Thai Mango Export:
A Slow-but-Sustainable Development

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1. Introduction

1.1 Mango is a Native Crop of Thailand

- Mango is native to Indo-Myanmar region
- Indo-China is the diverse place of mango
- 172 cultivars recorded in Thailand
- Ten are grown commercially
- In 2006: Cultivated area = 287,000 ha, Production = 2.2 mill. tons, Yield = 7.74 tons/ha
- Mainly produced for domestic consumption, 10% exported

1.2 Thailand has a Long History of Mango Development

- Mango is one of the most ancient crops
- Thai mangoes are unique in many respects:
- Some are so sweet that they are eaten with glutinous rice
- Some are eaten green with nutty taste
- Some are eaten green and sour:
  - One is a spicy dish, called “Yam”
  - Other is eaten with a sweet and spicy sauce, called “Nampla Wan”

2. Development Towards Exportation of Thai Mangoes

2.1 Development of Suitable Cultivars

- Thai mango cultivars are numerous
- Thai farmers are skill horticulturists
- Major cultivars include ‘Nam Dok Mai’, ‘Maha Chanok’, ‘Chok Anant’, and ‘Khiao Sawoei’

Popular Cultivars of Thai Mangoes

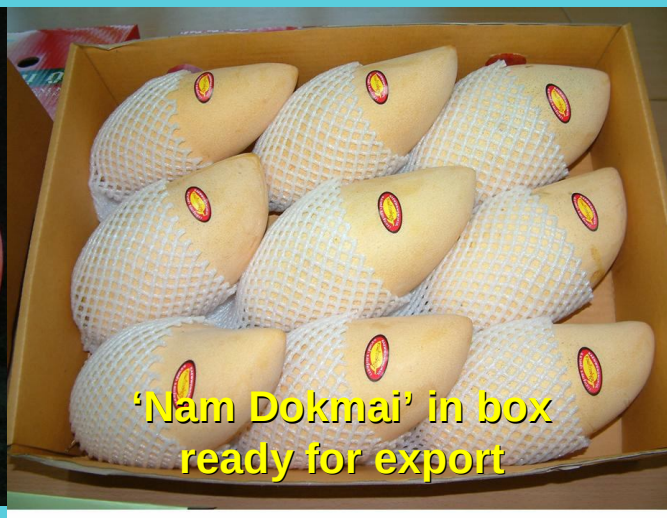

‘Nam Dokmai’

‘Maha Chanok’


‘Nang Klang Wan”


‘Nam Dokmai Si Thong’


‘E2R2’


‘Nam Dokmai’ in box ready for export

2.2 Development of Suitable Production Technologies

2.2.1 Pruning Techniques

2.2.2 Off-season Production

2.2.3 The Use of Specially-made Paper Bags to Cover the Fruits

2.2.4 Fruit Thinning

2.2.5 The Measure on the Use of Agrochemicals

2.2.1 Pruning Techniques

Pruning is done in two periods:

- **At the Age of Two Years (1.5 m):**

  - to initiate a canopy

  - cut off central shoots to have open center with 3-5 main scaffold branches

  - when plant is 2.5 m high, flower forcing can be done

2.2.1 Pruning Techniques (Con't.)

After Fruit Harvest:

- Cut off protruding branches
- Trim off long vertical shoots
- The plant will flush new leaves
- When young leaves fully expand, treatment of paclobutazol can be done
- The plant remains in low stature, enabling easy manipulation

Pruning after fruit harvest

2.2.2 Off-season Production

- The use of paclobutrazol as a soil drench is widely practiced
- Key factors: healthy trees and proper stage of tree development
- Up to 2-3 cropping times can be induced provided trees are properly prepared and orchards are well managed
- Success varies among cultivars
- The chemicals must be carefully applied to avoid damage to the trees

2.2.3 The Use of Specially-made Paper Bags to Cover the Fruits

- The “carbon” bag provides suitable environment for perfect skin color appearance of the ripe fruit of green cultivar, but prevents color development of other-colored cultivars
- Two approaches to solve the problem:

  (i) by wrapping the fruit later than usual, about 30 days before fruit ripening – applies to yellow-color strain of ‘Nam Dokmai’

  (ii) by using the “white” bag to allow light to penetrate inside the bag – applies to ‘Maha Chanok’ cultivar
- Other practices include eradication of fruit fly, the use of integrated controlling technique based on ecological data of the fruit fly, coupling with the use of poison bait and repellant

2.2.4 Fruit Thinning

- One fruit / stalk is allowed to develop so that the fruit is fully developed
- This is done when the fruit is of a thumb size, although it consumes a lot of labor
- To avoid labor shortage problem, some orchards, especially in the north, thin the fruits during the time of fruit bagging

Bagging of the Fruits

Thin to one fruit / stalk & wrap with the bag

Pruning & Thinning

2.2.5 The Measure on the Use of Agrochemicals

- Specification on the amount of residue permissible based on “positive list” has been issued
- Growers must be GAP-registered, following the regulation set up between the growers and the exporters and closely examined by DOA
- Certain growers’ groups have managed to buy chemicals with the large and dependable agrochemical companies by themselves on their own behalf
- Some asked the companies to bid their chemicals and made legal negotiation afterwards

2.2.5 The Measure on the Use of Agrochemicals (Con't.)

- Prior to exporting the mangoes, the exporters will take samples of the mangoes for analysis of chemical residues by sending the samples to:

  (i) Regional R&D Office in the area, or

  (ii) "One Stop Services Center"

- If the amount exceeds the MRL, growers are not allowed to harvest the fruits until further analysis reveals that they have not exceeded the MRL


Using a tractor-drawn mower to cut weeds
in the mango orchard


Panasonic

2.3 Development of Suitable Post-Harvest Technology

2.3.1 Grading

- Includes separation into different sizes with optimum quality, such as clean skin with no blemish, good color and shape
- Has provided the growers with maximum income as the price for grade-A mango is 40-50% higher than grade B

Harvesting

Transport to the packing house

Packing House

Selection of quality fruits

Grading

2.3.2 Vapor Heat Treatment

- VHT is used to kill fruit fly larvae and pathogens causing anthracnose and blossom end rot
- VHT is at 47ºC for 20 min. During the first period of increasing the temperature up to 43ºC, the air must have RH between 50-80%, and at 43ºC, the air must be saturated with heat at RH over 95%
- After the treatment, reduction of heat must be done by blowing the wind or spraying with water
- The following cultivars have been accepted by the Japanese markets: 'Nang Klang Wan', 'Raet', 'Phimsen Daeng', 'Nam Dokmai', and 'Maha Chanok'.


Packing mangoes in foam net
after vapor heat treatment


PANTENE
PANTENE

2.4 Cluster Strategy of Thai Mango Growers' Groups

- After implementing VHT, export of Thai mangoes to Japan has steadily increased, even though there has also been a strict control on chemical residue
- This was mainly the result of the adoption of the cluster strategy of the mango growers to join hands in the production of quality fruits throughout the year

2.4 Cluster Strategy of Thai Mango Growers' Groups (Con't.)

Participating Partners:

2.4.1 Mango Growers' Groups

2.4.2 DOA

2.4.3 DOAE

2.4.4 Exporters

2.4.5 Agrochemical Companies

Meeting of the growers, private companies and government agencies

2.4.1 Mango Growers' Role

2.4.1.1 Grouping of Growers

- Mango growers' groups have been set up throughout the Kingdom
- Managed by committee members to set up the policy to run the activities of the group
- Some formed a cooperative organization while others formed a community business group
- They have a meeting plan to set production schedule to meet the exporter's order
- They have their own chemical stock purchased directly from chemical companies and distributed to their members

Members of a Mango Growers' Group with their proud products

2.4.1.1 Grouping of Growers (Con't.)

- The groups managed their organization like a cluster by sharing their input resources, production planning, packing shed, the markets, etc.
- Agricultural experts have been invited to train the members on how to manage the orchards including tree pruning, fruit wrapping, harvesting, grading, packing, chemical spraying, especially to meet the Japanese's strict requirement not to exceed the MRL

2.4.1.2 Distribution of Production Sites

- There are 20 groups around the country producing mangoes for export, from eastern to central northern, north and northeastern areas
- Thai mangoes are available nearly all year round
- These successful tasks were accomplished by the well-organized clusters of mango growers, a joint venture among growers, DOA, chemical supply company, and exporters.

Year-round production of mango in different locations in Thailand


สหกรณ์ ชมรมชาวสวนมะม่วงจังหวัดฉะเชิงเทรา จำกัด
ห้องเย็น
1 มีนาคม 2550
VICTOR
ห้องคัดบรรจุ

2.4.2 DOA's Role

2.4.2.1 Application of GAP

- DOA provides a guideline for GAP to every member of the mango growers' group
- The growers must use agrochemicals which are recommended in order to satisfy the importing countries' requirements.
- DOA has certified the orchards which practice GAP
- It also registers the mango exporters for Japanese markets

2.4.2.1 Application of GAP (Con't.)

- The exporters must be satisfied with all criteria set such as having a number of GAP orchards which have been certified by DOA, and must exhibit the chemicals which are acceptable to the Japanese importers – the "positive list"
- These include the list of prohibited chemicals, namely chloropyrifos and propiconazol
- The growers are advised to select those among the positive list the chemicals that have low MRL and avoid those with high MRL

GAP Mango Orchards


บริษัท อริฟท์ จำกัด
กรมวิชาการเกษตร
โครงการความปลอดภัยอาหาร ด้านพืช
รับรองแปลงผลิต มะม่วง
ของ นายอำนาจ ชังกะนาค
รหัสรับรอง

2.4.2.2 Establishment of "One Stop Services Center"

- This is done by coordinating the activities of the growers, exporters, and govt. agencies
- Each has its own duty to work in harmony with the others
- The crucial point is the management on the use of agrochemicals in which the importing countries have set up a very strict regulation
- DOA liaised with the Japanese Govt. in quality control of mangoes exported to Japan through the "One Stop Services Center" with support from various agencies

2.4.2.2 Establishment of "One Stop Service Center" (Con't.)

- DOA sets up the project, "the management of chemicals in the mango orchards aiming for export to Japan" under the "One Stop Services Center"
- This provides exporters with privilege as Japanese Govt. will not re-examine the samples, while those who do not join the project will have to pay fee to examine the samples, which costs several tens of thousand baht
- There are 25 exporters who join in the project

2.4.3 DOAE's Role

- DOAE promotes GAP among mango growers' groups
- Also provides facility for VHT which was found to be effective in controlling fruit fly larvae
- Some groups have set up their own facility with their own fund

2.4.4 Exporters' Role

- The exporters provide guidance to the growers, especially on the chemicals to be applied, based on the positive list
- They must provide the list of chemicals and application method for each period of growth of the mango plants
- This information has to be shown to DOA through the "One Stop Services Center" which, in turn, passes on to the Ministry of Public Health of Japan

2.4.5 Agrochemical Companies' Role

- Agrochemical companies must provide the positive list of chemicals to DOA
- Most agrochemical companies set up a very strict practice in selecting a list of chemicals to be sold to the growers
- The manufacturers of the quality chemicals or their representatives are fully trusted by the growers' groups in choosing those chemicals for use in their orchards


สถานที่เก็บสารเคมีการเกษตร
Chemical stock room
อันตราย

2.5 Achievements of the Clustering Strategy

2.5.1 Provides Supply Chain for Export Market

2.5.2 Earlier Success in Exporting Thai Mangoes

2.5.3 Export of Thai Mangoes

2.5.1 Provides Supply Chain for Export Market

- The fruits produced by the groups are superior to those of other growers as they follow the guide-lines strictly
- Since production sites are scattered through-out the Kingdom, and with proper practice of application to produce out-of-season fruits, mangoes are produced almost all year round
- This has provided the supply chain from the orchards to the consumers, utilizing capital investments of the growers' groups and with supports from the local administration, without the budget of the Government

2.5.2 Earlier Success in Exporting Thai Mangoes

- One of the earlier companies which was active in exporting mangoes to Japan is Taniyama Siam Co.
- It has encouraged the development of mango growers' groups to export their mangoes to Japan seriously up to the present time, using 'Nam Dok Mai' as the main cultivar
- Many other companies have also been launched to export Thai mangoes
- From the Japanese market, the foreign markets of South Korea, New Zealand, Middle East, and Russia soon followed

2.5.3 Export of Thai Mangoes

- Thailand has exported both fresh and processed mangoes for more than three decades
- In 2004, export volume of fresh mangoes was 2,500 tons, valued at 133 million baht; processed mangoes (canned, dried and frozen mangoes) were also exported
- The major international markets for Thai fresh mangoes are still in the Asian region, partly because of the lower transport costs and relatively short distances
- The major export markets for fresh mangoes are, in descending order: Japan, Malaysia, Indonesia, Singapore and Hong Kong
- For canned mango, the importing countries are Japan, Australia, England and Germany

Table 1. Mango production of Thailand, 2004-2006

Category	2004	2005	2006
1. Area (ha)	310,116	281,988	286,697
2.Production (tons)	1,802,665	2,093,223	2,218,262
3. Yield (kg/ha)	6,494	7,425	7,738

Source: Office of Agricultural Economics (2006) and Department of Agriculture (2006).

Table 2. Various types of mango exported from Thailand, 2004-2006

Unit: Volume (tons), value (million baht)

Types of mango	2004		2005		2006		Growth rate (%)			
							2004/2005		2005/2006	
	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value
Fresh mango	2,494	133	11,169	259	11,282	294	347.8	94.7	13.5	13.5
Canned mango	10,689	367	12,446	432	12,488	438	16.4	17.8	0.0	1.4
Dried mango	180	49	217	59	637	101	20.5	20.4	193.5	71.2
Frozen mango	832	48	679	66	5,253	314	–18.4	37.5	673.6	375.8
Total	14,195	597	24,511	816	29,660	1,147	72.7	36.7	21.0	40.6

Source: Office of Agricultural Economics (2006)
Note: No statistic available for across-the-border export, which is sizable figures

Table 3. Major export markets of Thai fresh and frozen mangoes, 2004-2006

Unit: Volume (tons), value (million baht)

Country	2004		2005		2006 (Jan-Oct.)		Growth rate (%)			
							2004/2005		2005/2006 (Jan-Oct)	
	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value
1. Japan	821	86.46	964	120.99	1,243	135.50	17.42	39.94	36.59	17.21
2. Malaysia	620	9.02	8,363	84.18	7,152	70.93	1,248.87	833.02	–14.48	–15.74
3. USA	11	0.81	2	0.27	9	2.45	–81.82	–66.33	350.00	296.69
4. Lao PDR	44	0.29	694	6.98	508	4.97	1,477.27	2,293.16	–26.48	–28.41
5. So. Korea	74	9.80	106	13.98	87	10.02	43.24	42.74	–8.42	–19.43
6. Indonesia	428	7.34	315	6.06	511	4.54	–26.40	–17.3 6	62.74	–25.18
7. Hong Kong	76	3.72	131	5.52	68	2.49	72.37	48.33	–48.09	–54.64
8. Singapore	128	2.53	34	2.23	44	2.24	–73.44	–11.81	29.41	0.03
9. China	67	2.45	190	3.32	68	1.98	183.58	35.62	–60.69	–24.75
Total	2,269	123.42	10,799	243.53	9,690	235.43	375.93	97.32	–10.27	–3.46

Source: Department of Customs (2006)

Table 4. Major export markets of Thai canned mango, 2004 – 2006

Unit: Volume (tons), value (million baht)

Country	2004		2005		2006 (Jan-Oct)		Growth rate (%)			
							2004/2005		2005/2006 (Jan-Oct)	
	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value	Vol.	Value
1. Japan	2,787	101.23	4,490	159.28	3,736	127.49	61.11	57.35	-9.95	-13.76
2. Netherlands	885	29.24	529	20.87	312	11.01	-40.23	-28.64	-29.89	-34.24
3. Australia	1,595	56.50	1,552	56.07	1,041	35.34	-2.70	-2.53	-13.32	-18.53
4. USA	692	20.18	566	16.80	638	25.29	-19.65	-16.76	19.70	57.27
5.New Zealand	309	8.70	312	9.20	282	8.84	0.97	5.70	27.03	42.63
6. Russia	132	4.26	151	5.11	144	4.93	14.39	20.11	-4.64	-3.49
7. So. Korea	112	3.93	106	4.40	46	1.96	-5.36	11.81	-56.60	-55.51
Total	10,680	366.11	12,446	432.47	10,577	365.94	16.54	18.12	-2.62	-3.07

Source: Department of Customs (2006)

2.5.3 Export of Thai Mangoes (Cont'.)

- Export volume of Thai mangoes has been relatively small in comparison with the country's total production of 2.2 million tons, yet export volume is rising
- With due concern for consumers' health and to meet international quality standards, all organizations involved are working together, aiming to produce both fresh and processed mangoes of superior quality
- A quality assurance system is introduced and practiced in all production sites

2.5.3 Export of Thai Mangoes (Cont'.)

- In 2006 total amount of mangoes exported was 29,600 tons, valued at 1,150 million Baht - still negligible as compared to major agricultural commodities exported from Thailand
- Two points should be considered
- One: the statistics were obtained from official exported items recorded by the Department of Customs, without those exported across the borders, which were sizable indeed
- Two: the exceptionally high growth rate in 2005 as compared to 2004 which were 347.8% in volume and 94.7% in value in exporting fresh mango
- Total amounts of mangoes exported were also high, 72.7% for volume and 36.7% for value in 2004 as compared to 2005
- This was mainly due to clustering strategy

Sale Promotion in Japanese Market

In a Japanese Supermarket

3. Discussion

3.1 Slow Development

- Mango development took place around 1975 through the cooperation of various govt. and non-govt. agencies
- One of the achievements was the development of ‘Nam Dokmai No. 4’ cultivar - an off-season cultivar; it was adopted as the most important commercial cultivar
- Various planting techniques have been developed and extended to the growers, e.g. the change of cultivar through top grafting, close-space planting, and off-season production through the use of paclobutazol

3.2 Sustainable Development

- From 1975 onwards, development started to develop, first by developing suitable cultivars, followed by adoption of production and post-harvest technologies (pruning technique, off-season production, VHT, bagging of the fruits, etc.)
- The most significant development, was the adoption of cluster strategy in which mango growers join hands among them-selves with supports from DOA, DOAE, the exporters, and agro-chemical companies in producing quality fruits almost all year round from different areas for export markets
- Development of mangoes for export was slow in the beginning, but would be sustainable in the long run

3.3 Future Trend

- With the signing of FTA with many countries, coupling with the setting up of the “One Stop Services Center” by DOA to facilitate the export procedure, the amount and value of mango exports are expected to increase at a much higher rate in the near future.

3.4 The Need for Long-term Strategic Plan

- There is at present no government agency responsible for developing mango as a system of production in Thailand
- Thus, there is a need to set up the organization solely responsible for long-term national strategic plan of mango production, marketing and export

Mangoes on Sale in Local Market

‘Maha Chanok’ mango displayed at Siam Paragon Department Store


‘Nam Dokmai Si Thong’

Mangoes on Sale in Local Market

‘Maha Chanok’ mango displayed at Siam Paragon Department Store


‘Nam Dokmai’

Frozen Mangoes

Washing

Frozen fruits ready for export

In the 'High-Care' Production Room