



Coconut fruits on trees, Wuzhizhou Island, Hainan Province, China. Credit: YuanGeng, Adobe Stock.

# Exploring the pathway of high-quality development of Hainan's coconut industry

## ABSTRACT

*The coconut industry is a typical example of tropical island agriculture. The coconut tree is reputed to be the 'tree of life,' and its nutritious fruit, known as a 'functional health food,' is rich in fiber, vitamins, and minerals. There are over 90 coconut producing countries worldwide, and almost one third of the global population relies on coconut as a food and econom-*



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*ic source. This chapter begins with a literature review on the coconut industry, followed by an analysis of the current situation of Hainan's coconut industry through a combination of qualitative and quantitative methods using datasets from 2012 to 2021. The author aims to dive into existing problems and explore the pathway of high-quality development of Hainan's coconut industry, in the hope of shedding light on how tropical island countries can promote economic growth through the development of the coconut industry.*

## INTRODUCTION

With their unique geographical locations and natural landscapes, islands are attractive tourist destinations. Most tropical islands grow coconuts. According to statistics from the Food and Agricultural Organization (FAO) in 2021, coconut acreage in the Philippines and Indonesia is among the top in the world. Coconut is also the most widely planted crop in many Pacific islands, such as the Federated States of Micronesia, Cook Islands, and Nauru. Tropical island states are favored tourism destinations for their beautiful beaches dotted with coconut trees. The coconut industry is a feature industry of tropical islands and attracts global tourists, increasing coconut consumption and boosting the economic benefits of the tourism sector.

The island of Hainan is located in the tropical zone. Eighty percent of land in Hainan

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is in rural areas, 60% of the population is farmers, and 20% of GDP comes from agriculture. Therefore, it is a free trade port with a distinct agricultural sector. It is also known as the 'Coconut Island.' According to the Hainan Statistical Year Book (2022), coconut is the fourth largest tropical crop on the island in terms of planting area, with a planting history of over 2000 years. As will be discussed below, coconuts play an important role in alleviating poverty, revitalizing rural areas, protecting the eco-environment, boosting tourism, and increasing farmers' income. Coconut

trees have become an iconic image of Hainan, highlighting the vision and drive of the local people in the new era.

This chapter begins with a literature review on the coconut industry, followed by an analysis of the current situation of Hainan's coconut industry through a combination of qualitative and quantitative methods using datasets from 2012 to 2021. It then summarizes the achievements of Hainan's coconut industry before diving into existing problems. Finally, observations and suggestions are discussed on how the development of Hainan's coconut industry may have relevance for other island countries and regions.



Coconut trees attract global tourists to Hainan Island. Credit: Kirill, Adobe Stock.

## LITERATURE REVIEW

The major coconut producing countries in the Asia Pacific region have conducted early and systematic research on the coconut industry, covering the entire industrial chain. For example, Hyman (1990) explored the position of the Philippines' coconut industry in the world market and policy incentives in the country. The Philippines is the largest coconut producing country in the world. Coconut fruits are mainly processed into coconut oil and feed, while domestic consumption accounts for only 23% of the total. Due to unstable domestic policies, import tariffs in the international market and policies of other major producing countries have had a negative impact on the Philippines' coconut industry. Magat (1991) analyzed the Philippines' coconut industry through the lens of production, market, technology, and technical support. The Philippines started to develop the coconut industry in 1642 under the Spanish colonial rule. After several hundred years of development, it has become the pillar industry of Philippine agriculture. The main exports are dried coconuts, coconut oil, and dried coconut meat. A number of institutions have been established to support development of the coconut industry, including the Philippine Coconut Bureau, the Philippine Coconut Producers Association and the Philippine Coconut Research and Development Foundation, supplemented by policy incentives in taxation, export and land reform.

Arancon (1999) reviewed thirty years of the coconut industry in the Asia Pacific Coconut Community (APCC) member countries (1969–1999), covering history, pro-

duction, and market. The paper first analyzed the importance of the coconut industry for socio-economic development in member countries, followed by an overview of breakthroughs made by each member country in variety selection, field management, post-harvest and downstream processing, and development and application of new products in the past 30 years. The paper also analyzed market demand and trends of different products, and discussed technology, policy framework, and future prospects.

Abeysekara and Waidyarathne (2020) reviewed price forecasting in major coconut producing countries using a time series model and system method. The single factor time series model is widely used for predicting price fluctuations of coconut products. The Vector Autoregressive Model and the Artificial Neural Network Model are the best methods for multivariate testing.

Biswas (2020) used the SWOT approach to analyze the challenges and strategies of improving coconut cultivation in West Bengal, India. The Coconut Development Bureau has proved to play an important role in national coconut production, and relevant technologies and results can be popularized nationwide after the successful trials in West Bengal. Jayasekhar and Neethumol (2021) gave a brief introduction to the Indian coconut industry at the crossroads. With coconut oil as the main product, the Indian coconut industry is directly affected by fluctuations in coconut oil prices.

## CURRENT SITUATION OF HAINAN'S COCONUT INDUSTRY

### *Production*

Hainan is the main coconut producing area in China. Based on calculation and analysis of data from Hainan Statistical Yearbook (2022), the island's annual output and annual production value respectively accounted for over 99% and 97% of the country's total. From 2012 to 2021, coconut planting and production in Hainan have shown a stable and upward trend. Hainan's coconut cultivation is mainly concentrated in Wenchang City, Qionghai City, and Lingshui County. Wenchang City has the largest planting area and the only one that exceeds 10,000 hectares. In 2021, the coconut planting area in Wenchang City reached 15,005 hectares, accounting for 41.3% of the total in Hainan Province. Second in cultivated space is Qionghai City, with a coconut planting area of 6,722 hectares, accounting for 18.5% of the total in the province. Lingshui County, with a coconut planting area of 3,377 hectares, accounted for 9.3% of the provincial total. As the main coconut producing area in China, Hainan features a high degree of regional concentration. The coconut planting areas of Wenchang, Qionghai, and Wanning together account for 69.1% of the total on the island. In 2021, the coconut harvest areas, which refers to coconut orchards that have already borne fruit, in Wenchang City, Qionghai City, and Lingshui County were 11,620 hectares, 6,165 hectares, and 3,148 hectares, respectively. Their outputs — 59.18 million, 67.93

million, and 5.11 million — respectively accounted for 29.1%, 33.4%, and 2.5% of the total coconut production in Hainan Province, adding up to a total of 65.0%.

**TABLE 1: Coconut Planting in Hainan Province (2017–2021)**

	Year End Area (Hectare)	New Area of the Year (Hectare)	Harvest Area (Hectare)	Total Output (10,000)
2017	31424	1227	27231	21770
2018	34396	3153	28121	22677
2019	34527	820	28240	23162
2020	35695	1946	28133	21279
2021	36323	3065	28202	20308

Data source: Hainan Statistical Yearbooks 2018, 2019, 2020, 2021, and 2022.

### Processing

There are 359 coconut processing enterprises in Hainan, which directly or indirectly employ over two million people. This employment spans the entire industry chain — from researchers engaged in scientific and technological innovation to coconut farmers and coconut processing enterprises to businesses providing agricultural materials to coconut industry associations and coconut marketing personnel. However, the industry is dominated by small- and medium-sized enterprises, with no more than 10 companies that each have an output value of over 14 million USD. In Hainan, a coconut is utilized to the fullest extent. Not a single bit is wasted. Coconut-based products mainly fall into three categories. The first is food products, including coconut juice, coconut powder, coconut candy, coconut chips, coconut cookies, and edible coconut oil. The main brands are Coconut Palm, Nanguo, Chunguang, Yeguo, and Yeniu. Coconut juice by Coconut Palm has been designated as a national banquet beverage. The second category is non-food products, including coconut cultivation substrates, coconut mats, door mats, flower baskets, coconut fiber mesh, non-edible coconut oil, coconut shell charcoal, and activated carbon. The main brands include Sleemon, Airland, Jinpan, Mulinsen, and Huajing. The third category are handicrafts made mostly by small workshops, as represented by Yepai. The main products include furniture, tableware, stationery, murals, coconut bags, belts, pendants, headwear, bracelets, necklaces, keychains, wind chimes, candlesticks, clocks, and watches. In Wenchang City alone, there is one provincial-level intangible cultural heritage artist of coconut carving, 15 folk artists, and 18 coconut carving factories. Their products have won multiple national awards.



Coconut Button Factory in Dongjiao, Hainan, China. Source: Anna Frodesiak, WikiCommons.

### *Local sales*

Coconuts produced in Hainan are sold mostly as fresh fruit. Nearly 130 million fresh coconuts are consumed annually within the province, mainly by local residents and tourists. A further 100 million are sold off the island. In recent years, market demand for fresh coconuts has been strong, and prices have been rising. The farm price of local fresh tall coconuts has been increasing year by year to around 3–5 yuan per nut. Its retail price ranges from 7–10 yuan per nut, and in some cases, up to 12 yuan per nut. The farm price of fresh dwarf coconuts is 5–6 yuan per nut, and the retail price is 15–20 yuan per nut. The direct economic benefits are considerable.

### *Import and export*

As Hainan coconuts are mostly consumed as fresh fruit, the price of fresh coconuts in Hainan is relatively high. In order to reduce production costs and ensure stable supply of coconut fruits, a large number of processing enterprises in Hainan have to import fruits from abroad for coconut processing. Hainan's coconut processing enterprises mostly import fruits from countries such as Thailand, the Philippines, Indonesia, Vietnam, and India. Hainan's coconut imports mainly include coconuts in the inner shell (endocarp), coconut juice, and dried coconuts. Coconuts in the inner shell (endocarp) represent the largest imports. In 2021, 518,800 tons of coconuts in the inner shell (endocarp) were imported into Hainan, accounting for 59.50% of the national total, mainly from Indonesia, Vietnam, and the Philippines; 794.45 tons of dried coco-

nuts were imported into Hainan, mainly from Indonesia, accounting for 4.01% of the national total; 1592.70 tons of coconut juice was imported into the province, mainly from Indonesia, accounting for 2.07% of the national total.

Hainan's coconut products are mainly sold domestically, while a small portion of dried coconut meat, coconut juice, and floor covering products made of coconut shell fiber are exported to the international market. In 2021, Hainan exported two tons of dried coconut meat to Ecuador, accounting for two-thirds of the national total; 543 tons of coconut juice were exported, accounting for 60.91% of the national total, mainly to Hong Kong, China; 23.42 tons of floor covering products made of coconut shell fiber were exported, accounting for 3.73% of the national total, mainly to Germany, Canada, and France.

### *Technology*

Hainan Province is the home to the Coconut Research Institute of the Chinese Academy of Tropical Agricultural Sciences, the only national coconut research institution in China. The institute released the world's first whole genome sequencing of coconuts and obtained the DNA fingerprints of major cultivars in the world, which makes it a world leader in coconut molecular biology research. This research institute has cultivated six new coconut varieties unique to China, playing an important role in rural revitalization of Hainan and Yunan provinces. It has also developed groundbreaking technologies for the detection, monitoring, and biological control of major invasive pests such as coconut leaf beetles and red palm weevils, to effectively prevent and control primary pests of palm crops.

## **ACHIEVEMENTS OF HAINAN'S COCONUT INDUSTRY**

### *A key industry for rural revitalization*

As General Secretary Xi Jinping pointed out, industry is the foundation for development. A booming industry promises steady income growth for farmers (people.cn, 2020). Without industries, there can be no rural revitalization. As Hainan is a free trade port with a distinct agricultural sector, it has favorable climate resources for developing the coconut industry. Many cities and counties have identified the coconut industry as a lever to reduce poverty. One example is the Wenye varieties of coconut bred by the Coconut Research Institute of the Chinese Academy of Tropical Agricultural Sciences. One *mu* (1 *mu*  $\approx$  666.7 m<sup>2</sup>) of land can accommodate 18 trees, which blossom in three years, and bear fruit in the fourth year. Each plant on average yields 150 coconuts annually. At six yuan per fruit on average, the output value per *mu* can reach 16,200 yuan, and the average net income per *mu* can reach 15,000 yuan, after deducting 1,000 yuan for management costs. In 2019, the Jinjiling Branch of the Hainan

Rubber company planted 1,133 *mu* of coconuts, including 143 *mu* of coconuts in the Hongming area. Private investors subscribed for 19 years of management rights for the Hongming area at a price of 15,000 yuan per *mu*. As yet another example, Hainan Jialetan Agricultural Technology Co. Ltd. has reached a cooperation agreement with relevant departments in Tunchang County to plant 34,000 golden coconuts in eight towns, including Tuncheng Town, Xinxing Town, and Poxin Town. Through the ‘enterprise+cooperative+farmer’ model, farmers are encouraged to join the cooperative for shared benefits, contributing to rural revitalization in Tunchang County through industrial development.

### *A pillar industry for belt and road cooperation*

The high-quality development of coconut industry in tropical island countries can add economic benefits to the tourism industry. As of December 2022, China has signed more than 200 “Belt and Road” cooperation documents with 150 countries and 32 international organizations. The global coconut growing regions are mostly located in tropical countries along the routes of the “Belt and Road” initiative (BRI) throughout Southeast Asia, South Asia, Africa, Latin America, and the South Pacific islands. These regions are endowed with unique resources, but the development level of the coconut industry is not high, especially in Africa and the South Pacific islands.

This suggests an urgent need for cooperation with China. For example, coconut is the most widely planted crop in Micronesia, but the per-unit yield is only 70% of the world average, and less than 40% of that in China. This is mainly due to a lack of good varieties, outdated cultivation and management techniques, and a lack of prevention and control measures for diseases and pests, especially for coconut leaf beetles. President Urusemal and President Christian of Micronesia have successively visited the Chinese Academy of Tropical Agricultural Sciences to seek technical support in improved coconut varieties and seedlings, cultivation technology, and planting management. In 2018, the Chinese Academy of Tropical Agricultural Sciences sent 12 experts on coconuts, forage, flowers, pest control and agricultural prod-

uct processing to the Federated States of Micronesia to offer training courses in Yap, Chuuk, Kosrae and Pohnpei states. In 2019, a standardized coconut plantation was established in Pohnpei State, Micronesia, as a demonstration site, and in 2021 a video training session on comprehensive utilization was held for the coconut industry of Kiribati.

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In addition, since 2014, the Chinese Academy of Tropical Agricultural Sciences has sent experts to the Maldives and other countries to offer technical assistance in coconut leaf beetle prevention and control, supporting the high-quality development of the coconut industry in the tropical BRI countries.

### *A model industry for ecological conservation*

In his speech at the celebration of the 30th anniversary of the establishment of Hainan Province and the Hainan Special Economic Zone, General Secretary Xi Jinping announced that the CPC Central Committee had decided to support the development of a national pilot zone for ecological conservation in Hainan. The province was encouraged to explore a path of harmonious development between humanity and nature and to accumulate experience that could be used for ecological conservation nationwide. The coconut has a strong adaptability to soil and can withstand up to Level 10 typhoons. Apart from being grown in large patches in coastal sandy areas, coconut trees are also planted in the front and back yards of every rural household, and on both sides of the village roads in Hainan, becoming a typical species for the courtyard (or home-based) economy and landscaping.

Coconut groves are also good for carbon sequestration, absorbing 345.35 grams of carbon dioxide and releasing 251.16 grams of oxygen per unit leaf area annually (Wu et al., 2010). The coconut industry has played a leading role in improving rural ecology and building eco-industrial chains. At the same time, Hainan Province has a complete coconut industrial chain that is able of producing a wide variety of coconut-based products. Even the waste can be recycled into fuel, fertilizer, and edible mushroom culture medium. Coconut leaves can be processed into new types of building materials that are green and environmentally friendly. That is a perfect example of building eco-friendly and eco-based industries. Lingshui Li Autonomous County has issued the “Action Plan for the 100,000-*mu* Coconut Grove Campaign” to develop the coconut industry and boost farmers’ income, improve urban and rural environment, enhance sand prevention and fixation, and promote ecological conservation in Lingshui (Li and Chen, 2018).

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## **PROBLEMS OF HAINAN’S COCONUT INDUSTRY**

### *Low level of internationalization*

The coconut planting areas in China are relatively limited, and domestic production only accounts for 0.4% of the world’s total. China is the world’s largest importer of

coconuts in the inner shell (endocarp), accounting for over 40% of the global total, and its import volume of coconut oil and dried coconuts is also considerable. Hainan enjoys advantages in coconut cultivation and processing, has advanced technologies and a large number of enterprises, but none of these enterprises have grown into multinationals with international influence, and only a few companies have gone global or engaged in overseas planting, processing, and marketing. Domestic coconut enterprises lack exchanges and cooperation with leading foreign peers, and do not fully understand the inspection and quarantine standards of the international coconut market, or market access policies of other coconut importers. As a result, domestic coconut producers have a very small international market share.

### *Low level of mechanization and climate limitations*

Despite the importance to Hainan, the coconut is still a minor tropical crop in China. Unlike staple crops, the systematic study of the coconut is conducted by only a few research institutions, and primarily the Coconut Research Institute of the Chinese Academy of Tropical Agricultural Sciences and Hainan University. The lack of cold and drought resistant varieties has restricted the planting area of the coconut, making it impossible to grow the plant on a large scale in tropical South Asia. Also, the absence of mechanized fruit picking technology and the need to rely on manual labor have resulted in high coconut picking costs. There is insufficient research into deep processing technology. So, the sector is flooded with traditional products such as coconut sugar, coconut powder, coconut oil, and coconut carvings, but it is difficult to extract functional ingredients (protein, sugar, fat, vitamins, micronutrients, etc.) from coconuts to produce functional products such as fatty alcohol, fatty acid, facial masks, essential oil, and edible fiber.

## **EXPLORING THE PATHWAY OF HIGH-QUALITY DEVELOPMENT OF HAINAN'S COCONUT INDUSTRY**

### *Accelerating application for modern coconut industrial parks/clusters*

Based on market demand, resource endowments, ecological conditions, and existing foundations, strong platforms and modern coconut industrial parks/clusters can be built up to high standards. There is a potential to improve the entire industrial chain, integrating production, processing, R&D, warehousing, logistics, and commerce, to form a RMB 100-billion industry (13 billion USD). New bellwether enterprises for the coconut industry can be cultivated, further processing of coconut products can be supported, and more farmers can be encouraged to participate in the whole industrial chain and grow local employment and boost income. To promote the development of the whole industrial chain, the financial institutions must be connected with the

industrial parks/clusters, and more production factors need to be attracted, including capital, technology, talent, and land. Leading coconut processing enterprises need to be encouraged to reach out upstream and downstream of the industry. Upstream, standardized demonstration plantations, professional cooperative organizations, leading enterprises, and large growers can be pushed to increase investment in modern production factors and build high-standard production and processing facilities. Downstream, post-harvest sorting, peeling, distribution, storage and transportation, branding, and socialized service systems also need to be established.

### ***Building a policy support system for the coconut industry***

To promote the development the coconut industry, it's important to build a good policy support system by drawing on the experience of major coconut producing areas overseas. Some ways this can be achieved include:

- (1) Innovative subsidy policies for cultivating seedlings of improved coconut varieties.
- (2) Encourage private investment in coconut seedling breeding bases, high-yield coconut demonstration bases, and coconut product sales platforms.
- (3) Establish a coconut industry development fund for research and application of new technologies for coconut processing and deep processing of coconut products.
- (4) Include coconut production and processing machinery as eligible items for receiving agricultural machinery purchase subsidies.
- (5) Provide ecological subsidies according to ecological compensation standards to those planting coconut groves on barren slopes, wasteland, and barren mountains.
- (6) Establish and improve the policy-based insurance system for the coconut industry by introducing coconut seedling cultivation insurance, coconut price index insurance, and coconut tree wind damage insurance.

The goal is to increase investment, scale up industrial development, improve R&D of deep-processed products, and expand domestic and foreign markets through a whole set of industrial support policies, to form a complete and healthy industrial chain.

### ***Building a technical support system for the coconut industry***

Drawing upon the capabilities of research institutions such as the Chinese Academy of Tropical Agricultural Sciences, Hainan Academy of Agricultural Sciences, and Hainan University, and enterprises (e.g., Coconut Palm Group and Hainan Chunguang Food



Young woman enjoying coconut juice. Source: dodotone, Adobe Stock.

Co., Ltd.), it is recommended that the Hainan coconut industry develop a technology system similar in approach to the Hainan areca nut industry technology system. The focus will be on cultivation of well-known and high-quality varieties, standardized production of seedlings, efficient cultivation management, fruit harvesting machinery, integrated processing machinery, and R&D of health food, foods for special medical purposes, daily chemicals, military materials, and oil chemicals. More efforts will be made in scientific and technological innovation to increase high-tech application across the industrial chain, and steadily improve the economic benefits of the coconut industry.

### *Accelerating the development of coconut deep processing industry*

The implementation of Regional Comprehensive Economic Partnership (RCEP) will strengthen Hainan's geographical advantages and provide an opportunity for the Hainan Free Trade Port to build an industrial chain and supply chain within the ASEAN region. Hainan is the only place in China that enjoys 'zero tariffs' across three supply chains (inside China, within, and outside the RCEP region). This is a unique advantage for expanding the coconut deep processing industry (a type of processing where the technologies and processes are more advanced and the processed products are of higher value), which relies on international markets for raw materials and product sales. To fully tap into policy incentives, coconuts can be imported from Southeast Asian countries for deep processing in Hainan and increase the products' value by more than 30% before entering China's mainland tariff-free. Benefiting from the low tax rates of Hainan Free Trade Port, leading domestic and foreign enterprises will be

attracted to launch a series of industrial projects in Hainan that integrate processing, packaging, food preservation, logistics, R&D, demonstration, services, and other links across the industrial chain (Chi, 2022).

### *Accelerating international cooperation in the coconut industry*

Since China has a small tropical zone and produces and processes such a small percentage of the global coconut market, attention must be paid to the vast tropical zone around the world. In terms of output, coconut is the fifth largest tropical crop in the world, next only to sugarcane, oil palm fruit, cassava, and bananas. Tropical countries along the “Belt and Road” are uniquely positioned to develop the coconut industry. Under government guidance, Hainan businesses can build overseas coconut production and processing bases, which will be covered by the intergovernmental agricultural economic cooperation framework. Overseas investments by businesses will shift from wholly owned new construction to a variety of forms, including joint venture, cooperation projects, new construction, expansion, merger and acquisition, equity participation, and stock market listing. Companies should be encouraged to make overseas investment in coconut production, processing, and research demonstration bases, as well as production, sales, storage, and transportation facilities.

### *Establishing an international coconut organization in Hainan*

There are over 90 coconut producing countries worldwide, currently served by only two international coconut organizations. One is the International Coconut Community, an intergovernmental organization headquartered in Indonesia with some 20 member countries. The other is the International Coconut Genetic Resources Network, an online platform that focuses on sharing data on coconut germplasm resources. Due to a lack of operating funds, this latter organization has been taken over by the International Coconut Community. Therefore, the world is in need of an international organization that can effectively bring together global resources, facilitate collaborative research, and promote coconut trade. The proposed establishment of the International Coconut Organization, with its headquarters in Hainan, will serve as a bridge for agricultural exchanges between China and the BRI tropical countries, promote all-round, multi-level and wide-ranging cooperation and exchanges with the BRI countries, and form a community of shared interests. It is an important step to facilitate the implementation of the “Belt and Road” initiative and the achievement of

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the United Nations Sustainable Development Goals.

The coconut industry in Hainan is an important carrier of the island economy, and its development requires sound policy and technological support. Choosing an industry model fit for local conditions also relies on cooperation between island countries.

## CONCLUSIONS

Tropical islands are the main coconut producing areas. The development of Hainan's coconut industry is closely linked to that of the tropical island states. While Hainan's coconut industry embraces major opportunities ahead, it also faces many challenges, which require sustained efforts to improve industrial demonstration, industrial policies, technological innovation, deep processing, and foreign cooperation. The conclusions of this chapter are important for Hainan and tropical island states to carry out strategic research and development of the global coconut industry, jointly address key scientific and technological bottlenecks in the sector, and step-up international cooperation, exchanges, and trade ties between coconut producers.

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