

REPORT ON WEBINAR SERIES ON TROPICAL FRUITS MANGOSTEEN

17 December 2025 | 2:30pm, Kuala Lumpur (GMT+8) | via Zoom

Prospects for Expanding Mangosteen Production and Markets



Photo: by:
Sóc Năng Đông



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1.0. EXECUTIVE SUMMARY

The mangosteen, often referred to as the 'Queen of Fruits' for its unique exotic taste and nutritional value, is gaining popularity in global markets. The distinctive purple fruit with its sweet white arils or flesh is protected in a pericarp rich in xanthones, a powerful antioxidant. The hardy, evergreen perennial tree is well adapted to the humid tropics, even tolerating high water tables and flooded conditions.

Besides the exotic taste, several factors can bolster mangosteens positive market trajectory. Health appeals with antioxidants, vitamins and minerals that align with wellness trends, with ongoing research into xanthones enhances its functional food image. Digital communications and marketing, improved logistics and cold chains, air freight and supermarket proliferation increase global access. Southeast Asia booming tourism introduces the fruit to new consumers, creating demand in nonproducing countries. Furthermore, the premium price for selected, early producing varieties makes cultivation attractive for growers.

The challenges and opportunities in improving mangosteen production and markets were discussed in a webinar organized by International tropical fruits network (TFNet) on 17 December 2025. Experts from Thailand, Malaysia, Indonesia, Vietnam and India presented country perspectives. The webinar was attended by 131 participants from 13 countries including Malaysia, Thailand, India, Vietnam, Philippines, Fiji and Australia, indicating global interest in the future of the 'Queen of Fruits.'

The objectives of the webinar were:

- a. To share information among mangosteen researchers, producers, processors and exporters on the current production, processed products, market trends and challenges in developing the fruit.
- b. To share information among stakeholders on the various initiatives that can be taken to increase mangosteen production and markets, including varietal development, best farm practices, postharvest management, research and development focus and policies to encourage its cultivation.
- c. To discuss initiatives in enhancing the visibility of mangosteen in global markets.
- d. To establish networking ties among mangosteen and other tropical fruits stakeholders.
- e. Possibility of having mangosteen listed as a separate fruit crop in trade statistics.

The webinar is expected to give insight into common varieties, best practices, pest and disease control, quality standards, processing options, demand and market in countries that are developing fruit. The speakers for the event are from Malaysia, India, Indonesia, Thailand and Vietnam.

Dr. Thannarut Chinnapan from Maejo University, Chiangmai, Thailand in presenting his paper on 'The situation of mangosteen production in Thailand' focused on the efforts of research in sustaining the country's dominance in production and exports. He highlighted the use of top grafted plants was reported to hasten the fruiting. He also discussed current research using gamma radiation to improve shelf life.

Mr. Christopher Biai from the Department of Agriculture, Malaysia cited mangosteen is ranked 9 in area planted and production, compared to other fruits including durian, banana, papaya and jackfruit. Production is mainly for the domestic market with some being exported following strict export protocols that are supervised by the Department of Agriculture.

Dr. Ellina Mansyah from the National Research and Innovation Agency Indonesia presented on 'Status of mangosteen production, cultivation and expansion in Indonesia' highlighted that while the mangosteen is still regarded a stallholders' crop, there has been rapid expansion in the area grown the last fifteen years mostly in a mixed system or agroforestry system. Exports have been targeted for China and Hong Kong.

The speaker from the Southern Horticultural Research Station Vietnam, Mr. Nguyen Van Son in his presentation 'The current status of mangosteen production and markets in Vietnam' added that even though that there has been a decline in production recently and that production is for the domestic market while there are opportunities for exports. Mangosteen is a relatively 'new' fruit crop that is being developed in India with approximately 250 hectares of planted areas. Dr. G. Karunakaran from IHR, Indian Council of Agricultural Research gave an account of the status and challenges in developing the fruit in India.

Generally, the common key challenges faced by all the producing countries are the long period before fruiting, internal fruit damage caused by pulp translucency and gamboge, external fruit damage due to the presence of gamboge, pest and diseases and consistent yields.

Mangosteen is usually eaten fresh, and its rind is normally disposed. The presence of xanthenes in the rind of the fruit has been the focus of many studies on its health functions, extraction and commercialization, besides juices, and other products.

Among the solutions cited by the speakers are the use of top grafted planting materials for earlier fruiting, better variety selection and gamboge reduction by improved practices.

The panel discussion delved into the sustainability of mangosteen production, whether current production and practices could sustain the industry in view of the other lucrative tropical fruits being developed and the long gestation time to fruit.

An issue with current harmonized data is the inclusion of mangosteen together with mango and guava. This has led to data discrepancies, and the webinar included a discussion on the current exercise to separation of the fruit types into individual codes. In relation to this, FAO is working on a new code that will see mangosteen detached from the current mango, mangosteen and guava group by 2028.

PRESENTATION SUMMARY

2. INTRODUCTION

TFNet CEO, Mr. Muhamed Salim Mohd. Ali in delivering his opening remarks welcomed and thanked all speakers and participants for their participation. He mentioned that the webinar is the continuation of a series which focuses on minor tropical fruits. He further commented that mangosteen was chosen this time due to its potential as a fruit crop to be developed further due to its growing popularity and commercial cultivation in some Southeast Asian countries.

The presentation session was moderated by Dr. Dorothy Candrabalan, TFNet Technical Officer.

Five speakers from Thailand, Malaysia, Indonesia, Vietnam and India, presented the mangosteen situation in their respective countries.

Dr. Thannarut Chinnapan from Maejo University, Chiangmai, Thailand delivered a presentation on 'The situation of mangosteen production in Thailand' while Mr. Christopher Biai from the Department of Agriculture, Malaysia spoke on 'Malaysia's mangosteen industry: production status and market outlook'.

Dr. Ellina Mansyah from the National Research and Innovation Agency Indonesia presented on 'Status of mangosteen production, cultivation and market expansion in Indonesia'. This was followed by Mr. Nguyen Van Son who delivered his presentation on 'The current status of mangosteen production and markets in Vietnam'

Dr. G. Karunakaran from IHR, Indian Council of Agricultural Research gave an account of the mangosteen situation in India in his presentation 'The current status of mangosteen production and market expansion in India'.

This section summarizes the webinar presentations organized by the topic heading.

PRODUCTION, MARKET AND EXPORT

Originally native to Southeast Asia, commercial cultivation of mangosteen now extends from SE Asia, South Asia, Latin America and Australia. The fruit is primarily grown by smallholders in monoculture, intercropped or mixed cropping and agroforestry systems. Leading producers are Thailand, Indonesia, Vietnam, the Philippines and Malaysia.

Thailand dominates global production with an estimated 70,000 hectares, followed by Indonesia [35,000 ha], Vietnam [7,600 ha], and Malaysia [3,500 ha]. India currently with approximately 250 hectares is also developing the fruit commercially. In 2023 and 2024, Thailand reported a production of approximately 300,000 tons. Seasonally mangosteen is available in Thailand's Eastern region from April to May and in the Southern region from June to August.

In Indonesia, production remained relatively consistent with less than 1,000,000 tons from 2018 to 2023, significantly lower than other fruits such as banana, mango, pineapple, citrus and durian. Between 2008 to 2023 however, harvested area quadrupled increasing 373 percent to about 35,000 ha, while production grew 500 % to about 400,000 tons. Exports from Indonesia were generally accounted for 13 to 21 % of production with an increase of 179 % from 2005 to 2023. From 2017 to 2020, the main export destinations for Indonesia's mangosteen were China (44%), Hong Kong (42%) and the rest to Vietnam, Thailand, Malaysia and Singapore.

In 2024, Malaysia recorded a mangosteen production of approximately 30,200 metric tons from a harvested area of 2447 ha (total planned area of 3500ha) in the key production states of Kelantan, Kedah and Johor. The average yield was 12.35 per metric tons per hectare, valued at RM 153,270,446. In the same year Malaysia exported 2,568 metric tons valued at RM 9,125,733 or about 8.5 % of fruit produced to China, Brunei, Hong Kong Indonesia and the Netherlands. In contrast, imports from Indonesia and Thailand totaled 3,823 metric tons valued at RM 8,385,117.

Vietnam reported a total production area of 7,600 hectares in 2023 with an average yield of 5.62 tons/ha and total production of approximately 38,000 metric tons. The main growing areas are the Southeast region (42 %) and Mekong Delta region (58 %). An estimated 60 to 70% of production serves the domestic market, while 30 to 40 % is exported. The fruit is exported mainly to China, the United States, and more than 20 countries in the region.

Although mangosteen has been grown in India for a long time (some trees in Kerala are over 100 years old), its commercial development and cultivation are relatively recent, with a total area of approximately 250 hectares, mostly in the state of Kerala for the domestic market. It also occupies a niche, domestic market with high retail prices due to limited supply and commercial expansion remains limited.

CULTIVARS, PLANTING SYSTEMS AND FIELD PRACTICES

Until recently, mangosteens have been propagated by seeds. The apomictic nature of seeds makes propagation easier, producing mostly true to type seedlings. However, the main challenge is the long juvenile phase, where seedlings normally take five to six years to bear fruit, due to poor root system development. This has discouraged many smallholders from cultivating this fruit. To address this, planting with top grafted plants has become popular in Thailand, Vietnam, Indonesia and Malaysia reducing the time to fruiting to as early as 3 years.

While Thailand has selected varieties suited to its different regions, Indonesia grows mainly the local 'Ratu Kemang' and 'Ratu Tembilahan' varieties which differ in pedicel length, gamboge occurrence and fruit edible portion. Indonesia also encourages the use only registered and recommended cultivars for production and distribution. Popular cultivars based on fruit shape, aril and seed characteristics and sweetness recorded in Malaysia are the GA1, GA and GA3. Vietnam most popular selection is the Lai Thieu

mangosteen, while India grows local varieties propagated mainly by seed.

The planting distances vary slightly by country. In Thailand, spacing is 8 X 8, or 10 X 10 meter, square or triangular planting. In Vietnam, planting distances range from 6 to 7 m X 6 to 7 meters. In Indonesia, depending on the planting system spacing ranges from 8 to 10 meters square or triangular. India has adopted new high-density plantings on raise beds, trench and terrace farming, with spacing of 4.5 X 4.5 or 3.6 X 3.0 meters.

Mangosteen is grown either mono-cropped or intercropped. In Indonesia, 60 to 70 % of mangosteen farms are in traditional mixed farming systems with other fruit types and crops, 20 to 30 % are grown as intercrops with other tree types and 5 to 10 % are grown in a mono-cropped system. In India, the fruit grows well in partial shade both as monocrops and an intercrop under coconut.

Because mangosteen seeds are apomictic, planting materials are easy to obtain through direct seedling plants. However, due to the poor root system, seedling plants take up to 5 or 6 years to bear fruit. Grafted mangosteen seedlings are therefore becoming the norm. In Thailand, where this technique is popular, it has been reported that grafted plants now can bear fruit in 3 years.

Canopy management is also important in ensuring the trees are pruned to maintain the height and foliage density. This practice is carried out in all commercial farms to ensure optimum production and easier harvesting. In India, in newly planted areas, the tree is pruned to 2.5 meters to 3 meters high.

As a new player in mangosteen commercial production, researchers in India have observed that trees grown in higher elevation are more productive and produce better quality fruits.

PESTS AND DISEASES, PHYSIOLOGICAL DISORDERS

Pest and disease management is a critical aspect of mangosteen cultivation, and is closely linked to weather patterns, especially in the humid tropics.

In Indonesia, common mangosteen pests include mealy bugs and ants. Reported diseases include root rot is caused by *Phytophthora* sp. and *Pythium* sp. Physiological disorders also occur, such as gamboge disorder on the fruit surface and internally, translucent flesh disorder, fruit cracking and sunburn.

In Vietnam, common insect pests include the citrus leafminer (*Phyllocnistis citrella*) and thrips (*Scirtothrips dorsalis*) which attack the leaf and fruit. Red mites (*Tetranychus* sp.) are found on the fruit, stem and branches. These pests typically affect between 5 to 25 % of plants. Less common are leaf damage by leaf borers and green weevil. Both occur sporadically at about 1 – 5 % of plants.

Diseases include gummy stem blight caused by *Phytophthora* sp, as well as algae spots

on stems and branches. Another disease that affects the stem is quick wilt caused by *Pestalotiopsis* sp. and the more serious leaf infection is leaf spot caused by *Pestalotia* sp. Occurrence of internal and external gamboges as well as translucent fruit are also considered serious problems in Vietnam.

Malaysia reported a major issue with disease caused by *Phytophthora* sp. The other common issue is the occurrence of gamboge on the fruit surface, which affects fruit quality.

In Thailand, fruit rot caused by *Colletotrichum gloeosporioides* is common. This is compounded by symptoms of gummosis, translucent flesh and gamboge resulting from high humidity and handling during harvesting. Thrip infestations on fruits and young leaves are also common. The leaf-eating caterpillar (*Stictoptera cucullioides*) which feeds on young leaves is another problem but can be controlled using

In India gamboge disorder on the fruit is a major challenge with some instances of sunburn injury during the summer months. Generally, the presence of gamboge, translucency and gummosis appears to be problem across all producing countries.

Climate plays a significant role in production, In Indonesia for example, production is impacted during El Nino and La Nina period, particularly due to inconsistent rainfall patterns, which increase the incidence of gamboge and cause seasonal shifts.

POSTHARVEST MANAGEMENT, QUALITY AND STANDARDS

Mangosteen is a climacteric fruit, therefore, harvesting at the right stage is critical. In Indonesia it is harvested 120 to 134 days after bud formation, also guided a harvest index of 4 or 5 based on skin color.

Similarly in Malaysia, the fruit is harvested at index 4 or 5 and graded according to size and weight. Fruit destined for the export markets must go through packing house operations, including selection, grading, cleaning, packaging, phytosanitary inspection, storage and transportation.

In Thailand, mangosteen is usually harvested 13 weeks after flowering using a bamboo pole with basket to reduce mechanical damage. Fruits are harvested when they turn pink / purple. Grading and selection follow, with the removal of damaged, blemished or insect infested fruits. The fruits are soaked in hot water for 20 minutes, washed and treated with Thiabendazole before hydrocooling to 13 degrees centigrade. The harvesting index is based on the peel color – greenish pink, pink, reddish brown. Fruits for exports are harvested at the pink to reddish brown stage. A study on the effects of radiation, using gamma ray and X-ray in Thailand has shown that irradiated fruits showed less weight loss during storage compared to non-irradiated fruits, without any noticeable change in fruit appearance.

In Vietnam the fruits are harvested 120 to 130 after flowering when the skin turns purple

and when the weather is cool and dry. They are then placed in perforated cardboard boxes and refrigerated at 12 – 15 degrees C. The fruits are packed and retailed in mesh bags of 2, 5 or 10 kgs.

In Indonesia, mangosteen farms have been registered to encourage farmers to adopt good agricultural practices and quality assurance systems. This is to improve quality and food safety, accelerate market access and facilitates traceability.

Poor handling of the fruits during harvesting can cause gummosis that affects quality. Harvesting is typically done using a basket attached to a long pole, to prevent fruits from falling to the ground.

Harvesting is also normally done when the weather is cool and dry, avoiding too hot weather or after the rain.

PROCESSING AND VALUE ADDITION

In the area of value addition, aside from leveraging on the xanthenes rich pericarp, few other value-chain added products have been developed, although there have been some initiatives involving freeze-dried products.

In Vietnam the fruit is consumed as juices, jams, extracts and used as salad. Indonesia has seed numerous initiatives to process and extract xanthenes from the pericarp into powder and capsules; mangosteens are also process into juices. In Malaysia and India, the fruit is often consumed fresh and there has been no significant processing initiatives to date.

CHALLENGES IN MANGOSTEEN CULTIVATION

Based on the presentations of the mangosteen scenario in the five countries, the challenges faced by growers can be summarized as follows:

- a. Fragmentation and market competition - Fragmentation of mainly smallholder farmers cultivating the fruit leads to inconsistent production and quality, market access, income volatility and logistical challenges. Besides these, farmers also have other options including growing other more lucrative fruit such as durian or others with shorter juvenile periods.
- b. Apomictic seed propagation and long juvenile phase – While the apomictic nature of mangosteen seeds makes propagation easier, producing mostly true to type seedlings, the main drawback is the long juvenile phase where seedlings normally take 5-6 years to bear fruit, mainly due to the root system. This long wait has discouraged smallholders from cultivating mangosteens.
- c. Inconsistent fruit quality and gamboge issue - The frequent occurrences of gamboge conditions can lead to inconsistent fruit quality that can impact marketability. More emphasis must be given to minimize this major preharvest physiological disorder.
- d. Weather dependent yields - Changing weather patterns which have an impact on pests and diseases occurrences and gamboge problem results in inconsistent

- yields and may upset production plans.
- e. Pests and diseases - Mangosteen is susceptible to pests and diseases that can affect productivity.
 - f. Perishability and shelf life – The fruit is relatively highly perishable with a limited shelf life, which poses challenges for storage and transport.

QUESTION AND ANSWER SESSION

The Q and A session was moderated by Mr. Yacob Ahmad, TFNet Senior Technical Officer. More questions and comments were received during participant registration before the webinar. Generally, all questions and comments were covered in the presentations. Please review the slide presentations for more details. The questions and comments received were:

1. **Wiwik Heny Winarsih, Brida, Jatim, Indonesia** - Whether there is a superior mangosteen variety that possesses good characteristics such as big size, shape, taste and presence of sap during harvesting

Response - As presented by the speakers, each country has developed their own variety according to fruit characteristics and market potential.

2. **Kasma Iswari, BRIN, Indonesia** – Whether there are industries in producing value added mangosteen products, for example, extraction of xanthones from the rind.

Response - This was covered in the presentation by Indonesia.

3. **Bachrudin Achmad, CV Agro Bangkit Sejahtera, Indonesia** – What are the export requirements for mangosteens.

Response - This was described by all speakers.

4. **Endang Gunawan, IPB University, Indonesia** – What other mangosteen uses besides for fresh consumption.

Response - This was covered in the session.

5. **Ismadi, Universitas Malikussaleh, Indonesia** – Whether mangosteen can be planted on land affected by flood and landslide.

Response - As information provided by the speaker from Thailand, mangosteen is hardy and and grow in waterlogged areas.

6. **Nursuhuh Suwali, Universitas Padjajaran, Indonesia** – What are the developments in mangosteen production and markets worldwide.

Response - This was extensively covered by all speakers. Please review slides.

7. Dr. Mohd. Pak Dek, UPM, Malaysia – What are the global standards for mangosteens for export requirements.

Response – This was covered by all speakers. Please review the slides.

8. Iman Lyana Abdullah, DOA, Malaysia – Can sustainable farming practices improve global mangosteen production.

Response – This was covered by all speakers, please review the slides

9. April Mae Betuigas, University of Science and Technology, S. Philippines – What are the key opportunities and constraints in mangosteen production for maintaining local and export markets.

Response – This was dealt with by all speakers, kindly review slides.

10. Shalendra Sami Reddy, Min. of Agri and Waterways, Fiji – Commented that mangosteen is a backyard fruit crop in Fiji and has huge potential if developed commercial due to its climatic suitability.

11. Aruna PerumaL, Tamil Nadu Agricultural University, India – What are the value added products from mangosteen.

Response – While not in detail, but this was mentioned by the presenters.

12. Shanmugasundaram KA, Tamil Nadu Agricultural University, India – List recent commercial varieties of mangosteens.

Response – Since mangosteen seeds are apomictic, and used for propagation, varieties have developed through time, with each country defining its own variety according to consumer demand.

13. Pradeep Kumar Vishwakarma, Dr. Rajendra Prasad Central Agricultural University, India – Where it is possible to grow mangosteens in subtropical and temperate regions of India.

Response – Mangosteen thrives well in the humid tropics and subtropics as indicated by the speakers.

ADDITIONAL Q AND A, PANEL DISCUSSION

The panel discussion involving moderator, Yacob Ahmad and all speakers, delved into a key question on whether mangosteen can remain on a sustainable path and what are the strategies required to enhance its development.

Moderator began with the speaker from Thailand, Dr. Chinnapan on whether the data presented are the latest, as it showed a significant increase from 68,000 ha 5 years ago to about 400,000 ha today. Dr. Chinnapan responded that data is sourced from the Extension Department. On whether the growers are big companies, he mentioned that most of the growers (estimated more than 90 percent) are smallholders and there is a synergy, where big companies are exporters work with the smallholders for supplies as long as they follow standard procedures and practices and produce quality fruit.

Mr. Van Son speaker from Vietnam responded that for Vietnam, the growers are mainly smallholders. Growing areas in the Mekong delta are also more prone to inconsistent yield, gamboge and disease problems due the high humidity environment.

On expanding growing areas and production, the speaker from Malaysia, Mr. Christopher Biai mentioned that smallholders remain the main producers in limited monocropped growing areas and more in mixed fruit cropping pattern. Areas are also given to durian cultivation which is the main fruit crop in Malaysia. The mangosteen situation is status quo; however, existing areas are being rehabilitated with incentives to increase productivity. There is also the possibility of expanding production in the East Malaysian states of Sabah and Sarawak.

On the situation in Indonesia, Dr. Ellina Mansyah mentioned there are two strategies. The short-term strategy involves the improvement of existing farms in terms of increasing productivity and quality management. The long-term strategy involves replanting old trees and supplying farmers with improved grafted seedlings.

Back to the question of using grafted seedlings, Moderator requested Dr. Chinnapan for more details on the success of grafted and marcotted mangosteen planting materials, who confirmed that results have been positive in using this planting material and that the juvenile growth period is drastically reduced to approximately 3 years, instead of normally 5 or more years.

Panel moderator then invited Sabine Altendorf of FAO to comment on the current initiative undertaken to streamline the current harmonized system that has different fruits under a common code, including mangosteen aggregated with mango and guava. Sabine responded that a proposal has been made to the World Customs Organisation to enhance the HS code system including separating mangosteen as a separate commodity. She continued that the step is in the right direction and FAO expects the new HS code to be implemented on 1 January 2028. Sabine also mentioned that some countries are already reporting mangosteen as a separate commodity in the production and trade database. Countries also have a standard data collection system that should not be an issue when the HS code system is being upgraded.

CONCLUSION AND WAY FORWARD

The past decade has seen improvements in mangosteen production due to research and improved practices. For instance, top grafting seedlings with scion from selected plants reduces the unproductive phase from over 5 years to 3 years, a technique adopted in Thailand, Vietnam, Indonesia and Malaysia. Improved field practices including balanced fertilizer application, pest and disease control and better harvesting techniques have generally yielded better fruit quality.

However, the situation in major producing countries appears status quo with slow growth, the way forward to enhance and expand cultivation of mangosteens will include more research and development into early-fruiting techniques and cultivars, improvement in root architecture to promote faster growth, pests and disease management, minimizing of gamboge incidences and sustaining yield consistency. As new areas are scarce, current areas need to be rehabilitated and improved with better cultivars and techniques. While monocropping is preferred, mixed cropping can minimize competition from other more lucrative fruit types like durian. While the market outlook remains positive, more must be done to improve productivity, maintain quality and seek consistent quality and yields.

APPENDIX - PROGRAM

Time	Content
02.30 – 02.40 PM	Introduction Mr. Mohamed Salim Mohd Ali, CEO, International Tropical Fruits Network (TFNet)
02.40 – 04.20 PM	Presentations Moderator: Dr. Dorothy Chandrabalan, Technical Officer, TFNet
	 <p>The Status of Mangosteen Production and Market Expansion in Thailand</p> <p>Assoc. Prof. Dr. Thanarut Chinappan Faculty of Agriculture Production, Maejo University Thailand</p>
	 <p>Mangosteen Production and Market Expansion – the Indonesian Experience</p> <p>Dr. Ellina Mansyah Senior Researcher (Tropical Fruit), Badan Riset dan Inovasi Nasional (BRIN), Indonesia</p>
	 <p>The Status of Mangosteen Production and Market Expansion in India</p> <p>Dr. G. Karunakaran Principal Scientist (Fruit Science), ICAR-Indian Institute of Horticultural Research, Bangaluru, Karnataka India</p>
	 <p>Improving Mangosteen Production and Market in Malaysia</p> <p>Mr. Christopher Biai Director, Crop Industry Development Div, Department of Agriculture Malaysia</p>
 <p>Expanding Mangosteen Production and Market in Vietnam</p> <p>Mr. Nguyen Van Son Deputy Head of Horticulture Department, Southern Horticulture Research Institute (SOFRI) Vietnam</p>	
04.20 – 04.40 PM	Q & A, Panel discussion Moderator: Yacob Ahmad (TFNet) Panel: All speakers Topic: Challenges and opportunities in developing mangosteen for the global market

APPENDIX - PRESENTATIONS

MJU 

Situation of mangosteen production in Thailand
17/12/2025



Asst. Prof. Dr. Chinnapan Thanarut
Division of Pomology, Faculty of Agricultural Production, MJU, Thailand

1

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Mangosteen; (*Garcinia mangostana* Linn.)

- ❖ It is the “Queen of Fruits” in Thailand
- ❖ An economic crop of Thailand.
- ❖ Received is a deciduous fruit tree



2

MJU

Mangosteen (*Garcinia mangostana* Linn.)
“Queen of Fruits” in Thailand

Fruit setting from grafted tree



3

MJU

Mangosteen in Thailand grown in the same area as durian



4



The propagation of mangosteen by shoot grafting

9



Method of mangosteen grafting: rootstock and scion

10



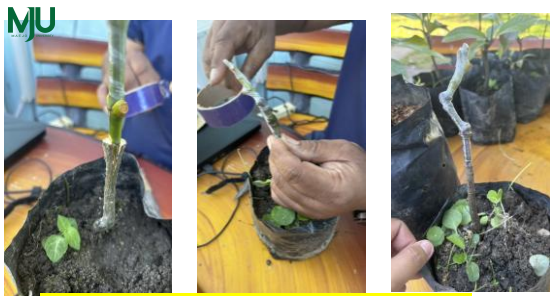
Mangosteen grafting: by Spliced grafting

11



Mangosteen grafting: by Cleft grafting

12



Wrap plastic around the cut area

13



The mangosteen seedling: grafted after 1 year

14



Mangosteen is planted with a grafted seedling can get fruit within 3 years.

15

MJU

Climate:

- ✓ Temperatures between 25-35°C
- ✓ Rainfall: more than 2,000 mm/year,
- ✓ The humidity of 70-80%.
- ✓ Water resources throughout the year,

The planting area:

The soil should be highly fertile, well-drained, and have a topsoil depth of more than 50 cm

Select the seedlings:

- With a grafted seedling and a complete root system.
- At least 2 years old.
- At least 30 centimeters tall.

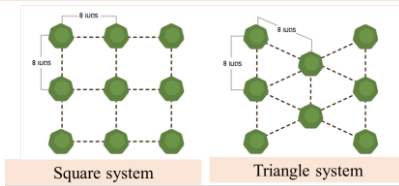


Source: Department of Agriculture

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Planting systems:
 - Square or equilateral triangle system with planting distances of 8x8 or 10x10 meters.-Wide row system

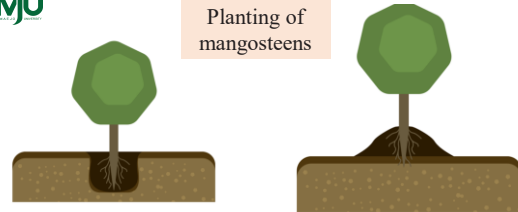


Source: Department of Agriculture

17



Planting of mangosteens



Planting holes and planting on raised mounds (dig out the ground).
 Suitable for dry areas.

Raised mound planting (On the surface of the ground)
 Suitable for high rainfall areas.
 Helps improve soil drainage.

Source: Department of Agriculture

18



Shading: During the young stage (1-2 years)

Provide sufficient water every 3 days in each stage of growth:

- Fruit setting stage: Water every 3 days at 80% of the normal watering rate.
- Fruit age stage (5 - 9 weeks): Water at 90% of the normal watering rate.
- Fruit age stage (10-12 weeks to harvest): Water at 80% of the normal watering rate.



Source: Department of Agriculture

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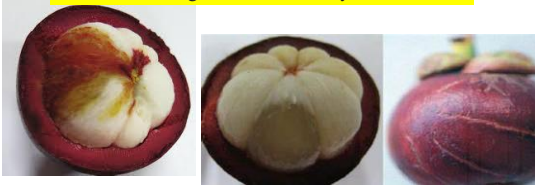
The canopy without pruning

The pruned canopy

Source: Department of Agriculture

20

"Glassy Flesh" or "Gel-like Texture",
Due to high water in the rainy season



Symptoms of latex loss in mangosteen fruit: Causes:
1. Impact on the fruit during harvesting and transportation.
2. Rainfall causes rapid changes in the water content inside the fruit.

Source: Department of Agriculture

Prevention and Control: Glassy Flesh and Gummy

1. Manage flowers and harvest time earlier before rainfall.
2. Maintain the trees healthy, without leaf burn, leaf spot, or leaf drop.
3. Manage the fruits are fully developed.
4. Harvesting carefully without fruit drop will be hard or stone fruit

Source: Department of Agriculture



Thrip & spider mite



Fruit cracking and gummosis

Source: Department of Agriculture



Thrips on fruits

Source: Department of Agriculture

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Thrips on young leaves

Source: Department of Agriculture

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MJU

Control of Thrips:

1. The critical period during the dry season,
2. The flowering and young fruit stages.
3. Spray pesticides 7 days before and after flowering.

Source: Department of Agriculture

34

MJU



Mealybug (*Pseudococcus cryptus* Hempel)

Source: Department of Agriculture

35

MJU

Mealybug Control:

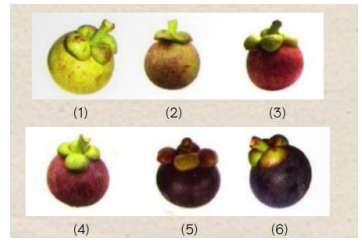
1. Spray with: Pesticides such as:
 - Carbosulfan 20% EC
 - Imidacloprid 10% SL
 - Carbaryl 85% WP
2. Mealybug infestation carried by ants; prevented by wrapping with cloth soaked in oil around the big branch.

Source: Department of Agriculture

36

- ❖ The mangosteen harvesting index (13 weeks after flowering)
- ❖ The harvesting index by the color of the peel (greenish-pink, pink, reddish-brown, purplish-red)
- ❖ The suitable fruit for export is pink/reddish-brown

Source: Department of Agriculture



The 6 stages of mangosteen fruit development

Source: Department of Agriculture

- Post-harvest management steps:
- ✓ Harvesting: Harvest when the fruit begins to turn pink/purple.
 - ✓ Handle carefully to avoid bruising.
 - ✓ Grading: Remove damaged, blemished, or insect-infested fruit to prevent the spread of fungal/bacterial infections.
 - ✓ Cleaning: Wash away dust and dirt.
 - ✓ Insect/insect egg control: Soak in hot water (40-55°C) for 20 mins, Thiabendazole
 - ✓ Pre-cooling: Reduce internal fruit heat by immersing in running cold water (hydro-cooling) to achieve an internal fruit temperature of approximately 13°C, then dry.

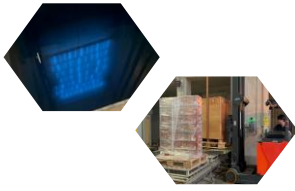
Source: Department of Agriculture



Extend the shelf life by radiation on the quality of mangosteen fruit

Source: Suchada and Peerasak (2024)

To study the effect of different types of radiation on the physical and chemical quality of mangosteen fruit during storage.



Source: Suchada and Peerasak (2024)

45

Results

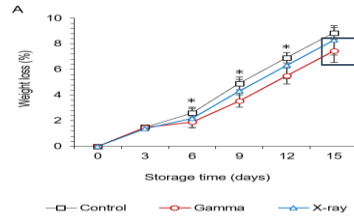
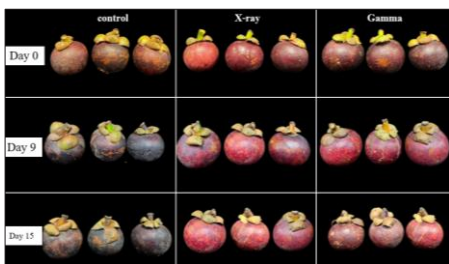


Figure. Change in percentage weight loss of mangosteen fruits irradiated with gamma rays and X-rays at 400 Gray (Gy) compared to a control group (no irradiation).

Source: Suchada and Peerasak (2024)

46

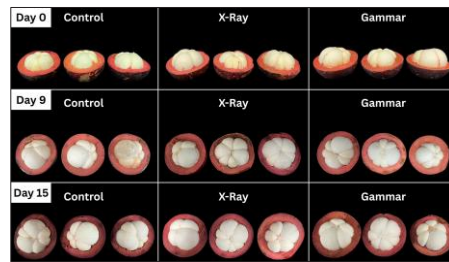
Figure. Color parameters of the mangosteen peel



Source: Suchada and Peerasak (2024)

47

Figure. Color parameters of mangosteen flesh



Source: Suchada and Peerasak (2024)

48



STATUS OF MANGOSTEEN PRODUCTION, CULTIVATION, AND MARKET EXPANSION IN INDONESIA



ELLINA MANSYAH

NATIONAL RESEARCH AND INNOVATION AGENCY (BRIN). INDONESIA 2025

International webinar on tropical fruits: Exploring Opportunities in Expanding Production, Consumption, and Market for Mangosteen - Tropical Fruits Network (TFNet), 17 December 2025

1



OUTLINE

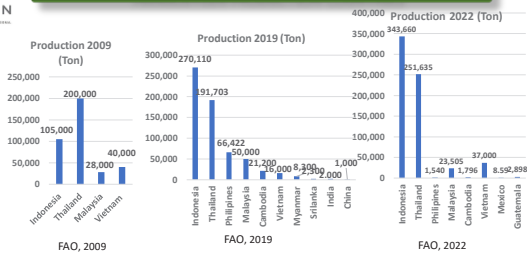
- I. INTRODUCTION
 - a. PRODUCTION & CULTIVATED AREA
 - b. EXPORT and DOMESTIC MARKET
 - c. STRENGTH, OPPORTUNITY, CHALLENGES AND RISKS
- II. MANGOSTEEN CULTIVATION
 - a. TYPES OF MANGOSTEEN ORCHARDS
 - b. HARVEST SEASON
 - c. PESTS AND DESEASE
- III. RESEARCH AND DEVELOPMENT
- IV. GOVERNMENT PROGRAMS

2



I. INTRODUCTION

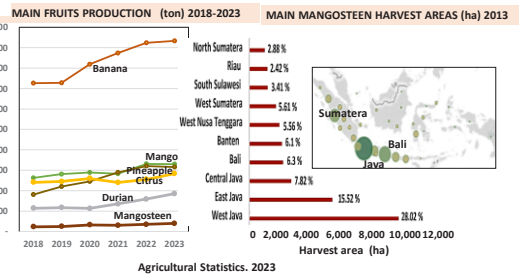
MANGOSTEEN PRODUCTION COUNTRIES



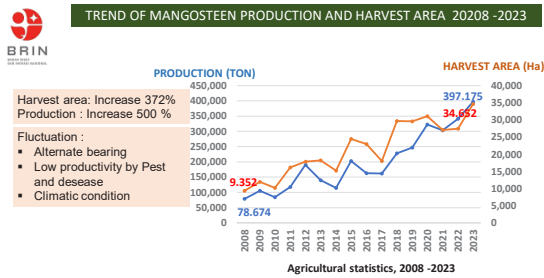
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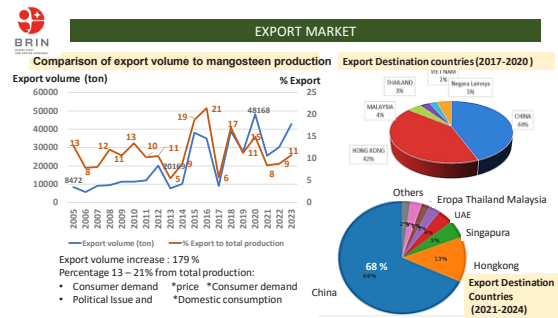
MANGOSTEEN PRODUCTION



4



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6

DOMESTIC MARKET

Domestic demand :

- Fresh Consumption
- Bioindustry (Processing products, juice, capsul,

ONLINE SHOP

TRADITIONAL MARKET

7

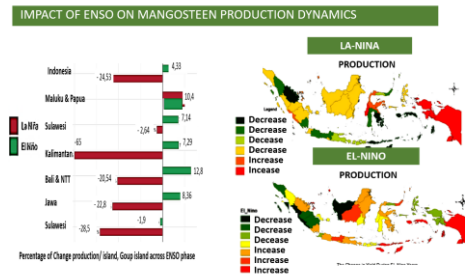
STRENGTH, OPPORTUNITIES, CHALLENGES, and RISKS

Strengths / Opportunities	Challenges / Risks
Increasing production volume & expanded cultivation area	Slow growth Productivity/tree relatively low (low input)
Diverse and growing export markets (China, Southeast Asia, Middle East, Europe)	Problems in collecting and shipping fruit Production centers are scattered among islands without International Airports
Improved supply-chain, packaging, cold-chain logistics enable quality exports	In some regions, post-harvest losses Production constraints due to non uniform adoption of best practices not uniform
Rising farmer income & rural economic impact,	Production constraints due to tree age/density; need for replanting / cultivation improvements
Growing value-added potential for processed products (extracts, powders) for export	Consistent with overseas regulations & phytosanitary based on traceability, and quality.

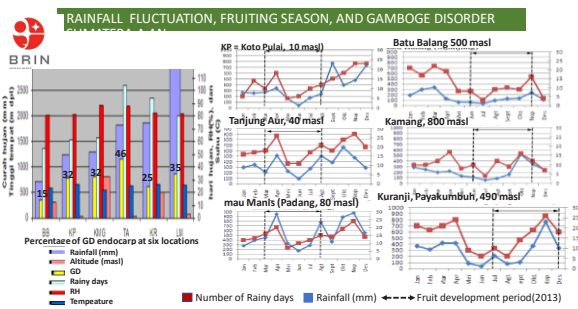
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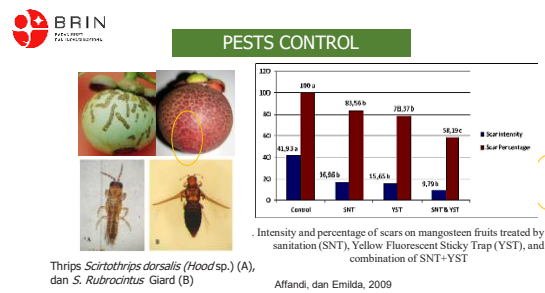
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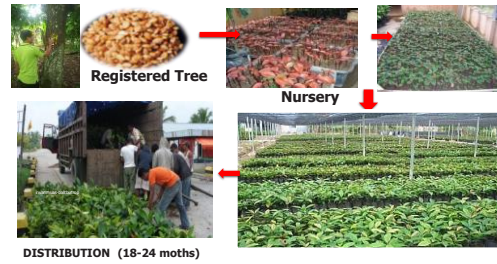


IV. GOVERNMENT PROGRAMS

1. Support for good quality of seedlings production and distribution
2. Support for training for Cultivation, Controlling Pests and Diseases dan post harvest
3. Standard National Indonesia (SNI) for mangosteen
4. Quality Control (Registration of mangosteen orchard and Phytosanitary Certificate

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MANGOSTEEN SEEDLINGS PRODUCTION AND DISTRIBUTION



18



STANDARD NASIONAL INDONESIA (SNI 3211:2009) FOR MANGOSTEEN

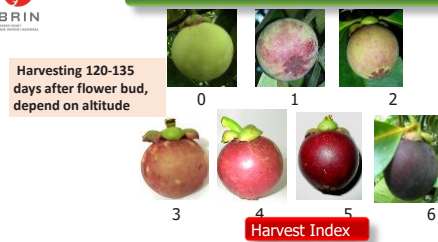
- ❖ Uniform fruit skin colour (reddish green to shiny light red)
 - ❖ Green and fresh petals
 - ❖ Clean fruit skin
 - ❖ Free from pests and desases
 - ❖ Free from Gamboge Disorder in fruit skin and pulp
 - ❖ Three classes fruit size:
- Size standard: ukuran dibagi menjadi tiga kelas:
- Super A₁ : 6 - 8 fruits/kg
 - Grade A₂ : 10 -13 fruits/kg
 - Grade A₃ : 14 -15 fruits/kg



19



HARVEST AND POST HAVEST HANDLING



20

QUALITY CONTROL

1. REGISTRATION OF MANGOSTEEN ORCHARDS

- Registered orchards must have implemented Standard Operational Procedures (SOP) and Good Agriculture Practices (GAP).
- Issued by the Local Agriculture Service with their assistance.
- Minimum area of 10 hectares within a single administrative area.
- Dokumented application of fertilizer and pesticide .

The Purpose of Mangosteen Farm Registration:

- Encourage farmers to implement a quality assurance system in mangosteen cultivation.
- Accelerate market access, particularly to export markets
- Improve the quality and food safety of mangosteen.
- Facilitate the traceability process.



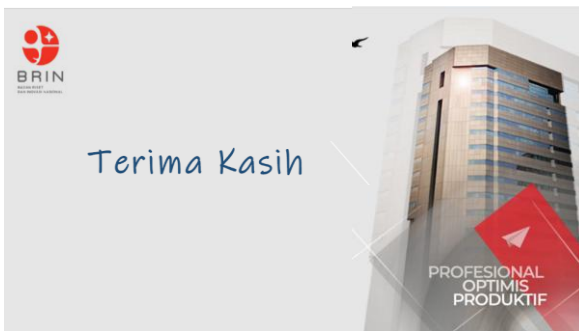
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1. ISSUED PHYTOSANITARY CERTIFICATE



Brushing and Air blow to remove ants
Field inspection, → packing house → ekspor (QR traceability).

22



23



The Current Status of Mangosteen Production and Market Expansion in India

Dr. G. Karunakaran, Pr. Scientist
ICAR- Indian Institute of Horticultural Research,
Bengaluru, Karnataka

1

Outline

- ✓ Introduction about mangosteen
- ✓ Current Status in India
- ✓ Currently Adopted Practices
- ✓ Climatic-conditions of Current Orchards
- ✓ Packing and Market
- ✓ Constraints & challenges
- ✓ Strategic Intervention



2

Introduction

History: Mangosteen was introduced to Kerala about 100 years ago-Sri Lanka



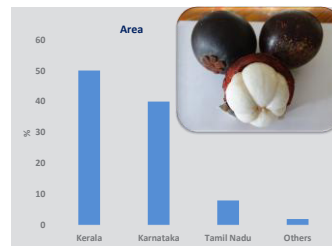
100 years old orchard at Kerala-The seedlings are collected from fallen fruit

- Delicious, High-value tropical fruit & Nutraceutical Value:
- ✓ Rich in antioxidants, vitamins C (12 mg/100g), B-complex, minerals-Iron (0.35 mg/100 g), Calcium (9 mg/100 g) & fiber (1.8 g/100 g), , especially xanthones in the pericarp,
- Income diversification for farmers and Premium domestic

3

Current Status in India

- Cultivated in Kerala, Karnataka, Tamil Nadu, Andaman & Nicobar, NE states
- Mostly small-scale and scattered orchards
- Commercial expansion is limited
- In Kerala, >100 old years trees are existing and yields well



4

Currently Adopted Practices

- Warm humid tropics and Deep well-drained soils
- Grown well in partial shade, as monocrop and as an intercrop under coconut plantations
- Seedling and Planting season: June-July
- In India, Earlier which is planting in 20 ft X 20 ft; Presently two Spacing followed 15 X 15 ft & 12 X 10 ft



- Planting method: Raised bed/ Trench farming or terrace farming (Slopes)
- Irrigation: supply of water during dry months

5

Climatic-conditions of Current Orchards

Region / Traits	Mountains (High elevation)	Foot Hills (Mid-elevation)	Coastal (Lower elevation)
Climate	Sub-Tropical humid	Tropical humid	Tropical humid
Flowering	May-June	Nov- Dec	Feb- Mar
Fruiting	Sep-Oct	Mar-April	June-July
No. of fruits /tree	150-350	150-200	100-200
Fruit wt. (g)	90-100	65-90	45-65
Yield/tree	45-50	25-30	15-20



Bearing fruits in 25 years old tree in Mid-elevation

❖ Trees grown under higher elevation are better fruit quality and higher productivity in comparison with other regions

6



Support for branches and Proper drainage

7

Packing and Market



Sorting, Grading and packing

- Niche price- domestic markets
- Export opportunities to SE Asia & Middle East
- Quality and consistency in supply market are key parameters



Photo Courtesy: Mr. Shree Padre, Journalist, India



8

Production Constraints & Challenges

- Long juvenile phase
- Narrow agro-ecological adaptability
- Availability of varieties –limited (Due to apomictic reproduction)
 - ✓ **Narrow genetic base and difficulty in breeding new varieties**
- Highly susceptible to sunburn injury - high temperature- summer
- **Gamboge-disorders**
 - ✓ More severe during the summer months (March–May) due to high temperatures
 - ✓ Incursion of water in the pericarp
 - ✓ Due to depletion of calcium level
 - ✓ Oozing of creamy yellow latex from branches , stem &fruits



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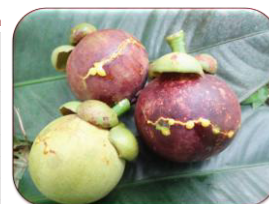
Strategies to overcome Gamboge

- Adoption of high-density planting with the spacing of 12 X 10 ft
- Pruning at the level of 8-10 ft
- Summer months: overhead protection by shade net & Daily irrigation
- Rainy days-Rainout Shelter
- Calcium, Magnesium and Zinc & Maintenance of soil pH >5.0

Estimated Returns from cultivation Mangosteen

Year after planting	Yield kg/tree	Returns/tree @RS. 100/kg	Returns(@50 trees/acre)
1-3rd yr	Nil	Nil	Nil
4	10	500	25,000
5	10	500	25,000
6	20	2000	1,00,000
7	30	3000	1,50,000
8	40	4000	2,00,000
9	50	5000	2,50,000
10	50	5000	2,50,000
15 th yr	75	7500	3,75,000
20 th yr	75	7500	3,75,000

(3 yr old seedlings are planted)



10

Strategic Interventions for Developing a Competitive Niche Industry

Targeted interventions can scale localized success into a sustainable high-value sector:

 Early-bearing planting material Promotion of 3-4-year-old seedlings to significantly reduce the juvenile phase	 Agro-ecological suitability mapping Identification and expansion of ideal cultivation zones for assured productivity	 Farmer awareness & capacity building Education on nutraceutical value and premium market potential	 Integrated disorder management Effective management of major disorders (e.g., gamboge) to ensure yield stability
---	---	---	---

Outcome: Transformation into a competitive, export-oriented niche industry



11

THANK YOU



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3

INTRODUCTION



- 1 Mangosteen (*Garcinia mangostana* L.) is a seasonal tropical fruit.
- 2 In Malaysia, it is mostly planted around houses or in mixed orchards along with other fruits like durian, rambutan, langsung, cempedak, and jackfruit.
- 3 It is known as the "Queen of Fruits".

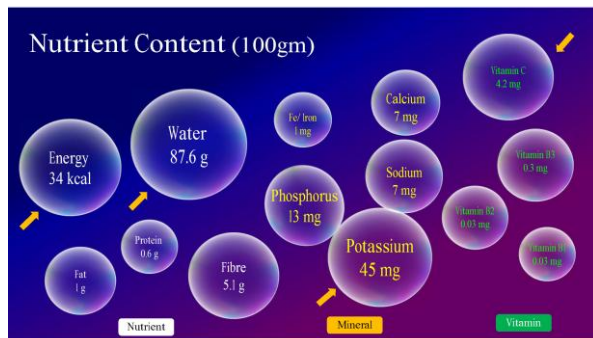
4 The mangosteen fruit is green when young and changes to a purplish-brown color when ripe.



5 The flesh is white, sweet, aromatic, juicy, and slightly fibrous.



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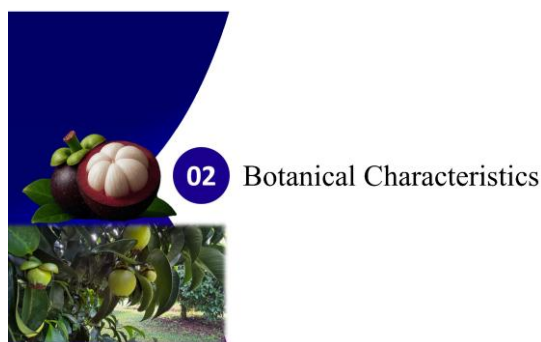
Mangosteen (*Garcinia mangostana* Linn.) is a well-known tropical tree indigenous to Southeast Asia. Its fruit's pericarp abounds with a class of isoprenylated xanthones which are referred as mangostins.

Numerous in vitro and in vivo studies have shown that mangostins and their derivatives possess diverse pharmacological activities, such as antibacterial, antifungal, antimalarial, anticarcinogenic, antiatherogenic activities as well as neuroprotective properties in Alzheimer's disease (AD). This review article provides a comprehensive review of the pharmacological activities of mangostins and their derivatives to reveal their promising utilities in the treatment of certain important diseases, mainly focusing on the discussions of the underlying molecular targets/pathways, modes of action, and relevant structure-activity relationships (SARs).

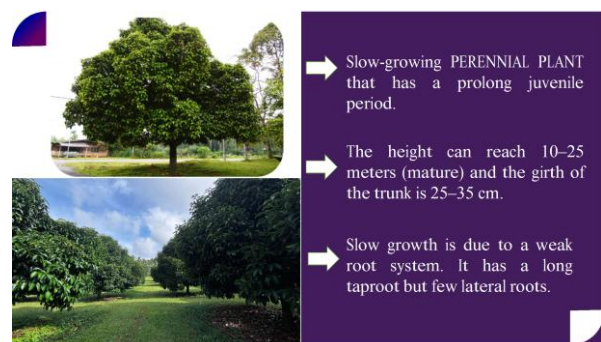
Meanwhile, the pharmacokinetics (PK) profile and recent toxicological studies of mangostins are also described for further druggability exploration in the future.

Source: Chinese Journal of Natural Medicines Volume 15, Issue 2, February 2017, Pages 81-93

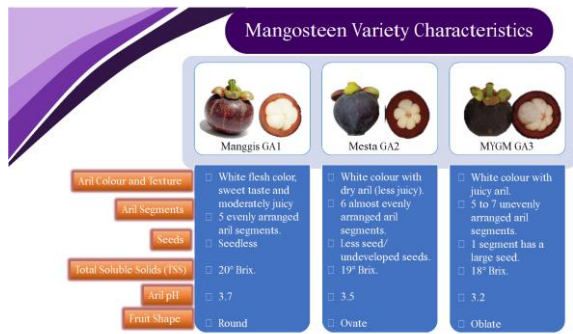
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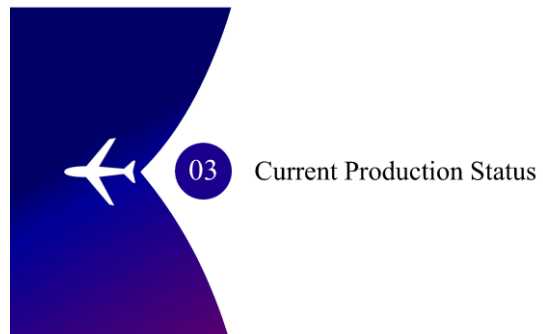
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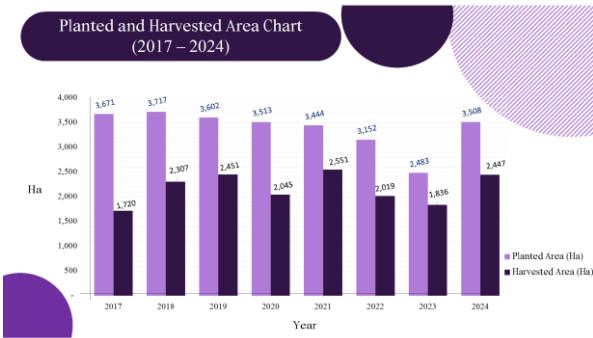
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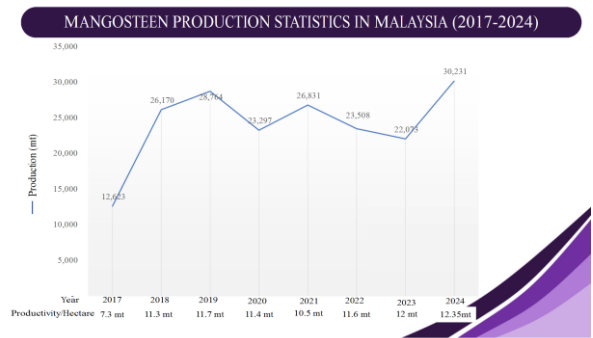
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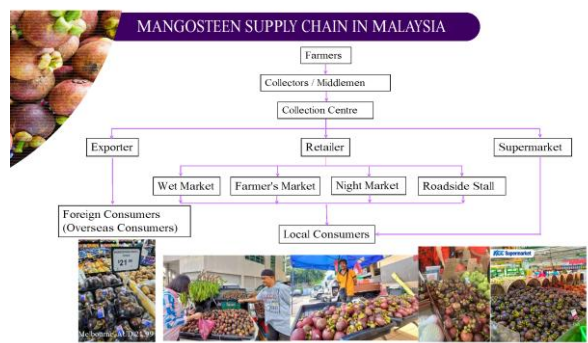
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05 Domestic Market Status

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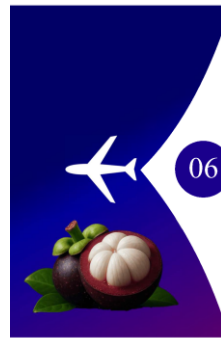
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Average Price

Local Market Year 2024

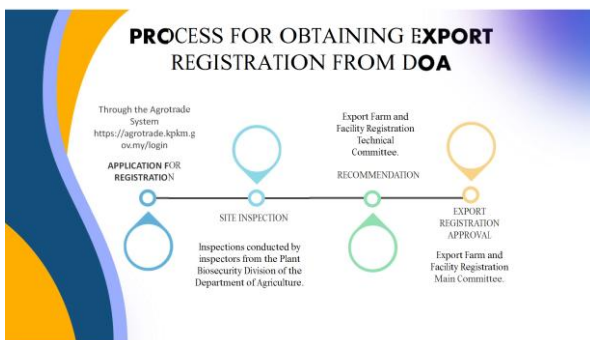


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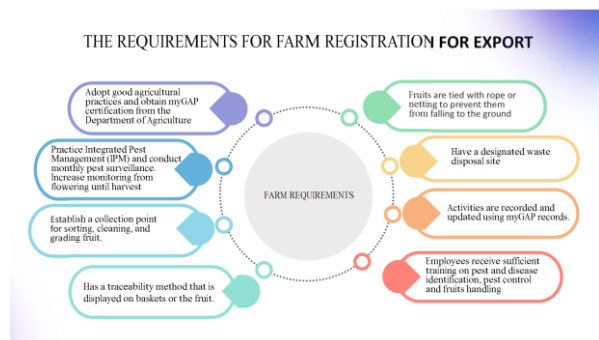


06 Export Market Performance

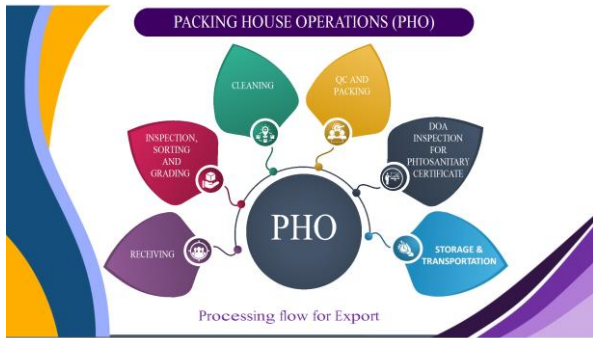
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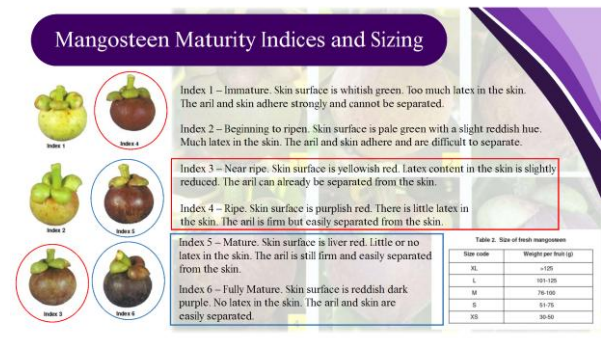
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Cleaning

Fruits are cleaned from unwanted foreign materials such as debris, soil, leaf remnants, branches, insects, dirt, dust and cobwebs by using brushes or high-pressured air guns.



25

QC & Packing

- Packing are performed in an enclosed area to ensure quality control and sanitary.
- The fruits shall be re-inspected prior to the grading and packing process.
- Fruits shall be packed properly using a suitable packing material.



26

DOA Inspection

Inspection table, along with the necessary equipment, is provided for the phytosanitary officer to conduct product inspections.



27

Storage and Transportation

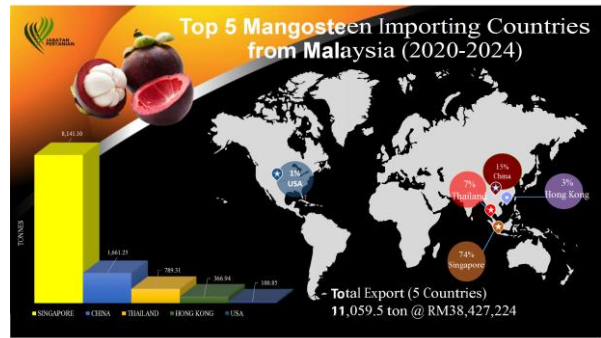
Final packed products will be temporarily stored in the processing area before being dispatched on the same day.



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29



30

07 Value Chain Challenges in Malaysia

31

Challenges in Production (Upstream)

- Prolonged Fruiting Period (Juvenile Stage)**
 - Mangosteen trees require a considerable amount of time (6 to 10 years), to reach maturity and begin yielding marketable fruit.
 - Leads to a slow Return on Investment (ROI) and high maintenance expenses, which diminishes the crop's appeal to new investors or younger farmers.
 - Limited plantation area and aging trees restrict production.
- Aging Workforce and Tree Stock**
 - The majority of mangosteen orchards are small-scale operations managed by farmers aged over 50 years. Furthermore, most of the trees themselves have exceeded 25 years of age (lack of industry continuity).
 - The fruit supply is insufficient to meet market demand.
- Gummosis and Disease Incidence**
 - Mangosteen trees are highly susceptible to diseases (such as the fungus *Phytophthora*) and the issue of gummosis (the exudation of yellow latex). This occurs when fruit or branches are damaged or when exposed to excessive humid/rainy weather/ climate change (compromises fruit quality & price).

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Challenges in Post-Harvest and Logistics (Downstream)

- The mangosteen fruit possesses a short shelf life after being harvested and is easily damaged, especially if improperly handled or stored at ambient temperature.
- Requires suitable transportation (e.g., refrigerated trucks) to maintain the quality and durability of the fruit.
- There is a deficiency in investment in post-harvest infrastructure and technology, such as fully equipped packinghouses, precooling treatments and harvesting technology.
- Results in inconsistent quality and physical damage to the fruit, particularly critical for export markets which demand premium quality.

Short Shelf Life and Fragile Fruit

Lack of Post-Harvest Infrastructure/ Harvesting Technology

33

08 Opportunities for Expansion

34

STRATEGIC THRUST

STRATEGIC PARTNER
Establish cooperation with industry/technology providers to obtain the best existing technology and transfer it to farmers.

MODEL FARMING
Develop model farms for farmer reference.

PARTICIPATORY OBSERVATION
Implement technology application in the field/ farmer plots to accelerate technology transfer.

INCENTIVES
Provide targeted/selective incentives to accelerate the adoption of technology by farmers.

JABATAN PERTANIAN
Under the 12th Malaysia Plan (2020-22), the Department of Agriculture (DOA) has provided incentives under the long-term fruit development project totalling RM 45 million. Of this amount, RM 2.7 million has been allocated for mangosteen cultivation, involving 521 farmers and covering an area of 436.56 hectares.

CAPACITY BUILDING
Provide training to enhance the skills and knowledge of farmers' manpower.

35

08 CONCLUSION

36

CONCLUSION

The mangosteen industry in Malaysia has several major opportunities for advancement, especially with the increase in global demand for premium tropical fruits and the focus on health products.

These development opportunities are categorized into three main aspects: Global Market, Product Innovation, and Value Chain Efficiency Improvement.

These opportunities require close cooperation between Ministries/ Departments/ Agencies/ Research Institutions/ Private sector and entrepreneurs to transform mangosteen from seasonal and small-scale produce into a high-value export commodity.







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 Crop Industry Development Division,
 Wisma Iain, Block 4G2, Level 19 & 22,
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THANK YOU



The current status of mangosteen production and market expansion in Vietnam

Nguyen Thanh Hieu, Tran Thi My Hanh, Dang Quoc Chuong, Nguyen Van Son,
 Nguyen Vu Son, Vo Huu Thoai
 Southern Horticultural Research Institute (SOFRI), Vietnam



1

CONTENT

1. Production situation
2. Production management
3. Market and export
4. Studies on mangosteen
5. Challenges in production and market
6. Future plans



2

Fruit production in Vietnam

MAJOR fruits based on areas are banana, mango, durian, pomelo, orange, longan, jackfruit, lychee, dragon fruit, pineapple, rambutan, passionfruit, avocado and custard apple (MARD, 2022)

MINOR fruit types are papaya, mangosteen, guava and others.

Total fruit production area 1.2 million ha (MARD, 2022)

The export value of Vietnam's fruit and vegetable industry was 7.2 billion USD (2023).

Avocado
Banana
Barbados cherry
Coconut
Durian
Dragon Fruit
Jackfruit
Lemon
Longan
Mango
Mandarin
Mangosteen
Orange
Papaya
Pineapple
Rambutan
Star apple

3

VIETNAM'S FRUIT AND VEGETABLE EXPORT VALUE FROM 2014 - 2024



4

Mangosteen production in Vietnam

- Vietnam in 2020, total production area was **7,236 ha**, with a production of 37,821 tons and average yield of 5.62 tons/ha
- Vietnam in 2023, the total area of mangosteen cultivation nationwide reached approximately **7,600 ha**



5

Production situation

Mangosteen

- Main area production:
- South-East region (2.900): Ho Chi Minh City (formerly Binh Duong), Dong Nai, Da Nang (formerly Quang Nam).
- Mekong Delta region (3.800 ha): Vinh Long province (formerly Ben Tre, Vinh Long, and Tra Vinh), Can Tho city (formerly Can Tho city, Hau Giang, and Soc Trang)



(Source: Ministry of Industry and Trade, 2023)

6

Production situation

Ecological requirements

- Temperature for mangosteen trees to grow is **25-35°C**. Air humidity \geq **80%**.
- Light during the first two years, mangosteen trees need to be shaded from direct sunlight, reducing the amount of sunlight by about 50-60%. Once the tree begins to bear fruit, shading is no longer necessary.
- Rainfall: The minimum rainfall must reach **1,270 mm/year**.
- Soil: Suitable for growing on **bazan, alluvium soil** with good drainage.
- pH soil: **5.5-7.0**



7

Production situation

Varieties

Lai Thieu mangosteen

- Short stem, sweet and sour taste, smooth and glossy skin, no roughness or cracks, dark red or light red color.
- Flowering: December and January
- Harvest: **May - June**



8

Production management

Cultivation practices

- Planting distances vary from 6-7 x 6-7 m (Density planting 204 - 277 trees/ha).



9

Production management

Cultivation practices

Canopy management



Pruning the tree after harvest

The tree has an evenly canopy after pruned

10

Production management

Cultivation practices

Fertilizer

- The recommended NPK amount for mangosteen trees from 8-15 years old is 1.200 g N + 1.200 g P₂O₅ + 1.200 g K₂O/tree/year
- Organic manure: composted manure 20 - 30 kg/tree/year or Commercial organic fertilizer 5 - 10 kg/tree/year



11

Production management

Important pests

Insect	Location damaged	Popularity Level
Citrus leafminer (<i>Phyllocnistis citrella</i>)	Leaf, fruit	+++
Thrips (<i>Scirtothrips dosalis</i> Hood)	Leaf, fruit	+++
Red mite (<i>Tetranychus</i> spp.)	Fruit, stem, branch	+++
Borer leaf-eating	Leaf	++
Green weevil	Leaf	++

Note: (-) Not infected: 0%+ Rare, sporadic appearance: > 0% - 5% of plants infected(++) Frequent appearance: > 5% - 25% of plants infected(+++) Frequent appearance: > 25% - 50% of plants infected(+++) Very frequent appearance: > 50% of plants infected



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Production management **Important diseases**

Diseases	Location damaged	Popularity Level
Gummy stem blight (<i>Phytophthora</i> sp.)	Sem, branch	++
Algal spot (<i>Cephaleuros virescens</i>)	Stem, branch	++
Leaf spot (<i>Pestalotia</i> sp.)	Leaf	+++
Quick wilt (<i>Pestalotopsis</i> sp.)	Branch	++
Gamboge	Fruit	+++

Near translucent pulp: sporadic appearance: > 0% - 5% of fruit infected (+) Frequent appearance: > 5% - 25% of plants infected (++) Frequent appearance: > 25% - 50% of plants infected (+++) Very frequent appearance: > 50% of plants infected

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Production management

Translucent pulp

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Production management

Internal and external gamboges

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Production management **Management of important pests and diseases**

Disease control

- Increase pH soil (5.5-6.5)
- Apply lime on the soil, 2 times after harvesting and begin raining season
- Use SOFRI-Trichoderma or beneficial Bacteria (SOFRI-VK1) combined with OM to control the fungi in the soil
- Stop watering when serious disease

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Production management

Pest control

- ❖ Using the parasitic fungus *Paecilomyces* sp. (SOFRI-PAECILOMYCES) to manage insect pupae in the soil, green caterpillars, and leaf-eating caterpillars.
- ❖ Use sticky traps.
- ❖ Creating favorable conditions for natural enemies



Management of important pests and diseases

Harvest & post-harvest

Harvesting

- From flowering to harvesting **120-130 days**
- Harvest when the weather is cool and dry. Avoid harvesting when it is too sunny, after rain or fog



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Harvest & post-harvest

After harvesting, the fruit is placed in perforated cardboard boxes. Ripe fruit (entirely purple) can be refrigerated at 12-15° C to keep the peel fresh for longer.



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Harvest & post-harvest

Post-harvest

- Packaging: stored in mesh bags with weights 2, 5, and 10 kg quantity
- Outside the mesh bag, there is usually a hard plastic basket or Packed directly into a carton
- Truck (about 20 tons/truck) for mangosteen transport.



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Harvest & post-harvest

Processing products

- Mangosteen juice drink
- Mangosteen jam
- Mangosteen extract
- Mangosteen salad

Mangosteen Salad

Combo Mãng Cụt

Mangosteen extract

Mangosteen jam

Canned juice

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Market and export

Currently in Vietnam, the domestic market remains the main consumer, accounting for approximately 60-70% of production, while the remaining 30-40% is for export.

> The first 7 months of 2023, the export value of all types of mangosteen reached 679 USD, accounting for 0.01% of the total export value of

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Market and export

> Exported to 30 different markets.

> Among them, **China** and **USA** are the two main export markets

Country	Percentage
Trung Quốc (China)	50%
Mỹ (USA)	19%
Việt Nam (Vietnam)	15%
Đức (Germany)	8%
Hàn Quốc (South Korea)	7%
Đài Loan (Taiwan)	2%
Thái Lan (Thailand)	2%
Canada	2%
Úc (Australia)	2%
Singapore	2%
Khác (Others)	2%

(Source: Taca Business Consulting, 2024)

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Studies on mangosteen by SOFRI

1. Clonal selection of mangosteen cultivars in the Eastern South of Vietnam in 2001–2002
2. Effect of foliar fertilizers on yield and quality of mangosteen in Ben Tre province in 2001–2003.
3. Effect of NPK rates on yield and quality of mangosteen grown in Ben Tre province in 2002–2003
4. Influence of Thiourea and Urea on the emergence of new shoot in mangosteen in 2002–2003
5. Effect of spray fertilizer on leaves on efficiency and fruit quality of mangosteen in alluvial soil South East Vietnam in 2002–2003
6. Initial results about follows habit bloom on branches and effect of prune on efficiency and fruit quality of mangosteen in alluvial soil South East Vietnam in 2002–2003
7. Sensitivity to the fruit flies *Bactrocera dorsalis* Hendel and *Bactrocera correcta* Bezzi of mangosteen, cavendish banana, xiem-banana & dabo long variety in 2002–2003

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Challenges in Mangosteen Production and Market in Vietnam in the Future

1. Production-Related Challenges

- Climate Change and Agro-ecological Stress → unstable yields, poor fruit quality, and increased tree mortality, especially in traditional growing regions.
- Long Juvenile Period and Low Productivity → typically require 7–10 years before bearing fruit, limiting farmers' willingness to invest. This reduces competitiveness and slows down large-scale commercial expansion.
- Pests and Diseases → Soil-borne pathogens (e.g., *Phytophthora* spp.), Stem canker and root rot under waterlogged conditions, Insect pests affecting fruit skin quality.
- Limited Technical Standardization → leads to inconsistent fruit size, latex contamination, and variable internal quality.

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Challenges in Mangosteen Production and Market in Vietnam in the Future

2. Market and Value Chain Challenges

- Quality Consistency and Food Safety → small-scale and fragmented, making standardization difficult.
- Postharvest Losses and Shelf Life: Limited access to cold chain infrastructure and modern packaging technologies constrains long-distance exports.
- Market Competition : Thailand (dominant exporter with branding advantage), Indonesia and Malaysia (increasing quality and volume). → Without clear branding, geographical indication (GI), or varietal differentiation, Vietnam risks being positioned as a secondary supplier.
- Price Volatility and Market Dependence: Supply fluctuations, Dependence on a few export markets, Informal trade channels. → This creates income instability for farmers and discourages long-term investment.

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Future plan

- ❖ Review and plan for concentrated production areas
- ❖ Institutional & financing mechanisms
- ❖ Climate-smart production & orchard management
- ❖ Variety & genetics program
- ❖ Pest, disease and soil health management
- ❖ Postharvest chain & cold-chain investments
- ❖ Market, branding and traceability

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Thank you for your attention!



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