# Building a Climate-Resilient Agriculture in ASEAN

Bridging the Information Gap:
First Step to Sustainable Agriculture

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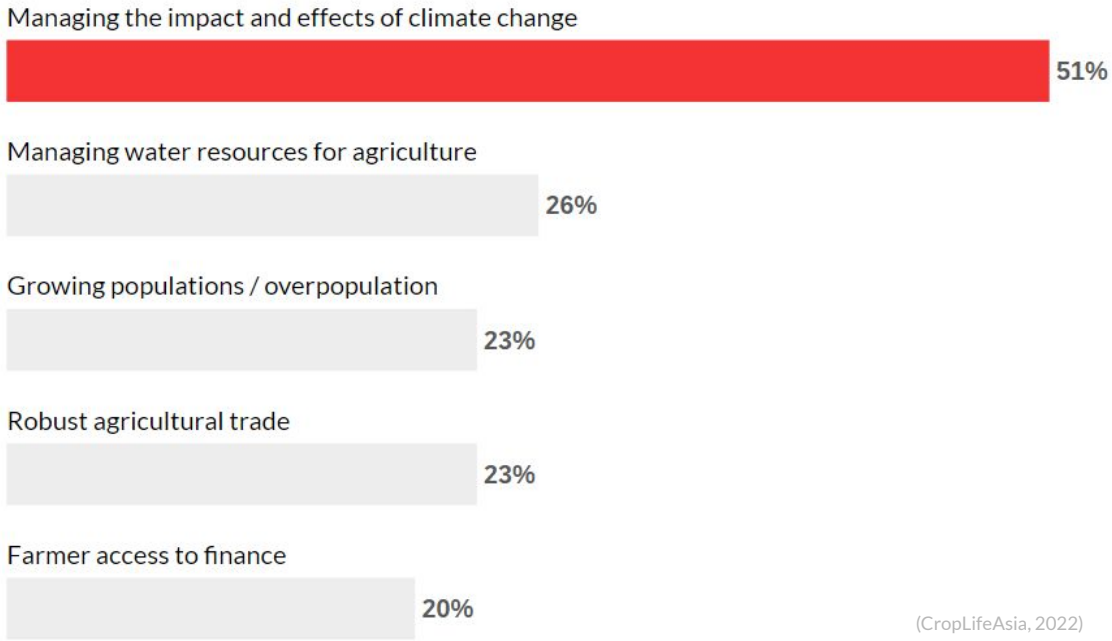
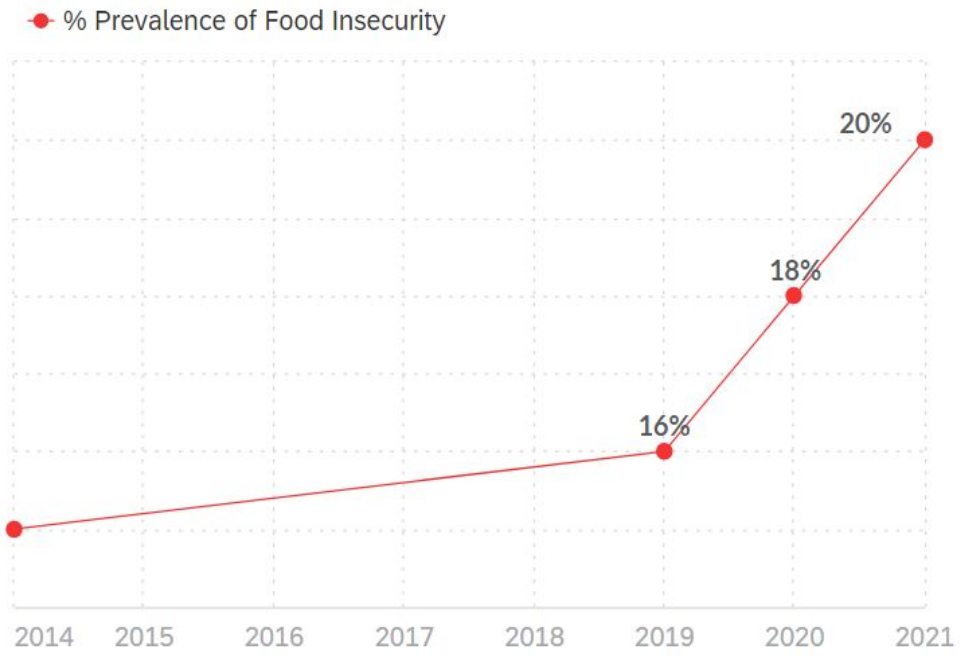
**Impact of climate change** is the **TOP 1** food systems obstacles faced by ASEAN countries as agreed by ASEAN policymakers.




(CropLifeAsia, 2022)
[1]

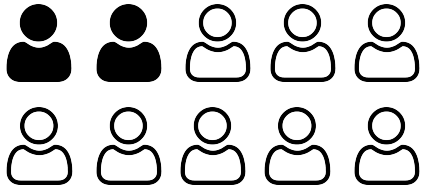
[1] *Survey data are derived from the "Policymaker Survey: Climate Change Impact on ASEAN Agriculture" (2022), collected from 35 ASEAN policymakers between late 2021 - early 2022.*

# Yet the % ASEAN population prone to food insecurity has been **increasing**.




(FAO, no date)
[2]

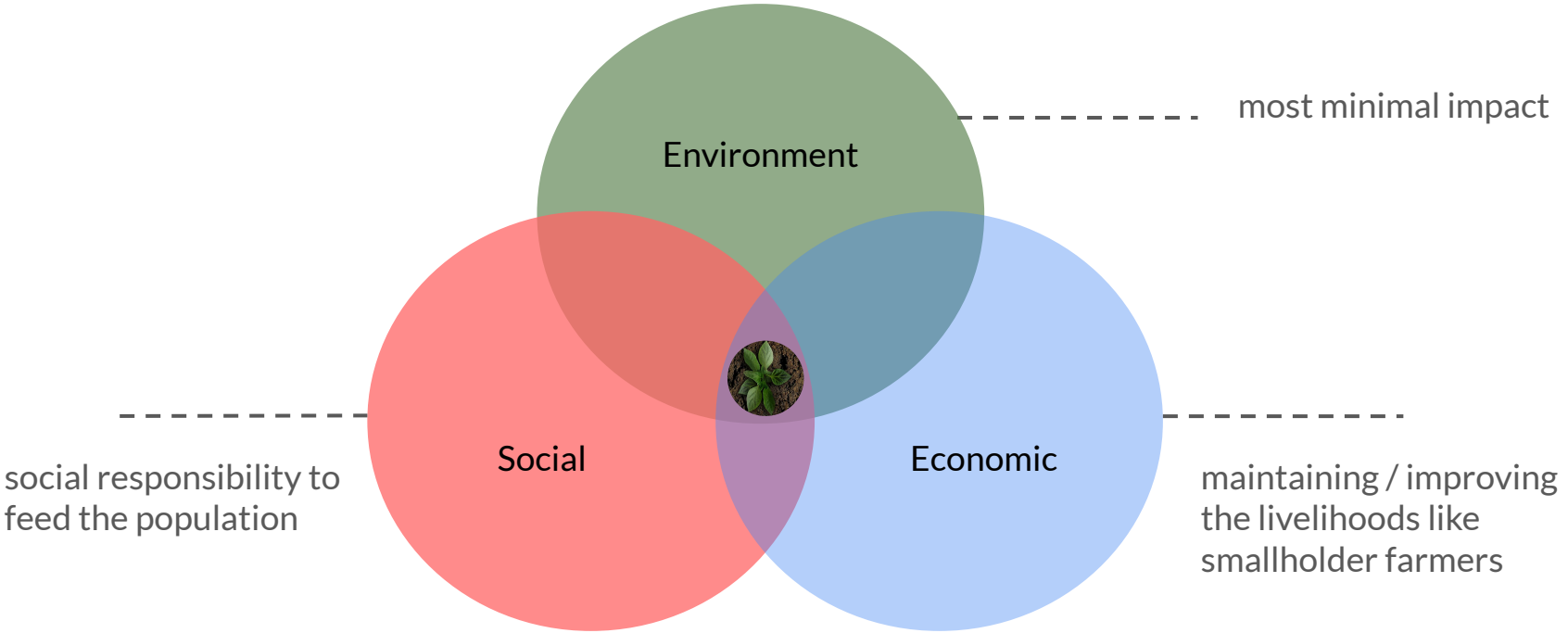
**≈20%**



ASEAN population is prone to food insecurity.

[2] *Data for this slides are retrieved from the FAO SDG Indicators Data Portal (n.d.).*

To feed a wider population, **sustainable agriculture** has garnered attention.




(FAO, no date)

ASEAN region should move together towards sustainable agriculture, considering we have shared characteristics…

## Make up of Smallholder Farmers

# 100 million

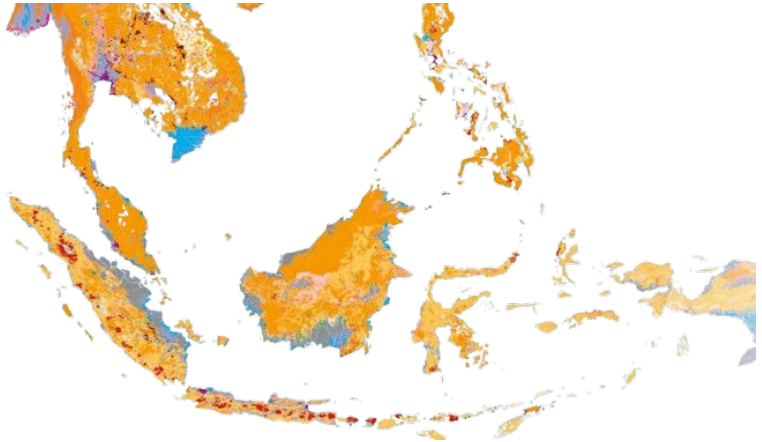
(WWF, 2021)

average owns

**≈ 5** acres of land

(WWF, 2021)

## Similar Soil Types



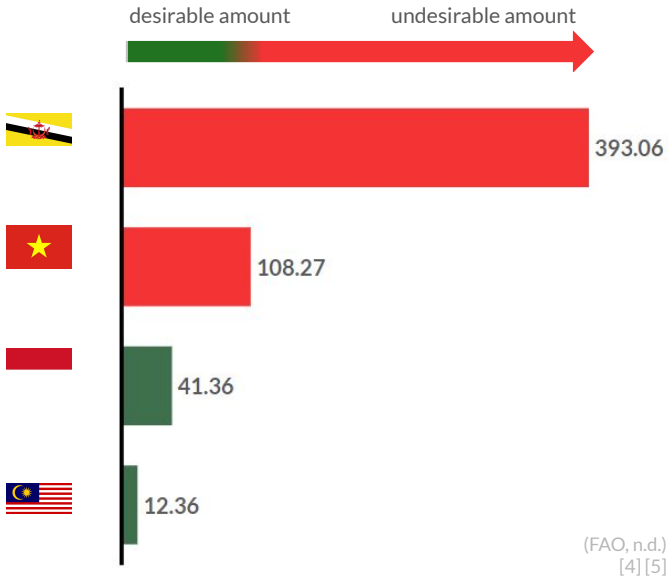
**acrisoils** and **cambisols** made up the majority soils with characteristics of low in soil fertility and medium soil fertility respectively.

(European Commission, JRC, & FAO, 2023 ; ASEAN, 2017) [3]

[3] *The soil map is retrieved from the Soil Atlas of Asia by the European Commission, JRC, and FAO (2023), and further supported by data from the ASEAN Guidelines on Soil and Nutrient Management (2017), as referenced in the appendix.*

Environment

However, ASEAN agriculture is unsustainable. Environmentally, we observed signs such as **excess nitrogen levels in cropland** (kg/hectare), indicating that nitrogen is overapplied to crops.




(FAO, n.d.)
[4] [5]

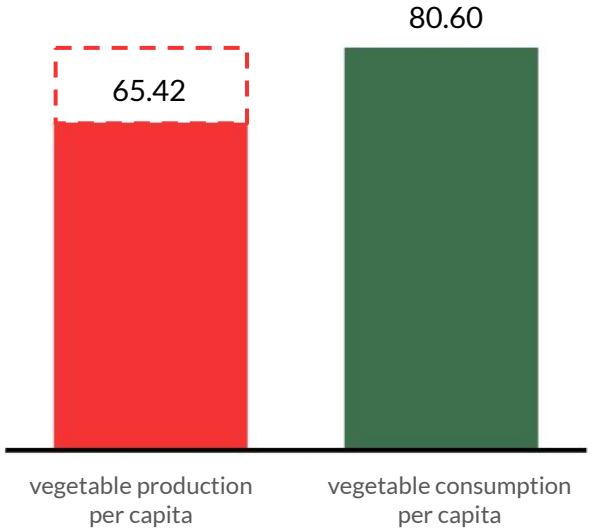
implies

- Soil degradation
  (from excess nutrient buildup)
- Air pollution
  (the production of GHG gas)

[4] *The desirable nitrogen surplus amount is 80 kg/hectare and below.*
[5] *Data for the bar chart are retrieved from FAOSTAT under the sustainability indicators, specifically the sub-indicator: Cropland Nutrient Balance, measured in kg / ha.*

Social

From social aspect, **total local production per capita (kg/capita)** is unable to meet the **total local consumption per capita (kg/capita)**.




(World Population Review, n.d. ; World Bank, n.d. ; Our World In Data, n.d.) [6]

implies

- Unable to feed the entire population
- Risk to nutrients imbalance

**Economic Implications:**

ie. reduce farming yields & income
Increase input price

[6] *Brunei and Singapore were excluded from the total ASEAN consumption and production aggregation due to the unavailability of local vegetable production data for Brunei and Singapore minimal domestic vegetable cultivation. Laos was excluded from the calculations as it was identified as an outlier, not representative of the ASEAN region.*

# Let's dissect the **root cause** using the marketing buyer's journey approach.

## Awareness Stage

Most farmers are aware of the problem. i.e. impact climate change brings to farming.

## Consideration Stage

Farmers do consider sustainable farming as a solution.

Many **give up** at this stage due to **lack of support** and **low accessibility of the info.** [8]

## Decision Stage

Minority smallholder farmers are adopting sustainable practices.

[7]

(appendix 3.0)

[7] *The marketing buyer's journey approach was developed after conducting three in-person interviews—one with an organic farmer and two with regenerative farmers—and reviewing a smallholder survey conducted by the Khazanah Research Institute with 2,200 farmers across Malaysia, collected between 2022 and 2023.*

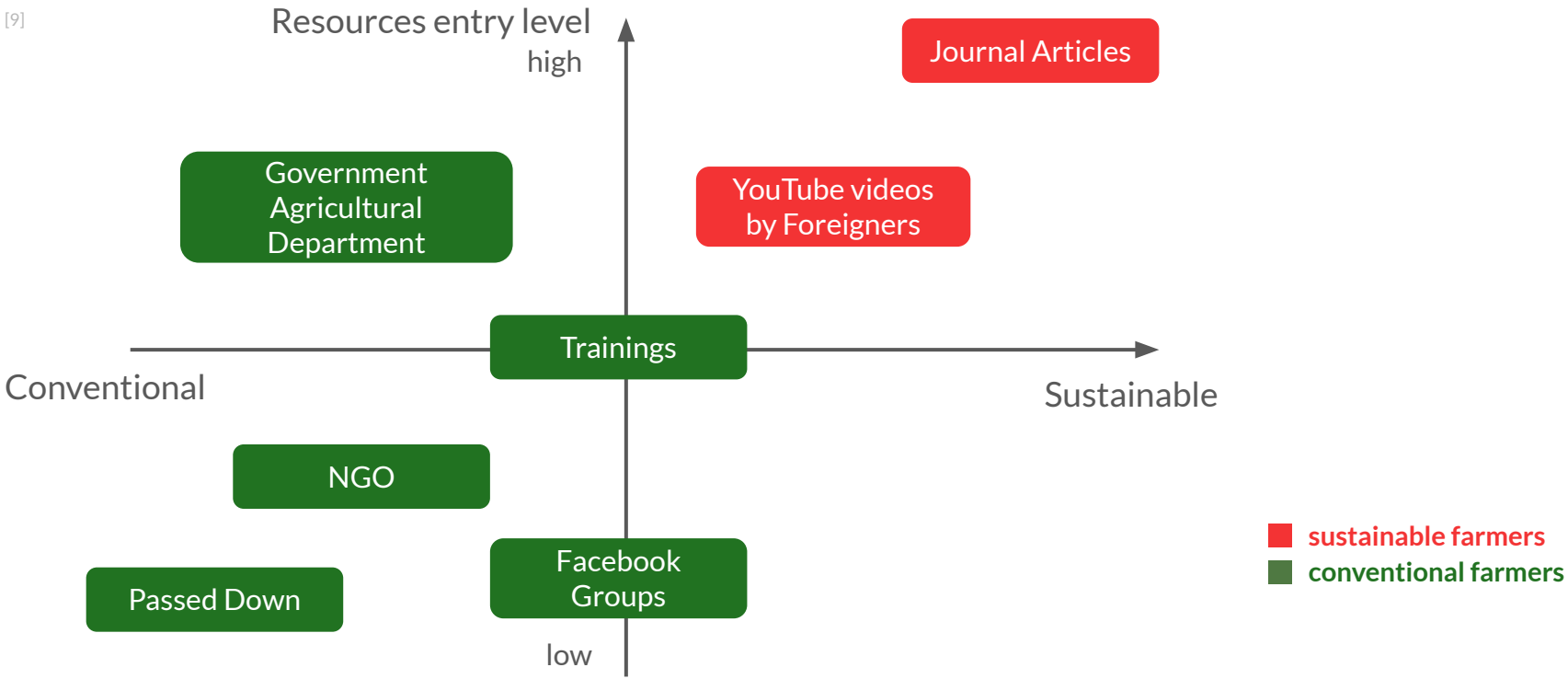
[8] *"Need contextualise information to Malaysian. All that has had to be studied and field-trialed painstakingly. A lot of people cannot go through this." - interviewee A*

**Information Gap** is restraining farmers from farming sustainably.

Now, let’s zoom into Malaysia’s data to understand more about the root cause.

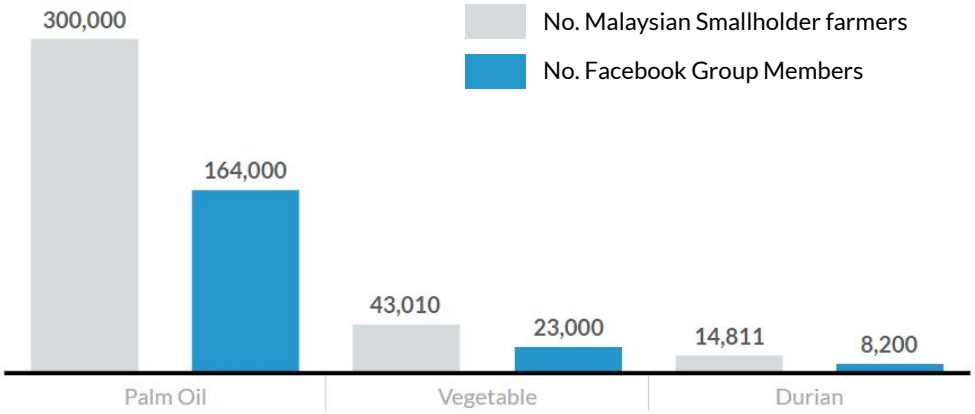
**Sustainable farming knowledge** comes in formats that are difficult for those without a formal education or strong language skills to access and are limited as compared to **conventional farming knowledge**.

[9]




[9] *The product matrix was developed after conducting three in-person interviews with 1 organic farmer and 2 regenerative farmers from Malaysia, and performing extensive online research using reputable sources such as Khazanah Research Institutes production. This approach ensured that the matrix reflects both practical insights from the field and current knowledge consumption trends.*

We observed that smallholder farmers likely rely on **informal sources** for agricultural information, with **Facebook group memberships** exceeding **50%** of the smallholder farmer population for each crop.




(ISEAS, 2020; AM Research Sdn Bhd, 2024; UPM, 2023)
appendix 4.0
[10]

## Top 3 Discussions: [11]

- Farming Methods
- Market Price
- Mental Support

[10] *The data on Malaysian smallholder farmers population for each crop were retrieved from multiple sources, including the ISEAS (2020), Universiti Putra Malaysia (UPM) (2023), and Am Research Sdn Bhd (2024). The number of Facebook group members was sourced directly from Facebook, with detailed group information available in the appendix.*

[11] *The top three discussions were derived from a content analysis of over 30 posts and comments across 10 public Facebook groups related to farming, with total memberships ranging from 6,500 to 164,000. Observations were conducted over one week, from September 22 to September 29, and all data was anonymized to ensure ethical compliance. The source links for the 10 public Facebook groups are also provided in the appendix 5.0.*

Smallholder farmers **lack adequate trainings and support** to transition into sustainable agriculture.

# 41%

[12]

"of smallholders surveyed have not attended any training, but this is not representative of their interests in upskilling themselves"

(Khazanah Research Institute, 2023)

**Reasons:**

- Lack exposure to training programme
- Training irrelevant to their needs

## We ask in our interviews…

Q: How can we convert conventional farmers into sustainable farming? [13]

"The only way to fight this issue is **education** in school, not education when they're already adults"

"Network and exchange ideas with them and slowly build that **support system** through themselves

The most important **knowledge**... at least can understand the growth process of plants. This is quite difficult, but it is a basic requirement

[12] *Both quantitative and qualitative data were sourced from Khazanah Research Institute's Project Semai, which surveyed 2,200 crop smallholders in Malaysia from 2022 to 2023.*
[13] *The qualitative data are retrieved from a three in-person interviews—one with an organic farmer and two with regenerative farmers in Malaysia where interviews output can be found in appendix 3.0.*

November 1, 2016

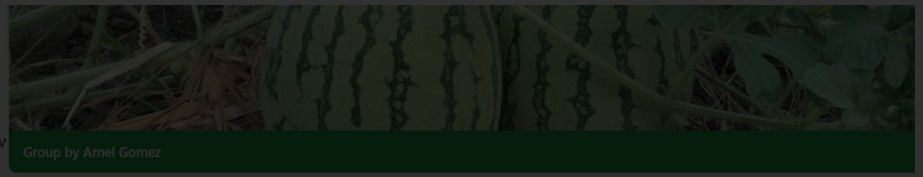
# What Are the Challenges Facing Lao Hill-Tribe Coffee Farmers?

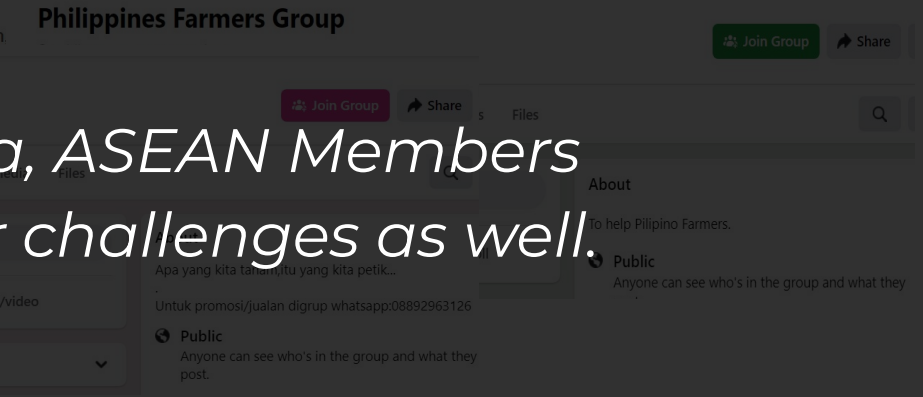
**5. Lack of Knowledge**

Farmers often use less productive farming practices simply because those are the methods they're familiar w
farmers are unaware of pruning and tree management techniques.

Farming Arabica on steep mountain slopes can be less labour intensive than other prevailing crops, like corn
Tears (Chinese pearl barley). Yet farmers may be also be
yield and bean flavour.

Farmers are also often unaware that
research programme from CIRAD has found that rubber-
they won't do it.




*Not just in Malaysia, ASEAN Members States faced similar challenges as well.*

Mohammad Yunus

## Opinion | The push for sustainable palm oil isn't going far enough

Smallholders in Southeast Asia are too often left out of sustainable oil palm initiatives due to unaffordable costs and a lack of technical support

# **Problems** farmers faced in accessing info

**Information Gap**

- **Low Accessibility**
- **Low Quality**
- **Low Digital Skills**

# **Opportunities** for us

**Information Gap**

**Lack trainings** | **Low Accessibility** | **Low quality info**

**HarvestOptima Suite**

**Sustainable Farming Academy** | **Sustainable Farming Tools**

Advisor Bot

IPM Guide

Ask Others!

## Solution 1: Sustainable Farming Academy

A platform connecting pioneer sustainable farmer with budding sustainable farmer with knowledge.

**HarvestOptima Suite**

Local Experienced farmers ⟷ Knowledge transfer ⟷ Budding Practitioners

Provide trainings & workshops

Learn from local experienced farmers

training partners (instructors):

GreenHouse OF NATURAL FOOD SDN BHD

Regenerative Agriculture Malaysia

Characteristics of these farmers:

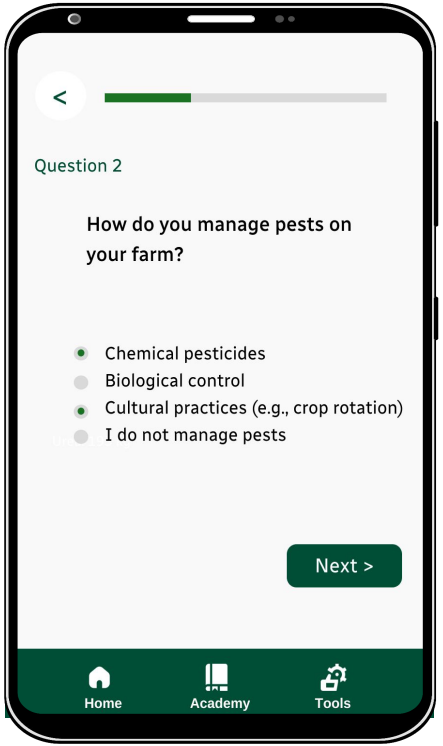
- The ones who accessed to journals
- Went abroad to learn
- Localised content

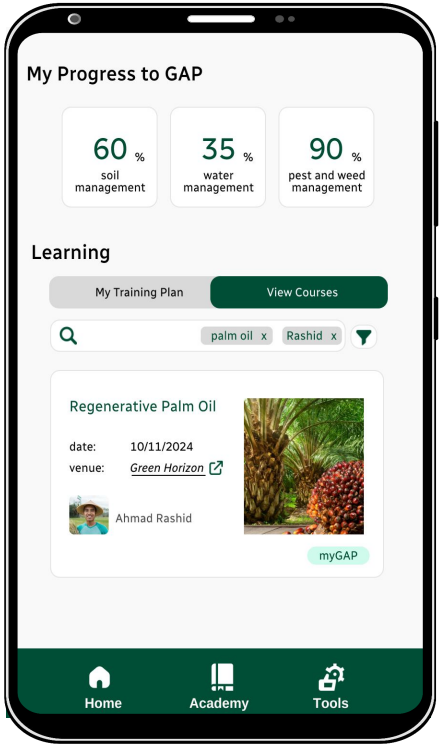



# Solution 1: Sustainable Farming Academy

Mobile app act as a complementary tool to support the learning.

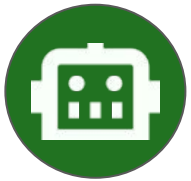
- Personalised learning plans through farming methods assessment
- Book physical training slot easily
- Curriculum aligned with Good Agricultural Practice (GAP) standards



## Solution 2: Sustainable Farming Tools

Complementing these training programs, HarvestOptima Suite offers a range of practical tools to support farmers in implementing sustainable practices.



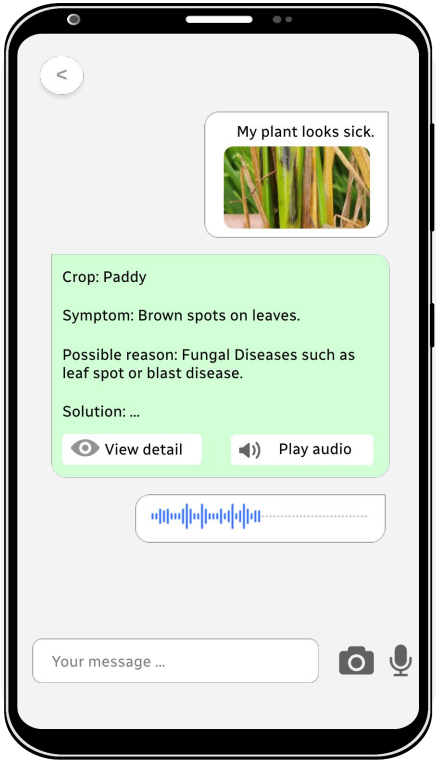
Advisor Bot

IPM Guide

Ask Others!

# Verified knowledge

- Real-time solution
- Professional - verified knowledge base
- Simple local language

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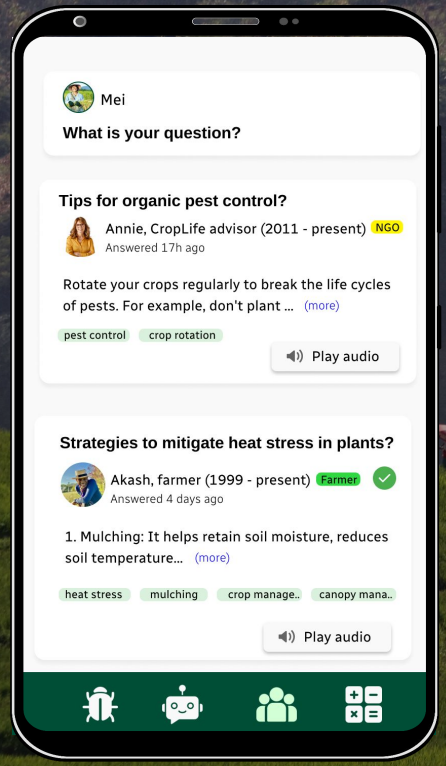



**Ask others!**

- Expert verification system

App Preview:

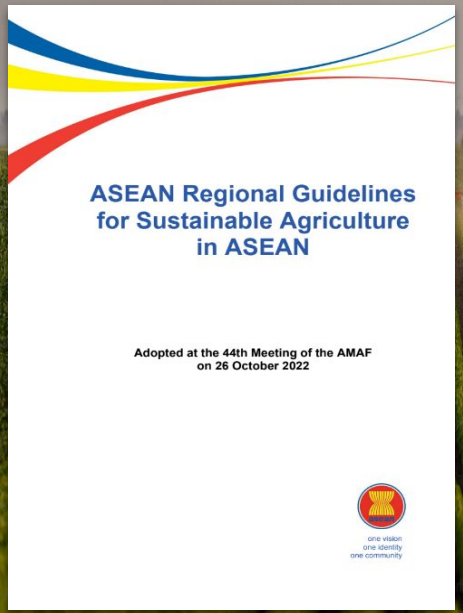
** specific technologies used
[1] Retrieval Augmented Generation (RAG)
[2] Large Language Model (LLM)

# Easily Navigable

Actionable advice personalised to your crop

Satellite-powered crop detection

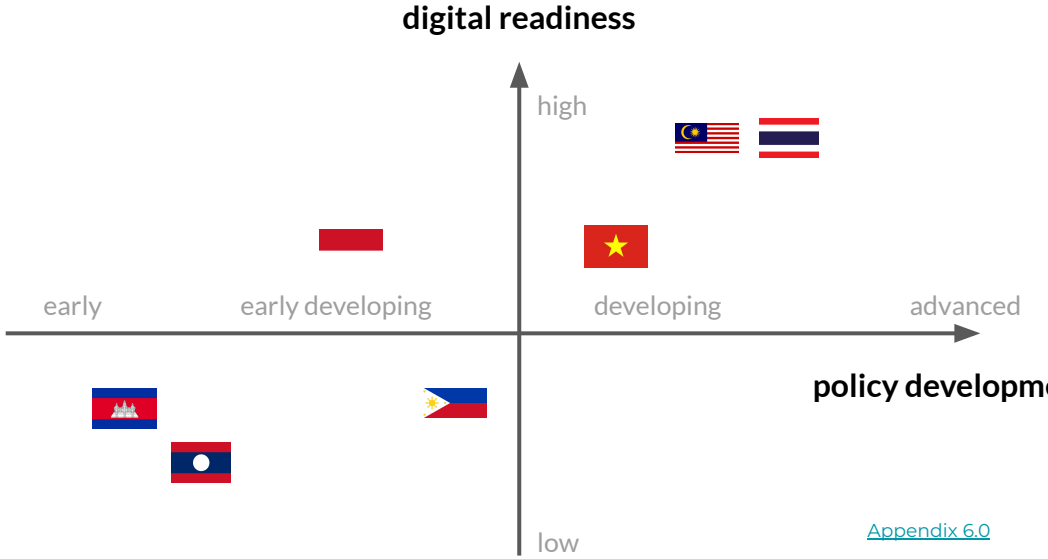
ASEAN is committed to **accelerating** the adoption of sustainable agriculture.




Guideline


Action Plan

# **ASEAN Member States** are slowly shifting to sustainable agriculture.




**2** **ASEAN member states** are slightly ahead with transition into sustainable agriculture with greater digital readiness and policy readiness.

Appendix 6.0

[8] *The evaluation of each country's readiness to transition into sustainable agriculture focuses on two main aspects: policy development stage and digital readiness, which encompasses infrastructure, accessibility, affordability, and quality. This analysis is based on national strategic agriculture plans and policies sourced from the Food & Fertilizer Technology Centre (FFTC) and the Food and Agriculture Organization (FAO) for policy development, as well as the Universal Service Provision Fund, percentage of rural population, fixed and mobile internet access, internet speed, and affordability to assess digital readiness. Detailed findings are presented in Appendix 6.0.*

# Our solution is...

## Feasible

**2**

ready country markets

## Scalable

**4**

country markets

phase 1 

phase 2 

## Sustainable

**6**

long-term national & regional partnerships

**3**

revenue streams

(Appendix 8.0)

## Impactful

**≈65%**

ASEAN smallholder farmers

Source:ASEAN (2023)

# Implementation Timeline & Key Enablers

## 2024 - 2025

**R&D and Partnerships Building**

Training Course Preparation
Knowledge database preparation
Prototyping & iteration
Market Research

## 2025 - 2026

**Pilot Testing**

MVP Testing & iteration

## 2026 - 2029

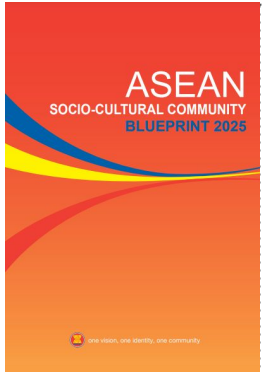
**Product Launch & National Expansion**

## 2030 onwards

**Regional Expansion**

| Knowledge Partner | Outreach Partner | Implementation Partner | Tech Partner |
|---|---|---|---|
| Established & experience farmers<br>Research institutes<br>Ministries of agriculture | Farmers cooperatives and associations<br>Local established & experienced farmers<br>NGO | | Tech provider |

## ASEAN Blueprints




**A.4.** Promoting Information and Communication Technology (ICT)

**B.3.** Enhancing food security and safety

**D.10.** Responding to Climate Change and addressing its impacts


**B.4.** Productivity-Driven Growth, Innovation, Research and Development, and Technology Commercialisation

**B.8.** Sustainable Economic Development

## UN SDG Targets

Appendix 9.0


**Target 2.3**

By 2030, double the agricultural productivity and incomes of small-scale food producers


**Target 2.4**

By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production


**Target 13.1**

Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries


By 2030,
x2 yield & farmers income
ensure a food-secure
ASEAN

# THANK YOU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# Appendix

# Appendix 1.0 - ASEAN Soil Groups Distribution Data

Table 3 Proportional area of FAO-UNESCO Soil Groups (FAO 1974) in the ASEAN region.

| FAO-UNESCO Soil Group | BRN | KHM[A] | IDN | LAO[B] | MYS[C] | MMR | PHL | THA | VNM[D] |
|---|---|---|---|---|---|---|---|---|---|
| | (%) | | | | | | | | |
| Acrisols | 57 | 14 | 29 | 73 | 62 | 10 | 25 | 38 | 63 |
| Alisols | | | | | | | | | 1 |
| Andosols | | | 4 | | | | 4 | | |
| Arenosols | | | | 3 | 3 | | 1 | 2 | 2 |
| Cambisols | | 2 | 35 | 12 | 11 | 28 | 11 | 2 | |
| Ferralsols | | | 12 | 1 | 4 | 39 | | <1 | 8 |
| Fluvisols | 13 | 27 | 10 | 1 | 3 | 2 | <1 | 1 | 18 |
| Gleysols | 10 | 12 | | 2 | 4 | 14 | 2 | 8 | 2 |
| Histosols | 10 | | 8 | | 8 | | | <1 | |
| Leptosols | | | | 1 | | | | 1 | 1 |
| Lixosols | | | | 1 | | | | | |
| Luvisols | | 28 | | 4 | 3 | 3 | 11 | 8 | |
| Nitosols | | 1 | | | | 3 | 42 | | |
| Plinthosols | | | | | | | | 5 | |
| Podzols | | | | | 2 | | | <1 | |
| Regosols | | | | 2 | | | | | |
| Vertisols | 10 | 16 | 2 | | | 1 | 4 | | |
| Slope complex[E] (Thailand; Vietnam) | | | | | | | | 32 | 5 |

[A]Rice soils only (White et al., 1997); [B]Soil Survey Land Classification Centre, National Agriculture and Forestry Research Institute, 2015; [C]Department of Agriculture (Peninsular Malaysia, Sabah and Sarawak), 2004 (unpubl. data) UNESCO; [D]Vietnam Soil Science Society, 2000; [E]Slope > 35%.

(ASEAN, 2017)

## Appendix 2.0 - Soil Descriptions

| Soils | Characteristics | Major Crops |
|---|---|---|
| Acrisols | Acidic soils with low base cation status; formed under conditions of strong leaching; increase in clay content in the subsoil; may have hard - setting surface characteristics; **low soil fertility status**; **low soil biological activity**. | Upland rice, paddy rice, soybean, maize, groundnut, cassava, tea, coffee, rubber, pineapple, sugarcane, banana, cashew |
| Cambisols | Brown soils with a weakly developed subsoil; loamy to clayey texture; generally well structured with a moderate plant available water - holding capacity; slightly acidic to neutral pH; satisfactory soil fertility; risk of landslip if deforested on sloping land | Forest, fruit trees, rubber, mango, pineapple, soybean, maize, cassava, coffee |

(ASEAN, 2017)

# Appendix 3.0 - In-Person Interview Output

[Link to spreadsheet]

| | | | |
|---|---|---|---|
| 1. The top 3 challenges for sustainable farming. (yes for sustainable farming) | a) Mindset shift:<br>"The top three challenges for me personally as a farmer, right? I mean, influencing others is science. I guess in the six years that I've been doing this, which is not a lot, honestly, there are much older generation farmers out there and they've been doing this for like decades right but I guess if you want to say strictly for our generation what are the challenges that I observed myself and other farmers will chew it up number one is the mindset shift away from conventional agriculture to more sustainable means."<br>b) Lack of support:<br>"The second challenge would be the lack of support from our Malaysian context. Now, what I mean by that is be it through support of financial funding, be it through partnerships, collaborations with both private entities and government bodies, right, is sorely lacking in the Malaysian context, right."<br>c) Building community:<br>"The third challenge I would say is the community you see without the knowledge and without the support and evidence that we are hoping that our ancestors and the government can provide us, we have no one else to rely on but ourselves. We need to look at our neighbors our fellow farmers be it from whichever state however far sabah sarawak kelantan to penang we need each other to support each other both emotionally and say hey hey we're doing something right you know hey keep it up bro kind of a thing" | "Number one would be the societal aspect. Because breaking through into the agriculture industry in Malaysia is quite tough because the society within it is quite tough. There's a bit of discrimination within the industry especially if you are a city boy coming into the rural areas to start agriculture projects"<br>b) Economic challenges:<br>"Second would definitely be economically because in malaysia actually it's a double-edged sword when it comes to the economics of things. You can make a lot of money here in Malaysia, to be very honest, bigger than those first world countries such as the US or the UK, right? ... However you have to put more effort into the business compared to the organized structures that exist within first world countries."<br>c) Access to land:<br>"Third would be, okay, I take it back. Third one is also a big issue for me, which is access to land. ... So it is quite hard to find a land that can be rented above two, three acres, you know. And even if you find it comes back to the societal issue where if you are successful, you might agree at a price already with the landlords, but when they start seeing you a bit more successful, they will start to they start to dig in you know either by raising rent prices and both then what we agree or they want to take the land back" | a) Soil quality and environmental conditions:<br>"In Malaysia, this place is actually a very old area. So, in this area, our water quality is mainly brown, because our water quality is brown. In brown areas, and in high-temperature weather, our water quality is very high, also very warm, and also has a lot of rain."<br>b) Knowledge and education:<br>"The knowledge of sustainable agriculture is not easily accessible to everyone.<br>c) Labor and management:<br>"In terms of Operation Cost, it is indeed far higher, much higher due to operational differences, like we often have to rely on manual labor. This is much higher in terms of labor costs for organic farming. This is undeniable in terms of cost." |
| 2. Question on if they experienced climate change impacts | "Because the rain pattern is becoming so erratic, it's becoming less frequent. But when it does rain, it's a lot more extreme. So, I think just two weeks ago, there was this recent flux and wave of sharing online. We can see a lot of farmers posting wind damage. Corn, fruit trees, being blown over by the recent typhoon." | The farmer doesn't directly address climate change impacts. However, he shows awareness of environmental factors affecting farming:<br>"During the monsoon season heavy rains and wet conditions they're the ideal environment for fungus right so i had a fungal outbreak but my plants were strong and resilient enough that, and this, I'm talking about all, the whole plot of Bendi, right? Got infected by fungus. Just like that, within two days." | High heat, high rainfall. Soil condition and weather |
| - mostly they don't give a direct answer for this questions, so you can jsut mentioned that their answer(what they have stated) have some sort cover that they are aware of the impacts by climate change | | | |
| | mentions several sources of information and support:<br><br>1) Online resources: ""Hence, we go to Uncle Google and Auntie YouTube. We go visit and read and study all these journal articles that others have done their research overseas and try our best to extract that information and try and apply it in the local context.""<br>2) Community support: ""We need to constantly ask ourselves, push ourselves | The farmer mentions several sources of information and learning: | "So I say the second reason is because I get the most |

## Appendix 4.0 - No. of Facebook Group Members for Palm Oil, Durian and Vegetable

| Crop | Smallholder population | Facebook Group Members |
|---|---|---|
| Palm Oil | 300000 | 164000 |
| Durian | 14811 | 8200 |
| Vegetable Farmers | 43010 | 23000 |

source: (ISEAS, 2020)
source: (AM Investment Bank, 2024)
source: (Universiti Putra Malaysia, 2023)

# Appendix 5.0 - Facebook Group Memberships and Source Links

| Groups | Members |
|---|---|
| Pemborong Dan Pembeli Pertanian Malaysia | 33.8K |
| Malaysia Agriculture | 6.5K |
| Pertanian dan ternakan | 21.3K |
| Kelab Pengusaha & Penanam Tebu | 100.8K |
| Persatuan Penanam Sawit Malaysia | 164k |
| PERTANIAN PETERNAKAN RAKYAT MALAYSIA | 21.1K |
| 油棕公会 | 72.5K |
| Pertanian dan Penternakan Malaysia | 33.6K |
| 榴莲 马来西亚华农交流平台 | 8.2K |
| Persatuan Penanam Sayur Malaysia | 23K |

# Appendix 6.0 - National Agricultural Strategic Plans / Digital Readiness

| | Strategies related to Sustainable Agriculture | To Take Note | Stage |
|---|---|---|---|
| National AgroFood Policy 2.0 | Paradigm Shift towards a sustainable food system.<br><br>Adapted to Climate Change | It's observed greater focus put on Modern Agriculture rather than sustainable agricultural practices. | Developing stage |
| Thailand Agriculture Policies and Development Strategies | Strong emphasis on the balance and sustainable management of agricultural resources and environment | Thailand launch the plna as a 20-year development plan with many sub-development plans within which clear priorities is needed and ensure it's relevant in this VUCA world. | Developing stage |
| Vietnam's National Action Plan on Sustainable Food Systems period 2021-2030 | Strong emphasis of sustainable agriculture: Transition to ecological agricultural production (agroforestry, organic, IPM,SRI/SRP, VAC, landscape agriculture, favorable weather...)<br><br>Invest in large-scale training and technical assistance to assist vulnerable farmers, cooperatives, and businesses in adopting good agricultural practices and increasing resilience | | Developing stage |

Source: Food & Fertilizer Technology Centre (FFTC)

# Appendix 6.0 - National Agricultural Strategic Plans / Digital Readiness

| | Strategies related to Sustainable Agriculture | To Note | Rating |
|---|---|---|---|
|  Strategic Plan of the Indonesian Ministry of Agriculture 2020-2024 | Show emphasis on climate-resilient agriculture<br><br>Maintaining the sustainability of agriculture resources and the availability of agricultural infrastures and facilities | Strategic Plan did not mentioned about food self-sufficiency. | Early Developing Stage |
|  Philippine Agriculture and Fisheries Extension Strategic Plan 2023 - 2028 | Strengthen capability exchange of farmers/fishers in the adoption of appropriate and modern technologies<br><br>Upskill farmers/fishers, AEWs and ESPs through distance learning programs and knowledge sharing activities | The plan is just recently launched in 2023. | Early Developing Stage |

Source: Food & Fertilizer Technology Centre (FFTC)

# Appendix 6.0 - National Agricultural Strategic Plans / Digital Readiness

| | Strategies related to Sustainable Agriculture | To Note | Rating |
|---|---|---|---|
|  Lao PDR Agriculture Development Strategy to 2025 and vision to the Year 2025 | Budding focus on sustainable development and organic agriculture. | Limited but growing efforts. Many smallholder farmers in Laos already practice low-input or traditional farming methods, using fewer chemical fertilizers and pesticides compared to industrial farming good foundation for transition into sustainable farming. Planning stage for agriculture modernisation. | Early Stage |
|  Strategic Development Plan for Cambodian Agro-Industries | Emerging focus on sustainable agriculture. strong strategic plans developed | The complexity of coordinating between various government bodies could slow down progress.<br><br>While there is a focus on adopting new technologies, more investments in agricultural technology and climate resilience are necessary. | Early Stage |

Source: Food & Fertilizer Technology Centre (FFTC)

# Appendix 6.0 - National Agricultural Strategic Plans / Digital Readiness

| | Indonesia | Malaysia | Thailand | Philippines | Vietnam | Cambodia | Myanmar | Lao |
|---|---|---|---|---|---|---|---|---|
| Universal Service Provision Fund | since 2010 | since 2008 | since 2012 | | | recently | | |
| % Rural Population | | | | | | | | |
| Fix Internet | | | | | | | N/A | |
| Mobile Internet | | | | | | | | |
| Internet Speed | | | | | | | | |
| Affordability | | | | | | | | |

Source: https://www.eria.org/uploads/An-Inclusive-Digital-Economy-in-the-ASEAN-Region.pdf

# Appendix 7.0 - Customer / Consumer Journey for Experienced Farmers and Budding Practitioners

## Experienced farmers

Labels i.e., if satisfy myGAP or myOrganic

1. Propose training content and labels for courses

↓

2. Peer review process by other experts, and refinement

↓

3. Workshop outline and available training slot details are published on the app, ready for booking

↓

4. Schedule an on-site audit with a platform representative

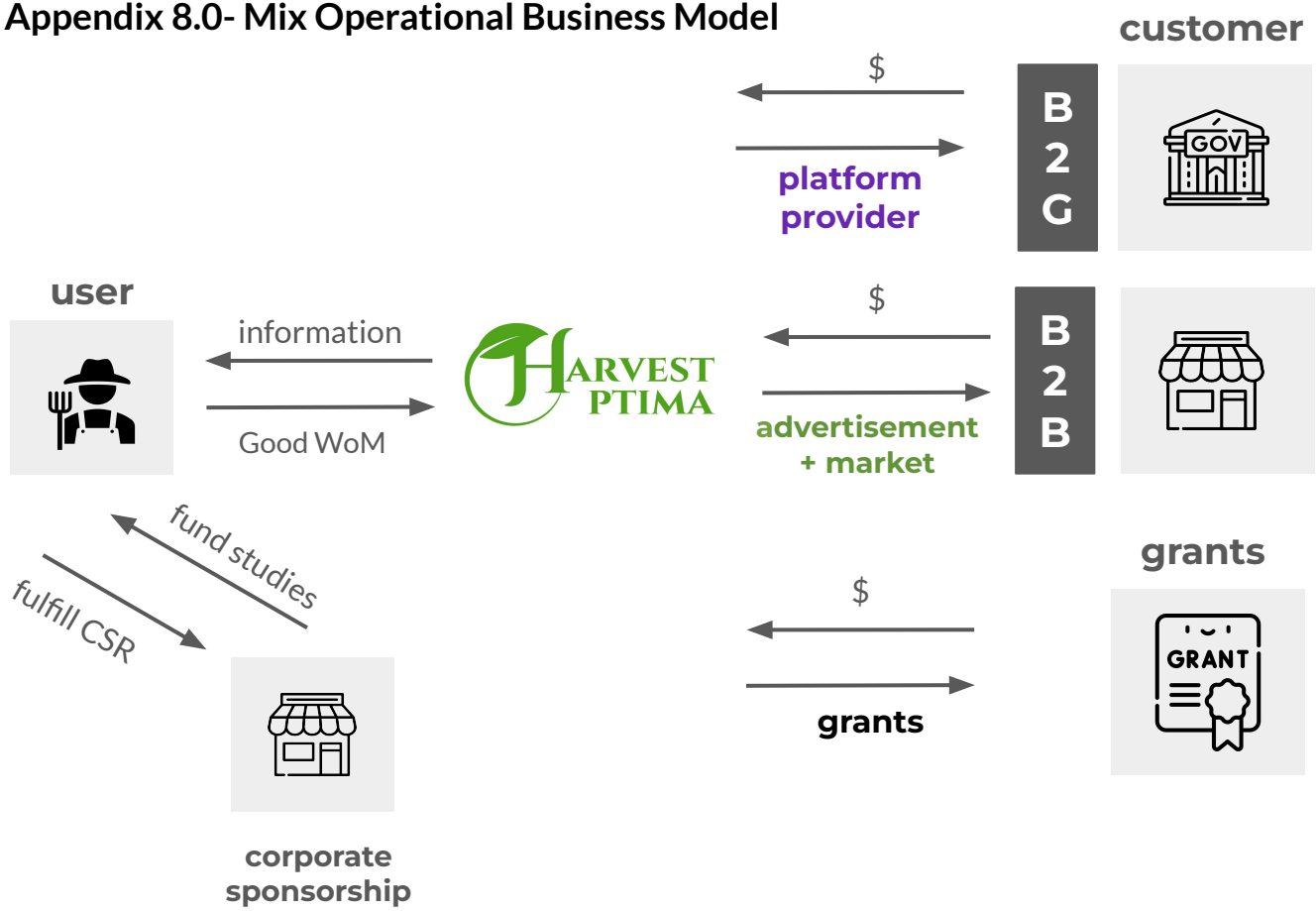
## Budding practitioners

1. Assess their farming methods

2. Receive personalised training plan suggestion

3. Pay and book a training slot

## Appendix 8.0- Mix Operational Business Model




3 revenue streams

- Platform
- Advertising
- Grants

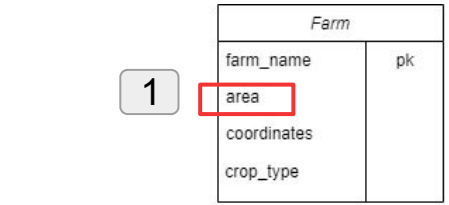
## Appendix 6.0 - Full Description of SDG Indicators

| | |
|---|---|
| Target 2.3<br>  | By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment |
| Target 2.4<br>  | By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality |
| Target 13.1<br>  | Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries |

# Appendix - Prototype Design For Sustainable Farming Tools

| | Front end: SAP Build Apps | | |
|---|---|---|---|
| Feature | Agri Advisor Chatbot | Integrated Pest Management | Discussion Forum |
| Technology | Retrieval Augmented Generation (RAG) on LLM i.e., BlenderBot by meta | Crop classification on GEE remote sensing imagery | SAP HANA Cloud |
| API used | Llama AI API (LLM) | Google Earth Engine (GEE) API (fetch remote sensing imagery) | |
| Benefits | Free | | |
| | Reliable information - No content hallucination | Reduce user manual inputs by detecting crop type and farm segments area through satellite imagery | User engagement and content analytics monitoring |

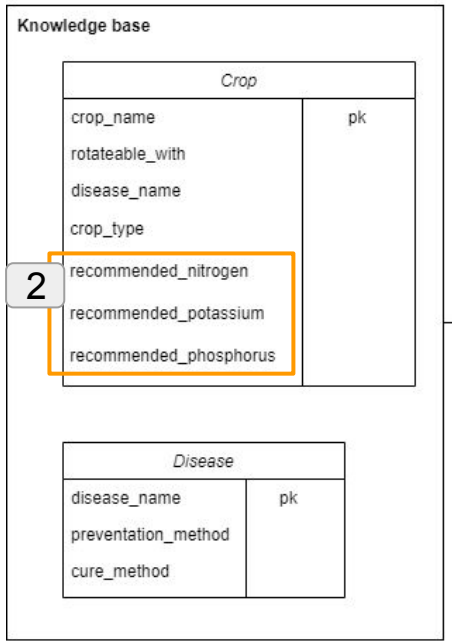
# Appendix - Technical Architecture

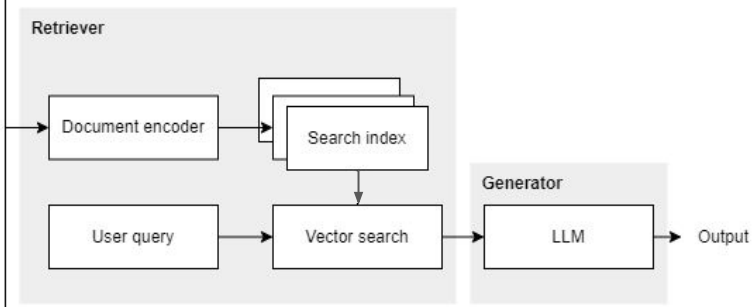



$$ureaNitrogenContent = 0.46$$
$$tspPhosphorusContent = 0.46$$
$$mopPotassiumContent = 0.60$$
$$ureaRequired = (recommendedNitrogen - currentNitrogen) * area / ureaNitrogenContent$$
$$tspRequired = (recommendedPhosphorus - currentPhosphorus) * area / tspPhosphorusContent$$
$$mopRequired = (recommendedPotassium - currentPotassium) * area / mopPotassiumContent$$

20,25,50 are the fertiliser product unit weights

$$bagUrea = ureaRequired/20$$
$$bagTsp = tspRequired/25$$
$$bagMop = mopRequired/50$$



# Appendix - About CRN

| Organisation | Description | Field of Work |
|---|---|---|
| ASEAN Climate Resilience Network | The ASEAN-CRN is established to ensure that ASEAN member states (AMS) are in a better position to adapt their agricultural sector to climate change and optimize its mitigation potential.<br><br>Members in ASEAN-CRN:<br>Brunei Department of Agriculture and Agrifood<br>Cambodian Agricultural Research and Development Institute (CARDI)<br>Indonesian Agency for Agricultural Research and Development (IAARD)<br>Laos National Agriculture and Forestry Research Institute (NAFRI)<br>Malaysian Agricultural Research and Development Institute (MARDI)<br>Philippines Department of Agriculture<br>Thailand Department of Agriculture<br>Vietnam Ministry of Agriculture and Rural Development<br>Singapore Food Agency | • National-level Implementation of Regional Agreements<br>• Knowledge Management and Capacity Building<br>• Mobilizing Resources<br>• Regional Policies and Engagement<br>• Research and Innovation |