ADB TA-9993 THA: Climate Change Adaptation in Agriculture for Enhanced Recovery and Sustainability of Highlands

Grower Certification Schemes, Organic Farming, and Good Agricultural Practices

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Foreword

Thailand has begun developing a basic food safety standard known as GAP (Good Agricultural Practices) to ensure safety for both producers and consumers. This standard encompasses production processes that minimize environmental impact. However, there is an increasing public demand for safe food, leading to stricter standards than the minimum domestic requirements, such as Participatory Certification and Thai Organic Agriculture (TAS). International standards, like IFOAM, EU, and NOP, are also considered.

Farmers in Nan and those living in highland areas face several limitations when it comes to obtaining certification. To address these challenges, additional support should be provided in the following ways:

(1) **Education and Awareness**: Organize workshops and informational sessions to emphasize the benefits of Good Agricultural Practices (GAP) certification. These benefits include improved product quality, access to larger markets, increased profits, and enhanced food safety.
(2) **Demonstration Farms**: Establish demonstration farms that highlight the successful implementation of Good Agricultural Practices (GAP). This will enable farmers to observe the tangible benefits and processes involved.
(3) **Financial Incentives**: Provide information about available grants, subsidies, or financial assistance programs that can help cover certification costs, making it more attractive for farmers.
(4) **Peer Support Groups**: Encourage the creation of groups or cooperatives where farmers can share experiences and resources, providing motivation to one another as they work towards certification.
(5) **Expert Guidance**: Provide access to agricultural experts or consultants who can help farmers understand and meet Good Agricultural Practices (GAP) standards.
(6) **Success Stories**: Share case studies or testimonials from farmers who have successfully achieved GAP certification and highlight the positive impacts it has had on their businesses.
(7) **Market Access Promotion**: Inform farmers about potential new markets and buyers who prefer or require GAP-certified products. This information can provide them with a competitive edge.
(8) **Training Programs**: Develop training programs that focus on GAP practices and requirements, ensuring that farmers acquire the necessary skills and knowledge for certification.

By combining these strategies, we can create a supportive environment that encourages Nan farmers to pursue GAP certification. This, in turn, will benefit their operations and contribute positively to the agricultural community as a whole.

Additionally, very few farmers have obtained the organic Thailand Certificate. In this context, all sectors should collaborate to achieve the following goals. Various stakeholders can assume specific and cooperative roles:

(1) Government Agencies:
- Policy Development: Create and enforce policies that promote organic farming and outline transparent certification processes.
- Financial Support: Provide grants, subsidies, or low-interest loans to help farmers cover certification costs.

- Training Programs: Organize workshops and training for farmers on organic practices and certification requirements.

(2) Agricultural Cooperatives:
- Resource Sharing: Facilitate shared resources, such as equipment and marketing efforts, which can reduce the burden on individual farmers.
- Collective Learning: Promote peer-to-peer learning and sharing experiences among farmers pursuing organic certification.

(3) NGOs and Non-profit Organizations:
- Education and Advocacy: Raise awareness about the benefits of organic farming and certification.
- Capacity Building: Provide training and technical assistance in organic farming methods and certification processes.

(4) Research Institutions:
- Technical Guidance: Conduct research on best practices for organic farming and develop materials that help farmers understand the benefits and methods of organic agriculture.
- Innovation Development: Work on developing more efficient organic farming techniques and pest management solutions.

(5) Certification Bodies:
- Transparent Process: Ensure the certification process is straightforward and accessible, providing necessary guidance at every step.
- Support and Training: Provide farmers training on meeting certification standards and technical support during certification.

(6) Agribusiness and Market Buyers:
- Market Access: Commit to buying certified organic products, increasing demand and providing farmers financial motivation.
- Partnerships: Collaborate with farmers to guarantee fair prices for certified products and provide feedback to help improve practices.

(7) Community Organizations:
- Local Support Networks: Create support networks that facilitate knowledge sharing and provide encouragement throughout the certification journey.
- Events and Workshops: Organize local events to celebrate certified farmers and promote organic products within the community.

(8) Consumers:
- Responsible Buying: Purchase organic products, demonstrate market demand, and encourage more farmers to pursue certification.
- Awareness Campaigns: Engage in campaigns to educate others about the benefits of organic farming and support local certified farmers.

Fostering collaboration among these stakeholders can create a supportive ecosystem that helps farmers navigate the challenges of obtaining the Organic Thailand Certificate while also promoting the benefits of organic farming. Focusing on these components can lead to developing food agriculture standards that benefit farmers, meet consumer needs, and promote sustainability within the food system. This collaborative approach ensures that all stakeholders are engaged in the process, fostering a healthy and sustainable food environment.

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Abbreviations

ADB	Asian Development Bank
ACFS	The Agricultural Commodity and Food Standards
AIT	Asian Institute of Technology
EU	Organic Agriculture Standards of European Countries
GAP	Good Agricultural Practice
GDP	Growth and national income
IFOAM	The International Federation of Organic Agricultural Movements
RMUTL Nan	Rajamangala University of Technology Lanna-Nan
NGO	Non-Governmental Organization
NOP	National Organic Program[1]
PGS	Participation Guarantee Systems
OAN	Organic Agricultural Network
SCE PGS	Sustainable Community Enterprise Participatory Guarantee System
SDGsPGS	Sustainable Development Goals Participatory Guarantee System
TA	Technical Assistance
TAS 9000	Thai Agricultural Standard
TSAC	Thailand Sustainable Agriculture Confederation
WTO	The World Trade Organization
WWF	World Wild Fund for Nature

[1] NOP is a federal regulatory program that develops and enforces consistent national standards for organically produced agricultural products sold in the United States.

1. What are Good Agricultural Practices (GAP)?

Regarding the Ministry of Agriculture and Cooperatives notification on September 30, B.E. 2552 on the Thai Agricultural Standard entitled Good Agricultural Practices for Food Crop (TAS 9001-2552), which has been published in the Royal Gazette, dated December 28, B.E. 2552 (2009), the said standard is amended to the changing situation according to the framework of ASEAN Economic Community Blueprint (AEC Blueprint). The Agricultural Standards Committee deems it necessary to revise the TAS 9001-2552 for Thai produce recognition of food safety and quality for consumption and to consider the environment, workers' health, safety, and welfare more[2].

NOTIFICATION OF MINISTRY OF AGRICULTURE AND COOPERATIVES SUBJECT: THAI AGRICULTURAL STANDARD: GOOD AGRICULTURAL PRACTICES FOR FOOD CROP UNDER THE AGRICULTURAL STANDARDS ACT B.E. 2551 (2008)

The Agricultural Standards Committee deems it necessary to establish a voluntary standard on Good Agricultural Practices for Food Crops by the Agricultural Standards Act B.E. 2551 (2008) to promote such agricultural commodities and meet its standards on quality and safety.

Under Section 5, Section 15, and Section 16 of the Agricultural Standards Act B.E. 2551 (2008), the Minister of Agriculture and Cooperatives issues this Notification on the Establishment of Thai Agricultural Standard: Good Agricultural Practices for Food Crop as follows:

(1) The Notification of the Ministry of Agriculture and Cooperatives on Thai Agricultural Standard entitled Good Agricultural Practices for Food Crop dated 30 September B.E.2552 (2009) is repealed.
(2) The Thai Agricultural Standard on Good Agricultural Practices for Food Crops (TAS 9001-2013) is a voluntary standard with details attached.

1.1 Thai Agricultural Standard - Good Agricultural Practices for Food Crop

1.1.1 Scope

This agricultural standard covers provisions of good agricultural practices (GAP) for food crops such as vegetables, fruits, field crops, spices, and herbs at every step of the farm and postharvest handling where produce is packed and/or collected for sale. GAPs aim to obtain safe produce of proper quality for consumption by considering the environment and workers' health, safety, and welfare.

1.1.2 Definitions

For this standard:

(1) Hazardous substances are materials or substances, either chemicals, microorganisms, or microbial toxins, which may harm humans, animals, plants, property, or the environment.
(2) Pesticide means a hazardous substance used in agriculture regulated by the Department of Agriculture according to the Notification of the Ministry of Industry entitled the List of Hazardous Substances issued under the Hazardous Substances Act B.E.2535 (1992) and its amendments.

[2] National Bureau of Agricultural Commodity and Food Standards Ministry of Agriculture and Cooperatives (2013)

(3) Pesticide residue means any specified substance in food, agricultural commodities, or animal feed resulting from pesticide use. The term includes any derivatives of pesticides such as conversion products, metabolites, reaction products, and impurities considered toxicological significance.
(4) Pest means living organisms such as diseases, insects, animals, and weeds that are injurious to crops.
(5) Fertilizer means organic, synthetic, inorganic materials or microorganisms from natural or synthetic formation to supply plant nutrients or change the soil's chemical, physical, or biological properties to promote plant growth.
(6) Hygiene means all conditions and measures necessary to ensure the safety and suitability of an agricultural commodity at all stages of production and fit for consumption.
(7) Traceability/Product Tracing means the ability to follow the movement of a food through specified stage(s) of production, processing, and distribution.

1.2 Requirements

Requirements of Good Agricultural Practices (GAP) for Food Crops shall be in Table 1.

Table 1:
Items and requirements of GAP for food crop.

Items		Requirements
1. Water	Water used in planting area	1.1. Water used in production shall come from environmental sources that do not cause contamination of hazardous substances in produce. In case of risk, water should be analyzed by either official or accredited laboratories for hazardous substance contamination. The analytical result record shall be kept as evidence.
		1.2. Do not use untreated sewage water from industrial factories or other sources, e.g., community or hospital, that can cause contamination of hazardous substances. If it is necessary to use such water, there shall be clear evidence or proof showing that it has been treated and can be used in the production.
		1.3. Take a sample of water at least once before entering the production system and when the environment is likely to cause contamination by official oraccredited laboratories for hazardous substance analysis. Analytical result records shall be kept as evidence.
		1.4. Water used for dissolving fertilizers and pesticides shall have a quality that does not decrease the effectiveness of such inputs.
		1.5. Availability of irrigated methods appropriate to the crop water requirement and soil moisture level.
		1.6. Availability of appropriate irrigated methods to prevent water loss and minimize risk affecting the environment of the planting area and its vicinity.
		1.7. Availability of wastewater management from on-farm activities, e.g., sewage from the toilets and other wastewater disposals, to minimize risk affecting the environment of the planting area and its vicinity.
		1.8. Maintain the effectiveness of the irrigation system.
		1.9. Water sources for agriculture should not cause environmental

Items		Requirements
		destruction.
		1.10. Availability of conservation practices for water sources and its environment.
		1.11. Select a planting site with sufficient water supply for quality crop production.
	Water used for hydroponics	1.12. Regularly change water for crop production in hydroponic systems. In case of reuse, there shall be a system to reduce the amount of microbial and/or chemical contamination.
		1.13. Maintain a clean water supply system as appropriate to prevent microbial contamination.
	Water used for postharvest practices	1.14. Water for postharvest practices shall be of potable water quality or equivalent with particular caution on the contaminations of the following cases: - water contacted with the edible portion of the produce - physical characteristics of the produce that holds water, such as uneven leaf and other surfaces of produce
2. Planting area		2.1. The planting area shall not be located in the environment, causing contamination of hazardous substances on produce. In case of environmental risk, the soil shall be analyzed by official or accredited laboratories for hazardous substance contamination. The analytical result record shall be kept as evidence.
		2.2. If a contamination risk area must be used, clear proof of the treatment method used to minimize the contamination to the safety level shall be provided.
		2.3. Take a soil sample at least once before entering the production system and when the environment is likely to cause contamination for hazardous substance analysis by official or accredited laboratories. Analytical result records shall be kept as evidence.
		2.4. If soil or planting material is fumigated or treated with chemicals to treat soil-borne disease, the chemical type, date, rate, method of application, and the operator's name shall be recorded and kept as evidence.
		2.5. New planting areas shall not adversely affect the environment. If it does, mitigation or prevention measures shall be in place.
		2.6. Plot layout and preparation or adjustment shall consider the impacts on food safety, produce quality, the environment, and workers' health, safety, and welfare.
		2.7. Maintain planting area to prevent soil degradation.
		2.8. Select crops for planting by soil type. Planting practices should not cause any risk to the environment.
		2.9. The code and information of the planting plot shall be made available by specifying the farm owner's name and contact address, the name and contact address of the plot keeper (if any), the farm location map, the farm and plot layout, and the crop and variety grown.
		2.10. Provide land use history for at least the past two years.
		2.11. The area used for planting shall comply with relevant laws and regulations.

Items	Requirements
3. Pesticides	3.1. If pesticide is used, follow the recommendation of the Department of Agriculture (DOA), Ministry of Agriculture and Cooperatives, or instruction on the label registered with DOA Stop applying pesticides before harvest by the withdrawal period indicated on the label of each pesticide or the official recommendations. In case there is evidence or doubt of improper use, the produce shall be analyzed for pesticide residues by either official or accredited laboratories for pesticide residues analysis. The record shall be kept as evidence. Suppose the result of pesticide residue analysis is higher than the maximum residue limit under the relevant standards or laws. In that case, causes shall be investigated, corrective action shall be taken, or preventive measures shall be in place to avoid the recurrence of incidents. Such records shall be kept as evidence.
	3.2. Do not use or possess pesticides prohibited from manufacture, import, export, or hold under the Hazardous Substances Act B.E. 2535 (1992) and its amendments.
	3.3. If the production is for export, do not apply pesticides prohibited by trade partner countries or follow their requirements.
	3.4. Availability of documents and information on permitted or prohibited pesticides for domestic use and trading partner countries.
	3.5. Properly select chemical sprayers and equipment, including the spraying method. The sprayers shall be regularly checked to ensure they are ready to be used effectively.
	3.6. Do not mix more than two types of pesticides unless the involved government agencies recommend it or there is supporting scientific information.
	3.7. Appropriate Integrated Pest Management shall be applied to minimize the use of pesticides.
	3.8. The container of the leftover pesticide that cannot be used up in one application shall be tightly closed and kept in the pesticide storage. The new container shall be identified if the pesticide is transferred to another container.
	3.9. Types of pesticides shall be orderly grouped in the specified secure storage to prevent mishandling, contamination of produce, and harm to personnel.
	3.10. Other chemicals, such as fuel, cleaning agents, and other non-agricultural substances, shall be stored in good order to prevent produce exposure and environmental contamination.
	3.11. Clean the chemical sprayer and equipment after each use and dispose of the rinsed water using a method that does not contaminate the environment.
	3.12. The empty pesticide container shall be destroyed to prevent reuse or disposal using the proper method.
	3.13. The deteriorated or expired pesticide container shall be kept in a secured location and destroyed to prevent reuse or disposal with the proper method.

Items		Requirements
		3.14. Record or make a list of stocked pesticides.
		3.15. Operators and/or supervisors shall have proper knowledge of pesticide use. They should be knowledgeable about pests, pesticide selection, application rates, sprayers, and related equipment.
		3.16. Operators shall have the knowledge and skill to protect themselves from pesticide application and first aid.
		3.17. To protect themselves from toxic substances while working with pesticides, the operators should wear proper clothes and personal protective equipment, such as a mask or nose-covering cloth, gloves, hats, and boots.
		3.18. The pesticide spraying operator shall always be in the windward direction. Care should be taken to ensure the mist does not contaminate the adjacent plots and environment.
		3.19. The operator shall take a shower, shampoo, and change clothes right after each pesticide application. Used clothes shall be cleaned every time and separated from the normal laundry.
		3.20. A first aid kit and a complete set of accidental protective equipment, such as eyewash solution, clean water, sand, etc., should be available.
		3.21. Availability of instruction documents in case of accident or emergency displayed in the chemical storage area.
4. Pre-harvest quality management	Product control plan	4.1. Availability of production control plan to obtain desired produce based on Good Agricultural Practices or information from recognized research, government agencies, experts of that crop, or trading partners to establishcontrol measures at every step that may affect safety and/orproduce quality and/or environment and/or worker's health, safety and welfare.
	Production Inputs	4.2. List and record production inputs and their sources. Provide details of essential production inputs such as seeds or planting material, fertilizers, supplements, and pesticides required in the production process, as well as specify the details on volume and date of purchase.
		4.3. Seeds, planting materials, and propagated parts shall be obtained from reliable sources, accurate to the type of variety meeting the market demand, and traceable to their sources and history.
		4.4. Do not plant seeds or planting materials or propagated parts known to be poisonous for consumption unless there is a recommendation on the proper way to consume them.
		4.5. If dressing the seeds with pesticides, follow the method and rate recommended on the officially registered label and keep a record.
		4.6. Availability of good management for the application of fertilizer and soil conditioners to prevent physical, chemical, and microbiological contamination on produce to the level unsafe forconsumption. The fertilizers shall be registered with the Departmentof Agriculture, Ministry of Agriculture and Cooperatives.
		4.7. In case organic fertilizer is produced on a farm, it shall be wholly fermented or decomposed or sufficiently processed by other means so as not to cause transmission of diseases to

Items		Requirements
		humans. Record the method, date, and duration of such process.
		4.8. Do not use human sewage for fertilizer.
		4.9. Mixing, storing, and transferring fertilizer and soil conditioners or places for composting shall be separated and located in an area that does not contaminate food crop areas and water sources.
		4.10. Apply fertilizers appropriate to the cultivated crop at the rate recommended on the label.
		4.11. For hydroponics, monitoring shall be taken using plant nutrient solution and recorded.
		4.12. Provide sufficient and appropriate agricultural tools and equipment for operations.
		4.13. Provide separated, secure, and easy access-to-access storage for agricultural tools and equipment.
		4.14. Regularly check tools and equipment, including electrical appliances, to prevent accidents and hazards to operators.
		4.15. Check tools and equipment that require accuracy in operation, such as pesticide spraying nozzles, at least once a year. In case of deviation, repair or replace it to function effectively according to its standard operation.
		4.16. Clean tools and equipment, including containers, are used to hold and transport produce each time before and after use.
	Management of production steps	4.17. Availability of a production management system to obtain produce that meets the trading partners' requirements.
	Disposal of waste and unused or irrelevant production materials	4.18. Infected plant parts shall be burnt outside the planting plot, considering its environmental impact.
		4.19. Separate types of waste and unused or irrelevant to production materials. Provide sufficient garbage disposal areas orspecify their locations. In addition, waste reduction during the production process shall be carried out.
5. Harvest and postharvest handlings		5.1. Harvested produce at the appropriate harvesting period. The product should be quality that meets the market or trading partner's requirements.
		5.2. The harvesting shall be done hygienically to prevent contamination that affects consumption safety.
		5.3. Sort off unqualified produce. If quality grading and sizing are performed before distribution, the product shall be sorted according to its standard or trading partner's requirements.
		5.4. Use tools or specific methods to prevent produce from bruises or damage due to harvesting.
		5.5. Prevent contamination of hazardous substances on the farm's already sorted or packed produce. Harvested produce shall not be placed directly on the ground.
		5.6. Separate waste and pesticide containers from those used for harvesting and transporting produce to prevent contamination.
		5.7. Equipment, containers, and materials directly in contact with produce shall be made of materials that do not cause

Items	Requirements
	contamination.
	5.8. Maintain the cleanliness of equipment and containers in order to prevent contamination from producing and check so that they are ready to use.
	5.9. Provide separate storage for equipment, containers, and materials from pesticides or other chemicals, fertilizers, and soil conditioners, including preventing contamination from pests.
	5.10. Separate the inferior-quality produce from the good ones, plan to utilize such unqualified produce, and check for commingling.
	5.11. The site for postharvest handlings shall have a structure that can prevent the risk of contamination.
	5.12. Preventive measures shall be provided in case of risk from physical contamination arising from tools and equipment.
	5.13. Prevent pets from entering the operation area, particularly the sites for harvest, sorting, packing, and storage. In case of risk, preventive measures shall be provided.
	5.14. In case bait or traps are used to control pests, they shall be placed in an area that does not cause a risk of contamination to produce, containers, and materials. The record shall be kept.
6. Holding, moving produce in planting plots, and storage	6.1. The availability of hygienic management of the planting plots, moving methods, and holding and storage of produce to prevent contamination from hazards and foreign matters affecting the safety of consumption and the quality of the produce.
	6.2. Availability of floor covering material in the holding area of harvested produce to prevent contamination from garbage, soil, filth, or other hazards from the ground
	6.3. A vehicle used for moving or transporting pesticides, fertilizers, or soil conditioners shall not be used to move or transport the produce to protect it from harmful contamination. If it is unavailable, the vehicle shall be cleaned to protect against such contamination and keep a record of its use.
	6.4. Select appropriate containers for moving produce from the planting plot to the packing area. The containers shall have a liner to protect the produce from bumping.
	6.5. The arrangement of harvested produce in the holding area of the planting plot shall be proper, and the produce shall be protected from injuries due to scratching or bumping.
	6.6. Moving produce in the planting plot shall be carried out with care and be able to prevent contamination that is harmful to consumption.
	6.7. Proper care and protection shall be required before transportation for rapidly deteriorated produce.
	6.8. Transport vehicles shall be able to maintain produce quality.
	6.9. Packed produce for transport shall be handled with care and transported to the collection location immediately after harvest and/or after dressing, sorting, or sizing.
7. Personal hygiene	

Items		Requirements
		7.1. Workers shall have the knowledge and understanding or receive personal hygiene training to work hygienically.
		7.2. Those who come directly into contact with produce, particularly after harvest, shall maintain personal hygiene and take preventive measures to prevent the produce from contaminating.
		7.3. Personal hygiene facilities should be sufficiently provided, ready for use, and able to prevent contamination from waste to planting plots and produce.
		7.4. Any sick operator should inform the supervisor to decide to move to duty so as not to cause contamination to produce.
		7.5. Operators involved in the pesticide activity shall have their health examination at least once a year.
		7.6. Availability of proper basic facilities for operators.
		7.7. Provide training to educate operators appropriately on their responsibilities.
		7.8. Farm owners and operators shall have adequate knowledge and understanding or receive training related to Good Agricultural Practices.
8. Record keeping and traceability	Documents and record keeping	8.1. Availability of record on water use with details such as kind of crop, date, location, and water consumption or irrigation period (Sections 1.5 and 1.6).
		8.2. Availability of record on the application of chemicals for soil-borne disease treatment (Section 2.4).
		8.3. Availability of record on planting plot code and information on each plot (Section 2.9).
		8.4. Availability of record on every application of hazardous agricultural substances, at least indicating kind of crop, chemicals, objectives of the application, applied date, application rate and method, harvesting date, and operators' names (Section 3.1).
		8.5. Availability of record or evidence on pesticide's sourceof origin and list of stored pesticides. (Sections 3.4 and 3.14).
		8.6. Availability of record on details related to theprocurement and application of fertilizer and soil conditioner such as date, kind, amount, application rate and method, period of growing which received fertilizer application, and operators' name (Section 4.2).
		8.7. Availability of record on pre-harvest and post-harvest handlings at the essential steps affecting produce safety (Section 5.2).
		8.8. Availability of record on pre-harvest and post-harvest handlings at the essential steps affecting produce quality (Sections 5.3 and 5.10).
		8.9. Availability of record on control of pests (Section 5.14).
		8.10. Availability of record on using vehicles for transport (Section 6.3).
		8.11. Availability of record on training history and/or the result of health examination and/or personal hygiene management (Sections 7.1, 7.5, 7.7, and 7.8).

Items		Requirements
		8.12. Update documents or record forms for each production season. Collected a complete record with every record signed by responsible operators.
		8.13. Documents and/or records shall be kept in categories separated by each production season to facilitate inspection and utilization.
	Traceability and verification - Traceability	8.14. Production in holding and moving or packing for distribution shall bear the lot number or be tagged with the code or mark of production source or harvested date for traceability.
		8.15. Record information on the buyer or the location of the sale, including the quantity sold, in case of a sale.
		8.16. Record operations and important documents related to the operation for at least two consecutive production years, or as required by the entrepreneur or trading partner countries, to ensure the traceability and recall of goods whenproblems arise.
		8.17. In cases where problems occur in the planting plotaffecting food safety, separate the produce and prevent it from being distributed. If the incident is found after the sale, immediately inform the buyers.
		8.18. In cases where problems in the planting plot affect food safety, investigate the cause and find the solution to prevent the recurrence of the problem and keep the record.
	Traceability and verification - Verification	8.19. Verify Good Agricultural Practices or the record at least once a year to ensure the production process, improve operating steps according to their objectives, and maintain verification and corrective action.
		8.20. Availability of action to resolve relevant complaints and keep the record of action to the complaint.

1.3 Steps of Gap procedure of Food plants[3]

The health-conscious trend has made consumers concerned about food safety and being free from harmful contamination. Therefore, consumers are increasingly demanding products that are of quality and safe. Good Agricultural Practices for Food Crops (TAS 9001-2013) or the Food Crops GAP, defined by the Ministry of Agriculture and Cooperatives, are guidelines for farmers to follow, considering the environment, health, and safety.

The welfare of farmers is to obtain quality products that meet standards and are safe, without contamination that is harmful to producers and consumers.

Food plants under this standard mean vegetables, fruits, field crops, spices, and herbal plants used as food, with eight main requirements as follows:

(1) **Water**

- Water used in the plantation
- Water used does not cause contamination that is harmful to the produce
- Do not use wastewater from various sources such as industrial plants, communities, or hospitals. If water is used, it must be treated before use.
- Collect water samples at least once during the beginning of organizing the production system to analyze hazards.
- Watering should be appropriate for the type of plant and soil.

[3] National Bureau of Agricultural Commodity and Food Standards (2561)

- Wastewater management, water maintenance for efficiency, not destroying the environment.
- Water used in the hydroponic planting plot
- Change the water regularly and maintain the clean water supply system.
- Water used with plants after harvesting, such as water for washing produce, must be clean and safe to consume.

(2) **Planting area**

- Do not plant in areas that can be contaminated by dangerous substances or have treatment methods to reduce contamination.
- Send soil samples to analyze dangerous substances at least once during the initial production system.
- The information must be recorded if chemicals are used to fumigate or pour on the soil. - New planting areas must consider the environment, take care of the planting area, and select appropriate plant types to prevent soil degradation.
- Keep a history of soil use for the past 2 years, and the planting area must comply with the requirements of relevant laws.

(3) **Agricultural hazardous substances**

- Use according to the instructions or the label registered with the Department of Agriculture, Ministry of Agriculture and Cooperatives.
- Do not use agricultural hazardous substances specified in the Hazardous Substances Act B.E. 2535 and its amendments.
- In the case of production for export, do not use agricultural hazardous substances prohibited by trading partner countries.
- The user must be familiar with the correct use of agricultural hazardous substances, types of pests, and related equipment.
- Land use management, such as selecting the correct equipment and spraying method, not mixing more than two types of agricultural hazardous substances, storing chemicals properly, cleaning tools, having instructional documents in an emergency, and having essential first aid equipment.
- Practitioners must know about protecting themselves from toxic substances, such as wearing tight clothing, masks, gloves, and shoes, spraying drugs upwind, and cleaning the body after spraying drugs.
- Empty containers of hazardous materials must be destroyed or disposed of in a proper manner. But if farmers practice proper pest management, that is, they take care of and maintain plants to be strong, free from plant diseases, insect diseases, and other pests that disturb the plants, and they reduce the use of chemicals, it will reduce the potential dangers to humans and the environment.

(4) **Quality management in the production process before harvesting**

- In the case of hydroponic cultivation, nutrient solutions must be monitored and recorded.
- Production factors such as seeds and seedlings must come from reliable sources. Fertilizers or soil conditioners must not be contaminated with microorganisms and chemicals that are unsafe for the product. Fertilizers must be stored in proportion to prevent contamination. Fertilizers are not made from human feces.
- Agricultural tools and equipment are sufficient for work and have separate storage areas. Check tools regularly. Clean tools every time after finishing work.
- **Waste disposal**: Diseased plants must be burned outside the planting area. Separate waste types correctly.

(5) **Harvesting and post-harvest practices**

- Harvest products of the right age and hygienic quality according to market demand or trading partner requirements
- Sort out substandard produce. If sorting produces according to quality class and size, use the TAS or trading partner country standards.

- Prevent product contamination, such as not placing products on the ground, separating containers of waste and agricultural hazardous substances from product containers, keeping equipment and containers clean, having separate storage areas for equipment and containers, and preventing pets from being in the work area.

(6) **Product collection, transportation in the plantation, and storage**

- There is a hygienic product resting place. The flooring materials are used in the product resting area. There is a correct method for transporting and storing the product.
- Vehicles used to transport agricultural hazardous substances, fertilizers, and soil conditioners should not be used to transport the product.
- The place where products are placed in the product resting area must be suitable and able to prevent scratches, impact, heat, and sunlight.
- Products must be transported carefully to prevent contamination during transport.

(7) **Personal hygiene**

- Workers or those who come into direct contact with the produce must have knowledge and understanding, receive training in personal hygiene and good agricultural practices, and be able to practice in a way that does not cause contamination to the produce.
- Workers must have adequate personal and basic hygiene facilities.
- Workers who deal with hazardous agricultural materials must have a health check at least once a year.
- Those who come into contact with the product when they become ill must notify the production supervisor.

(8) **Recording data and monitoring**

- There are documents recording related data, such as water use, chemical use, use of agricultural hazardous substances, use of fertilizers and soil conditioners, practices before and after harvest, elimination of vectors, use of transport vehicles, training
- Monitoring is done by attaching product codes to show the production source and harvest date. If there is a problem with unsafe products, the product can be recalled, and the cause and solution can be investigated
- The practice should be reviewed at least once a year.

According to the standards set by the Ministry of Agriculture and Cooperatives, good agricultural practices for food crops are guidelines for producing clean, safe, and international-quality agrarian products. Therefore, practicing at every step is the key to advancing Thai agricultural products into the world market.

Some Farmer's Bua Yai subdistricts, such as the Herbal Essential Oil Extraction Enterprise Group, received the GAP certificate.

Figure 1:
The Eight Processes of Good Agriculture Practices.

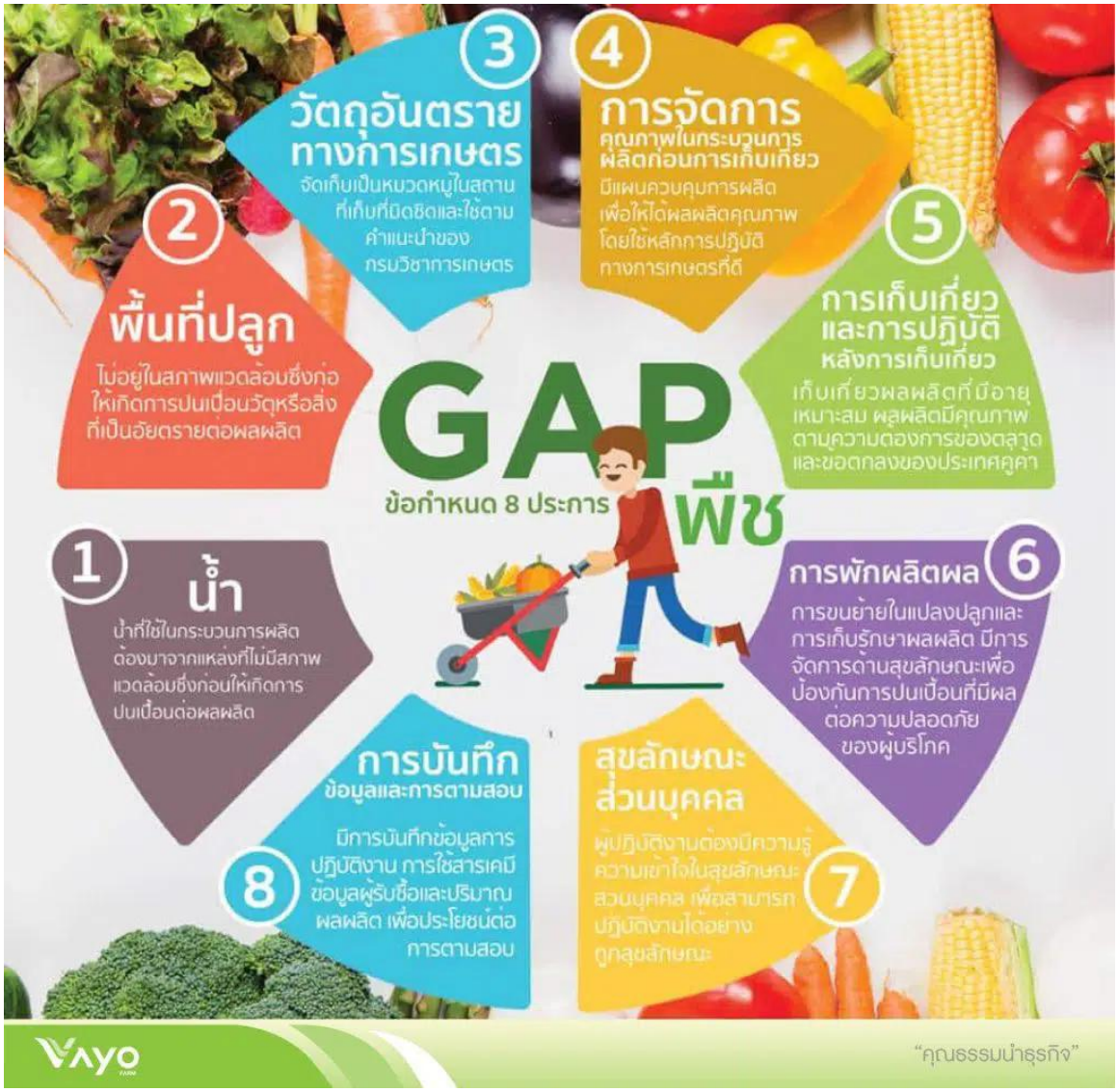


Figure 2:
Requirement for GAP Certificate.

1.4 Safe agricultural products, confident in the Q mark[4]

Agricultural product certification mark. A mark displays agricultural products to certify their origin, components, production methods, quality, or other characteristics. This mark is essential in communicating information to consumers or buyers to create acceptance, confidence, and trust in agricultural products with standards, quality, and safety. It symbolizes the significance of communicating and linking information between producers and consumers. Consumers will know that agricultural products displaying certification marks have been produced and inspected by standards and can trace the origin of such products.

There are three types of agricultural product standard certification marks:

(1) The mandatory standard certification mark is a green Q with a circle in a green hexagonal frame.
(2) The general standard certification mark is a green Q with a circle.
(3) The general standard certification mark for organic agricultural standards can be any color to make it easy to see.

Persons entitled to display agricultural product standard certification marks. People who have received standard certification marks are entitled to display agricultural product standard certification marks, which can be both general and mandatory standards.

Methods of using and displaying agricultural product standard certification marks:

(1) **Agricultural product certification**: The certificate recipient must display it clearly and easily on the agricultural product or its packaging, wrapping, binding, or label. The code under the standard certification mark must be specified.
(2) **Production system certification**: Display it at business premises. The certification documents are for advertising and public relations purposes only. They cannot be displayed on agricultural products.

[4] https://warning.acfs.go.th/en/articles-and-research/view/?page=94

Figure 3:
Example of Displaying Code under the Agricultural Product Standard Certification Mark.

2. Principles of Organic Agricultural Standards[5,6]

Organic farming is a holistic agricultural management system that supports the ecosystem and biodiversity. It emphasizes using natural materials, avoiding synthetic raw materials, and not using genetically modified (GMO) plants, animals, or microorganisms. Products are managed with an emphasis on careful processing to maintain organic farming conditions and their important quality at every stage.

2.1 Organic crop production method requirements

(1) Organic crop production method Specify the "adjustment period."
- **Herbaceous crops**: At least 12 months before planting
- **Perennial crops**: Specify 18 months before harvesting the produce, and there must be evidence showing that no chemicals were used throughout the specified period

However, producers can gradually change the area to organic farming. It is not necessary to change organic farming entirely. There must be a clear separation of areas, management processes, and different types of plants or varieties that can distinguish the differences in the produce. The area that has been organic farming must not be changed to farming that uses chemicals again.

(2) Have measures to prevent contamination that may occur from soil, water, and air, such as:
- Have obstacles
- Make a barrier
- Plant plants as a buffer zone

(3) Must maintain and increase soil fertility and beneficial biological activities in the soil, such as
- Planting legumes
- Using green manure
- Using organic materials

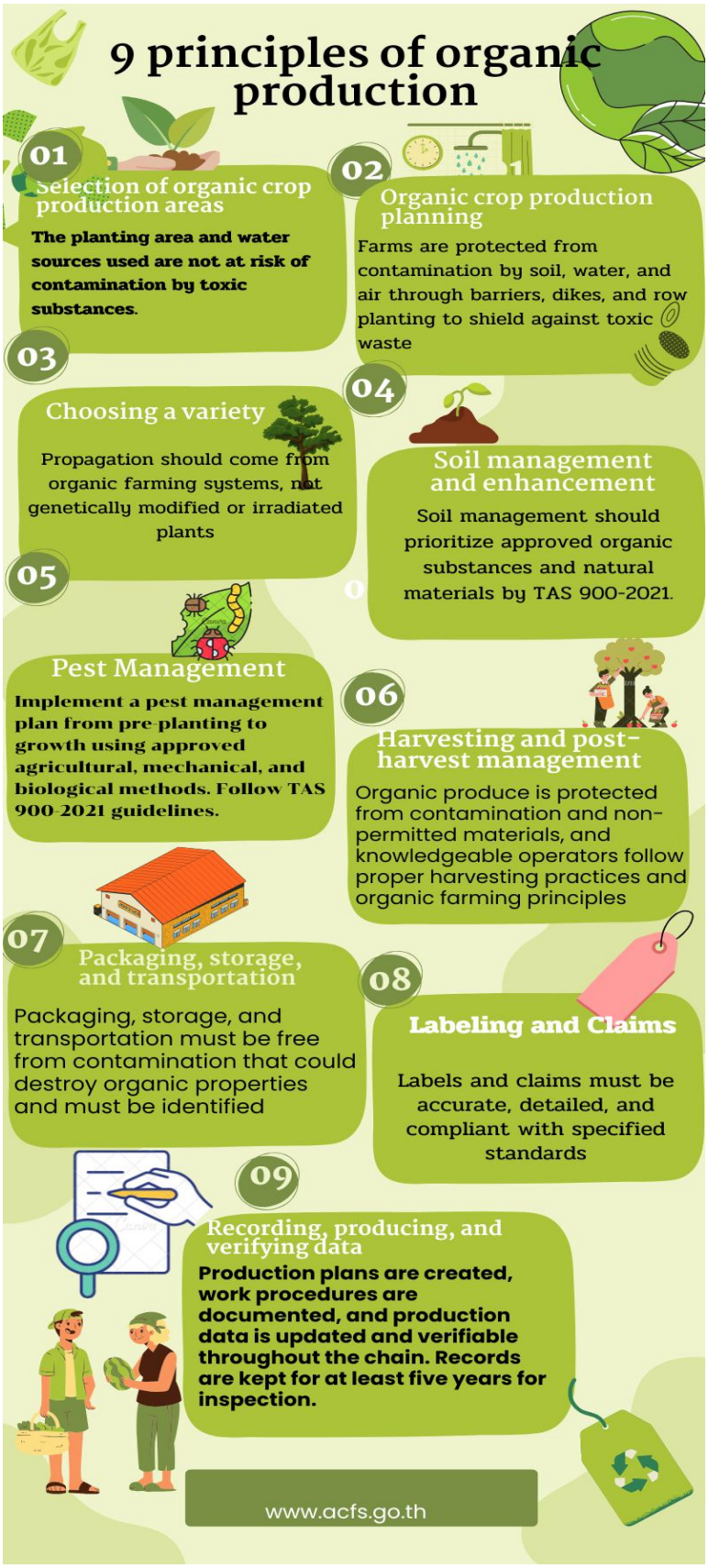
(4) Control, prevention, and elimination of pests, plant diseases, and weeds, such as: * Using appropriate plant varieties, conserving natural enemies of pests (predators, parasites)
- Maintaining the ecosystem to prevent soil erosion by planting cover crops, rotating crops, and planting without tillage.

(5) Seeds and propagation materials
- Must come from an organic farming system; no chemicals used

(6) Plants and parts of plants used for consumption that come from nature are considered organic products only if
- Products come from natural areas that have never been farmed and have never used prohibited chemicals for at least 3 years
- Farming related to natural products must not affect the environment

[5] http://e-book.acfs.go.th/Book_view/240
[6] Chavis Sawatsasarn (2018). Organic Farming Handbook. Agricultural Research and Development Office Region 7. Department of Agriculture. Ministry of Agriculture and Cooperatives.

Figure 4:
The Nine Principles of Organic Production.



Thai Organic Standard (TAS 9000) is a voluntary standard set by the Department of Agriculture in Thailand. Here are some of the pros and cons of this standard:

Pros:

(1) **Promotes sustainable agriculture**: TAS 9000 encourages farmers to adopt sustainable practices that protect the environment and conserve natural resources.
(2) **Improves product quality**: The standard sets high-quality standards for organic products, ensuring they are safe and healthy for consumers.
(3) **Builds consumer trust**: TAS 9000 helps to build consumer trust in organic products, as they are assured of their authenticity and quality.
(4) **Supports local farmers**: The standard can help to support local farmers by creating a market for their organic products.

Cons:

(1) **Limited international recognition**: TAS 9000 is not yet widely recognized internationally, which may limit the export potential of Thai organic products.
(2) **Costly certification**: The cost of organic certification can be a barrier for some farmers, mainly small-scale farmers.
(3) **Potential for greenwashing**: Some companies may use the organic label to mislead consumers about their products' sustainability, undermining the standard's credibility.
(4) **Limited availability**: Organic products may not always be available or affordable, especially in certain regions.

Overall, TAS 9000 is a valuable tool for promoting sustainable agriculture and ensuring the quality of Thailand's organic products. However, it is essential to be aware of the challenges and limitations associated with the standard.

Access to the Thai Organic Certificate for farmers can be limited due to several challenges. Here are some of the key limitations:

(1) Cost Issues
- **Certification Fees**: The costs associated with the certification process can be prohibitive for small-scale farmers.
- **Transition Costs**: Farmers may face additional expenses when transitioning from conventional to organic farming, such as investment in organic inputs or infrastructure.

(2) Knowledge and Education Gaps
- **Lack of Awareness**: Many farmers may not fully understand the benefits of organic certification or how to achieve it.
- **Insufficient Training**: Limited access to training programs on organic farming may hinder farmers' compliance with certification requirements.

(3) Administrative and Bureaucratic Barriers
- **Complex Processes**: The certification process can be complex and bureaucratic, deterring farmers from applying.
- **Documentation Requirements**: Farmers may struggle with the extensive documentation and record-keeping certification required.

(4) Market Dynamics
- **Limited Demand**: In some areas, the local market for organic products may be small, reducing the incentive for farmers to undergo certification.
- **Price Competition**: Cheaper, non-organic products can make it difficult for certified products to compete.

(5) Geographical Challenges
- **Remote Locations**: Farmers in remote or rural areas may have limited access to certification bodies or support services.

- **Infrastructure Limitations**: Poor transportation infrastructure can impede the distribution of organic products, affecting market access.

(6) Support and Resources
- **Lack of Assistance**: Limited support from the government or NGOs in navigating the certification process can be a barrier.
- **Resource Constraints**: Farmers may lack access to necessary organic farming resources, such as approved seeds or inputs.

(7) Cultural and Social Factors
- **Traditions**: Some farmers may hesitate to change traditional farming practices, which can conflict with organic methods.
- **Community Norms**: Social pressure or a lack of community support can discourage farmers from pursuing organic certification.

2.2 Conclusion

Addressing these limitations requires a multifaceted approach that includes providing financial support, enhancing education and training programs, streamlining the certification process, and building better market access for organic products.

3. International Organic Agriculture Standards

3.1 Introduction

Thailand's development in recent decades has primarily focused on economic growth and national income (GDP). In agriculture, increasing productivity through chemicals and monocultures has led to environmental and health problems for producers and consumers.

Organic farming offers a sustainable solution. It uses natural mechanisms to improve yields and manage pests without synthetic chemicals. This approach also helps prevent pest resistance.

The principles of organic farming can be adapted to local conditions, and this manual provides farmers with guidelines to produce traceable products that meet international standards. The aim is to foster innovation and technology to enhance products for the global market.

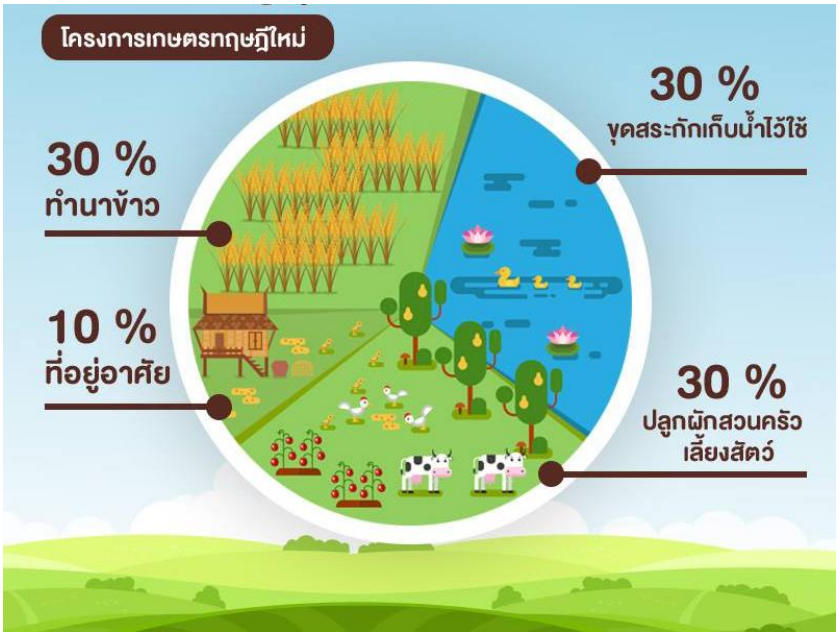
Therefore, farmers should read and understand the "Organic Agriculture Standards," which can be implemented to build confidence in products, especially plants grown in organic farming systems. Nowadays, people worldwide turn to health products more and more because the organic farming system with international organic farming standards is being accepted by people worldwide. Because it creates safety and does not cause pollution and residue in the environment. As a result, the health of producers and consumers is improved. In addition, it also supports climate change adaptation in agriculture for enhanced recovery and sustainability of highlands.

3.2 International Organic Agriculture Standards

3.2.1 Goals of Organic Farming

(1) Restore and maintain the fertility of natural resources by utilizing raw materials from the farm for the most significant benefit.
(2) Prevent and avoid practices that cause environmental pollution.

Figure 5:
Division of arable land according to principles: new theory agriculture.



(3) Develop a production system to become self-sufficient, build a diverse ecosystem of plants and animals, and maintain sustainable natural resources.
(4) Support production and all management processes that consider humanitarian principles.
(5) Adhere to post-harvest practices and processing that are natural methods, save energy, and have minimal environmental impact.

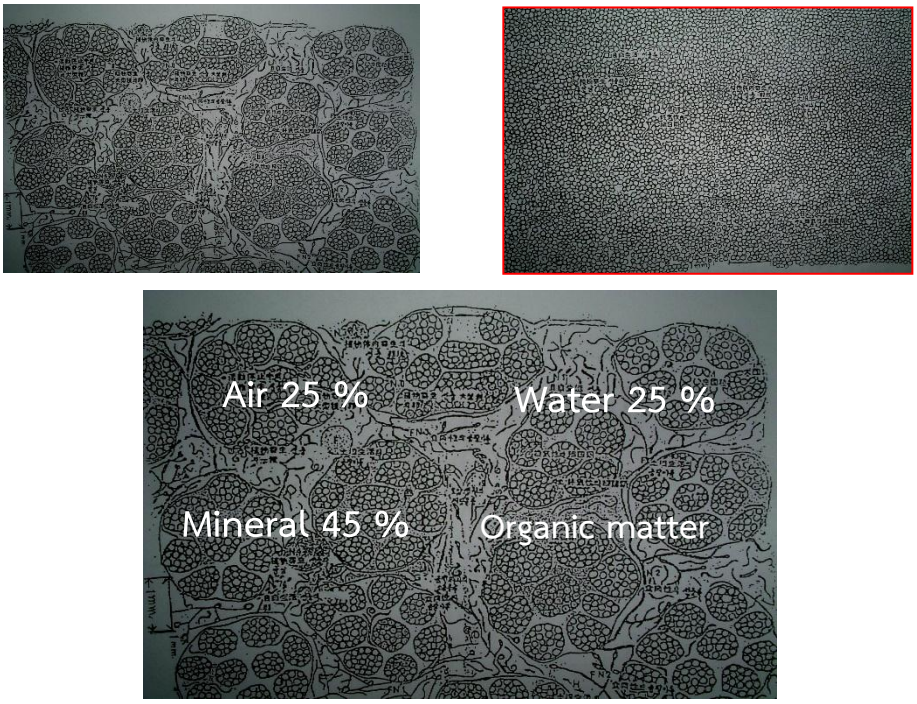


Figure 6:
Good soils suitable for organic farming (a. soils for organic agriculture; b. soils for chemical agriculture; c. soil structure suitable for organic agriculture).

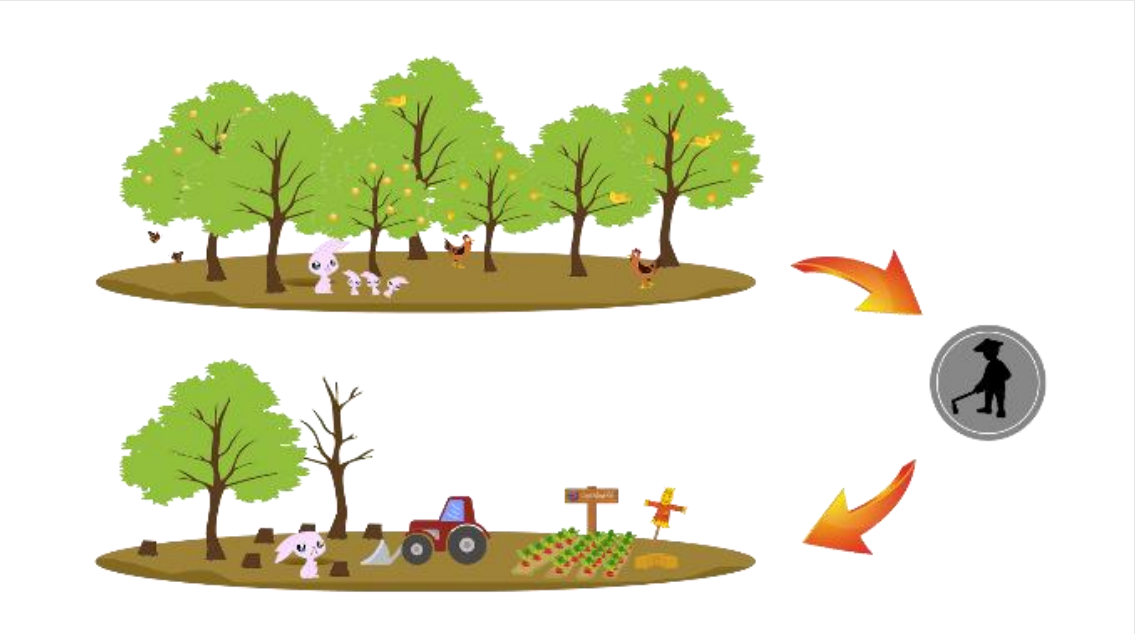
3.2.2 Organic Agriculture Standards

Plot Practice

- Every plot of organic farming must record the use of inputs every time. It must be done in the organic farming system, except for farmers participating in the organic farming program for the first year. But next year, we must do organic farming in every plot.
- Farms or gardens must be completely free of chemicals, including pesticides, made from herbs with chemical ingredients except those without chemicals.
- Do not cut down public forests or encroach upon new forest areas for organic purposes.

Figure 7:
Plot practices.

Figure 8:
Do not cut public forests.



- The plants must not use chemicals or pesticides to plant legumes or various plants in the plot.

Figure 9:
The plants must not be applied with chemicals.

- Do not burn and destroy objects such as leaves, twigs, garbage, rice straw, or others.

Figure 10:
Do not burn agricultural residues.

- Biennial crops have a minimum transition period of 1-2 years. They are considered organic crops because they must be harvested after this period.

Figure 11:
Encourage plans for biennial crops.

- Perennial plants or perennials have a minimum transition period of 2-3 years. They must be harvested after this period and are considered organic crops.

Figure 12:
Encourage plans for perennial plants.

- Farmers are prohibited from applying chemical fertilizers, herbicides or mulch, and all kinds of synthetic hormones.

Figure 13:
Prohibit application and synthesis of chemical particles.

- Use a combination of organic fertilizers, compost, bio-fertilizer, microorganisms, and green manure.

Figure 14:
Recommendations for using biomaterials.

- Use mulch to control weeds and conserve soil moisture. (use straw, leaves, plastic mulch)

Figure 15:
Recommendations for planting practices.

- **Overall production**: Farmers must notify the total area, record organic and general planting plots, and complete all organic plantings the following year.

Prevention of contamination

- Plants in chemical plots must be different plants or generations from organic plots.
- Organic farming plots must be separated from chemical plots at least 1 – 4 meters apart; the more, the better. (Must have trees as a buffer to prevent external chemicals from entering the organic plot).

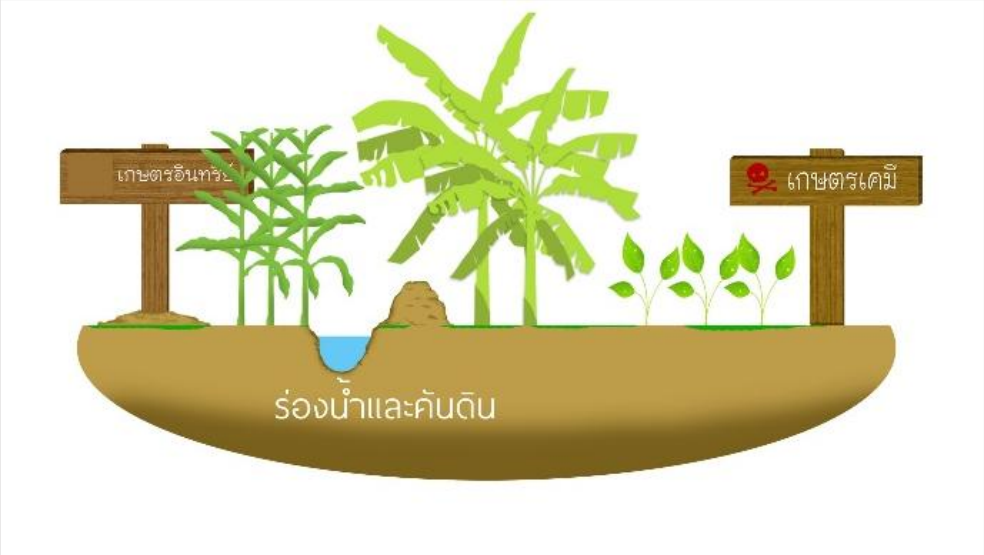
Figure 16:
Distance between organic farms and conventional farms.

- If neighboring plots are sprayed with chemicals, organic farming plots must have a windbreak by planting more than the chemical plants in the neighboring plots and not using the same type of certified plants. The windbreak plants are not considered organic plants.

Figure 17:
Buffer zone between organic and conventional crops.

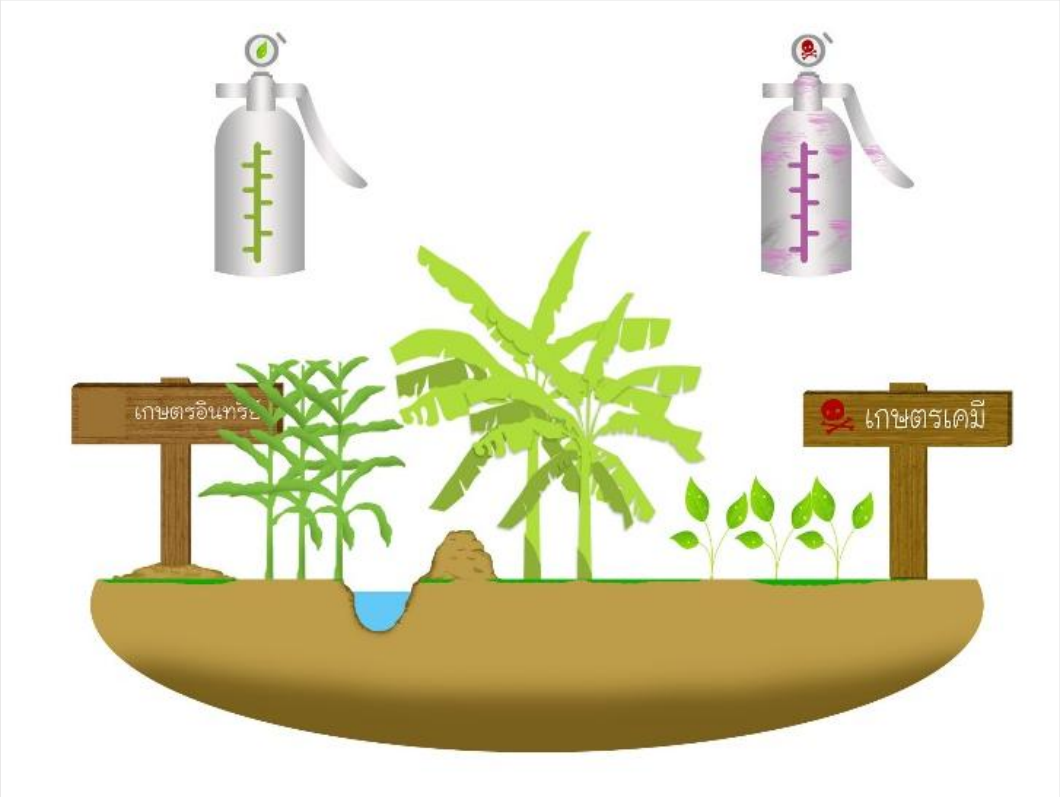
- Organic farm plots must have a buffer line to prevent water contamination, such as berms, ditches, water channels, or shrub lines from filtering chemicals, as the Institute recommends.

Figure 18:
Buffer zone for water usage and organic crop production.



- Do not use agricultural tools such as chemical injection tanks to inject herbal extracts into organic plots.

Figure 19:
The prohibition of using chemicals for production.



- The produce of relatives/neighbors must not be mixed with, and organic and chemical produce management must be distinguished. Do not pile, sort, or pack close to each other.

Figure 20:
Do not mix organic produce with conventional produce.

- Members must have measures to prevent soil erosion.

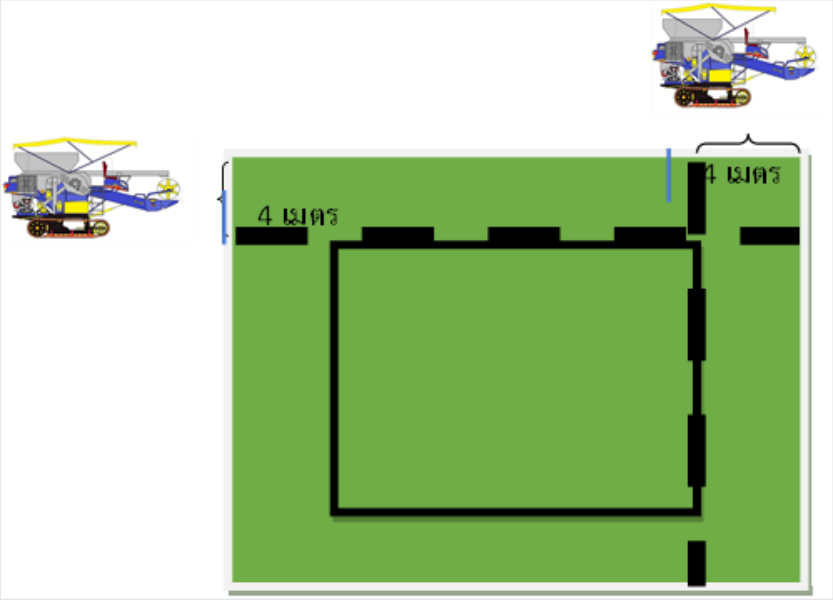
Figure 21:
Take measures to prevent soil erosion.

- Using spraying chemicals in the storage or packaging plants is prohibited.

Figure 22:
Do not spray chemical substances.

- If there is no buffer line, organic produce up to 4 meters can be harvested but should be sold together with other non-organic produce.

Figure 23:
If no buffer zone exists, the produce must be sold alongside non-organic produce.



The use of planting material

- Farmers must record production inputs/raw materials, sources of planting materials, and the amount of produce produced in the organic farming system every time.

Figure 24:
Every step of the production process must be recorded.

- Genetically modified plants and microorganisms or plants known as GMOs (GMOs) are prohibited in organic plots.
- Use seeds or cuttings that are organic and of the type that the project provided only, except in the case of insufficient organic seeds or cuttings, but with permission from the project
- Members must notify the project for inspection and approval before using other production factors.
- Herbs such as neem, galangal, lemongrass, onion, chili, caterpillars, ginger, and wormwood can prevent and eliminate pests.
- Organic vegetable seeds cannot be mixed with chemicals or pesticides or soaked in synthetic hormones.
- Do not use compost from the municipality, and do not use commercial branded fertilizers before receiving permission from the project.
- Do not use human feces as fertilizer.

Figure 25:
Do not use fertilizers contaminated with human feces.

- Chicken manure from liver cage farms is forbidden, but local or chicken manure from free flock (broiler) farms can be used as fertilizer.
- Do not use synthetic hormones of unknown origin to accelerate growth.
- All members should produce humus/bio-fermented organic compost for their use to reduce production costs and allow the use of planting materials that have been certified by the Department of Agriculture only.
- There may be a risk of chemical contamination in organic farming plots adjacent to chemical agricultural plots. Farmers must strictly follow the instructions.

Figure 26:
Do not use manure fertilizer from chicken raised in a closed system.

Post-harvest management

- Sacks or containers used to put organic produce must be new and clean sacks or containers only.
- Do not use sacks of chemical fertilizers or animal feed packaging bags.
- Bags, sacks, or containers used for organic produce must specify the producer's name, member code, and production status.
- Harvesting of all types of produce must comply with organic agriculture standards, such as harvesting at the right age. Quality is according to the type of product and must be based on quality.
- Production in organic and general farm plots must be separated if the project detects after the project. There is an immediate penalty for being an organic member.
- If you or a related person is transporting produce, you must clean and record vehicle registrations to prevent contamination from general transport vehicles.

Figure 27:
Vehicles used to transport produce must be separate from vehicles used to transport chemicals or hazardous agricultural materials.

- The produce that comes out must have a sign indicating that organic or general produce is not secretly sold as organic.

Record form

- Organic growers must provide records to trace their organic crop production system. Examples of such records are:
- Field activity record form
- Form for recording the use of planting material
- Instrument cleaning record form
- Harvest record form
- Transport record form
- Sales record form
- Training

Farmers who operate organic farming systems must undergo training to learn and understand organic farming standards.

Figure 28:
Farmers Should be Trained in Organic Farming

CERTIFICATE OF ATTENDANCE

This is to certify that

SOMJIT INKHLAM

Attended the

Internal Control System for Organic Rice Auditor

Industrial Cluster Development of Organic Rice Year 2 under Economic Value Added to SMEs
(Integrated Promotional Investment) 2018
and has successfully completed the course
Held on
April 23–25, 2018
at Memorial Building Her Royal Highness Princess Maha Chakri Sirindhorn, Maejo University Chiang Mai

Mr. Chinaitsaret Thitichattinan
Agricultural Researcher
Institute of Product Quality and Standardization, Maejo University

Assoc. Prof. Danuwat Peng-ont
Director of
Institute of Product Quality and Standardization, Maejo University

Certificated No.20180425-007-026

Soil, Water, and Product Analysis

Farmers should send samples of soil, water, and produce to be analyzed for pesticides or heavy metals at least once a year.

Figure 29:
Soil and water collected from the field and sent to the laboratory for further analysis.

Table 2: Comparison of organic farming standards.

Item	TAS	IFOAM	EU	NOP	SDGs PGS
Transition period (plants)	The minimum is 12 months for annual plants and 18 months for perennials.	The minimum is 12 months for yearly plants and 18 months for perennials.	The minimum is 24 months for annual plants and 36 months for perennials, but there are exceptions where the transition period can be reduced to 12 and 18 months.	Set a minimum of 36 months, starting from the last use of prohibited chemicals. During the transition period, there is no need to do complete organic farming according to standards and without checking during the transition period.	The transition period is 36 months, except for natural agriculture and agroforestry without chemicals, but it is subject to document confirmation.
Organic matter from off-farm	Prescribed to use raw materials from conventional systems but must undergo appropriate fermentation processes.	Determine the amount brought into the farm based on local conditions and crops.	Determine the amount imported to be used in the farm, especially manure.	The amount of manure used outside the farm is not specified.	Do not specify the amount that can be made, but must be organic fertilizer from the Entrepreneurs are ready to disclose ingredients that do not contain synthetic chemicals or are fertilizers certified by reliable agencies.
The use of raw manure and the pre-harvest period for consumption (people)	No time limit	No time limit	No time limit	Set period	No time limit
Plot covering material	No requirement	No requirement	Bark, sawdust, and wood chips sprayed with chemicals after felling cannot be used as mulches.	No requirement	No requirement
Human excrement fertilizer	Not allowed	Plants not intended for consumption are permitted, but there are exceptions if	not allowed	No requirement	not allowed

Item	TAS	IFOAM	EU	NOP	SDGs PGS
		proper management has been made first.			
Compost	No requirement	No requirement	No requirement	There are details about raw materials used for composting, fermentation time, temperature in the compost pile, and the number of turns.	No requirement
List of inputs allowed to be used as fertilizer on organic farms	- Do not use sewage sludge - Do not use manure (chicken manure) from industrial farms.	- Do not use sewage sludge - Do not use manure (chicken manure) from industrial farms.	- Do not use sewage sludge - Allow Stillage and stillage extract - Do not use manure. (chicken manure) from industrial farms - Details on heavy metal contamination in production inputs have been established.	- Do not use sewage sludge - Do not use manure (chicken manure) from industrial farms.	- Do not use sewage sludge - Do not use manure (chicken manure) from industrial farms.
List of inputs that are allowed to be Used for protection	Allowed upon acceptance by A certification body. -ryania - diatomaceous earth - potassium permanganate	Allowed upon acceptance by a certification body. -ryania - diatomaceous earth - potassium permanganate	Allowed (not available in IFOAM) - hydrolyzed proteins - metaldehyde allowed (not available in IFOAM, CODEX) - pyrethroids (deltamethrin or lambda cyhalothrin) - mineral oils (other than light paraffin-based mineral oils)	No requirement	Allowed upon acceptance by a certification body.
Criteria for Allowing Other Factors of Production	The criteria for evaluating planting materials are quite detailed.	The criteria for assessing planting materials are quite detailed.	No	No requirement	The criteria for assessing planting materials are quite detailed.
Labeling in case the					

Item	TAS	IFOAM	EU	NOP	SDGs PGS
amount of raw materials is organic					
-70%-94%	“Made from organic” (specify ingredients)	“Made from organic” (specify ingredients)	Not allowed	“Made from organic” (specify ingredients)	“Made from organic” (specify ingredients)
-95%-99%	“Organic”	“Organic”	Specify the percentage of the ingredient that is an agricultural product.	“Organic”	“Organic”
- 100%	“100 percent organic”	“100 percent organic”	“100 percent organic”	“100 percent organic”	“100 percent organic”
Radiation	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
GMO or GMO-derived products are ingredients in food.	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
Raw materials, non-organic ingredients	It needs to be considered on a case-by-case basis and reviewed periodically.	It needs to be considered on a case-by-case basis and reviewed periodically.	Listed in Annex VI section C	- This must be considered on a case-by-case basis and reviewed periodically. - Do not use mixtures grown using municipal sewage sludge.	It needs to be considered on a case-by-case basis and reviewed periodically.
certification body	Department of Agriculture, ICAPS Agricultural Product Production System Certification Institute	A.C.T. (Organic Agriculture Certification Thailand)	Onecert (Onecert Asia Agri Certification (P) Ltd.) Bioagricert, CERES	Onecert (Onecert Asia Agri Certification (P) Ltd.), Bioagricert, CERES	The National Bureau of Agricultural Commodity and Food Standards (ACFS)
logo					

4. Sustainable Development Goals Participatory Guarantee System[7]

Developing a Participatory Guarantee System (PGS) is essential and has been increasingly accepted by various agencies because it helps save certification costs and, more importantly, creates a stakeholder participation process in each area. A PGS can certify agricultural plots and products in all sustainable farming activities.

The SDGs PGS network has developed four provincial-level driving mechanisms: the organic farm inspection working group mechanism, the business mechanism, the participatory organic agriculture certification committee mechanism, and finally, the mechanism to manage data in the SDGs PGS SAN (Sustainable Agriculture Network) database system, using the market to lead production, enabling farmers to manage production for trade to the market tangibly and sustainably.

The Sustainable Development Goals Participatory Guarantee Systems (SDGs PGS) network has transitioned from developing four provincial-level mechanisms to establishing a national-level mechanism: The Sustainable Agriculture Federation of Thailand. This federation will oversee the development of participatory organic agricultural standards (SDGs PGS) in collaboration with provincial mechanisms nationwide.

4.1 Principles of Sustainable Agriculture

Sustainable Agriculture is an agricultural system that covers farmers' way of life, production processes, and all management forms. Its goal is to balance the economy, society, environment, and ecosystem, leading to self-reliance and the development of farmers' and consumers' quality of life. Sustainable agriculture covers natural, organic, agroforestry, mixed, and new-theory agriculture.

(1) Natural Farming: A farming system that adheres to four main principles: no tillage, no fertilization, no weeding, and no chemical pesticides (according to Masanobu Fukuoka). Organic Agriculture: A farming system that emphasizes environmental, social, and economic sustainability, soil improvement, and respect for the natural potential of plants, animals, and agricultural ecosystems. Organic farming reduces the use of external production factors and avoids the use of chemicals while at the same time applying nature to increase productivity and develop disease resistance.
(2) Agroforestry: A farming system in forested areas that involves intercropping, raising animals, and sustainably collecting forest products. It aims to mimic natural forest ecosystems with dense plant coverage and high humidity.
(3) Integrated Farming: This approach combines diverse plants and animals in one area, where each activity supports the others. It maximizes resource use and efficiency in food, minerals, air, and energy.
(4) New Theory Farming: This system divides land into four parts based on suitability: 30% for ponds (water storage), 30% for rice, 30% for perennial fruit trees, and 10% for structures like houses and sheds.

[7] Rueangrob A(n.d.). Sustainable Development Goals Participatory Guarantee System. https://anyflip.com/ydguq/bxnh

4.2 Thailand and the Development of the National Organic Agriculture Strategy 2017 - 2021

Organic agriculture emphasizes food quality and safety for producers and consumers while conserving natural resources and the environment sustainably. The government recognizes its importance and has tasked the Ministry of Agriculture and Cooperatives with developing the National Organic Agriculture Development Strategy for 2017-2021 under the National Organic Agriculture Development Committee. This strategy builds upon the First National Organic Agriculture Development Strategy Plan from 2008 to 2011.

The National Organic Agriculture Development Committee has created a Subcommittee to develop the National Organic Agriculture Development Strategy. This strategy will align with key frameworks, including the 20-Year National Strategy for Sustainable Growth, the United Nations Sustainable Development Goals (SDGs) on ending hunger and promoting sustainable agriculture, and the 20-Year Agriculture and Cooperatives Strategy focused on strengthening farmers and managing agricultural resources sustainably.

The National Organic Agriculture Development Strategy for 2017-2021 was developed through a participatory process involving input from government, the private sector, civil society, and educational stakeholders across the North, Northeast, South, and Central regions. The National Organic Agriculture Development Committee approved the finalized strategy on December 1, 2016, before being submitted to the Cabinet.

On April 11, 2017, the Cabinet approved the National Organic Agriculture Development Strategy for 2017-2021. This strategy aims to increase the area of organic farming and the number of farmers involved, boost the domestic organic market, and strengthen local organic farming groups. It requires collaboration across all sectors—government, private entities, civil society, education, farmers, and consumers—to make Thailand a regional leader in sustainable, internationally recognized organic agriculture.

4.3 Development of Thai and International Organic Agricultural Standards

The World Trade Organization (WTO) values international food trade, which must meet Codex, IPPC, and OIE standards. These standards include food safety, pest and disease control, and the power of plants and animals that will be imported into the destination country. Therefore, there are strict practices and agreements in international trade related to this matter.

In Thailand, organic agricultural standards are certified under Organic Thailand (Volume 1-2009) and internationally by ACT. These certifications cover all production, processing, labeling, and distribution aspects for food and animal feed, including plants, livestock, and aquatic animals.

Farmers must comply with food safety regulations and meet the standards of Organic Thailand, ACT, or IFOAM. They apply for certification through bodies like the Department of Agriculture, which includes a farm inspection. Once certified, their products can be marketed, enhancing consumer confidence.

Thailand is working to upgrade its organic agricultural standards to align with internationally recognized benchmarks such as Codex, IFOAM/IOAS, and EU regulations. The Agricultural Commodity and Food Standards (ACFS) is enhancing its inspection and certification system to be comparable to major trading partners like the EU, the United States, Japan, and China.

To support this effort, the ACFS is developing agencies within the Ministry of Agriculture responsible for organic certification and establishing an organizational framework that meets international standards. Thailand has also applied to be included on the EU's Third Country List for direct exports of organic products. It collaborates with ASEAN to align its standards and create a mutual recognition system.[8]

[8] http://www.oae.go.th/ewt_dl.php?nid=21685

4.4 Participation Guarantee System (PGS)

The "community certification" system is a form of organic certification that recognizes farmers in a producer organization through first-party certification. Sometimes, buyers may conduct certifications (second-party), but there is no independent inspection (third-party). This system prioritizes farmer participation more than other certification methods.

The International Federation of Organic Agriculture Movements (IFOAM) and various organizations created the certification community system to address the unsuitability of complex independent certification systems for organic farmers selling locally. Such complexity leads to high registration fees for certification bodies, resulting in elevated certification costs for producers.

Strict regulations often limit farmers' participation in certification systems and hinder innovative methods for small-scale farmers worldwide.

In response, IFOAM organized a meeting in Brazil in April 2004, attended by Witoon Panyakul from GreenNet, the only Southeast Asian representative. This led to the development of the Participatory Guarantee System (PGS), or "community certification" in Thai, allowing producer groups to self-verify.

4.4.1 Definition

IFOAM defines PGS as a locally focused quality assurance system. It certifies producers based on the active participation of stakeholders and is built on a foundation of trust, social networks, and knowledge exchange.

4.4.2 Components and formats

The key components of the PGS community certification system are:

(1) Famers and consumers share a vision of the community certification system's basic principles, and participation may vary from project to project.
(2) Participation in consuming organic agricultural products from this system. The production principles and standards arise from the participation of stakeholders (producers, consultants, consumers), which makes the system credible because of this participation.
(3) Transparency: The stakeholders know the mechanisms and processes involved in the certification process. However, this does not mean everyone needs to know all the details equally. At the same time, information that may be personal or commercially confidential must be protected.
(4) Trust: The certification community system is based on the belief that farmers can be trusted and the use of social/cultural control mechanisms to certify organic agricultural standards.
(5) Learning process: The community certification system aims to certify products and is a tool for developing learning to develop communities and organic agriculture. 6. Horizontal linkages that share power and responsibility among the people involved are not just a matter of 2-3 people.

The key characteristics of the community certification system are:

(1) Standards and requirements are developed with the participation of stakeholders (Norms conceived by the stakeholders)
(2) Based on grassroots organizations
(3) Is appropriate for smallholder agriculture
(4) Principles and values that aim to improve the livelihood of farmer families and promote organic farming
(5) Documented management systems and procedures should specify that farmers must prepare only necessary documents and information. The community certification

system should also have a recording system that shows that farmers have complied with organic farming standards.

(6) Mechanisms to verify farmer's compliance
(7) Mechanisms for supporting farmers to enable farmers to practice organic farming truly
(8) There is an agreement or agreement among farmers to comply with the requirements and standards [a bottom-line document]
(9) some seals or labels are evidence of organic status
(10) There are clear and previously defined consequences for farmers who do not comply with the standards, and the consequences are recorded in the database or made publicly available.[9]

4.5 Participatory Guarantee Certification System (PGS) in Thailand

In Thailand, many groups of people see the importance of driving the Participatory Certification System (PGS) depending on the locality, and the stakeholders of each group are different. However, each group has the same thing:

There is a farm inspection process. Each group has a diverse and extensive process of stakeholder participation.

(1) Producers, consumers, stakeholders, and extensionists are involved in the decision-making process, producer certification, and knowledge exchange.
(2) Each farmer is committed to complying with organic standards and agrees to have an annual farm inspection. This inspection will be conducted by a group of inspectors, including farmers, consumers, etc. In the farm inspection, an inspection report will be prepared, which shows whether each person complies with or does not comply with the organic standards. There is a reliable certification mark.

Farmers and processors who have passed the application and certification process will receive a certificate. They can use the certification mark on their products or display it in stores where they sell them. The certification agencies in each country and region may be different. It may be a local NGO or a farmer's organization. [10]

Figure 30:
Participatory Guarantee Systems (PGS).

[9] http://www.greennet.or.th/article/1138
[10] https://www.ifoam.bio/sites/default/files/pgs_brochure_thai_web.pdf

4.5.1 Principle Criteria for Participatory Organic Certification System (PGS), National Bureau of Agricultural Commodity and Food Standards (ACFS) (www.acfs.go.th)[11]

PGS is a community-based organic certification system based on community stakeholders' firm and continuous participation and the fundamental principles of mutual trust, social networking, and knowledge exchange.

The objective is to expand the organic agricultural production base of small-scale farmers to have wider access to the market, especially for domestic consumption, by having communities participate in managing a reliable PGS certification system accepted by the government and consumers.

(1) PGS is a social process involving four main stakeholders: PGS organic producers, local advocates, consumers or entrepreneurs, and PGS organizing organizations.
(2) The main components of the PGS system include managing it according to the six international PGS principles (IFORM) and organic agricultural standards such as TAS 9000, ASEAN, Codex, European Union, United States, and Japan.
(3) The principles of the PGS organization include a Shared vision, Participation, Transparency, Trust, Horizontality, and a Learning process.
(4) Key features of the PGS Group: All members must participate in organizing the following: Define the group's organic farming requirements and have an accessible group documentation management system.
(5) Registration of certified people and management of logo use: The organization shall have a mechanism to regulate the registration of accredited persons, the display of the logo, the conditions of use, suspension, and revocation.
(6) Acceptance mechanisms: 1) Establish mutual acceptance mechanisms such as self-assessment to examine group processes and evaluate the organization of the PGS system, and 2) Visit friends' farms to link networks to facilitate knowledge exchange.

[11] National Bureau of Agricultural Commodity and Food Standards (ACFS), Ministry of Agriculture and Cooperatives (2019)

4.5.2 Advantages of PGS

(1) Empowers Farmers: Gives farmers a voice in setting standards and monitoring compliance.
(2) Cost-Effective: It is typically more affordable than third-party certification, which makes it accessible for small-scale farmers.
(3) Local Relevance: Rooted in local knowledge and traditions, addressing farmers' needs.
(4) Community Building: Fosters social cohesion among farmers.
(5) Environmental Benefits: Encourages sustainable practices, benefiting the environment.

4.5.3 Cons of Participatory Guarantee Systems (PGS)

(1) Limited Recognition: PGS may not be recognized internationally, restricting market access for certified products.
(2) Lack of Standardization: Varying standards can lead to inconsistency and confusion.
(3) Potential for Abuse: A lack of transparency may result in abuse.
(4) Limited Resources: PGS may struggle to monitor and enforce standards effectively.
(5) Time-Consuming: Participation can be demanding for farmers, involving meetings and inspections.

Generally, PGS can promote sustainable agriculture and empower farmers in developing countries, but it carries potential risks and challenges.

4.6 Participatory Organic Farming Standards Development SDGs PGS

The development of participatory organic farming standards, SDGsPGS, began in 2013 when Dr. Anurak Ruangrob joined the Sammachiap Foundation's community development initiative. The aim was to establish sustainable local occupations using community resources. This included the One Tambon One Company project, where three socially responsible organizations collaborated to create guidelines for developing Sammachiap occupations across five tampons.

Sammachiap principles emphasize avoiding harm to oneself, others, and the environment while ensuring income exceeds expenses. This approach promotes agriculture that produces safe, chemical-free products, benefiting both producers and consumers. Additionally, it encourages product processing and community tourism, contributing to income generation and strengthening the grassroots economy.

To support sustainable farming in the community, the Sammachiap Foundation established SCE International Co., Ltd. in 2014 to connect local products with the market. In 2015, they developed the SCE PGS organic farming standard, with Mr. Narong Kongmak creating the certification curriculum and manual. Dr. Anurak Ruangrob led the nationwide implementation of the organic farming network.

On January 13, 2016, there was a collaboration to create a full-area livelihood using the area as a starting point. Promoting organic agriculture and developing organic agricultural standards with participation was essential in building a full-area livelihood and promoting community processing/markets and community tourism. Later, Dr. Anurak Ruangrob joined the Community Organization Development Institute (Public Organization) and included the promotion of organic agricultural clusters as an essential part of driving work with the community organization movement, enabling the development of SCE PGS to expand to more than 30 provinces within only 2 years.

In April 2018, Dr. Anurak Ruangrob and partners in the organic agriculture cluster aimed to enhance participatory organic agriculture standards to meet international practices. They rebranded the initiative as SDGsPGS (Sustainable Development Goals - Participatory Guarantee System), aligning it with the UN's sustainable development goals and the Thai organic agriculture

strategy while supporting the 12th National Economic and Social Development Plan (2017-2021). This initiative builds on IFOAM's concept of participatory organic agriculture standards.

The SDGsPGS is gaining universal recognition as a new vision for sustainable agriculture. On May 18, 2018, the Sustainable Agriculture Network, collaborating with Dr. Anurak Ruangrob, held a meeting at Suan Sang Fan in Amnat Charoen Province. Representatives from over 20 provinces established the "Sustainable Agriculture Federation of Thailand" and designated the SDGsPGS as its central certification system. This federation will manage the SDGsPGS to support sustainable agricultural reform in Thailand.

Figure 31:
The development of SDGsPGS.

5. Case Study: SDGsPGS certification, Bua Yai Subdistrict, Na Noi District, Nan Province

In the Bua Yai Subdistrict Nanoi district, Nan province case study, we selected the participatory guarantee certification (SDGsPGS) under the Nan Organic Agriculture Federation. This certification standard provides flexibility in land ownership, field inspection using locally trained field inspectors, etc.

Some farmers involved in Bua Yai subdistrict had already obtained Good Agricultural Practices (GAP) certification before the project's implementation. However, Technical Assistance (TA) did not support this certification, as the required certification type needed to be independent. Consequently, during the project's implementation, TA organized activities to assist farmers in the study area in applying for participatory guarantee certification (SDGsPGS).

The workshop “Capacity Building Workshop on Grower Certification Scheme (e.g., participatory guarantee system), organic farming, and good agricultural practices (CB7)” was organized as a part of the Asian Development Bank (ADB) Technical Assistance (TA) on “Climate Change Adaptation in Agriculture for Enhanced Recovery and Sustainability of Highlands” to Thailand. The rationale for conducting the CB-7 workshop included the dissemination of knowledge about the benefits of organic farming and the marketing and database system of the organic farming federation, farmer's actual agricultural plot inspection by agricultural plot inspectors for participatory guarantee certification; farmers practiced microbial fertilization and plant hormone production and the evaluation of the workshop objectives.

The TA's ultimate objective is to design and implement activities that will yield positive development outcomes and benefits for rural communities in Nan Province. This requires active participation of the farming community.

The specific objectives of the workshop were:

(1) To disseminate knowledge and share experience on grower certification schemes (such as PGS), organic farming, and good agricultural practices from different perspectives, such as private sectors, government agencies, NGOs/CSOs, and organic farmers.
(2) To build the capacity of local communities, including women, on grower certification schemes, organic farming, and good agricultural practices by showing the participants step-by-step the transformation and allowing them to practice key essential steps during the workshop.
(3) To enhance farmer knowledge on soil quality improvement and biological pest control preparation.
(4) To certify farmers who are ready to switch from conventional farming to a participatory guarantee system.

A total of 65 farmers attended the meeting from 5 villages, 37 females and 28 males. The participatory assessment of agricultural participatory guarantee system knowledge before and after the training found that farmers had increased knowledge.

Farmers in Bua Yai practiced inspecting their plots by agricultural inspectors. Of the 49 farming plots inspected, 39 were certified participatory guarantee systems (SDGsPGS) in the first year of transition, and two farms were certified participatory guarantee system agriculture in the second

year of transition. Bua Yai farmers understand and implement the participatory guarantee system (SDGsPGS). Undoubtedly, the number of plots and the number of participatory organic farming are likely to increase shortly.

In addition, through the training on composting, biological pesticides, and plant hormones, farmers have worked together very well, reflecting the ability of the network of farmers even though they come from different villages. Farmers are delighted to use bio-fertilizers and biopesticides in their agricultural plots.

They are 65 Farmer participants: Farmers from 5 villages, a total of 65 people, consisting of Village 2, 45 people, male 18 female 27; Village 8, 2 people, male 0, female 2; Village 4, 11 people, five males, six females; Village 1, 6 people, three males, three females; Village, one person, male 0, female 1; 6 Inspectors, six females (Mrs. Thikamporn Kongsorn, Ms. Chong-euang Panti, Mrs. Kalaya Kansan, Ms. Hathaiphat Chusrithong, Mrs. Pornsinee Kongprom, Mrs. Nattira Trongtor)

The SDGsPGS network defined six issues for developing organic agriculture: 1. Expansion of organic certification areas, 2. Organic product management, 3. Development of inspectors, 4. Lessons learned and research and development, 5. Integration of cooperation with all sectors, and 6. Public awareness communication.

In 2021, the PGS Organic Agriculture Council of Thailand was established by merging several PGS networks with the Ministry of Agriculture and Cooperatives and the National Bureau of Agricultural Commodity and Food Standards. This initiative aims to promote Participatory Guarantee Systems (PGS) as a vital tool for agricultural development. Dr. Anurak Ruangrob is the vice chairman of the PGS Organic Agriculture Council of Thailand. The main goal is to exchange knowledge, share knowledge, create awareness of PGS, and make it a public issue for society to recognize the importance of PGS, which is an essential mechanism in reforming organic agriculture in Thailand.

Figure 32:
The logo of SDGs PGS.

Dr. Ekapong Musikacharoen, Director of Technology and Innovation Business Promotion Group Promotion and Coordination Division for the Benefits of Science Research and Innovation, Office of the Permanent Secretary for Higher Education, Science, Research and Innovation, has presented about Organic Agricultural Network: OAN.

The organic farming network information system was developed to give farmers the tools to manage their plot-level data.

The three objectives:

(1) For farmers to have their database and be able to register their farms online, online farm cost and production plan
(2) To allow buyers to trace back to certified plots of participatory organic farming standards.
(3) To act as an intermediary in marketing organic products in advance

Figure 33:
Organic Agricultural Network: OAN.

Figure 34:
Process Innovation of SDGs PGS.

Process Innovation upgrades farmers to smart farmers by providing them with information to develop a Participatory Guarantee System (PGS) throughout the value chain. It is a proactive process supported by the government under the principle of area-based development, self-managed provinces.

5.1 Agricultural Plot Inspection

The six field inspectors separately inspected the farmer's plot.

Plot inspectors must go to the farmer's plot with the owner of the plot to inspect the size of the plot, surrounding agricultural areas, current farming operations, evidence of pesticide use or harmful substances that may be left in the plot, water sources for agriculture and taking pictures of farmers in the four corners of the agricultural area.

Figure 35:
Photographs of All Four Directions of the Agricultural Area.

Farmers are very interested in field inspections. The field inspectors provide helpful knowledge and encourage farmers who want to switch from traditional farming practices to certified SDGsPGS agriculture.

Plot inspectors are very important because they have careers as farmers. They understand the transition from traditional agriculture to being certified, and they communicate very well with farmers.

5.2 Data recording and data submission

The inspector will have a form to complete the information required for the plot's certification. Specific details, such as the land use of neighboring areas and plants in the buffer zone, can be filled out during the on-site inspection. Other information, like the history of the plot's ownership, can be provided later.

Once the form is completed, the inspector must enter the information into the Nan Organic Agriculture Federation database (OAN). The data will then be forwarded to the Nan Organic Agriculture Federation Committee for review.

The committee will generally meet monthly to review the farmer's plots submitted for certification. Once the review is complete, the coordinator will communicate the results to the farmers, informing them of the certification outcomes.

Figure 36:
Inspectors Filled Out the Form for SDGs PGS.

5.3 Nan Province Participatory Guarantee Committee

Assistant Professor Dr. Wilaiporn Chanchai, Vice President of Rajamangala University of Technology Lanna Nan (RMUTL Nan), chaired the SDGsPGS Participatory Organic Agriculture Certification committee in Nan Province. The committee members included Phra Khru Sujinankit, President of the Nan Organic Agriculture Community Enterprise Network; Ms. Thikamporn Kongsorn, Manager of the Nan Organic Agriculture Community Enterprise Network; Ms. Duangduean Khattiyanet, Director of the Three Careers Sufficiency Economy Learning Center; Mr. Prathum Chinnasen, Managing Director of Pracharat Rak Samakkhi Nan Social Enterprise; representatives of Nan Provincial Commerce; representatives of Nan Provincial Public Health; representatives of WWF (Thailand); representatives of Kasikornbank Nan Branch; and representatives of Big C. Representatives from the Faculty of Agriculture, Rajamangala University of Technology Lanna Nan, and representatives from each farmer group who participated in the SDGs PGS, totaling 40 people. Assistant Professor Dr. Wilaiporn Chanchai, Chairwoman of the Certification Committee, said that organic farming today cannot be done alone. We must form strong groups and, most importantly, meet organic agricultural standards. Nan Province is fortunate that farmers can access the SDGs PGS organic agricultural certification, which the provincial certification committee cannot visit and inspect all the certified farms. Today is the certification process where the Nan Sustainable Agriculture Federation inspected the farms, filtered the data, and presented the conclusions to explain that examining the farms and filtering for certification is rigorous and that consumers are confident in. Therefore, the working group is

requested to maintain the quality standards and develop further so that organic farmers in Nan can have a better quality of life.

5.4 Certification and Compliance

During the support provided by TA, 49 farming plots were inspected for certification. Of these, 39 plots were certified under the participatory guarantee system (SDGs PGS) in the first year of transition. In contrast, two farms received accreditation under the participatory guarantee system in the second year.

Figure 37:
The SDGs PGS of Nan Certification.

An example of the increased income of small farmers who received PGS certificates is the case study from Lampang province. The results of using the Participatory Guarantee System (PGS) to drive organic farming in small-scale farmer communities based on shared vision, trust, horizontal relationships, transparency, participation, and learning processes, using the National Organic Agriculture Standard (Organic Thailand) to guarantee the quality of organic products according to the PGS and Organic 3.0 operating guidelines, can increase the number of organic farmers by 34 people, with an average production cost before entering the PGS system of 1,512 baht and a reduced production cost after entering the PGS system of 450 baht, indicating that the PGS system reduces production costs by 70.23 percent. In addition, the price of organic products certified by the PGS system increases by 15-79 percent, resulting in farmers having an average income increase of 11.11 percent per person per year. The PGS system can increase the capacity of female farmers, promote the human rights and health of farmers, support access to fresh and safe quality organic food, increase consumer acceptance, and strengthen the group. And increase marketing channels, and farmers are most satisfied with the organic agricultural certification using the PGS system.[12]

[12] Maneechoti S and Athinnuwat D. (2019). Application of Participatory Guarantee Systems toward Organic 3.0 and increased small farmer income. Thai Journal of Science and Technology 8(5): 468-487. Doi: 10.14456.tjst.2019.53

5.5 Summary and Recommendations

5.5.1 Conclusions

The output of the training workshop, titled "Capacity Building Workshop on Grower Certification Scheme (e.g., Participatory Guarantee System), Organic Farming, and Good Agricultural Practices (CB7)," was impactful. Sixty-five farmers from four villages participated, with more females than males in attendance.

During the workshop, plot inspectors evaluated agricultural plots transitioning from traditional farming to certified agriculture. The farmers assessed 49 plots. 33 farmers from essential oil extraction groups managed 33 plots covering 89.075 rai (where 6.25 rai equals 1 hectare) and received SDGsPGS certification during the first year of their transition period. Additionally, eight more farmers were certified in the first year, while two others received approval for their second-year transition period.

5.5.2 Recommendations

Farmers certified under the SDGsPGS program can receive either an unconditional or conditional pass. Those who receive a conditional pass must implement improvements based on the inspector's recommendations. Additionally, farmers must continuously inspect their agricultural plots for two years, which is considered a transition period. Farmers who have fulfilled all requirements will be awarded their SDGsPGS organic certification in the fourth year. Farmers need to adhere strictly to the instructions provided by the inspectors. We anticipate that certified SDGsPGS farmers will serve as positive role models for others, increasing the number of certified farmers and the area of agricultural land certified under this program.

6. Appendices

6.1 Appendix A

Relationship between Requirements on Good Agricultural Practices for Food Crops and Modules of Food Safety, Produce Quality, Environmental, and Worker Health, Safety, Welfare.

TAS 9001-2013

Items	Requirements	Modules			
		Food Safety (FS)	Produce Quality (PQ)	Environmental Management (EN)	Worker Health Safety, Welfare (WHSW)
1. Water	1.1	√			
	1.2	√			
	1.3	√			
	1.4	√			
	1.5		√		
	1.6			√	
	1.7			√	
	1.8			√	
	1.9			√	
	1.10			√	
	1.11		√		
	1.12	√			
	1.13	√			
	1.14	√			
2. Planting Area	2.1	√			
	2.2	√			
	2.3	√			
	2.4			√	
	2.5			√	
	2.6	√	√	√	√
	2.7			√	
	2.8			√	
	2.9	√			
	2.10	√			
	2.11			√	
3. Pesticides	3.1	√			
	3.2	√			
	3.3	√			
	3.4	√			
	3.5	√			
	3.6	√			
	3.7	√		√	
	3.8	√			
	3.9	√			√
	3.10	√		√	

Items	Requirements	Modules			
		Food Safety (FS)	Produce Quality (PQ)	Environmental Management (EN)	Worker Health Safety, Welfare (WHSW)
	3.11			√	
	3.12	√			√
	3.13	√			
	3.14	√			
	3.15	√			√
	3.16				√
	3.17				√
	3.18			√	√
	3.19				√
	3.20				√
	3.21				√
4. Pre-harvest quality management	4.1	√	√	√	√
	4.2	√			
	4.3		√		
	4.4	√			
	4.5	√	√	√	√
	4.6	√			
	4.7	√			
	4.8	√			
	4.9	√			
	4.10		√		
	4.11	√		√	
	4.12				√
	4.13				√
	4.14				√
	4.15	√			
	4.16	√			
	4.17	√	√	√	√
	4.18			√	
	4.19			√	
5. Harvest and postharvest handlings	5.1		√		
	5.2	√			
	5.3		√		
	5.4		√		
	5.5	√			
	5.6	√			
	5.7	√			
	5.8	√			
	5.9	√			
	5.10		√		
	5.11	√			
	5.12	√			
	5.13	√			
	5.14	√			
6. Holding, moving produce in	6.1	√	√		
	6.2	√			
	6.3	√			

Items	Requirements	Modules			
		Food Safety (FS)	Produce Quality (PQ)	Environmental Management (EN)	Worker Health Safety, Welfare (WHSW)
planting plot, and storage	6.4	√			
	6.5		√		
	6.6	√			
	6.7		√		
	6.8		√		
	6.9	√			
7. Personal hygiene	7.1	√			√
	7.2	√			
	7.3	√			√
	7.4	√			
	7.5				√
	7.6				√
	7.7				√
	7.8				√
8. Record keeping and traceability	8.1		√	√	
	8.2			√	
	8.3	√			
	8.4	√			
	8.5	√			
	8.6	√			
	8.7	√			
	8.8		√		
	8.9	√			
	8.10	√			
	8.11	√	√		
	8.12	√	√	√	√
	8.13	√	√	√	√
	8.14	√			
	8.15	√			
	8.16	√			
	8.17	√			
	8.18	√			
	8.19	√	√	√	√
	8.20	√	√	√	√

Note:
FS is an abbreviation for Food Safety
PQ is an abbreviation for Produce Quality
EN is an abbreviation for Environmental Management
WHSW is an abbreviation for Worker Health, Safety and Welfare

6.2 Appendix B

Substances allowed for organic production, inputs used as fertilizers, and soil conditioners.

Substance name	Details/Specifications
1. Manure from livestock and poultry	- If it is not from the organic production system, it must be recognized by the certification body or relevant authority. - Sources from industrial farms are not allowed. (using large amounts of chemicals or veterinary drugs and liver cage culture) - Do not apply fresh animal manure to food crops so that there is a risk of contamination of pathogenic microorganisms to the brico-bearing parts of the crop.
2. Compost from animal and poultry waste	
3. Manure and compost from manure	
4. Dried manure from livestock and poultry	
5. Animal waste	- If it is not from the organic production system, it needs to be accepted by the certification body or the relevant authority, it should be fermented and/or diluted under controlled conditions and not allowed from factory farming.
6. Natural Fertilizers	- Required to be recognized by a certification body or relevant authority
7. Straw	- Required to be recognized by a certification body or relevant authority
8. Compost from mushroom-growing material	- Required to be recognized by the certification body or relevant competent authority, the materials used must fall under these items.
9. Compost from organic materials left over from homes	- Required to be recognized by a certification body or relevant authority
10. Compost from waste plant materials	-
11. Residue from slaughterhouses and aquaculture factories	- Must not use synthetic substances and must be recognized by the certification body or relevant authority.
12. By-products from food and weaving industries	- Must not use artificial additives. - Required to be recognized by a certification body or relevant authority
13. Seaweed and seaweed products	- Required to be recognized by a certification body or relevant authority
14. Sawdust, bark, and wood waste	- Required to be recognized by a certification body or relevant authority
15. Wood ashes	- Required to be recognized by a certification body or relevant authority
16. Natural phosphate rock	- Required to be recognized by a certification body or relevant authority - Cadmium content must not exceed 90 mg/kg (milligrams per kg).
17. Basic Slag	- Required to be recognized by a certification body or relevant authority
18. Potassium rocks and potassium salt from mines (e.g. Kainite and Sylvinite)	- must contain less than 60% chlorine
19. Potassium sulfate (e.g. paten kali)	- Obtained by physical processing but not chemically enhanced to increase solubility.

Substance name	Details/Specifications
	- Required to be recognized by a certification body or relevant authority
20. Natural calcium carbonate (such as chalk, marl, quicklime, phosphate chalk)	-
21. Magnesium stone	-
22. Calcareous magnesium rock	-
23. Magnesium sulfate (Epsom salt)	-
24. Gypsum (calcium sulfate)	-
25. Stillage and Stillage extract	- Excluding ammonium stillage
26. Sodium chloride (Sodium chloride)	- only rock salt
27. Aluminum calcium phosphate	- Cadmium content not more than 90 mg/kg P2 O5
28. Trace minerals (such as boron, copper, iron, manganese, molybdenum, zinc)	- Required to be recognized by a certification body or relevant authority
29. Sulfur	- Required to be recognized by a certification body or relevant authority
30. Crushed stone	-
31. Soils such as bentonite, perlite, zeolite (bentonite, perlite, zeolite	-
32. Organisms in natural biology (such as earthworms)	-
33. Vermiculite	
34. Materials used in cultivation (Peat)	-
35. Humus (humus) from earthworms and insects	-
36. Zeolite	-
37. Charcoal from wood	-
38. Alkali chloride (chloride of lime)	- Required to be recognized by a certification body or relevant authority
39. By-products of the sugar factory	- Required to be recognized by a certification body or relevant authority
40. By-products from processing ingredients manufacturing plants from organic agriculture	- Required to be recognized by a certification body or relevant authority
41. By-products from coconut palm oil and cocoa	- Required to be recognized by a certification body or relevant authority

6.3 Appendix C

Substances used for pest and disease control of plants.

Substance name	Details/Specifications
1. Plants and animals 1.1 A preparation containing pyrethrins extracted from *chrysanthemum cinerariaefolium*.	- Required to be recognized by a certification body or relevant authority
1.2 Preparations of rotenone or active ingredients from plaques (*Derriseliptica*), *Lonchocarpus*, *Thephrosia* spp.	- There is a prevention of contamination of the water source. - Required to be recognized by a certification body or relevant authority
1.3 Preparations from *Quassia amare*	- Required to be recognized by a certification body or relevant authority
1.4 Preparations from *Ryania* speciose	- Required to be recognized by a certification body or relevant authority
1.5 Active ingredients from neem or Azadirachtin from *Azadirachta* spp.	- Required to be recognized by a certification body or relevant authority
1.6 Propolis	- Required to be recognized by a certification body or relevant authority
1.7 Vegetable and animal oils	-
1.8 seaweed, seaweed meal or seaweed extract, seawater, and salty water	- Do not use chemicals
1.9 gelatin	-
1.10 lecithin	- Required to be recognized by a certification body or relevant authority
1.11 casein	-
1.12 Natural acids such as vinegar	- Required to be recognized by a certification body or relevant authority
1.13 Fermentation from aspergillus	-
1.14 shiitake fungus extract	-
1.15 Chlorella Extract	-
1.16 Natural plant preparations except tobacco	- Required to be recognized by a certification body or relevant authority
1.17 Tabacco tea, except pure nicotine	- Required to be recognized by a certification body or relevant authority
1.18 tea residue	- Required to be recognized by a certification body or relevant authority

Substance name	Details/Specifications
1.19 wood vinegar	- Required to be recognized by a certification body or relevant authority
2. minerals 2.1 Organic compounds such as Bordeaux mixture, copper hydroxide, and copper oxychloride.	- Required to be recognized by a certification body or relevant authority
2.2 burgundy mixture	- Required to be recognized by a certification body or relevant authority
2.3 copper salts	- Required to be recognized by a certification body or relevant authority
2.4 Sulphur	- Required to be recognized by a certification body or relevant authority
2.5 Powdered minerals such as stone meal, silicates	-
2.6 diatomaceous earth	- Required to be recognized by a certification body or relevant authority
2.7 silicates and bentonite	-
2.8 sodium silicates	-
2.9 sodium bicarbonate	-
2.10 potassium permanganate	- Required to be recognized by a certification body or relevant authority
2.11 paraffin oil	- Required to be recognized by a certification body or relevant authority
3. Microorganisms used for biological pest control 3.1 Microorganisms (bacteria, viruses, fungi such as Bacillus thuringiensis, Granulosis virus)	- Required to be recognized by a certification body or relevant authority
4. Others 4.1 Carbon dioxide and nitrogen gas	- Required to be recognized by a certification body or relevant authority
4.2 Potassium soap (mild soap)	-
4.3 Ethyl alcohol	- Required to be recognized by a certification body or relevant authority
4.4 Homeopathic and Ayurvedic preparations	-
4.5 Herbs and bio-transformed preparations	-
4.6 Sterilized male insects	- Required to be recognized by a certification body or relevant authority
5. Using Traps 5.1 Pheromone preparations	-
5.2 Preparations from metaldehyde used in traps	- Required to be recognized by a certification body or relevant authority