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# Farmer Development

Agricultural sector is essential to economic mobilization and better livelihood of people in the countries across the globe. Agro products and food are the most important export products of the Southeast Asian region, and a key to sustainable economic development. Thai Wah strives to uplift quality of life of everyone throughout our value chains, and continue to create value, as well as innovation and sustainability, in all the value chains through various channels.

Efficient sourcing of raw materials, as well as sustainable management and development of supply chain, need systematic support in terms of modern technologies, proper agricultural know-how, and access to international resources and education. The support has been provided through our “Thai Wah Farmer Networks” to promote development throughout the supply chain, which would tangibly lead to long-term positive change.

Even with the continuous growth of our business and the broadened scope of supply chain, Thai Wah remains adamant to source agricultural raw materials responsibly and sustainably through promoting engagement of business partners and network of other partners in various sectors, i.e., public sector, NGOs, etc.

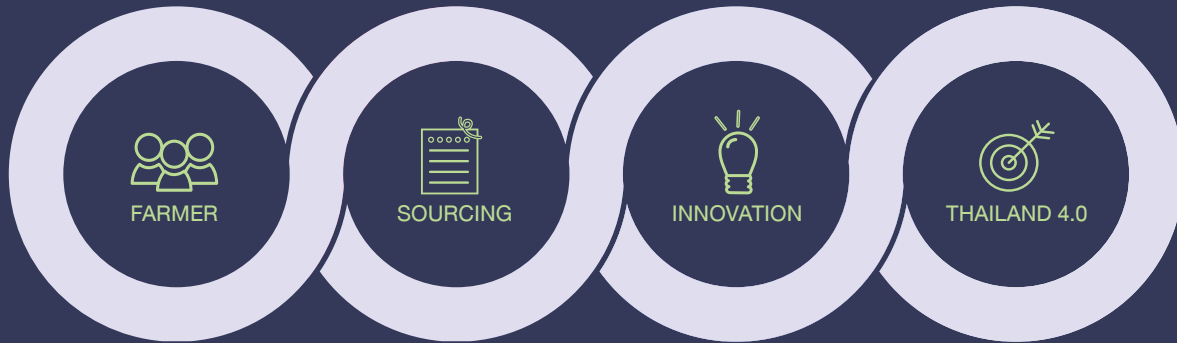


# Sustainable Development and Management of Supply Chain

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Amidst the rapidly changing business environment, economic challenges, increase in population, and limitation of natural resources, which have significantly affected the quantity and quality of agro products, Thai Wah is well aware of the need to manage and develop a supply chain in a sustainable manner as we believe that supply chain is the key to business efficiency and success. The focus has been made in all related procedures, from the supply of raw materials and production processes to sales of products in a

responsible and environmental-friendly manner. The Company also strives to conserve and rehabilitate watershed areas in a bid to promote natural resource security that is fundamental to people's livelihood, and maintain balance and sustainability of our business operation, as well as to develop innovations and technologies to enhance the capacity of agricultural and associated food supply chains.



### Farmer club

- Assist farmer in all solutions for the cultivation to increase productivity and reduce production cost from plant to harvest and deliver the factory

### Root Stations

- Get higher fresh root at source
- Create convenience as close to cultivation areas
- Keep good relationship with farmers
- Fair price was calculated base on quality of starch content
- Cash card payment.

### Innovation

- TWPC cultivation model
- High value added cassava planting
- Mobile application for farmers (weather forecast, raining forecast, and cassava knowledge)
- Queuing system for roots selling at factory

### Smart Farming

- Improve cassava yields
- Farm demonstration model since 2019
- Communication system with farmers through the application

## Model Farm at School

The Company strives to promote strong organizational growth, in parallel with sustainably creating social and community value, starting from youths, as individuals, to families, and communities. We are well aware that social responsibility is vital to our business capability, and thereby implementing “Thai Wah’s Agricultural Sustainability” campaign for the development of green farmers, societies, and communities. The campaign is aimed to instill a passion for agriculture among the new generations, and educate them on integrated farming according to the royal initiatives, as well as on safe agriculture and organic farming, in order for them to

become capable farmers and role models to other farmers in their community. Participated youths are expected to adopt agro-technology knowledge, gained from the campaign, and smart farming under Thailand 4.0 Policy in their production process. Through Thai Wah’s entire financial subsidy, the campaign will be initiated at the youth level, while the outcome will be taken forward to the family and community levels later in a bid to empower the nation’s agro-industry as a whole. A secondary school in Mae Sot district, Tak province, has been chosen for the pilot campaign



Aims to instill a passion for agriculture among the students, educate them on integrated farming according to the royal initiatives as well as promoting safe agriculture and organic farming



Promotes the school as a community learning center and a model on integrated farming according to the royal initiatives



Create and develop potential farmers, who are capable and knowledgeable in agro-technologies back to the community

### Phase

1

#### Planting seedlings of sufficiency

Planting agricultural prototype in school

2

#### Branch into the community

Disseminate agricultural knowledge in the community

3

#### Put fertilizer on sustainability

Create a new generation of farmers by providing scholarships to model schools

## Volatility of Weather Patterns and Outbreak of Diseases



In addition to bracing ourselves against the volatility of weather patterns, the Company also focuses on promoting resilience to mitigate risks that may impact our security for sourcing of agricultural raw materials and production process. Thai Wah has established both short-term, medium-term, and long-term strategic management plans to enhance resilience to the volatility of weather patterns, i.e., R&D on new durable varieties and raw material substitutes, and identification of additional raw material sources, etc., to diversify risks related to weather volatility and the outbreak of diseases, which may impact current sources of raw materials.

Thai Wah Company, Mr. Umnat Sukprasongphol, Managing Director of Starch Business attend a tapioca trade information exchange event situation of tapioca and starch production trade trends in cassava production in Thailand and neighboring countries, including the situation of cassava mosaic disease. So that the members of the association acknowledge the current situation of cassava trade and future trends. The meeting was held at the Thai Tapioca Trade Association (TTTA) every quarter.

## Thai Wah Multiplication Program

X20 multiplication of CMD-free cassavas is an easy process. Twenty disease-free seedlings will grow from one stem in a month, instead of 4-5 seedlings per stem as before.



Greenhouse farming project for urgent production of cassava seedlings has been implemented to tackle the spread of cassava mosaic disease (CMD) in Thailand, Vietnam, and Cambodia, which has occurred since 2018, resulting in the inadequacy of disease-free seedlings for cultivation. Thai Wah, in collaboration with the Thai Tapioca Development Institute (TTDI), implemented the project to provide our farmer-members, with technology and knowhow for urgent production of cassava seedlings.

In 2020, the Company, in collaboration with the Thai Tapioca Development Institute, has built 10 greenhouses for the purpose of research and development of new seedlings, and the production increase of disease-resistant seedlings, as well as development of disease-free tapioca breeds by way of rapid multiplication technologies (X20 and X80) to produce large number of cassava seedlings within a short period of time. This is to ensure sufficiency

of disease-free setts for farmers during the next cassava planting season. A total of 362,151 stems obtained from the X20 multiplication process have been distributed to the farmers under Thai Wah network. The Company also plans to build more to 23 greenhouses in 2021 in Thailand, Vietnam, and Cambodia.

Thai Wah also strives to help generate incomes and uplift quality of life of the farmers by propagating new variety of waxy cassavas, of which its agronomic traits are higher quality and higher yield, to increase crop values. This is also in line with the Company's strategy to establish Thailand's role in the global tapioca starch industry through increase of economic values and exportation.

	2019	2020	Target 2021
Number of greenhouse farming (places)	3	10	23

# Responsible Supply Procurement

With a realization that efficient supply of raw materials involves not only sourcing of agricultural raw materials, but also the management of other kinds of raw material, i.e., packages, warehouses, and logistics, the Company has implemented strategic approaches for raw material management, such as surveys on the Company's primary sources of raw material to assess and analyze the quantity of raw materials to be supplied for now and its future trend.

Thai Wah also commits to promote long-term community development through new innovations that engender community sustainability. The initiative for promotion of our agricultural community is to create "Thai Wah Farmer Networks", that provides the farmers with resizable agricultural technology and introduce Thai Wah's smart farming solution model, which is the best in the region, for their better livelihood. Global supply chain management has also been improved to accommodate future demand and enhance farmers' wellbeing. Key operation plans include :



## THAI WAH FARMER NETWORK

- Secure sourcing supply
- Transfer knowledge and technology to farmers
- Build strong regional farm network



## AG TECHNOLOGY

- Co-develop technology for precision farming
- Enhance analytics capability to predict yield, supply, and price



## SMART FARMING SOLUTIONS

- Farming solution package for farmers for multiple crops
- Service through financing, education, marketplace
- Innovate agricultural inputs to improve yield and promote regenerative agriculture

## Thai Wah Farmers Network

Thai Wah valued farmers as business partners. We provide support and assistance to the farmers in a systematic manner through the adoption of modern technologies and useful agricultural-related knowhow, for them to grow and develop in accordance with the international standard. The Company believes that the mutual growth of business partners is a key to enable business stability. We give priority on knowledge transfer, together with sharing of experiences with our business partners. This is also to enhance production capacity and upgrade our agro products in a responsible manner, which will ultimately lead to the stability of agro-industry in the long run.

In 2020, 4 Thai Wah's root stations were in full operation, while construction of the 5th has been planned in 2021. With these root

stations up and running, the number of fresh cassava roots directly received from the farmers has been increased. The Company also managed to enhance trust and maintain a good relationship with the farmers. Raw material buying has been conducted fairly with the farmers. Raw material buying has been conducted fairly with the fresh cassava roots being priced according to the amount of starch content, and the payment has been made through an electronic cash card system. Aside from the fact that the Company managed to reduce the cost of raw material (fresh cassava roots), the root stations have made it more convenient for the farmers to sell their products and help reducing transportation costs and time. In 2020, Thai Wah bought over 120,000 tons of fresh cassava roots, accounting for 13% of all fresh cassava roots required, from over 6,000 farmers at the root stations.

	2018	2019	2020	Target 2021
Number of root stations (places)	4	4	4	5
Proportion of buying fresh roots through the root stations (%)	N/A	10	13	25



# Sustainable Agricultural Strategy



## Agronomist

- Mission “Farmer First”
- Expertise / Specialist
- Passion to serve farmer



## TWPC Learning Center

- 36 learning center in 2023
- Transfer knowledge & technology to farmers
- Create “TW Virtual Farming Classroom”



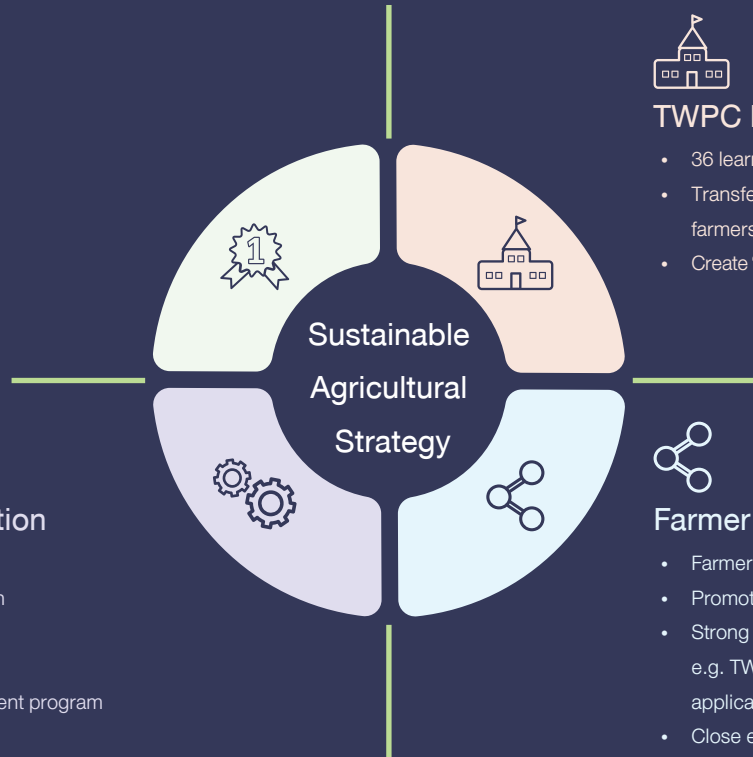
## Technology Adoption

- Practical solutions
- Effective implementation
- Easy adoption
- Promising results
- Impact to the development program



## Farmer Loyalty

- Farmer bonus scheme
- Promote TWPC farmers role model
- Strong farmer network community e.g. TW farmer line / Mobile application
- Close engagement from executive team



Thai Wah provides knowledge on safe and proper cassava cultivation and productivity increase techniques and distributes certified cassava cuttings to the Company's farmer-members. In 2020, we organized training courses for Thai Wah members, such as increasing productivity by improving soil, the use of certified varieties, and the use of modern agriculture machine. Including the use of mobile applications to track weather and cultivation. Currently, the number of Thai Wah's cassava farmer-members has increased around 1,189 farmers, from 380 to 1,569 farmers with an increase of yields from 5.5 tons/rai to 5.8 tons/rai, or an increase of 8%, which will be harvested in the crop 2020/2021.

As a result, the Company enjoyed a proportion of 53% in direct purchase of fresh root from farmers in 2020 for Thailand plants. The goal has also been set to increase a proportion of direct cassava sourcing from farmers to 63% in 2021 for Thailand plants, and 10% for Vietnam plants.

Thai Wah Tapioca Learning Center



	2018	2019	2020	Target 2021
Number of farmers participating in the project (person)	120	380	1,569	3,000
Number of planting areas participating in the project (rai)	2,400	15,000	19,088	40,000
Average yield per rai (tons/rai)	4.5	5.5	5.8	6.0
Number of farmers participating in the training (person)	200	250	897	2,500
Number of tapioca learning center	0	3	3	12
Supporting compost and soil improvement materials for farmer - members (tons)	370	3,400	9,051	15,000
Proportion of direct cassava roots sourcing from farmers in Thailand (%)	N/A	44	53	63
Proportion of direct cassava roots sourcing from farmers in Vietnam (%)	N/A	N/A	5	10



## Thai Wah Thanks Farmers (Thank You Farmers Day)

Thai Wah treats our farmers as partners and as a long-term part of Thai Wah strategies and growth. Thai Wah is delighted to partner with the local communities and local farmers to see how we can collaborate together for the sustainable development in a long-term through “Thai Wah Thank You Farmers Day” to thanks

all the farmers that always deliver cassava roots which is a raw material to our starch factory. The Company has paid dividends of profits from doing business back to farmers in every quarter in Phimai district, Nakhon Ratchasima province, Muang district, Udonthani province, and Tha Khantho district, Kalasin province.



## Pracharat Large-Scale Farming Scheme and Modern Agriculture

Throughout the success of large-scale plantation and modern agriculture under Pracharat (public-private partnership) scheme, Thai Wah has taken part in the scheme since 2016 with the large-scale cassava plantation of 1,740 rai in Nikom Sang Ton Eng sub-district, Pimai district, Nakhon Ratchasima province. The aim is to provide trainings and knowledge to farmers for cost reduction and productivity improvement through the adoption of a drip irrigation system and rainfed farming. Knowhow and technologies attained from the prototype large-scale cassava plantation have been transferred to other communities. The number of participated farmers and plantations increased from approximately 3,600 rai in 2019 to approximately 5,400 rai in 2020, and, an increase of cassava yields from 5 tons/rai to 5.5 tons/rai, or an increase of 8%.

### Pracharat Large-Scale Farming Scheme

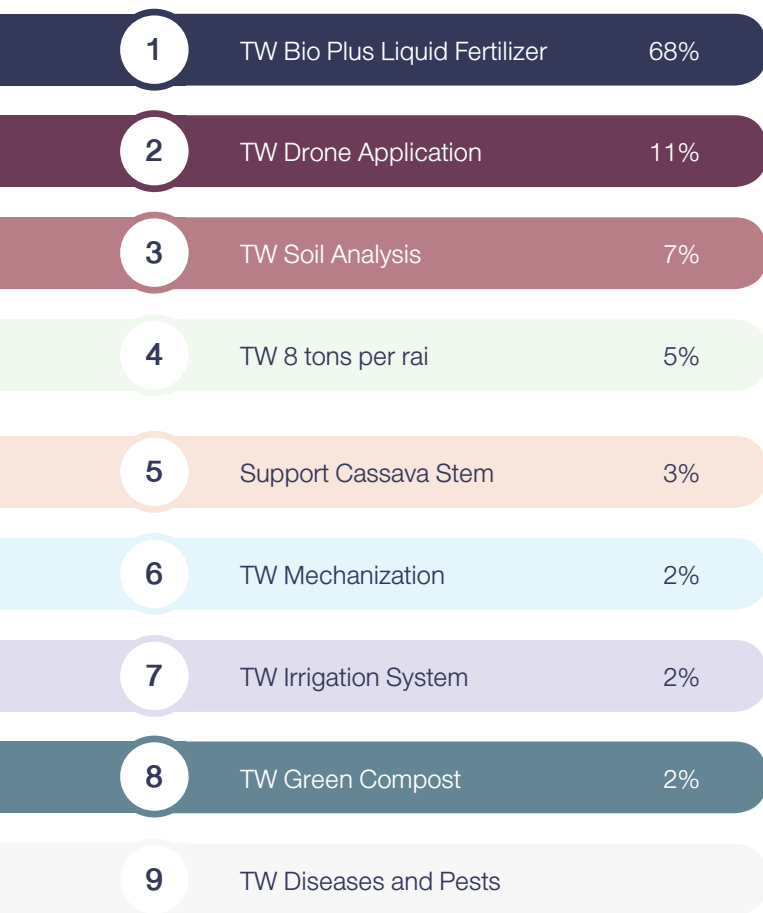
	2018	2019	2020	Target 2021
Number of farmers participating in the project (person)	110	154	245	320
Number of planting areas participating in the project (rai)	2,400	3,600	5,400	7,000
Average yield per rai (tons/rai)	4.5	5.0	5.5	5.8

## AG Technology

Thai Wah took part in the development of precision agriculture, through which digital farming technologies, i.e., tools and devices (hardware/software), IT services (precision positioning system, remote sensors, variable rate technology, etc.), and applications (measurement and assessment of weather condition, yields, and terrains, and waste management, etc.), have been applied in a bid to increase analysis efficiency, productivity, and yield quality which would lead to product competitiveness enhancement at the global level. In implementing precision agriculture, water, fertilizer, and pesticides have been apply at the precise amount and accurate timing to maximize efficiency. It is a cropping practice that optimizes resources at the plot or greenhouse level. Overall, farmers who adopted precision agriculture in their cultivation were able to increase yields four times, compared to traditional farming.

In 2020, the Company regularly held various farmer activities to strengthen Thai Wah Farmer Networks and promote sustainable sourcing. A number of innovations have been introduced, i.e., cassava planting-cum-fertilizing machine which save time, labor, and cost, and the semi-automatic cassava harvester (undergoing the development process in 2021), for the more convenient harvesting process. Know how has also been provided to the farmers in 9 major topics:

## Farmer Club Program 2020



1



### TW Bio Plus Liquid Fertilizer

This is the fertilizers produced from fermented manure mixed with essential plant macronutrients for foliar plant spray during the dry spell. The TW Bio plus liquid fertilizer has been distributing to members free of charge when they sell cassava roots to the Company. At present, 2 formulas of liquid fertilizer have been produced, one that suits 1–3-month-old cassava, and the other for 4-month-old cassava and above. This is, by far, the most popular program among the farmer members as the outcome is tangible, and the program significantly helps the farmers to reduce cost of chemical fertilizers.

2



### TW Drone Application

Providing drone service to farmers. In 2020, farmers, whose farming plots amounted to over 2,000 rai, made reservation for use of the drone.

3



### TW Soil Analysis

Introducing soil and fertilizers improvement, and soil restructuring to suit cassava cultivation, from soil condition analysis to problem solving.

4



### TW 8 tons per rai

Thai Wah has encouraged farmers to use knowhow and adopt modern technologies in cassava cultivation process, i.e., academic techniques in growing cassavas, and use of mobile applications to monitor yields and weather condition, through the support of the Company's agronomists and external experts. Farmers in Thai Wah network also had a chance to participate in a product competition. The winners of the competition have been named Thai Wah's role model farmers, and may share their successful stories to other farmers.

5



### Support Cassava Stem

Quality cassava sett provision to the members. The farmers may reserve the queue to receive quality and disease-resistant cassava stems, produced at the Company's greenhouses, free of charge for their seasonal cultivation. In 2020, over 540,000 stems were given out to the farmers.

6



### TW Mechanization

Introducing and providing advices on machineries, from planters usage to demonstration of modern machines usage on prototype plots, e.g., fertilizing machine, to enhance harvesting speed and convenience, etc.

7



### TW Irrigation System

This is the ideal irrigation system for cassavas that beats all the limitations. The program helps the farmers in identifying water sources, directly contacting manufacturers for low-cost agricultural factors, and providing knowledge on irrigation and other related systems that help minimize cultivation problems brought about by water scarcity.

8



### TW Green Compost

The program is aimed to promote organic agriculture among Thai Wah Farmer Networks through the use of natural materials, i.e., fresh fertilizers, for cultivation of cassavas and mixed crops. Under the program, Thai Wah provides bio-organic composts, or “TW Green compost”, which is used to improve soil condition and pH balance for “Good Soil, Fast Growth, Good Benefits”. The composts have been produced from manufacturing wastes, such as cassava peels and pulps, and sludges from wastewater treatment ponds which contain high soil organic matters, to fertilize the soil. In 2020, the Company distributed 8,000 tons of composts and soil-fertilizing materials to the farmers.

9



### TW Diseases and Pests

The Company’s agronomists have established disease and pest clinic with an aim to provide support and assistance on disease and pest problems in cassavas. The clinic also collaborates with concerned public agency to publish booklets and brochures on preventive and responsive procedures, and distribute them to Thai Wah Farmer Networks. Pesticides and pest control supplies are also given out on a regular basis.



## Thai Wah Agricultural Innovation



### Pre - Harvest

Crops

Green House / Breeding

TW BioPlus® & Green Compost

Soil

TW Soil Solution

Monitor

Farm Database

NIR Starch Content

Crop Health Monitoring

Drone (Yield Analytic)



### Post - Harvest

Harvest

TW RAPTOR : Roots Harvester and Loading System

## Smart Farming

Thai Wah continues to recruit new farmer members via the digital platform, starting with Thailand, in order to promote digital platform services for farming. The Company also conducts platform update, especially in terms of data accuracy, and expand our services, such as personal loan and fund acquisition.

In 2020, farmer and cultivation database on Thai Wah's digital platform has regularly been updated, from which growth analysis system was developed based on the vegetation index and cultivated area survey. Satellite images with over 90% accuracy is also used for crop monitoring. The database has also been used to analyze and forecast daily/weekly/monthly rainfall, which could be conducted up to 9 months in advance. In addition, in the year 2021, analysis model for yield forecasting, productivity, and yield quality (% of starch content) continue being developed.

All these digital platforms will contribute to the Company's planning for sustainable raw material sourcing. We also strive to help prepare Thai Wah farmers for technological changes, and improve their decision making on tapioca cropping through the adoption of digital platforms to ensure efficiency and maximize effectiveness.

## Mobile Application



	2018	2019	2020	Target 2021
Number of farmers membership on digital platforms (person)	121	501	1,242	10,000
Number of planting areas on digital platforms (rai)	2,950	9,577	39,992	230,000
Proportion of the total cultivated area of Thai Wah farmers (%)	2	6	25	100
Number of farmers membership on digital platforms who continuously login every month. Monthly active user (person)	N/A	N/A	70	2,000



## Smart E-Money Card

The Company also accepted advance registration for farmers to reserve cassava sales queues under the “Happy Farmers, Selling Faster and No Need to Wait” scheme. The mobile application system for queue reservation is being developed for the farmers to be assured that their products will be accepted and sold. The Company will also be able to plan for cassava supplies and collect cultivation-related data consistently. The payment of cassava will be made via e-money card of the banks the Company enrolled with. Currently, e-money card system and advance registration system have been up and running at our tapioca starch factories in Nakhon Ratchasima’s Pimai district, Kalasin’s Tha Khantho district, and Udonthani’s Muang district. In 2020, there are 5,592 E-Money card users in total, increased from 2,888 users last year. The average amount of money paid through an E-Money card accounted for 15,408 baht per person per month. Thai Wah helped reduce the number of farmers under the poverty line\* and supported farmers to have a better quality of life. The Company also plans to implement the scheme in other factories in the future as well.

\* Poverty line in 2019 was 2,763 baht per person per month (Source: Office of the National Economic and Social Development Council)

