

Postharvest Problems in Thailand : Priorities and Constraints

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Abstract

Postharvest loss in Thailand is still high both in terms of quality and quantity. Legal standards for fruits and vegetables are largely inexistent. For grains and beans, standards are recognized for wholesale and export market, but there is almost no system at the retail level. Fraud is now widespread even in high value commodities such as jasmine rice. The presence of pesticide residues in fresh vegetables is another problem that threatens the health of Thai consumers. Regular inspection is lacking. Organic vegetables are being promoted at the national level, but contamination is still detected in "organic"-labeled commodities. Lack of storage and shelf-life extension for fruits and vegetables is another postharvest problem. Currently only longan, onion and citrus are substantially treated and stored. For other commodities, information is being collected and technology developed by researchers working locally as well as in collaboration with foreign researchers.

Introduction

Situated in a rainy tropical region, protected from severe natural disasters, and endowed with a large percentage of arable land, Thailand has maintained itself as a net food-exporting nation for a long time. Production of many commodities ranks at the top of the world list (Table 1). The development in production technology including crop improvement and irrigation system has improved notably. Attention paid to postharvest practices is minimal however. Although the government recognized the importance of postharvest technology in the late seventies, no national institute for postharvest studies was set up. Currently, work in this field is carried out in laboratories, the smallest governmental units. There are 3 units at the Ministry of Agriculture, 1 unit at the Ministry of Science and Technology and 7 at the Ministry of University Affairs. No data on postharvest losses are collected systematically by any agency, although it is considered that the losses are high. Examples are shown in Table 1.

Many steps are involved in the postharvest handling of agricultural commodities, from harvesting to marketing. Problems do exist at all levels, but the severity varies. Postharvest problems in Thailand are summarized in Table 2. Each problem must be addressed by the party involved in order to reduce loss and improve quality. Main problems discussed in this presentation are those which became more serious in recent years and are not recognized by the government and the public at an appropriate level, and those facing pressure or competition from abroad, especially due to new international rules, regulations or requirements such as GATT and QA system.

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Table 1 Thailand agricultural production, world range and estimated postharvest loss

Commodities	Production* (Metric tons)	World range*	Estimated postharvest** loss (%)
Cereals (total)	26,426,000	16	8–14
Root tubers (total)	16,208,000	11	—
Fruits (total)	6,577,000	11	10–40
Vegetables (total)	2,712,000	32	10–60
Rice	21,800,000	6	—
Corn	3,965,000	17	—
Cassava	16,000,000	4	—
Dry bean	250,000	11	—
Garlic	112,000	8	—
Onion	260,000	26	—
Sesame seed	34,000	9	—
Pineapple	2,031,000	1	—
Mango	665,000	4	—
Banana	1,750,000	10	—
Cabbage	210,000	25	—
Cucumber	220,000	16	—
Cashew	20,000	8	—
Castor Bean	15,000	5	—

Source : * FAO Agricultural Production Report 1996.

** Estimated from various sources.

Table 2 List of prosthharvest problems in Thailand

Postharvest steps	Problems	
	Agronomic commodities	Horticultural commodities
Harvesting	Labor shortage loss	Labor shortage
Cleaning	Contamination with foreign objects	Pesticide contamination
Curing-drying	Inefficient	Inefficient
Quality sorting	Standards neglected	Lack of standards
Disease control	Toxin contamination	Not effective for long distance transport
Insect control	Future chemical ban	Expensive, damage to the commodities
Packaging	Mostly traditional packaging, oversized	Mostly traditional packaging
Cooling	...	Inadequate facilities
Storage	Moisture control	Physiologically limited
Transport	Mostly one way	Mostly one way/unrefrigerated
Marketing	Weak farmer organization	Weak farmer organization

Table 3 Thailand white rice standards (simplified) (%)

Grade	Full grain	Broken grain		Immature grain	Glutinous grain	Unhusked rice	Moisture
		long	short				
100%	≤60	<35	< 5	≤0.5	≤0.5	≤ 5	<14
5%	≤60	<33	3-7	≤2.5	≤0.5	≤15	<14
10%	≤55	<33	8-12	≤3.0	≤0.5	≤20	<14
15%	≤55	<28	13-17	≤3.0	≤0.5	≤25	<14
20%	≤50	<27	18-23	≤3.0	≤0.5	≤25	<14

Source : Ministry of Commerce

Quality sorting

Among the various steps in the postharvest chain in Thailand, I consider that the most serious problem now occurs at the level of quality sorting, while the world is moving toward better quality products, starting from the use of standards for quality control to quality assurance and currently quality system standards, which have already been widely accepted. Quality issues in Thailand agriculture are lacking, although there are sorting procedures for all the commodities produced in Thailand. For example, rice is sorted and graded according to the national standards shown in Table 3. These standards were accepted by all the parties involved in the past. Consumers bought rice according to variety and grade, mostly the 100, 5 and 10% grades. However, this grade standard has disappeared from retail markets in recent years. The young generation does not know that rice grades exist. The older generation seems to forget about it as well. It is hard to determine why this has happened. It is said that in the past consumers bought rice directly from a rice shop in a 15kg package, according to the grade. Recently, when supermarket chains expanded across the country, rice has been sold in smaller 5kg plastic bags without grade marked. It was considered to be better than that sold in traditional markets. As time passed, rice grade disappeared from the rice shops as well. This move has led to large-scale fraudulent practices, particularly in the case of high quality jasmine or fragrant rice. It is considered that most if not all the fragrant rice sold in the market is now mixed with non-fragrant rice. Even so, there is a weak concern from local consumers. Stronger complaints come from consumers abroad. The government recognizes the problem, but does not seem to consider it as an important problem. Worst of all, a few months ago, the Ministry of Commerce announced a voluntary standard for jasmine rice comprised of grades 1, 2 and 3. All of them were allowed to contain up to 10, 20 and 30% of non-fragrant rice, respectively. This move is acceptable by most if not all the traders, but I consider it as a very dangerous move, in taking account of the USA which is the most important competitor in the rice market. USA can also produce and export jasmine rice and even try to patent its own jasmine rice. What will happen to the Thai market share if the USA promotes its jasmine rice as an authentic jasmine rice without any non-fragrant rice mixture?

For horticultural commodities, grade standards are only used for a few crops such as Logan. For other commodities grades are used according to agreements between specific sellers and buyers, and are different between markets and regions and even between the periods

of the year. Most of these standards are based on the size of the commodity. Bigger size is considered better in quality.

Presently, durian and longan are the two main fruit crops for export. There is almost no competition from abroad, hence the lack of standards may not be an important problem. Durian is exported to Hong Kong and Taiwan in large quantities each year, despite the fact that complaints about immature fruit are always heard. The Department of Agriculture has tried to set up national standards in response to the expanding exports. They developed standards for durian, mango and rambutan. These standards are still based on size. Minimum requirements are very subjective and are difficult to interpret. Better standards should be developed and put into use.

The issue of quality involves 4 partners; producers or farmers, traders, consumers and the government. At present, farmers and consumers are not well educated to recognize the importance of having standards. Traders know it very well but try to avoid using them for their own benefit. The government knows the problem and tries to help but seems to lack the ability, particularly at the enforcement level.

Pesticide residues

The presence of pesticide residues in agricultural products is the second most important problem in Thailand. Not only the residues are harmful to the health of the consumers, but the farmers who apply pesticides to their crop themselves are facing serious health problems. Furthermore, ecological balance within the country is deteriorating at a fast pace. A clear example is illustrated in the case of mangosteen production. Normally mangosteen has a smooth purple surface, but if infected with thrips and mites at the blooming stage, the surface will develop into a rough, brown and unattractive fruit. The damage of mangosteen occurs more frequently in the eastern than in the southern part of Thailand due to the higher level of pesticide use in the eastern part of the country. These pesticides destroy natural enemies of the insects as well as induce insect pests to develop resistance to the chemicals. As a result, more and more pesticides must be used to produce fruits in the eastern part. In developed countries, the problem of pesticide residues is well recognized and tackled by all the parties involved. In Thailand this problem is recognized as well, but the measures to control the use of pesticides are much less effective. In 1993, the Department of Medical Science reported an alarming study on pesticide residues in food (Table 4). It was found that 42% of the samples studied contained some pesticide residues, and 6.2% exceeded the Codex Maximum Residue Limits. Citrus, grapes, jujube and spices are in the highest risk group, with more than 15% of the samples containing pesticide residues over the limit. Grains, beans, root crops and fruits that are consumed after peeling were in the lowest risk group, since no residues were found.

Crucifers, leafy vegetables and peas were in the medium risk group. Methamidophos and monocrotophos are the most frequently found pesticides. After this study was publicized, demand for organic food increased significantly. Organic farming is on the rise. However, no measures are taken to control pesticide use. There is not even a regular check on residues in agricultural products. Hence, it is considered that fruits and vegetables in the market are still contaminated with pesticides at about the same level. For organic food itself, pesticide residues

were also detected, mostly due to fraudulent sale of non-organic products as organic products.

Fortunately because of the current economic crisis, the Thai currency depreciation over 40% against the US\$ and 30% against the Japanese Yen, has led to a sharp increase in the price of pesticides. The farmers have no choice but using less pesticides. Alternatives, such as natural products are on the rise.

Table 4 Pesticide residues found in agricultural products

Commodities	No of Samples	Residues found (%)	Over Codex limit (%)	Pesticides found to occur over the limit
Citrus	44	86.4	15.9	Methamidophos, Methyl-parathion
Berry and small fruits	69	98.6	17.7	Monocrotophos, Dimethoate
Fruits with skin	14	85.7	—	—
Fruit pulp	44	11.4	—	—
Garlic & onion	37	13.5	2.7	Omethoate
Crucifers	34	32.4	8.8	Monocrotophos Chlorfevinphos
Melon & cucumber	70	20	1.4	Heptachlor
Fruit vegetables other than cucurbits	82	22	1.2	Carbofuran
Leafy vegetables	218	47.7	7.8	Methamidophos, Monocrotophos, Carbofuran
Beans	121	44.6	7.4	Monocrotophos, Methamidophos, Dimethoate, Methiocarp
Peas	48	35.4	—	—
Root crops	23	8.7	—	—
Grains	19	—	—	—
Spices	12	25.0	16.7	Methyl-parathion

Source : Bull. Dept. Med. Sci. 35 (1) : 1~12, 1993

Storage

Another postharvest problem in Thailand is the storage problem. In grain, natural toxin contamination, due to inadequate drying particularly at farmer level, has been well addressed and much progress has been achieved. More serious problem is the storage of horticultural commodities. Only root crops such as garlic and onion are significantly stored on a large scale. Most of the storages use traditional techniques, which are subject to huge loss. Only a fraction of these crops is stored under refrigeration. For fruits, only tangerines are stored on a large scale for a short period of time in order to keep the fruit at least until the Chinese New Year. Longan and durian are the other two main crops which are stored also for a short period, but only a fraction of the total production is taken care of. There is less than 1,000 ton capacity of cold storage in Chantaburi, the largest durian-producing province, where more than 4,000 tons of fruits, are harvested per day during the season. Most are harvested, cleaned-sorted,

packed and immediately shipped by refrigerated container. For vegetables, there is almost no storage since most vegetables can be grown all the year round. Huge loss of fruits and vegetables after harvest especially during the season is common. These problems were not very serious in the past, since surplus was not large. However, presently, Thailand is facing a strong pressure due to the economic crisis. Labor from the industrial sector is returning to the country home and starts to produce more agricultural products. In addition, the depressed price of cereal crops in the past few years has forced many farmers to switch at least part of their land from grain to fruit and vegetable production. Area under horticultural commodities especially fruit has increased significantly. Once this area becomes productive, the amount of produce in the market will be well in excess of local and export demand. The development of storage facilities to support this increase in product volume may not be a major problem as compared with the fact that these commodities are tropical commodities, which are subjected to chilling injury. Research in this field should be conducted more actively. Collaboration with scientists in developed countries including Japan should be very helpful to avoid the foreseen problem.

Source of problems

The main postharvest problems in Thailand mentioned above are technical problems which should not be too difficult to solve. However, these problems seem to have become more serious in recent years largely due to social rather than technical factors.

The Thai society is said to be family-oriented in contrast with that of most western or developed countries, which are law societies. Compromise is the usual way to solve problems or conflicts in Thailand. This problem-solving attitude together with the democratic system of government in Thailand has led to a society with low law enforcement. Corruption is widespread involving politicians, government workers as well as businessmen.

The Thai have recognized this problem of social illness and its causes, just recently. They are successful in moving toward reform by accepting a new constitution, which is considered to be better, particularly in relation to the procedures to screen politicians into the parliament and the government. Better politicians should in turn run a more transparent government. Rules and regulations will be respected and followed. As a result, most of the problems including the postharvest problems stated in this paper should be corrected more efficiently.

Collaboration with other countries

The above information covers only the Thai problems; priorities and constraints. However, many of the problems do not exist only in Thailand, but similar cases also occur in other countries. Hence, collaboration between nations having similar problems or interests should lead to mutual benefit. International collaboration in postharvest fields between Japan and Thailand occurs on a small-scale. A larger-scale collaboration between ASEAN and Australia for many commodities has been implemented for a long time. Japan and Australia are the donors in their collaboration. However, critics are still arguing against this collaboration, by stating that the donor benefits more, since scientific knowledge or information could be obtained cheaper, using less funds for the low salaries of ASEAN scientists rather than those

of the expensive donor counterparts. In response to this criticism, a survey was conducted by interviewing Thai researchers involved in collaboration with Australian scientists in the fields of postharvest technology. The results are shown in Table 5. To summarize, through collaboration, technical information discovered was commercially applied. Millions of dollars of foreign currency were gained. Thai scientists in the program became more experienced and able to handle their own postharvest problems with quality research. The use of SO₂ for exporting Thai longan is a good example. It is up to the Thai themselves to take advantage of the collaboration to benefit their own people instead of leaving it to their counterparts.

In conclusion, there are serious postharvest problems facing Thailand. These problems are technical, including the lack of adequate quality standards, pesticide residues, and storage of horticultural commodities. These problems seem to have a social origin to a large extent. Fortunately the Thai have their own way to solve problems among themselves as well as through collaboration with foreign partners.

Table 5 Opinion of Thai scientists on collaboration with Australian researchers in postharvest research*

Subject	Score**
Amount of research funds	3.3
Ease of fund use	3.4
Collaboration between researchers of both sides	4.5
Australian research capability	4.0
Technology transfer to Thai researchers	
in basic sciences	3.4
in applied sciences	3.6
Project accomplishment	
new basic knowledge acquired	3.0
new applied knowledge acquired	3.5
postharvest losses reduced and quality improved	3.5
Benefits from the collaboration	
for Australia	3.8
for Thailand	3.7
Collaboration after project end	3.4

* 12 persons interviewed : 4 females, 8 males ; 2 =30-39 years, 6 =40-49 years, 4 >50 years old ; 4 with MS and 8 with PhD.

** 5 =highest 4 =high 3 =medium 2 =low 1 =lowest

