

# QUALITY MANAGEMENT SYSTEM: GOOD AGRICULTURAL PRACTICE (GAP) FOR ON-FARM PRODUCTION IN THAILAND

Surmsuk Salakpetch  
Chanthaburi Horticultural Research Center  
Khlong, Chanthaburi, 22110 Thailand

## ABSTRACT

*Thailand has been gradually developing its quality management system by modifying concepts of international standards. Quality policy, quality objectives, quality plan, operation procedures, work instructions, forms and checklists are documented in the system. The concept of Hazard Analysis and Critical Control Point (HACCP) and the International Organization for Standardization (ISO) method was modified to develop the quality plan. The critical control point (CCP) and the control point (CP), which are indicated in the quality plan, will be used as guideline practices to get quality produce to meet customer requirements throughout the whole production cycle process. The certification was divided into three levels: Level 1 on food safety; Level 2 on food safety and free of pests; and Level 3 on food safety, free of pests, and quality. Growers in over 300,000 farms growing 28 crops have been educated on Quality Management System (QMS) since 2004.*

Key words: quality management system (QMS), quality objectives, quality plan, Hazard Analysis and Critical Control Point (HACCP), certification

## INTRODUCTION

Food safety and quality management system (QMS) schemes in the agriculture and food sectors are new systems that are widely recognized in Thailand. Knowing the potential to undermine the integrity of Thai food and agricultural produce and impede competitiveness, Thailand's Ministry of Agriculture and Cooperatives established a government-private sector working group to enhance the agricultural QMS that assures the quality of the country's plant, fishery and livestock goods.

The document on plant QMS provides information relating to on-farm food safety for fresh produce. The code of practices is designed for use by growers, trainers, facilitators, auditors and customers to achieve greater certainty and consistency in the development, implementation and auditing of an on-farm food safety program. This paper covers details and experiences in the implementation of the system for on-farm crop production only; those of the fishery and livestock production are not included.

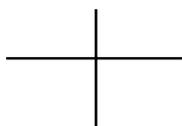
## HOW THE SYSTEM WAS DEVELOPED

A working group, initiated by the Department of Agriculture and consisted of people experienced in developing QMS for fresh produce, helped develop a system to assure the quality of fresh produce in Thailand. The Department of Fishery and the Department of Livestock are the ones responsible for fishery and livestock issues.

The system was announced to the public on 25 September 2002 to ensure that growers, traders and customers are familiar with the system. Two years later, the Thai government emphasized its policy by promoting 2004 as the Food Safety Year to make people aware of food safety and quality food.

The QMS of Thailand for agricultural goods was developed based upon the concepts of good manufacturing practice (GMP), good agricultural practice (GAP), Hazard Analysis and Critical Control Point (HACCP), sanitary and phytosanitary standards, quality assurance, and the ISO method.

The QMS was designed to guide the certification body to certify the on-farm



production process of individual growers or of produce-marketing firms. It is a management system to prevent, eliminate or minimize physical, chemical and biological hazards and to produce fresh fruits and vegetables that are free of pests and with marketable quality from the farm through the distribution channels for markets and processing. Also, the system guides growers to ensure safety and quality of fresh produce for customers. The on-farm management system emphasizes integrated pest management (IPM) and integrated crop management (ICM). Other agricultural crops such as rice, herbs and field crops are also included.

### CORE CONCEPT OF THE SYSTEM AND TRACE BACK MODEL

The core concept or requirements of the system is grouped into eight items that can serve as quality objectives of the system (Table 1). The details are in the operation procedures of the document.

Tracing back is a big task. Thailand has not yet started activities on this, but the model has been set (Fig. 1). The document states that growers must keep up-to-date records available to demonstrate that all activities of on-farm production are applied. These records will help trace the history of a produce from

Table 1. Core concept of QMS for GAP for on-farm quality and safety of fresh produce

Quality and safety items	Quality objectives
1. Water	} Physical, chemical and biological safety
2. Field and land history	
3. Pesticide issues	
4. On-farm stocking and transporting of produce	
5. Crop protection	Free of pests
6. Production process	} Quality to meet customer satisfaction
7. Postharvest handling	
8. Records	Trace back

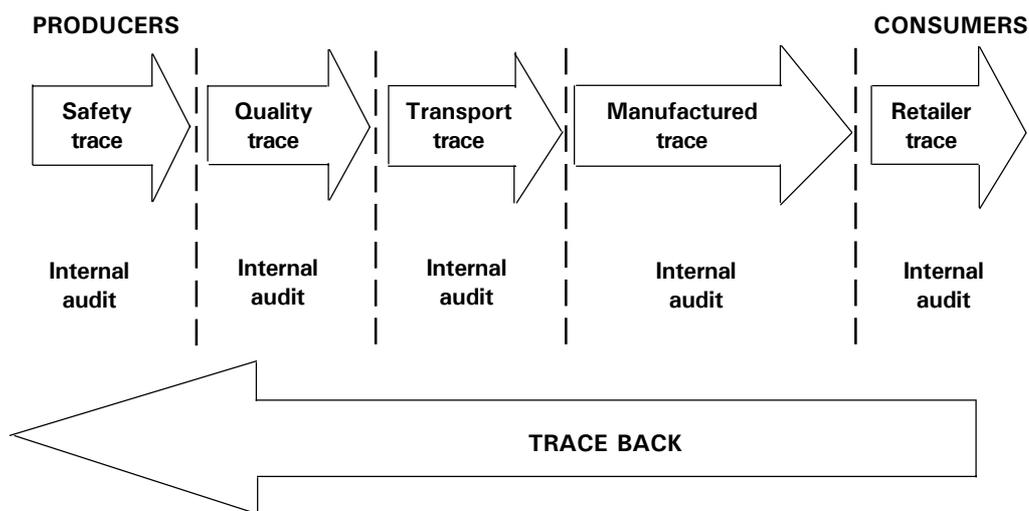


Fig. 1. Trace back and internal audit model.



the farm to the final consumers. The records must be kept for a minimum of three years. Thailand's QMS has already prepared a ring for the trace back activity to hook up so that the whole chain of QMS and trace back will be completed.

## COMPONENTS OF THE SYSTEM

The QMS for on-farm production has the following components: quality policy, quality objectives, quality plan, operation procedures and work instructions as well as forms and checklist. The document of the system has to be produced for individual crops owing to the different details in each component, particularly the quality plan.

### Quality Policy

It is the policy or vision of growers in the system. Normally, growers present their policy as follows: "We strive to produce fresh fruits and vegetables for fresh markets and processing and offer the best customer satisfaction." If they were durian growers, their quality policy would be as follows: "We strive to produce quality durian for fresh markets and processing and offer the best customer satisfaction."

### Quality Objectives

Quality objectives are developed based on customer requirements and used as guidelines to establish a quality plan. The quality objectives, for example, may be to produce fresh fruits and vegetables that meet customer satisfaction and physical, chemical and biological safety, and that are free of pests.

For durian growers, for example, their quality objectives would be to produce mature durian with no symptoms of hard flesh, wet core and mummy flesh and is chemically safe

and free of pests. For mangosteen growers, their quality objectives could be to produce shiny mangosteen with no symptoms of translucent flesh and interior gummosis, with a fruit weight not less than 70 g and is chemically safe and free of pests. The difference of quality objectives between the two crops is their respective eating quality that meets customer satisfaction.

### Quality Plan

The working group modified the HACCP and ISO method to develop the quality plan that was used as a practical framework to get quality produce in accordance with the system's quality objectives. The concept of HACCP helped them to identify where the potential product quality hazards may occur and what practices may be needed to prevent, eliminate, or minimize the hazards. Therefore, the agro-techniques for the whole production cycle process must be well prepared and developed.

A quality plan describes on-farm practices required to provide quality fresh produce that meets customer satisfaction. The eight-column-table quality plan (Table 2) offers interest and value to growers and other suppliers, auditors and customers. Growers must follow practices in the quality plan in order to provide fresh produce in accordance with the quality objectives. Auditors can use a plan to implement and audit an on-farm food safety program. Customers can be assured of buying quality and safe fresh produce.

- Process step : Stage of plant growth and development affecting the quality objectives
- Hazards : Problems or hazards related to quality objectives (descriptive information)

Table 2. Example of an eight-column table quality plan

Process	Hazards	Control measures	CP/CCP	Operating limits	Monitoring	Corrective actions	Records



- Control measures : The control measures of problems and hazards
- CP/CCP : In a particular stage of plant growth and development, should the practice (control point or critical control point) be followed to produce a fruit or vegetable in accordance with the quality objectives?
- Operating limits : Indicators to control or monitor hazards or CCP
- Monitoring : What, how to and frequency of monitoring
- Corrective actions : Corrective actions when problems or hazards exceed operating limits
- Records : All corrective actions must be recorded.

Examples of generic and durian quality plan are shown in Tables 3 and 4.

### **Operation Procedures and Work Instruction**

Operation procedures describe all procedures required in the system and the details of the core concept that have to be achieved. The work instruction includes the steps of on-farm techniques that will ensure growers to produce quality and safe fresh fruits and vegetables.

### **Forms and Checklist**

All practices indicated as critical control points in the quality plan must be recorded in the forms provided for the purpose of trace back. The checklist can be used to supplement existing and auditing checklists used by certification bodies or for internal audits carried out by a group of growers, a growers' cluster or an individual's business.

### **STATUS OF QUALITY MANAGEMENT SYSTEM (QMS) IN THAILAND (2005)**

Commencing in the fiscal year 2003, a generic document of the system and its documents, in particular, the quality objectives, quality plan, work instruction and forms of 28 crops developed by the Department of Agriculture have been published. The 28 crops include 14

fruit crops, namely banana, (*Musa* spp.), coffee (*Cofea arabica* L., *A. robusta* L.), durian (*Durio zibethinus* Murr.), longan (*Dimocarpus longan* Lour.), longkong (*Aglaia dookkoo* Griff.), lychee (*Litchi chinensis* Sonn.), mango (*Mangifera indica* L.), mangosteen (*Garcinia mangostana* L.), and pineapple (*Ananas comosus* L.) for consumption and processing, pummelo (*Citrus grandis* L.), rambutan (*Nephelium lappaceum* L.), tamarind (*Tamarindus indica* L.), tangerin (*Citrus reticulata* L.) and young coconut (*Cocos nucifera* L.). The rest are vegetables, namely, asparagus, baby corn (*Zea mays* L.), sweet corn, fresh soybean (*Glycine max* L.), groundnut (*Arachis hypogaea* L.), ginger (*Zingiber officinale*), chili (*Capsicum* spp.), okra, rice (*Oryza sativa* L.), vegetables in Family Cruciferae, legumes, capsicum and eggplant, melons and herbs.

Food safety based on the QMS is still Thailand's policy. The Ministry of Agriculture and Cooperatives, which is in charge of the food safety policy, assigned the Department of Agriculture and Extension to act as an advisory body. The Department of Agriculture serves as a certification body and the National Bureau of Agricultural Commodity and Food Standard acts as an accreditation body. The government serves as a certification body during the early stage of the QMS, after which, auditing is done by a private institution.

Growers and owners of 325,000 farms of 28 crops have been trained on the QMS and up to 5 percent of the 325,000 farms will be Level 1-certified.

The certification in the system is divided into three levels, as follows: Level 1 on food safety; Level 2 on food safety and free of pests; and Level 3 on food safety, free of pests and quality.

### **OVERCOMING OBSTACLES IN QMS IMPLEMENTATION**

The strong support of government policy makers is important. Education and extension are also important to create awareness among growers and other industry stakeholders (producers, collectors, packers, wholesalers, processors and retailers).

Consumer groups need to be encouraged to stimulate the demand for safe and quality foods.

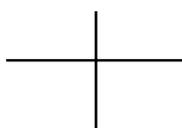


Government officials and others involved in the quality management system are encouraged to be educated and well-versed on each level of the QMS.

Private sectors or others interested in the system are welcome since implementation may be limited by the capacity of a government organization to provide resources.

## REFERENCES

- Anon. 2002. The Committee of Standard and Certification System for Commodity Development, Department of Agriculture, Thailand. (In Thai).
- Anon. 2004. Quality management system. Chanthaburi Horticultural Research Center, Department of Agriculture, Thailand. (In Thai).
- Anon. 2004. Quality management system: GAP. Royal Thai Government Gazette, No. 121, July 19, 2004.



No.	Process step	Hazards	Control measures	CP/ CCP	Operating limits	Monitoring	Corrective actions	Records
1.	Seed or propagation material preparation	<ul style="list-style-type: none"> <li>- Produce is not true to type</li> <li>- Non-marketable quality</li> <li>- Non-acceptance to quality objectives</li> </ul>	Seed or propagation material must come from reliable sources	CCP	True to type and in accordance with marketable quality	Seed or propagation material pedigree including source of origin or source of purchasing must be investigated	<ul style="list-style-type: none"> <li>- Variety required by market is needed</li> <li>- Seed or propagation material must meet its standard and come from reliable sources</li> </ul>	<ul style="list-style-type: none"> <li>- Variety name</li> <li>- Source of origin or of purchasing</li> <li>- Date and amount of purchasing</li> </ul>
2.	Crop protection during growth and development of leaf, flower and fruit (depending upon the plant parts consumed)	<ul style="list-style-type: none"> <li>- Non-marketable quality</li> <li>- Non-acceptance to quality objectives</li> </ul>	<ul style="list-style-type: none"> <li>- Diseases and insects affecting the produce during its growth and development until harvest will be examined and compared with key pest economic threshold level (ETL) of a particular crop</li> <li>- Produce must be free of damage from pests</li> </ul>	CCP	Key pest economic threshold level of a particular crop	Need to examine pests during a certain stage of plant growth and development at 5- to 7-day intervals and compare with their ETL	<ul style="list-style-type: none"> <li>- Integrated pest management (IPM) techniques of a particular crop is fully applied</li> <li>- Sorting out is needed to provide produce that is free of pests and any damage from pests</li> </ul>	<ul style="list-style-type: none"> <li>- Choice and rate of chemical applied</li> <li>- Records of application</li> </ul>
3.	Flower growth and development (fruit crop) <i>- Flower thinning</i>	Low fruit set	Apply flower density and thinning when operating limits are exceeded	CP	Depending upon an individual crop e.g. durian, flower cluster < 6 cluster per 1 meter branch long	- Examine flower number at a certain stage of development depending upon crops. If operating limit is exceeded, flower should be thinned out	- Recommended cultural practices of a particular crop (if required)	

No.	Process step	Hazards	Control measures	CP/ CCP	Operating limits	Monitoring	Corrective actions	Records
4.	Fruit growth and development (fruit crop) - <i>Fruit thinning</i>	Fruit size and shape do not conform with standards	Fruit which has slower growth, irregular development and damaged by pests should (must) be thinned out	CP/ CCP depends on crop	- Smaller fruit - Irregular shape - Fruit located at inappropriate position	- Examine fruit age, fruit number on each branch - Examine fruit size and shape	- Recommended cultural practices of a particular crop (if required)	
5.	Harvesting and on-farm postharvest handling	- Non-marketable quality - Non-acceptance to quality objectives - Quality loss	- Fresh produce must be harvested at an appropriate degree of development of a particular crop - Harvesting must be done with care - Harvesting equipment, containers and harvesting method must be appropriate - Harvested produce must be delivered to on-farm shade house immediately after harvest - Damaged produce must be sorted out	CCP	- Produce has quality acceptance to market - Harvested produce must be practically free of non-marketable quality	- Examine age or development of produce - Examine produce carefully after harvesting and sorting	- Trained workers must be assigned to harvest - Produce at an appropriate degree of development must be harvested - Harvesting equipment, containers and harvesting method must be clean and appropriate - Sorting out is needed to provide a produce that is free from any damage from pests, harvesting and other sources	- Total number of harvested produce - Number of quality produce - Records of application

No.	Process step	Hazards	Control measures	CP/ CCP	Operating limits	Monitoring	Corrective actions	Records
		<ul style="list-style-type: none"> <li>- Must be applied with care</li> <li>- Harvesting equipment, containers and harvesting method must be appropriate</li> <li>- Harvested produce must be delivered to on-farm shade house immediately after harvest</li> <li>- Damaged produced must be sorted out</li> </ul>					<ul style="list-style-type: none"> <li>- Sorting out is needed to provide produce that is free from any damage from pests, harvesting and other sources</li> </ul>	