and procuring advanced agricultural technologies. Incentivise TVET institutions that produce skilled agricultural graduates and offer scholarships to students pursuing agricultural studies to foster interest and alleviate financial constraints.

Potential Value Creation

- Facilitate knowledge transfer, preserving traditional wisdom while incorporating modern techniques, enriching the agricultural knowledge ecosystem.
- The availability of skilled workers not only boosts agricultural productivity but also fosters innovation within the industry. This skilled workforce can introduce and implement modern farming practices, leading to increased yields, resource efficiency, reduced environmental impact, and long-term agricultural resilience.
- Improved agriculture boosts local economies, creates jobs, and makes rural livelihoods more attractive, reducing the pressure of urban migration and promoting balanced regional development.

Stakeholders

- **Government (MAFS, Ministry of Education, Ministry of Higher Education, Ministry of Human Resource, TalentCorp Malaysia):** Allocate funding and collaborate with relevant agencies to develop and implement an integrated agricultural education curriculum.
- **Industry Players:** Provide scholarships and financial support to TVET institutions. Offer internship opportunities, job placements, and industry-specific training to bridge the gap between academic learning and industry requirements.
- **FSH:** Offer insights into the practical needs and challenges faced by farmers, helping tailor educational programmes to real-world agricultural contexts. Provide a platform and expertise for students to gain hands-on experience, fostering a deeper understanding of agricultural practices and promoting experiential learning.

Policy Recommendations (5/5)

v) Centralised Data Centre

Policy Recommendation
Implement a comprehensive data transparency policy for the agricultural sector, leveraging Geographical Information Systems (GIS) technology to enhance decision-making and promote sustainable practices.

GIS Data Integration	Data Standardisation	Open Data Sharing	Real-Time Monitoring
Develop a centralised GIS platform integrating data from diverse sources, including government agencies, research institutions, and farmers, to provide real-time data on soil quality, weather, crop health, and market demand. Ensure user-friendly accessibility for farmers, researchers and other relevant stakeholders, with necessary training and support.	Establish standardised data formats and protocols to ensure compatibility and seamless data exchange among different entities. This enhances the accuracy and reliability of the information shared across the agricultural ecosystem.	Enact regulations mandating the sharing of non-sensitive agricultural data across public and private sectors to encourage collaboration, research, and data-driven solutions. Implement strict privacy measures to safeguard sensitive information, including data anonymisation techniques and robust cybersecurity, to maintain stakeholder trust.	Integrate IoT devices and remote sensing technologies into the GIS framework to enable real-time monitoring of crops, weather conditions, and other relevant variables. This facilitates timely interventions and adjustments

Potential Value Creation

- GIS-powered insights, coupled with accurate and up-to-date data on soil moisture levels, weather forecasts, and market demand, empower farmers to make informed decisions. Farmers can adjust crop planting schedules based on weather predictions, allocate resources more efficiently (minimising inputs like water and fertilisers), and proactively manage risks to protect their crops. This not only reduces waste and improves crop yields but also promotes long-term sustainability in agriculture.
- Enhanced data visibility across the supply chain enables smoother coordination between producers, distributors, and retailers, reducing food waste and ensuring timely deliveries, benefiting the entire agricultural ecosystem.
- Open data availability fuels research and innovation, leading to the development of new technologies, practices, and solutions to address agricultural challenges.

Stakeholders

Government (MAFS, DOSM, and other relevant agencies): Mandate and oversee data protection while serving as the custodian of the data.

FSH: Define the scope and requirements for the data centre's development and facilitate its utilisation among farmers and partners.

Technology Provider: Develop a data platform encompassing software, storage, security measures, and other related components.

Social & Environmental Impacts

Social and Environmental Impacts

With FSH serving as the central hub to coordinate and manage initiatives for food security, the aspiration is to achieve:

Improved livelihoods & New Job Creation

- FSH can significantly enhance livelihoods by creating a stable source of income for local farmers and farm labourers. Farmers also stand to benefit from increased income through the TBDB Scheme and a share of the revenue generated by FSH.
- The provision of market data and insights empowers farmers with enhanced farm planning capabilities.
- It can also lead to the creation of new job opportunities within the supply chain and ancillary services including roles related to processing, packaging, logistics, and management.

Rural Revitalisation

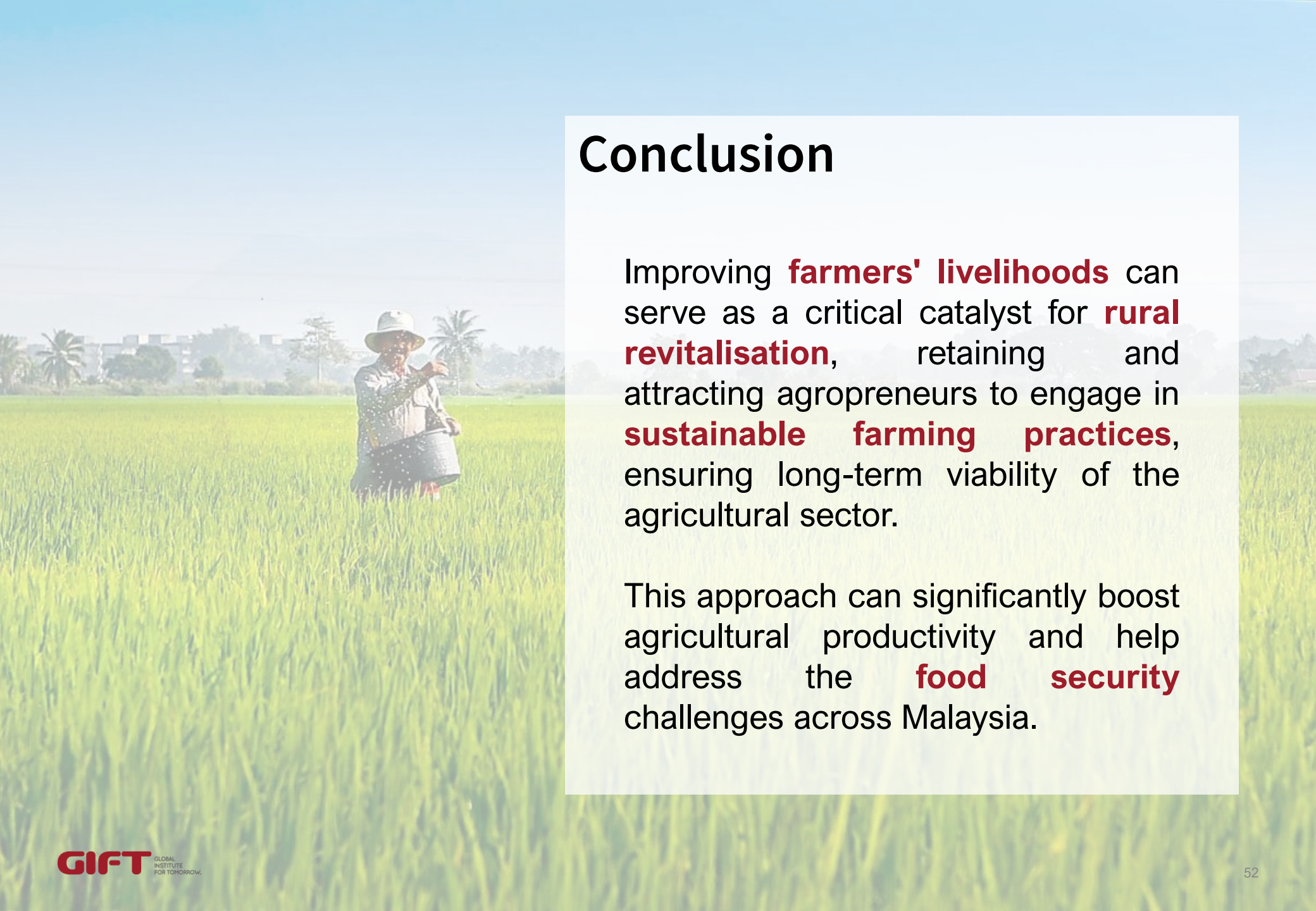
- FSH can attract investments and resources to rural areas that may have been economically stagnant.
- As FSH grow, it can stimulate demand for additional services in rural communities, such as restaurants, retail, and tourism.
- It promotes the idea that agriculture is not just about traditional farming but also encompasses innovative and entrepreneurial approaches, encouraging individuals, especially the younger generation, to return and contribute to their hometown.

Enhanced Sustainable Farming Practices

- Strong partnerships within FSH, involving farmers, experts, and industry stakeholders, will drive the exchange of ideas, fostering continuous improvements in farming operations.
- FSH can serve as a platform to promote sustainable practices such as reduced pesticide and responsible water use through providing resources, training, and incentives.
- This can enhance soil health, biodiversity, and long-term food security by preserving natural resources for future generations.

Enhanced Food Security

- FSH's stockpile establishment ensures a steady, diverse supply of fresh, local food, reducing import dependence and food shortage risks during crises.
- FSH can also facilitate the distribution of surplus produce, minimising food waste and making nutritious food more accessible to vulnerable populations.
- By supporting Farmers and promoting agricultural diversity, it improves the local food system's resilience, enabling it to adapt to changing environmental conditions and global uncertainties.



Conclusion

Improving **farmers' livelihoods** can serve as a critical catalyst for **rural revitalisation**, retaining and attracting agropreneurs to engage in **sustainable farming practices**, ensuring long-term viability of the agricultural sector.

This approach can significantly boost agricultural productivity and help address the **food security** challenges across Malaysia.

Appendix

Planting Strategies

To illustrate the planting strategy services offered by FSH, below are the recommended planting strategies for Rice, Corn and Cassava at the pilot project location, aimed at optimising land utilisation and productivity.

Increase yield of paddy

SSR for rice stands at 70%, which falls considerably short of the 10-year SSR goal of 100%. This challenge stems from the significant dependence on specific paddy areas that yield high averages, resulting in the underutilisation of the majority of paddy farms in the surrounding regions.

This can be seen in the North-West Selangor area, where Sekinchan boasts the highest yield (8.46 tonne/ha), while the remaining areas exhibit much lower yield (average of 5.82 tonne/ha). Strategies are needed to improve the average nation yield to achieve the SSR goal and beyond.

Inter-crop

Malaysia dedicates 5.8 million ha to oil palm plantations, with Selangor accounting for 106,008 ha. Additionally, the country ranks 12th globally in coconut supply, with 84,609 hectares of coconut plantations, including 9,281 hectares in Selangor.

The substantial size of oil palm and coconut trees has encouraged farmers to only practise monocropping. However, recent studies and practice across the region has shown the possibility to plant certain crops in between the oil palm trees, optimising land usage and enhancing produce diversity.

Inter-season

Selangor allocates 36,868 ha out of its 95,000 ha of agricultural land for paddy farming. Since paddy cultivation occurs during two periods of the year, there exists a gap in land utilisation.

Employing an inter-seasonal or crop rotation methodology will not only diversify the crop cultivation pattern but also enhance soil quality while reducing the potential risks posed by climate change in the future.

Planting Strategies

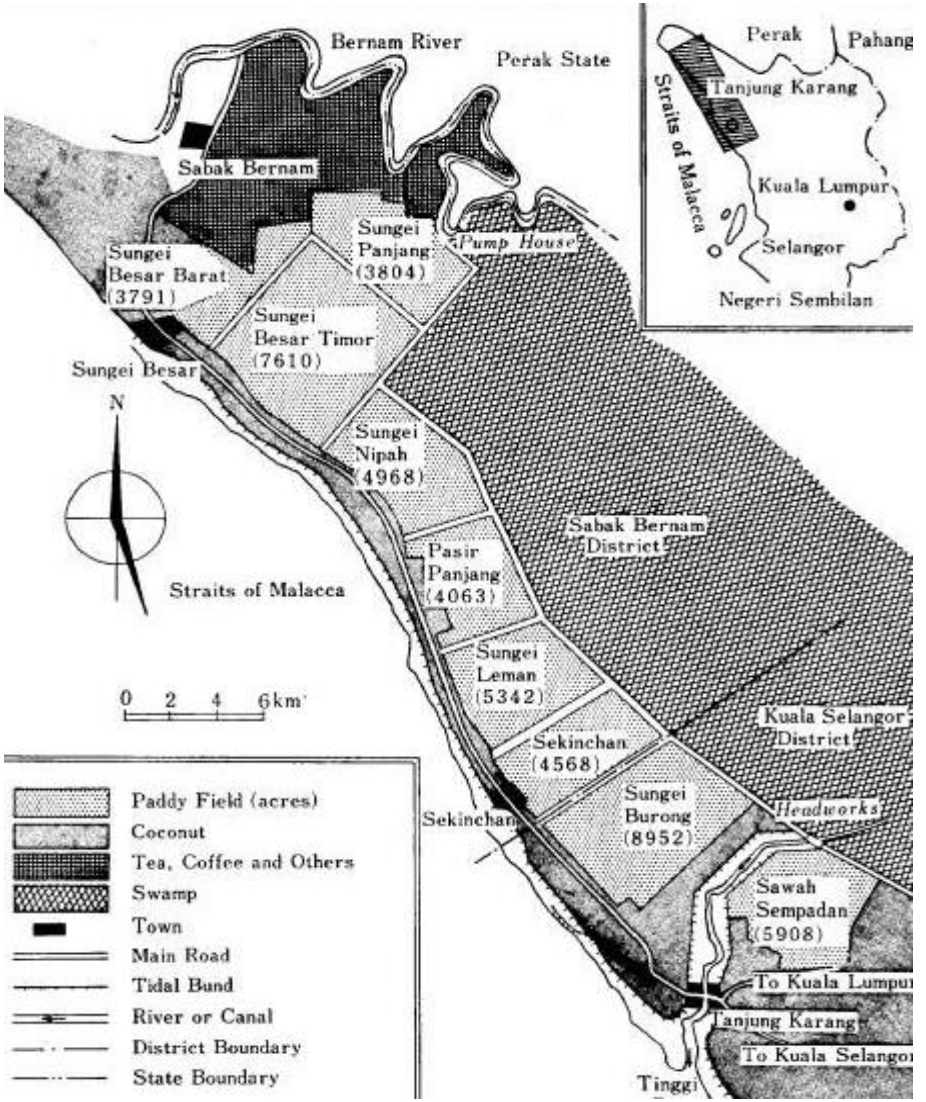
Increase yield of paddy

Agricultural practices that will benefit the underutilised areas (under 8 tonne/ha yield) in North-West Selangor:

- Use high yield variety of paddy seeds as developed by MARDI such as MR315 and MRQ104.
- Application of photosynthesis enhancers to improve yield (recent study indicate the yield could be improved by 30-60%)
- Ensure efficient usage of NPK* fertilisers in all areas of the paddy field through proper training & technology.
- Invest in water irrigation and drainage systems to prevent water stagnation and root damage.
- Adopt technology in planting, monitoring, and harvesting such as weather forecast, soil nutrition, etc.

*NPK – Nitrogen, Phosphorus, and Potassium

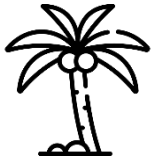
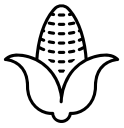
Area	Current Average Yield (tonne/ha)
Sekinchan	8.46
Sawah Sempadan	5.87
Sg. Burong	5.64
Sg. Leman	6.20
Pasir Panjang	6.11
Sg. Nipah	5.36
Panchang Bedena	3.53
Bagan Terap	6.31
Average	**5.82**



Planting Strategies

Inter-crop & Inter-season

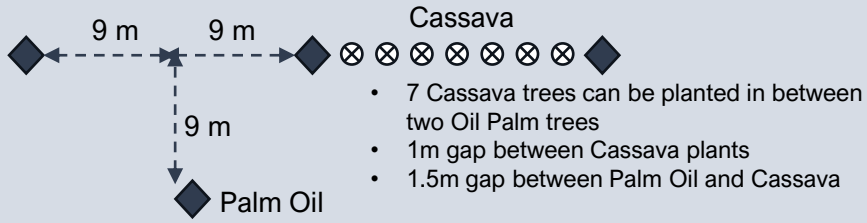
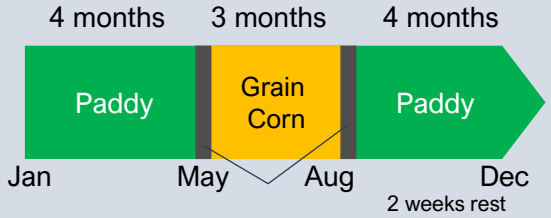
These planting strategies are tailored to encourage diversification and efficient land utilisation in the pilot area, taking into account the identified crops' characteristics. This approach empowers smallholders to cultivate multiple crops that contribute effectively to the stockpiling initiative.

Land Area	Existing Crop	Inter-Crop	Justifications
Area 1: 55,000 ha of project site	 Oil Palm	+  Cassava	• The majority of the project site is occupied by oil palm and coconut plantations. • The inter-crop model involving coconut & cassava and oil palm & cassava demonstrates long-term sustainability. • This approach optimises land utilisation within these plantations, particularly the spaces between the trees. • Cassava is a very versatile crop grown in various soils and climatic conditions – which are similar conditions as coconut and oil palm. • This can provide income in the early years of oil palm plantation as oil palm can only be harvested after three years. However, it is important to note that cassava can only be cultivated and harvested for the initial three years due to the oil palm tree's closed canopy.
Area 2: 20,000 ha of project site	 Coconut	+  Cassava	
Area 3: 20,000 ha of project site	 Paddy	+  Corn	• Grain corn crops are suitable for cultivation in paddy fields. • The grain corn has a short 90-day growth cycle, aligning well with the soil resting period of paddy fields. • The facilities used for processing paddy straw can also be applied for corn plants, both of which can be converted into animal feed, specifically silage.

Planting Strategies

Inter-crop & Inter-season

The illustration below demonstrates how land utilisation can be optimised through inter-land and inter-season planting.

Land Plot	Crops	Strategy	Land / Season Spacing
Area 1: 55,000 ha of project site	**Oil Palm + Cassava**	Inter-Land Planting (Maximise Land Usage)	 • 7 Cassava trees can be planted in between two Oil Palm trees • 1m gap between Cassava plants • 1.5m gap between Palm Oil and Cassava
Area 2: 20,000 ha of project site	**Coconut + Cassava**	Inter-Land Planting (Maximise Land Usage)	 • 6 Cassava trees can be planted in between two coconut trees • 1m gap between Cassava plants • 1.25m gap between Coconut and Cassava
Area 3: 20,000 ha of project site	**Paddy + Corn**	Inter-Season Planting + Increase Yield	

Planting Strategies

Inter-crop & Inter-season: Case Studies

Such practises have been conducted across ASEAN countries with similar climate characteristics with Malaysia.

Inter-Land Planting Method

Double row alley intercropping in Malaysia, with cassava (left) and black pepper (right). Photos: Maja Slingerland.

- There were no observed negative effects on the growth of oil palm or intercrops in the first 4-5 years.
- Training is required to ensure that intercropping is planned and implemented as an organised system, leading to increased benefits.
- Permanent intercropping is possible if the alternative oil palm spacings are adopted at establishment, such as the double row avenue (alley cropping) system.

Inter-Season Planting Method

Paddy Fields in Imogiri District - Bantul, Yogyakarta, Indonesia.

- At Ndemen Village in Imogiri, Yogyakarta, farmers implemented a Rice-Rice-Corn rotation pattern during wet season and dry season.
- The implementation of crop rotation patterns did not significantly affect these growth parameters.
- The rice farming in wet season produced higher Milled Dry Grain (MDG) than dry season.
- The application of crop rotation did not affect the availability of N-NH4, P2O5, Ca and Mg nutrients in irrigated rice fields, while the planting season did.

Source: Green Livelihoods Alliance - Millieudefensie, IUCN NL and Tropenbos International; A Suprihatin, B H Purwanto, E Hanudin and M Nurudin (2002) - Effect of cropping rotation patterns on rice productivity in irrigated rice fields

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