International Journal of Scientific Research and Management (IJSRM)
||Volume||13||Issue||02||Pages||8344-8352||2025||
Website: https://ijsrm.net ISSN (e): 2321-3418
DOI: 10.18535/ijsrm/v13i02.em03

Expanding Export Markets for Vietnamese Dragon Fruit

Mai Thi Dung, Dinh Huy Hai Duong, Ha Ngoc Son, Nguyen Chieu Khanh

University of Labour and Social Affairs
Banking Academy of Vietnam
Banking Academy of Vietnam
Annie Wright Schools | Tacoma, WA

Abstract
Dragon fruit is one of the main fruits of Vietnam, bringing high economic value and contributing significantly to agricultural export turnover. However, Vietnam's dragon fruit exports are facing many challenges. The decline in demand from China due to the country's increased domestic production, combined with technical barriers and strict phytosanitary requirements from major markets, has reduced export turnover. The lack of solidity in production linkages and limitations in post-harvest preservation technology are also weaknesses that need to be overcome. In this context, the study proposes many solutions to expand export markets. Solutions focus on improving product quality, complying with international standards, investing in preservation and deep processing technology, promoting product marketing to new markets, as well as taking advantage of free trade agreements to reduce costs and improve export efficiency.

Keywords: *Expand, market, export, dragon fruit, Vietnam*

1. Raising the issues

Vietnam is one of the countries whose economy depends significantly on agriculture, especially in the field of agricultural exports. In which, dragon fruit is identified as a key crop, bringing high economic efficiency to many localities of Vietnam (Ministry of Industry and Trade, 2024). The area of dragon fruit cultivation in Vietnam by October 2024 is about 50,000 hectares per year with a harvest output of 841,700 tons (Ministry of Industry and Trade, 2024). Dragon fruit is grown in 32 provinces in Vietnam; mainly concentrated in Binh Thuan with an area of 26,550 hectares, accounting for 53.1% of the dragon fruit growing area of the whole country. Correspondingly, the output of Binh Thuan dragon fruit also accounts for the highest proportion - 48% of the country's dragon fruit output (vietnamagriculture, 2024). In addition to localities with large dragon fruit growing areas such as Long An province (11,000 hectares), Tien Giang province (8,000 hectares), dragon fruit has been tested and developed in many localities in the North (Thoa., N.B., et al, 2018)

With large output and suitable climate and soil conditions; dragon fruit is an important product, contributing significantly to export turnover as well as the image of Vietnamese agricultural products in the international market. This role stems not only from the economic value of dragon fruit but also from cultural, social factors and sustainable development potential. The competitive advantage of Vietnamese dragon fruit lies in its superior quality, reasonable price and large supply capacity. Vietnam currently produces three main varieties of dragon fruit: white-fleshed dragon fruit, red-fleshed dragon fruit, and yellow-fleshed dragon fruit. Of which, white-fleshed dragon fruit accounts for the largest proportion in exports thanks to its competitive price, high yield and suitability to many markets. Red-fleshed dragon fruit, although having higher economic value, accounts for a lower proportion due to limited output and high care requirements.

According to statistics from the Ministry of Industry and Trade, (2024), from January to October 2024, dragon fruit output reached 841,700 tons (down 4.8% over the same period last year). The domestic market consumes about 15 - 20% of the above output, the remaining 80 - 85% of the output is exported with 10% official export and 70 - 75% unofficial export (Thoa., N.B., et al, 2018). Up to now, Vietnamese dragon

fruit has been exported to more than 40 countries and territories, of which the main consumer market is Asia (China, Thailand, Indonesia, Singapore, etc.); a small proportion exported to Europe (Netherlands, Spain, Germany, UK...); Americas (Canada, USA, Chile) and some newly expanded markets such as Myanmar, Spain and India.

Dragon fruit not only brings in significant foreign currency but also contributes to improving the economic life of farmers. Many households in dragon fruit growing provinces have escaped poverty and become rich thanks to dragon fruit. In addition, the development of dragon fruit production and export industry also creates many jobs in the supply chain, from cultivation, harvesting to packaging and transportation. However, dragon fruit export turnover will continuously decrease in 3 years 2022, 2023 and 2024. This comes from the decline in import demand from China - the main importer of dragon fruit from Vietnam. In addition, difficulties also arise from technical barriers, strict import policies, and strict preservation and transportation requirements for fresh dragon fruit. Climate change and outbreaks of pests and diseases also affect the yield and quality of dragon fruit. Another challenge is competition from other dragon fruit producing countries such as Thailand, Malaysia and Mexico. These countries are investing heavily in production technology and developing new dragon fruit varieties, increasing competitive pressure for Vietnam.

Based on the above problems, this study was conducted to analyze the current situation and propose solutions to expand the import and export market for Vietnamese dragon fruit.

2. Theoretical basis

2.1. Overview of dragon fruit

The pitaya plant belongs to the cactus family (Cactaceae), and is a species of the genus Hylocereus. It is native to Latin America and the West Indies. (Q. Hua, et al, 2018), (Crane & Balerdi, 2019). Nowadays, dragon fruit is grown in Asian countries such as Vietnam, Malaysia, Thailand, Philippines, Indonesia, China, Taiwan (CESTI, 2015). In addition, the Middle East region has Israel; the Americas region has Ecuador, Nicaragua, Mexico, Colombia.

Dragon fruit has attracted much consumer interest as a novel fruit with powerful nutritional and medicinal benefits. The quality of dragon fruit is guaranteed to be comprehensively assessed, based on the content of pigments and natural compounds beneficial to health in different dragon fruit varieties (N.A. Al-Mekhlafi, et al, 2020). With many varieties and cultivars, depending on the species and variety, dragon fruit has a number of color combinations of skin and ripe fruit flesh. This is also the basic criterion for distinguishing dragon fruit species.

Table 1. **Dragon fruit species**

Species	**Fruit color**	
	Bark	**Fruit pulp**
Hylocereus undatus	Red	White
Hylocereus undatus	Red	Red
Hylocereus contaricenes	Red	Red
Hylocereus monacanthus	Red	Red
Hylocereus ocamponis	Red	Red
Hylocereus megalanthus	Yellow	White
Hylocereus triangularis	Yellow	White
Cereus ocamponis	Red	Red

Source: Crane & Balerdi, 2019

General characteristics of the Dragon fruit tree grow best in tropical and subtropical weather conditions (65°F–77°F) and can tolerate warmer temperatures below 100°F. The plant is suitable for full sunlight conditions, prefers fertile, well-drained soil (Crane & Balerdi, 2019). According to the research of Q. Hua, et al (2018), The color of the skin and pulp of the fruit is related to stable pigments, especially nitrogen-containing betalains (betacyanin and betaxanthin), water soluble. Betalain pigments are characterized as notable aspects of dragon fruit quality because they are prominent natural components with health benefits.

Table 2. Ingredients in dragon fruit

Nutrient	Amount per 100g	% Daily value	Comment
Water	87g	NA	Very high water content
Protein	1.1g	2.1%	
Fat	0.4g	NA	Contains practically no fat
Carbohydrates	11.0g	3.4%	
Fiber	3g	12%	Very good source of dietary fiber
Vitamin B1	0.04mg	2.7%	
Vitamin B2	0.05mg	2.9%	
Vitamin B3	0.16mg	0.8%	
Vitamin C	20.5mg	34.2%	Contains more than 3 times the amount of vitamin C found in carrots
Calcium	8.5mg	0.9%	
Iron	1.9mg	10.6%	A good source of iron
Phosphorus	22.5mg	2.3%	
ZinC	NA	NA	

Source: R. Sinha, M. Jha, K. Karuna (2018)

Dragon fruit is rich in beneficial vitamins and minerals that can help reduce the risk of cancer and regulate healthy blood and energy (Parmar, M. Y., et al., 2019). Dragon fruit is rich in many nutrients and minerals including vitamin B1, vitamin B2, vitamin B3 and vitamin C, protein, fat, carbohydrates, crude fiber, flavonoids, thiamin and niacin (Hitendraprasad, P. P., et al, 2020). With the above characteristics, dragon fruit is used in a variety of ways thanks to its powerful health properties and outstanding nutritional value for health, including fresh dragon fruit, polyphenol extracts from the peel, used in a variety of drinks and dishes including smoothies, desserts and salads, dried dragon fruit, treatment preparations and cosmetics (X. Bai, T. Zhou, et al., 2018).

Characteristics of Vietnamese dragon fruit

Dragon fruit is suitable for tropical climates, can adapt to different types of soil, from sandy soil to clay soil or arid lands, the important thing is good drainage, average annual rainfall from 500 - 2,000 mm (CESTI, 2015). Vietnam is located in a favorable location with climate and soil suitable for tropical fruit trees, including dragon fruit. With an area of dragon fruit cultivation of up to 50,000 hectares and an annual output of 841,700 tons (Ministry of Industry and Trade, 2024), Dragon fruit is one of the high-yielding crops and one of the main agricultural exports in Vietnam. Promoting dragon fruit exports helps optimize natural potential and abundant labor resources in the agricultural sector. Due to the promotion of off-season production (spreading the harvest season by applying lighting techniques), Vietnamese dragon fruit can now be harvested year-round. Favorable crop from April to September, unfavorable crop from October to February - March of the following year. This is the competitive advantage of exporting Vietnamese dragon fruit. In recent times, dragon fruit production nationwide has formed concentrated areas, creating conditions for applying technical advances, organizing production linkages, and consuming products.

2.2. The need to expand the export market of Vietnamese dragon fruit

Dragon fruit export is an international trade activity, in which dragon fruit - a key agricultural product of Vietnam - is produced domestically and transported to international markets for consumption. This is a process that includes many stages such as cultivation, harvesting, preservation, packaging and transportation, to meet the consumer needs and quality standards of foreign markets. Vietnamese dragon fruit is now not only known as fresh fruit but also processed into many value-added products such as juice, jam, dried fruit, or used as raw materials for the production of functional foods.

Dragon fruit exports are often in an unstable situation, with fluctuating prices, and at times falling in price (vneconomy.vn, 2023). In addition, the figure of 67.8% of Vietnam's dragon fruit export output in 2024 depends on the Chinese market, posing an urgent need to expand export markets to minimize risks and increase economic value. Concentrating exports on a few markets creates the risk of imbalance in the supply

chain and great risks if there are fluctuations from the partner side. Requirements on plant quarantine, traceability and food safety standards of demanding markets such as the US and EU also put considerable pressure on Vietnamese manufacturers and exporters.

The need to expand and diversify the dragon fruit export market is also driven by the increasing demand for healthy, nutritious food globally, especially in developed countries such as the US, Japan, Korea and European countries. Dragon fruit, with its high fiber, vitamin C and antioxidant content, is a fruit that fits well into this consumer trend. In addition, the popularity of dragon fruit in food and beverage processing, such as smoothies, juices, and functional foods, further increases the commercial value of the product. Expanding export markets like this not only helps reduce dependence on one or a few specific markets, but also helps Vietnam take advantage of the potential of markets with high purchasing power, contributing to increasing the added value of products and reducing dependence on a few trading partners.

In other words, market diversification not only reduces risks but also brings many long-term economic benefits to Vietnam. Notable benefits include:

- **Export turnover growth:** Entering new markets with high demand will help increase export value, thereby contributing to national GDP growth.
- **Stabilize prices:** With many trading partners, dragon fruit prices will be less affected by fluctuations in a specific market, helping to stabilize income for farmers and export businesses.
- **Encourage sustainable production:** Developed markets often require high standards of quality, traceability, and environmental protection. This encourages producers to improve their growing, storage, and processing practices, thereby building a more sustainable supply chain.

To expand export markets, product quality is the key factor. Markets such as the US, Europe, and Japan have very strict requirements on food safety standards, plant quarantine, and product labeling. Export standards for dragon fruit vary between markets. Each market will have its own requirements for importing dragon fruit from foreign markets [Box 1].

Box 1. Dragon fruit export standards

1. Standards for dragon fruit exported to the Chinese market

– When exporting dragon fruit, it is necessary to ensure its appearance such as the fruit is not rotten, has no pests, is intact, has beautiful color (with the red color of the dragon fruit reaching 60-70%), is not blackened or has mold spots.

– Dragon fruit has straight ears and is green with a length of 1.5-2cm. The number of broken ears is less than 3, and those with broken ears close to the fruit will not be selected.

– To be exported, the flesh of dragon fruit must not be mushy, cloudy, rotten or cracked. The thickness of the peel must also meet the standard, not too thick or too thin. The flesh that meets the standard will have blood color and black seeds.

– The weight of dragon fruit must meet the requirement of 300 - 600 grams per fruit, depending on the type and market. Dragon fruit weighing less than 500 grams will have an average price, those weighing over 500 grams will be classified as high-end fruit and have a higher price.

2. Standards for dragon fruit exported to the US and European markets

– The weight of each dragon fruit will range from 300 to 350 grams and the ripeness of the fruit will be 80 to 85%, the weight of the fruit must be uniform in the same package.

– There are two types of dragon fruit allowed to be imported into this market: red-fleshed dragon fruit and white-fleshed dragon fruit. The selected fruit must be firm, have fresh flesh and black seeds that meet the requirements.

– The packaged dragon fruit must be selected, have a beautiful shape and be clean, the red color accounts for 70% of the color of the fruit. The ears of the dragon fruit must be straight, thick, green, not yellow, and at least 1.5cm long to meet the standard.

– The fruit must not be bruised, sunburned, chipped, cut, or have any green spots on the outside of the fruit. In addition, the fruit must not be damaged by problems such as mold or insect damage.

– Dragon fruit export shipments to the US and Europe must have their origin, information and strict inspection confirmed. GlobalGAP certification is required, compliance with the SPS

Agreement is required, ensuring food safety and hygiene for export, and plant inspection is required…

3. Standards for dragon fruit exported to Korean and Japanese markets

– Dragon fruit appearance: The fruit must not have any cuts, dents, or cracks. Absolutely do not choose fruit that shows signs of bruising, waterlogging, or mold. The fruit must also be carefully selected to ensure that it is not waterlogged or discolored.

– Food safety and hygiene: Dragon fruit selected for packaging must be clean, free of dust, dirt, sand, insects, pesticides, etc. Dragon fruit must pass phytosanitary inspection and nutritional quality must be achieved before customs clearance.

– Dragon fruit should be processed using hot steam method, provided that the temperature reaches at least 46.5°C and the minimum processing time is 40 minutes.

Source: Author group synthesis

3. Research methodology

Data collection method:

The group of authors used the document research method to systematize the theoretical basis of agricultural exports; policies to encourage agricultural exports; the necessity of agricultural exports in general and dragon fruit in particular; indicators to identify, classify and evaluate the current status of dragon fruit exports. These studies were selected by the authors from the Import-Export Report, data from the General Statistics Office, FAO, WTO; Thematic Reports of the Ministry of Industry and Trade, General Department of Customs. The main contents were analyzed by topic and analyzed through synthesis and narrative methods.

To study the current situation of dragon fruit export in Vietnam, the research team focused on examining the following contents: export turnover, export markets, opportunities, and barriers in exporting dragon fruit in Vietnam. To assess the current situation, the article collects data from domestic and foreign books and scientific journals, from aggregated data of the Ministry of Industry and Trade; reports of the General Statistics Office and the General Department of Customs. Data is updated to October 2024. From the collected data, the authors synthesized and selected information suitable for the research content and used a combination of descriptive statistical methods to clarify the current situation.

Data processing method: Collected data is synthesized, calculated and reflected in tables. To evaluate and analyze data, the article also uses the comparison method to analyze dragon fruit export results (over time). From there, the research team proposed solutions to expand the export market for Vietnamese dragon fruit.

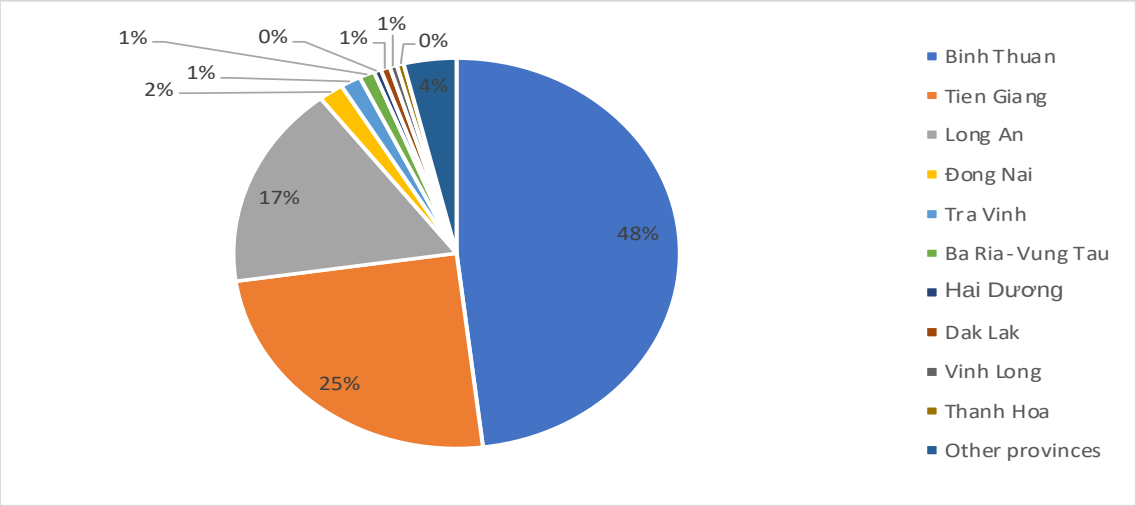
4. Current situation of dragon fruit export

4.1. Dragon fruit yield

Dragon fruit is an easy-to-grow fruit, has high yield, is drought-resistant and adaptable to soil and saline soil, so it is suitable for the southern provinces of Vietnam, such as: Binh Thuan accounts for 50.73% of the country's area, followed by Tien Giang 16.42%, Long An is 15.15%. White-fleshed dragon fruit is mainly grown in Binh Thuan; red-fleshed dragon fruit is mainly grown in Long An, Tien Giang and Dong Nai. From 2010 to 2020, the dragon fruit area had a growth rate of 15.1%/year and reached its highest level of 65,500 hectares in 2020. However, since 2020, due to the impact of the Covid-19 epidemic and China's Zero-Covid policy, the dragon fruit growing area in our country has decreased by more than 9,000 hectares compared to 2020 and by October 2024, there will be only 50,000 hectares.

According to statistics from the Ministry of Industry and Trade, (2024), from January to September 2024, dragon fruit output reached 841,700 tons (down 4.8% year-on-year) [Figure 1]. Of which, the 3 provinces with the largest proportion of dragon fruit output are: Binh Thuan estimated at 405,000 tons (equivalent to 48%); Tien Giang estimated at 207,000 tons (equivalent to 25%) and Long An at 142,000 tons (equivalent to 17%).

Figure 1. Dragon fruit output structure in the first 9 months of 2024 in Vietnam



Source: Ministry of Industry and Trade, (2024)

Although processing is considered a necessary solution to relieve the pressure of consuming fresh dragon fruit, currently, processed dragon fruit products are very difficult to consume, causing 97% of dragon fruit harvested in Binh Thuan to be exported only as fresh fruit (vneconomy.vn, 2023). Dragon fruit consumption is often unstable, prices are fluctuating, and at times prices drop. Meanwhile, dragon fruit processing is still on a small scale, processing and preservation technology is not advanced; packaging and design are still simple. Fresh fruit export and processing enterprises generally have limited capacity.

4.2. Export turnover

For many consecutive years, Vietnamese dragon fruit has been the main product, accounting for over 30% of the export value of the fruit and vegetable industry continuously from 2015 - 2020. In 2018, the highest record that dragon fruit brought to Vietnam was nearly 1.3 billion USD, but then gradually decreased and lost the 1 billion USD export mark in 2022. Currently, the proportion of dragon fruit in Vietnam's total fruit export turnover also decreased from 17.1% in the first 9 months of 2023 to 9.8% in the first 9 months of 2024 (Ministry of Industry and Trade, 2024).

In the first three quarters of 2024, dragon fruit exports decreased mainly due to a decrease in exports to the leading market, China, as the country's dragon fruit acreage and output have continuously increased in recent years, causing a sharp decrease in import demand. However, dragon fruit export turnover to other markets such as India, South Korea, the United States, Australia and the United Arab Emirates has grown positively.

Table 3. Dragon fruit export turnover in the period 2018-2024

Indicators	Year						
	2018	2019	2020	2021	2022	2023	2024*
Dragon fruit export turnover (million USD)	1204,4	1250,7	1121,3	1031,6	632,6	614	403,367
Increase/decrease volume (million USD)	-	46,3	-129,4	-89,7	-399	-18,6	-211
Increase/decrease rate (%)	-	3,8%	-10,3%	-8,0%	-38,7%	-2,9%	-34,3%

Source: Authors' group compiled and calculated from Vietnam's Import-Export Report for the years 2018-2023 and the Ministry of Industry and Trade, (2024)

*Note: * data as of end of September 2024*

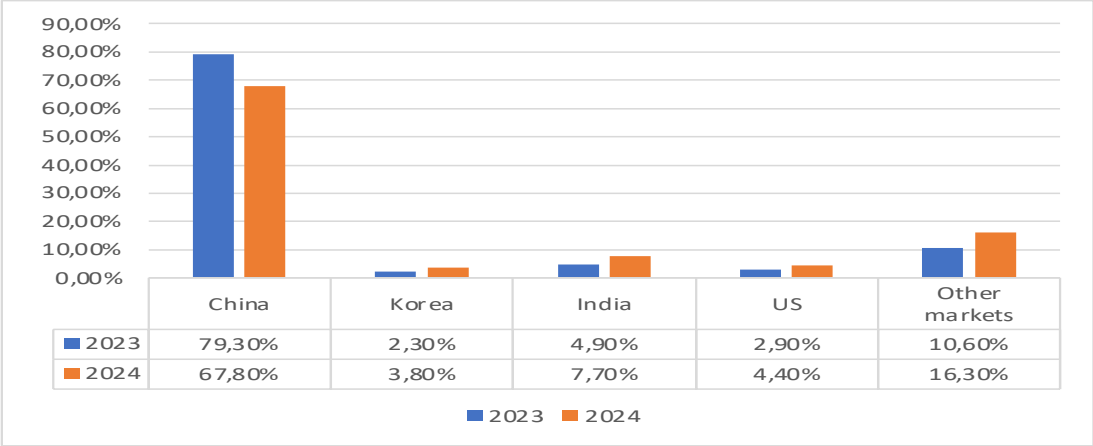
Dragon fruit export value continuously decreased from 1,204.4 million USD in 2018 to 614 million USD in 2023. In the first three quarters of 2024, the export turnover of all kinds of dragon fruit (fresh,

frozen, dried, juice) reached 403.367 million USD, down 18.4% over the same period last year and down 34.3% compared to 2023.

4.3. Key markets for exporting dragon fruit of Vietnam

In the first 9 months of 2024, except for China, Vietnam's dragon fruit exports to other major markets such as India, the United States, South Korea, the U.A.E and Australia all grew quite strongly compared to the same period last year.

Figure 2. Comparison of Vietnam's dragon fruit export market structure in the first 9 months of 2023 and the first 9 months of 2024



Source: General Department of Customs

- **Chinese market:** China is an important and potential export market for Vietnamese fruits with about 70% of total fresh fruit exports. Among them, dragon fruit is an easily consumed agricultural product originating from the belief in the luck brought by its name, shape, and color (dragonfruit, 2024). Despite the decline, in the first 9 months of 2024, China is still the largest market for Vietnamese dragon fruit with a turnover down 31.4% over the same period last year, down to 265.6 million USD (while in the first 9 months of 2023 it decreased by 9.3% compared to the first 9 months of 2022). The proportion of this market in total Vietnamese dragon fruit exports will decrease from 79.3% in the first 9 months of 2023 to 67.8% in the first 9 months of 2024 (compared to the first half of 2023).

One of the biggest reasons for the decline of dragon fruit is that the country has now invested heavily in promoting local dragon fruit production to ensure self-sustainability in dragon fruit production. China announced that it has planted 67,000 hectares of dragon fruit, with an output of 1.6 million tons, more than Vietnam in both area and output. On the other hand, exporting to China is done through informal trade channels, which increases risks, makes it difficult to access information, lacks understanding of regulations and market requirements, and faces fierce competition from Chinese companies (Thoa., N.B., et al, 2018). Meanwhile, Vietnam has signed the ASEAN-China Free Trade Agreement (ACFTA) which has been effective since 2010. However, many Vietnamese enterprises have not yet taken advantage of the opportunities and benefits of ACFTA.

- **Other markets**. In the context of a sharp decline in dragon fruit exports to the Chinese market, Vietnam is still exploiting other potential markets well, with export growth in the first 9 months of 2024, including: India (up 25.9%); the US (up 47.2%); South Korea (up 26.8%); UAE (up 35.5%); Thailand (up 10.7%); Netherlands (up 8.3%); Canada (up 37.7%); Australia (up 45.9%) ...

4.4. Price and quality of exported Vietnamese dragon fruit

The diversity of export markets has contributed to maintaining dragon fruit prices at a high and stable level, averaging around 0.63 USD/kg. At this price, farmers are enjoying a profit of about 30-40% (vietnamagriculture, 2024). For dragon fruit meeting GlobalGAP standards, the price is above 0.85 USD/kg for white-fleshed dragon fruit and 1.27 USD/kg for red-fleshed dragon fruit. This stability is largely due to fixed one-year contracts, which help farmers avoid the common "high yield but low price" situation.

In the current context, it is necessary to increase the quality, meet the requirements of quality, food safety, and design of fresh dragon fruit exported to new markets. The main variety is red-skinned, white-fleshed dragon fruit of our country. It has a beautiful and impressive size and appearance, but the taste is bland, not as crispy and sweet as the yellow-skinned dragon fruit. Unlike other commodities such as coffee or rice, dragon fruit is not widely known to consumers around the world (outside the Asian community). This demand depends largely on product marketing (especially information about the health benefits of dragon fruit), reducing costs and improving the sweetness of dragon fruit (dragonfruit, 2024)

5. Some proposals to expand the export market of Vietnamese dragon fruit

5.1. Barriers and opportunities for market expansion

Although Vietnamese dragon fruit has been present in many international markets, this product still faces many major challenges:

- Strict phytosanitary regulations and quality standards: Major markets such as the EU, the US and the UK apply strict food safety and phytosanitary standards. For example, the UK's increased frequency of inspections of dragon fruit exported from Vietnam has increased testing costs, extended customs clearance times and reduced the attractiveness of the product.
- Unsustainable production links: Links between businesses and farmers have not been firmly established, making it difficult to ensure consistency in quality and export standards.
- Limited preservation technology: With a short shelf life (3-5 days at room temperature), dragon fruit is easily damaged during long-distance transportation. Lack of packaging technology, post-harvest preservation, and deep processing makes it difficult for the product to meet the needs of distant markets.
- Impact of climate change: Increased pests and agricultural input prices increase production costs, affecting the productivity and competitiveness of Vietnamese dragon fruit.
- Changes in consumer demand (from China) and competition from some other countries

5.2. Opportunity to expand dragon fruit export market

Despite many challenges, Vietnam's dragon fruit industry has many opportunities for development:

- Advantages from free trade agreements: CPTPP and EVFTA open more favorable doors for Vietnamese dragon fruit to enter demanding markets.
- Organic food consumption trends: Organic dragon fruit is increasingly popular due to its health benefits and environmental sustainability.
- Global Market Growth: The global dragon fruit market size is expected to reach US$995 million by 2030, with a CAGR of 7.99% during 2025-2030. Rising demand from both Asian (China, Japan) and European markets creates conditions for Vietnamese dragon fruit to penetrate deeper.
- Ability to meet off-season production: Climatic conditions and the experience of Vietnamese farmers allow for off-season dragon fruit production (from January to May), providing a competitive advantage when supplies from other countries are low.

5.3. Proposed solutions to expand dragon fruit export market

To take advantage of opportunities and overcome barriers, it is necessary to synchronously deploy the following solutions:

- Improve product quality: Promote the application of VietGAP and GlobalGAP standards in production; invest in post-harvest preservation technology, increase storage capacity and long-distance transportation. Improving quality and uniformity in design will help dragon fruit meet the requirements of demanding markets.
- Strengthening trade promotion: Participating in international fairs, building national brands for Vietnamese dragon fruit. Registration of growing area codes and product traceability need to be focused on to ensure official export.
- Product diversification: Invest in deep processing technology such as juice, yogurt, jam, and cosmetics from dragon fruit to reduce dependence on fresh fruit consumption. This trend not only meets market demand but also helps sustainable development.
- Building a sustainable supply chain: Strengthening connections between businesses and farmers through cooperatives or cooperative groups to ensure stable supply and meet export standards.

- Adapting to climate change: Investing in disease-resistant dragon fruit varieties, water-saving, and organic farming solutions to cope with negative environmental impacts.
- Strengthen market research capabilities: Understand the characteristics and needs of each market, for example, the European market requires high nutritional value and sustainability, while the Chinese market is concerned with form and cultural beliefs.

By applying the above solutions, the Vietnamese dragon fruit industry can not only expand its market share but also increase its value and affirm its position in the international market.

6. Conclusion

The study has clarified the current situation of dragon fruit production and export in Vietnam, thereby analyzing the challenges and opportunities to expand export markets. Dragon fruit is a strategic crop with advantages in quality, price and large supply capacity. However, the industry is facing many barriers in terms of technology, markets, climate change, and international competition. The study emphasizes the role of improving product quality, improving production linkages, applying preservation technology, and taking advantage of free trade agreements to expand export markets. Although providing an overview of the current situation and solutions, the study still has some limitations that need to be overcome: (1) The figures are mainly taken from secondary sources, lacking in-depth analysis from actual data of businesses and farmers; (2) The study has not analyzed in depth the specific characteristics of each potential market, especially in Europe, the US and Middle Eastern countries; (3) Research has not focused on factors such as logistics, transportation costs, and the role of exporting enterprises in the dragon fruit supply chain. To improve the quality and practical application, further studies can focus on: In-depth assessment of the impact of global trade policies; Empirical surveys collecting opinions from exporters, importers, and consumers to have a more comprehensive view of global demand and consumption trends for dragon fruit.

References

1. cafef.vn, (2024). https://cafef.vn/vi-the-trai-nguoc-cua-2-bau-vat-troi-ban-cho-viet-nam-mot-lien-tuc-sut-giam-khong-loi-thoat-mot-len-nhu-dieu-gap-gio-nho-khach-sop-trung-quoc-thanh-mat-hang-ty-usd-chi-sau-2-nam-18824072422545132.chn#img-lightbox-2
2. CESTI, (2015). Dragon fruit, a fruit with great potential
3. Crane, J. H., & Balerdi, C. F. (2019). Pitaya (Dragonfruit) Growing in the Florida Home Landscape. Institute of Food and Agricultural Sciences Extension Service, University of Florida. HS1068. 6p.
4. Chu Khoi, (2023). Processed dragon fruit is difficult to consume, fresh fruit is still mainly exported. Vietnam Economic Magazine No. 48-2023 published on November 27, 2023.
5. dragonfruit, (2024). https://dragonfruit.net.vn/news/185-world-s-dragon-fruit-suppliers-and-demand.html
6. Hitendraprasad, P. P., Hegde, K., & Shabaraya, A. R. (2020). Hylocereus undatus (Dragon Fruit): A Brief Review. International Journal of Pharmaceutical Sciences Review and Research. Article No. 09. 60(1). 55-57pp.
7. MarkNtel, (2024). Global Dragon Fruit Market Research Report: Forecast (2025-2030)
8. Ministry of Industry and Trade, (2024). Analysis of supply and demand situation and forecast of dragon fruit products, October and 10 months of 2024. Special topic to carry out the task of "Providing market analysis and forecast information to promote and improve business efficiency and consumption of domestic agricultural products" in 2024
9. N.A. Al-Mekhlafi, A. Mediani, N.H. Ismail, F. Abas, T. Dymerski, M. LubinskaSzczygeł, S. Vearasilp, S. Gorinstein, Metabolomic and antioxidant properties of different varieties and origins of Dragon fruit, Microchemical Journal (2020), doi: https://doi.org/10.1016/j.microc.2020.105687
10. Parmar, M. Y., Pore, D., Sharma, S. K., Singh, T., & Pandya, N. (2019). Health Benefits of Dragon Fruit. Nutrition and Food Science International Journal. Juniper Publishers. Vol. 8. Issue 4. 3p.
11. Q. Hua, C. Chen, N. T. Zur, H. Wang, J. Wu, J. Chen, Z. Zhang, J. Zhao, G. Hu, Y. Qin, Metabolomic characterization of pitaya fruit from three red-skinned cultivars with different pulp colors, Plant Physiol. Biochem. 126 (2018) 117-125.
12. R. Sinha, M. Jha, K. Karuna (2018) Dragon fruit: a fruit for health benefits and nutritional security. https://www.semanticscholar.org/ Corpus ID: 169208222

13. Thoa., N.B., et al, (2018). Guide to exporting dragon fruit to the Chinese market.
14. vietnamagriculture, (2024). The export of Binh Thuan dragon fruit has increased in both quantity and value
15. X. Bai, T. Zhou, T. Lai, H. Zhang, Optimization of the microwave-assisted extraction of polyphenols from red pitaya peel using response surface methodology, J. Sci. Ind. Res. (India) 77 (2018) 419-424.