

*Managing to Reduce the Risk of Mango Harvest and to Make the Value of Integrated Agro-Tourism: A Case Study of Mango Orchard Entrepreneurs in Chachoengsao, Thailand*

Suchanat Pattanavongngam, Rajabhat Rajanagarindra University, Thailand

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**Abstract**

Mango is a kind of fruit which can be planted all over the world including Thailand, and Chachoengsao is one of five provinces where mangoes are planted the most in Thailand as the soil in those areas are suitable for planting mangoes. The objectives of this research were 1) to study the body of knowledge and the model of harvesting mangoes by mango agriculturists in Chachoengsao, and 2) to study guidelines for developing agro-tourism of mango agriculturists in Chachoengsao. Data was collected from mango agriculturists in Chachoengsao, using questionnaires, and interviews of sample group. The research findings were that the current planting of mangoes has been changed from growing the mangoes from seeds, to grafted mango trees that grow and produce faster than by seeds. In terms of harvesting, the labour force is mainly needed for small orchards as picking mango fruit is done by hand. However, for fruit on higher branches, some harvesting aids had to be employed such as a basket 'Takraw' which is used to assist in picking. Moreover, separating planting zones, and growing a variety of mangoes are to help insure mango fruit throughout the year. In terms of guidelines for developing agro-tourism of mango agriculturists in Chachoengsao, there was an agro-operation between mango agriculturists and government agencies of Khlong Khuean District to create agro-tourism in the community. The trip included visiting mango orchards and taking a boat trip to enjoy mangrove sightseeing along the Bangpakong River.

Keywords: Mango, harvesting mango fruits, agro-tourism

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## Introduction

Chachoengsao has been a significant area in terms of agricultural growth as this area is enriched with biological diversity, abundant natural resources, and local wisdom beneficial for sustainable development, and spectacular natural, cultural, and historical attractions. The entire area consists of 3,344,375 rai (1,321,887.35 acres), and 60% of this area is used for agricultural purposes. The significant economic crops are mainly; rice, rubber trees, coconuts, and mangoes. The mango fruit has been planted in every district of the province consisting of; Bangkhla, Khlong Khuean, Ratchasan, Plaeng Yao, Phanom Sarakham, Sanam Chai Khet, and Tha Takiap. The popular mango fruit species in Chachoengsao include *Nam Dok Mai*, and *Khiao Sa Woey*. The area that grows the “delicious” mango species is planted mainly in the Bangkhla and Khlong Khuean areas. As fresh water, brackish water, and salt water pass through those areas, the soil is filled with minerals suitable for growing tasty mangoes. Currently, a request for Geographical Indication (GI) of Nam Dok Mai Si Thong mango variety and coconut of Sao Cha Ngok Sub-district, Bangkhla District is in the process (Deputy of Chief Commercial Officer, 2016). Exports of mangoes from Chachoengsao earn approximately one billion baht a year, with especially high sales in Asia such as Japan, China, and South Korea, due to its quality, good taste, and reasonable price (Samawattanasak, 2017). In the agricultural aspect, the growing crops system should be developed in accordance with the potentiality of that area, following the sufficiency economy laid out by the Former King of Thailand, Rama 9. In addition, the network of learning and developing better quality and standards should be established, making use of the supported research and development, as well as the local wisdom explicitly held. In terms of tourism, the tourist attractions should be managed systematically to engage the people and participate in local tourism management. The new model of tour activities should be developed to be consistent with the natural and cultural potential of the area (National Research Council of Thailand, 2012). Nevertheless, problems remain in the growing of mango trees, especially in the districts of Bangkhla and Khlong Khuean Districts which have to be at high risk of flooding, as those areas are wetlands, increasing the likelihood of floods that destroy the crops. When the local agriculturists have encounter this problem; they have to plant again, and wait for the new crop 3-4 years later, so the agriculturists tend to reduce the areas for growing mango trees. However, the agriculturists who have plenty of areas are sometimes unable to harvest the crops in time, thus losing their crops along with their income. Therefore, the researcher would like to investigate how to harvest crops wisely and integrate harvesting with agro-tourism kept firmly in mind.

## Methodology

This research was conducted using mixed methods of quantitative and qualitative research. The objectives were: 1) to study the body of knowledge and the model for the harvesting of mangoes by mango agriculturists in Chachoengsao, 2) to study guidelines for developing mango agro-tourism by the agriculturists in Chachoengsao. The research population was composed of mango orchard entrepreneurs in Chachoengsao, who have emphasized on Good Agriculture Practice (GAP), members of The Mango Export Community Enterprise Bangkhla District and Mango Agriculturist Cooperative in Chachoengsao Province, totalling 226 people. The sample group consisted mainly of 145 people for the purpose of the quantitative

research (Yamane, 1967), and 30 orchard entrepreneurs for in depth interviews based on the educational purposes (Phothisita, 2006). The research instruments used for data collection were questionnaires, interviews, literary review, and information sources on the internet sites.

## Results

The research showed that the mango fruits that had been grown using the grafted mango trees. First, use the *kalon* mango tree which is one of mango varieties in Thailand) as the rootstock, and attach the graft of mango varieties such as *Nam Dok Mai*, *Khiao Sa Woey*, and *Khai Tuek* on to the *Kalon's* branch where they can join parts and the two plants, continue their growth together. *Kalon* mango tree is widely used as the rootstock because it is strong and resistant to environmental conditions. By this method, it can solve the problem of growing fruit trees from seeds which takes a very long time to bear fruit. The mango trees were planted at 3 x 3 meters in order for the mangoes to harvest more easily. By the use of the grafting technique, it took 3-4 years to bear fruits while it took more than 5 years growing from seeds.

According to the primary data collected by the Office of Chachoengsao Agricultural Extension (2017), regarding growing mango fruits in the entire area of 12,452.75 rais (4,922.04 acres), Bangkhla District had the most growing mango fruits totalling; 6,223.44 rais (2,459.86 acres), Khlong Khuean District; 2,294 rais (906.72 acres), and Ratchasan District had 1,479.88 rais (584.93 acres), respectively. And a total of 2,603 mango agriculturalists, and they had average 4.78 rais (1.89 acres) of growing mango fruits per person. The total areas which yielded the products were 10,615.99 rais (4,196.04 acres). The total yielded products were 5,236.666 tons. The average overall products were 523.25 kilograms per rai (0.395 acres). Bangkhla District yielded the most, totalling 1,590.809 tons, Ratchasan District yielded 10,615.99 tons, and Khlong Khuean District yielded 869.42 tons. In terms of yield per rai, Sanam Chai Khet District yielded the most, totalling 1,003.21 kilograms per rai, Tha Takiap District, Phanom Sarakham District, Ratchasan District, and Plaeng Yao District yielded 848.22, 768.27, 740.92, and 582.76 kilograms per rai respectively, which were higher than the average overall products. The other districts yielded lower than the average overall product shown as follows:

**Table 1** Growing mangoes by agriculturists in Chachoengsao

No.	District	Mango Agri-culturists (persons)	Areas of Growing Mango Fruits (Rai)	Average Area of Possession per Person	Areas of Yielded Products (Rai)	Products (Ton)	Average Products (Kilo-gram/rai)
1	Bangkhla	1,408	6,223.44	4.42	4,665.55	1,590.809	340.97
2	Khlong Khuean	448	2,294.00	5.12	2,042.45	869.420	425.68
3	Plaeng Yao	19	56.71	2.98	53.71	31.300	582.76
4	Mueang	363	938.24	2.58	933.24	444.485	476.28
5	Bang Pakong	16	24.12	1.51	24.12	3.370	139.72
6	Ban Pho	48	50.85	1.06	50.85	23.110	454.47
7	Phanom Sarakham	41	418.21	10.20	412.21	316.690	768.27

8	Ratchasan	158	1,479.88	9.37	1,466.56	1,086.600	740.92
9	Sanam Chai Khet	38	516.97	13.60	516.97	518.630	1,003.21
10	Tha Takiap	32	394.25	12.32	394.25	334.410	848.22
11	Bang Nam Priaw	32	56.08	1.75	56.08	17.842	318.15
	Total	2,603	12,452.75	4.78	10,615.99	5,236.666	523.25

Note: 1 Rai = 0.395256916996 Acres

In terms of harvesting mango fruits, as in Bangkhla, Khlong Khuean, and Mueang District, the mango orchards were found to have furrows, but mango orchards without furrows were found in other districts. However, the planted mangoes were closely placed in both kinds of orchards in order to harvest more easily. Thus picking mango fruits was done by hand for the small orchards not more than 20 rais (7.91 acres). Most of agriculturists in Khlong Khuean Districts possessed not more than 20 rais (7.91 acres). As for the big orchards with more than 20 – 500 rais (7.91 – 197.63 acres) in other districts, picking mango fruits was also done by hand but made use harvesting aids such as; a basket ‘Takraw’, aiding the labour force by allowing them to pick in the fruit from the orchards easily. But with larger orchards from 500 – 5000 rais (197.63 – 1,976.28 acres), picking mangoes was done not only by labour force and the ‘Takraw’ in addition to modern equipment. In this case, most mango agriculturists were also the leaders possessing the knowledge of production, the market mechanism and the knowhow to grow quality mangoes for export. These leaders tended to use technology in production and utilize Florigen (or flowering hormone) to grow mangoes. The flowering hormone was utilized every 15 days so as to aid the mango trees to bear fruit at different times of the year around every 6-7 months the orchards would yield a good harvest. In addition, some orchards were managed and used to attract tourists and sell a variety of mango species, as well as betel palms, and coconut trees (Kaewwongnukul, 2016 & Tanchiang, 2017) as follows:

No	Model	Method	Growing Area
1	Separating planting zones for big orchards	Using Florigen every 15 days – 2 months Picking by hand, Takraw, labour force, and equipment	> 500 – 5,000 Rais (> 197.63 – 1,976.28 acres)
2	Hiring labours or selling all mango fruits within the orchard	Picking by hand, Takraw, labour force, and middleman	> 20-500 Rais (> 7.91 – 197.63 acres)
3	Self-management by mango entrepreneurs for small orchards, not more than 20 rais (7.91 acres)	Picking by hand, and Takraw	1-20 Rais (0.395 - 7.91 acres)
4	Opening as agricultural tourist attractions	Selling the products to tourists	Every area in all sizes

In terms of agricultural tourism, the study found that Khlong Khuean District together with local government agencies arranged the agricultural tourism initiative to use bicycles to visit the mango orchards where the quality mangoes were grown for export. These mango orchards were also used as a demonstration center to share

knowledge of agriculture including planting, layering, and grafting. In addition, the agricultural crops and products were provided for tourists to buy. In addition to the bicycle tours, if the tourist group is very big, then the farmer's truck or "*Rot I Tan*" is provided to take tourists around to enjoy some sightseeing in the community and mango orchards where awarded with a prize for best quality mangoes, herbal garden, and sufficiency economy center (Rattanasin, 2017, Somboon, 2017 & Tanchiang, 2017).

From the studies on agricultural tourism in Khlong Khuean District, it was found that there were advantages of visiting mango orchards by bicycles as there was no pollution and saving energy. Tourists can enjoy nature and mango orchards up close. If tourists come in a large group which was recommended to contact Khlong Khuean Sub-District Administration Organization or Khlong Khuean District Office, as the modified farmer's trucks called "*Rot I Tan*" will be provided for the tourist group. Moreover, the agricultural demonstration center, herb garden, sufficiency economy center, and other tourist attractions are also provided. Tourists can travel on a one-day trip or spend the night in Chachoengsao, which has as many places of accommodation in the area. Interestingly, the researcher found another route worthy of travel; the Bangpakong River boat trip, where tourists can enjoy nature and sightseeing of Nypa palms, Cork trees, Mangrove trees along both sides of the Bangpakong River. Important to note: The mango orchards here having a World-Class reputation for growing "tasty and delicious mangos" are grown. Tourists can visit a variety of temples along the river and enjoy the route taken by boat for sightseeing in Khlong Khuean District, and along the Bangpakong River to the exit into The Gulf of Thailand. During November – December each year, dolphins come to this place to eat the school of coral catfish found that time of the year, which tourists can see flocks of birds at Bird Island (125 rai or 49.41 acres). In the evening, tourists can be impressed by the beautiful sunset scene of the Gulf of Thailand. Additionally, if tourists want to go to any other tourist attraction; such as Bangsaen, Si Chang Island, Pattaya, or even to Ko Samet in Rayong, these options are also available to provide diversity in the tour (Maitreewong, 2017).

## **Discussion**

According to the results of this research, Bangkhla and Khlong Khuean District had a mango growing are, totalling 6,223.44 rai (2,459.86 acres), and 2,294 rai (906.72 acres), respectively, and were able to produce mango fruit weighing 1,590.809 tons, and 869.42 tons, respectively. The average product per rai (0.395 acres) is 340.97 kilograms, and 425.68 kilograms, respectively, which is lower than the average product of 523.25 kilograms per rai overall. On the contrary, the growing areas in the district of Sanam Chai Khet, Tha Takiab, Phanom Sarakham, Ratchasan and Plaeng Yao where the mangoes have been grown in orchards without furrows, and in higher lands that are far from water sources or the Bangpakong River, their overall areas for growing mangoes was less than that of Bangkhla and Khlong Khuean District. But the average products were higher than every district, 1,003.21, 848.22, 768.27, 740.92, and 582.76, kilograms per rai respectively. After analysis, this might be from two causes. The first cause: different methods of growing mangoes. In Bangkhla and Khlong Khuean District, the mangoes were grown in the orchards with furrows for irrigation in the dry season, but are more difficult to manage with furrows. (Kaewwongnukul, 2015, 2016) 2The strength of growing by this method is that the

flesh is good and tasty. Unlike the mangoes from the orchards with furrows, the mangoes without furrows in Sanam Chai Khet, Tha Takiab, Phanom Sarakham, Ratchasan and Plaeng Yao are bigger in size, but the flesh and the taste are not so good. Second, Bangkhla and Khlong Khuean District have faced severe floods; once in 2011 and again in 2012, destroying the mango orchards forcing the agriculturists to start planting again. Consequently, not many orchards have yielded any product leaving the agriculturists to wait for 1 -2 years. In addition to this low yield, the area for growing mangoes; more than 100 rais (39.53 acres), are at risk of not being able to harvest in time. And, unfortunately, the harvest and the long holidays of Songkran Festival are in the same time period. So, it is difficult to seek labours as they return to their hometown. The agriculturists who have large growing areas are also the leaders of Community Enterprise and Cooperative and tend to utilize Florigen to grow mangoes in order to aid the mango trees to bear fruit at different times of the year around every 6-7 months the orchards would yield a good harvest (Kaewwongnukul, 2017). The mangoes in many varieties, both ripe and unripe mangoes have been grown and also other plants such as betel palms, coconuts, bananas, and various vegetables, the agriculturists can earn money all-year-round (Tanchiang, 2017). Moreover, the mango orchards can be used as the agricultural attractions including demonstration center, herb garden, sufficiency economy center to welcome the tourists who come to travel on a one-day trip or spend the night in Chachoengsao, which has as many places of accommodation in the area. In addition, the tourists can take a boat trip to enjoy nature and sightseeing along both sides of the Bangpakong River to the exit into the Gulf of Thailand. They can be impressed by the beautiful sunset scene of the Gulf of Thailand in the evening. Especially, during November – January each year, the tourists will have a great time to see dolphins which come to this place to eat the school of coral catfish (Maitreewong, 2017).

## **Conclusion**

Most of mango agriculturists have grown mangoes in many varieties, both ripe and unripe mangoes, that it has been considered a local wisdom in accordance with the principle of High Risk High Return. Growing mangoes in many varieties can help reduce the risks as the products will be yielded at different times so it can be possible to harvest in time. Each year, 70 – 80 tons of mangoes are lost due to being unable to harvest in time (Kunawut, 2015, 2016) Most of the mango agriculturists have collected the fallen mangoes from the trees to make dried mango paste or “*Mamuang Kuan*”, preserved mango, and have sold it at the orchard for 250 – 300 baht per kilogram. This is a good way to add value to the agricultural products. Additionally, mango agriculturists have joined in “the agro-tourism”. Using their mango orchards to be demonstration centres to give knowledge of mangoes, it can naturally be added to the agro-tourism connecting local tourist attractions with sources of agriculture and tourism allowing both to thrive from each other.

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**Contact email:** suchanat.pat1@gmail.com.