

WEBINAR SERIES ON TROPICAL FRUITS JACKFRUIT

21 July 2022

Developing the jackfruit for global consumption and markets




International Tropical
Fruits Network (TFNet)

REPORT ON THE INTERNATIONAL WEBINAR ON ‘DEVELOPING THE JACKFRUIT FOR GLOBAL CONSUMPTION AND MARKETS’



International Tropical
Fruits Network (TFNet)



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International Tropical Fruits Network (TFNet)
Box 334, UPM Post Office,
43400 Serdang, Selangor,
Malaysia.
Tel: 603-89416589
Fax: 603-89416591
Website: www.itfnet.org
E-mail: info@itfnet.org

Prepared by:
Yacob Ahmad

Layout by:
Christian Anthony T. Cangao

Photos:
Suriyawut Suriya - iStock
Towfiq Barbhuiya - Unsplash



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1.0. EXECUTIVE SUMMARY

Based on global trade volumes, the major tropical fruits are banana, avocado, mango, pineapple and papaya, while the other fruit types are categorized as minor. There have been gradual growth and demand recently for minor fruits such as jackfruit, guava, rambutan, passionfruit, rose apple, durian and mangosteen, as a result of growth in the travel and tourism industry, migration, changing consumer preferences, and aggressive market promotions. Currently, there are already efforts by producing countries to improve production, visibility, prioritize R and D and increase exports of these fruits.

An international webinar on minor tropical fruits featuring the jackfruit, was held on 21 July 2022 with the theme 'Developing the jackfruit for global consumption and markets', and jointly organized by the International Tropical Fruits Network (TFNet) and the Malaysian Department of Agriculture. The webinar was officiated by HE Dato' Haslina Abdul Hamid, Chairperson of TFNet's Board of Trustees and Secretary General of the Ministry of Agriculture and Food Industries Malaysia.

The main objectives of this webinar were:

- a. To share information among stakeholders on the various initiatives taken to increase jackfruit production and markets, including varietal development, best farm practices, R and D focus and policies.
- b. To explore the different processed products of jackfruit that can be developed for a more diverse and bigger market.
- c. To discuss on initiatives to enhance its visibility in global markets.

The webinar featured six presentations from India, Indonesia, Malaysia, Philippines and Vietnam with a maximum number of 281 attendees from more than 18 countries.

Main takeaways from the webinar were:

- a. All five countries have been developing jackfruit, mostly for the fresh market. The fruit is also popularly consumed cooked as a vegetable or processed into products. Generally, all countries have their indigenous and commercial cultivars with India topping the list with more than 1300 ascensions. These countries have also developed and commercialized their own cultivars. In addition, research and development focus are on pests and disease management, best farm practices, planting material production and distribution, processed products and protocols from fresh consumption.
- b. Most jackfruit growers are smallholders practicing backyard mixed fruit cultivation. However, in some countries such as Malaysia, besides mixed orchards systems, mono-cropped plantation style farms are also developed on government leased land for commercial growers (i.e, Permanent Food Production Parks).
- c. Common processed products developed are vacuum fried chips, jams and juices. The former is popular especially in Vietnam and Indonesia.
- d. Most of the common pests and diseases that afflict jackfruit in all countries are similar including fruit borer, bacterial fruit rot and phytophthora stem rot.
- e. With the current vegan fad, jackfruit now is a choice fruit used as a plant-based meat alternative. This will further enhance the role of jackfruit towards providing health benefits.
- f. Fresh jackfruit is still preferred by many, and clearly there is big potential for expansion.

Research is needed to minimize postharvest losses, improve packaging to extend shelf life, develop protocols for safe minimally processed jackfruit pulp. Freezing is an area to be explored to maintain freshness and tastes of fresh jackfruit arils or bulbs.

There is awareness on the importance of minor fruit types to add diversity and as sources of nutrients for food security. The presentations and discussion presented an optimism in the growth of jackfruit as a potential 'global fruit crop', which must be complemented by having suitable cultivars and aggressive promotion for export markets.

The webinar has also opened opportunities for players in the jackfruit industry to share information and establish a network, that is expected to expand. A jackfruit and other *Artocarpus* sp. conference or congress could be one that is forthcoming.

2.0. INTRODUCTION

Based on global trade volumes, the major tropical fruits are banana, avocado, mango, pineapple and papaya, while the others are categorized as minor. The minor fruits include jackfruit, guava, rambutan, passionfruit, rose apple, durian and mangosteen. A growing travel and tourism industry, increased migration, changing consumer preferences, more disposable middle class income and aggressive market promotions are factors that drive demand for some of these fruit types in the global markets. Currently, there are already efforts by producing countries to improve production, visibility, prioritize research and development (R&D), and increase exports of these fruits.

In view of the importance of minor fruits in providing diversity to the global fruit markets, food security and income generation for producers and stakeholders along the value chain, International Tropical Fruits Network (TFNet) is organizing a series of international webinars on selected minor fruits that can be developed further for global consumption and trade.

Many producing countries are already developing their jackfruit industry at all levels of the value chain. There have been substantial improvements in best farm and postharvest management practices, including processing. Even though, information on global jackfruit production and trade is sparse, recent reports have indicated that there have been substantial increases in domestic consumption and exports in producing countries. Efforts to develop and popularize the fruit further have been continuous with emphasis on food safety, quality, taste, longer shelf life and marketable processed products, such as minimal processing, chips, and as a plant-based alternative to meat.

The first of the international webinar series on minor tropical fruits was held on 21 July 2022 and officiated by HE Dato' Haslina Abdul Hamid, Chairperson of TFNet's Board of Trustees and Secretary General of the Ministry of Agriculture and Food Industries Malaysia. The first in the series commenced with a session on 'Developing the jackfruit for global consumption and markets'. The webinar was organized by International Tropical Fruits Network (TFNet) in collaboration with the Malaysian Department of Agriculture.

The main objectives of this webinar were:

- a. To share information among stakeholders on the various initiatives taken to increase jackfruit production and markets, including varietal development, best farm practices, R&D focus and policies.
- b. To explore the different processed products of jackfruit that can be developed for a more diverse and bigger market.
- c. To discuss on initiatives to enhance its visibility in global markets.

3.0. OPENING REMARKS BY CHAIRPERSON OF TFNet BOARD OF TRUSTEES.

In her opening remarks, HE Dato' Haslina highlighted the importance of minor fruits that should be developed further to generate income for producers, add diversity to the current fruit market and contribute to global food security. Minor tropical fruits are categorized as those that are less traded internationally as compared to the major tropical fruits, which are banana, pineapple, mango, avocado and papaya. Minor tropical fruits include jackfruit, guava, mangosteen, passionfruit, rambutan, longan and dragonfruit. HE Dato' Haslina also said that areas to focus include varietal improvement, best practices, safe, high quality, certified produce with good shelf life and marketing strategy. HE Dato' Haslina added that jackfruit is an appropriate fruit type to begin the webinar series with, as it has already made inroads as an important tropical fruit type to be further developed.

The TFNet Chairperson hoped that the presentations and discussions would be beneficial for all participants and would bring to fruition some recommendations for considerations.

(Full speech in appendix)

4.0. WEBINAR PRESENTATIONS

4.1. 'Status of the jackfruit industry in India'

- Dr. Prakash Patil, Senior Researcher, Fruit Coordinator, Indian Council for Agricultural Research (ICAR), India

Dr. Prakash began with an introduction to Jackfruit as a major indigenous fruit cultivated and consumed in India. Generally, it is cultivated traditionally by smallholders. During the last five years the area grown has consistently been around 1.88 lakh ha. (188,000 ha), while in 2020, production was about 19.45 lakh mtons (1.945 million mtons).

The 2020 jackfruit global market share for India was 37 percent for the Asia Pacific, 23 percent for Europe, 20 percent for North America, 8 percent South America and 12 percent for the rest of the world. In a SWOT analysis, Dr. Prakash listed versatility, hardiness, nutrient rich and many ranges of products as the strengths, while weaknesses include the lack of suitable varieties, lack of complete technological packages, inefficient postharvest and processing mechanized techniques, little information on consumer acceptability on processed products and challenges in the export of fresh fruit. While opportunities abound in the wide range of genetic diversity, upscaling of important products, potential for yield improvements and increase export demand, this is threatened by the lack of a defined market for fresh fruit and products, seasonality, varied consumer taste and losses during rainy seasons.

Main growing areas in India are Andhra Pradesh, Assam, Chhattisgarh, Jharkhand, Odisha, Tamil Nadu, Tripura and West Bengal, with a total collection of 1319 plant genetic resources (PGR) of which 438 have been numbered. Some of the outstanding cultivars are Palur-1 Jack, Konkan Prolific, PLR(J)-2, Swarna, Sindoo, PPI Jack, Selection G-65, Selection G-11a, Siddu

Halasu, and Kachehalli. Each are distinguishable according to their fruit size, quality, seasonality, taste, pulp thickness, and color. In addition to this, each growing region has its own popular cultivars, including those identified by APAARI (Asia-Pacific Association of Agricultural Research Institution). However, there are still information gaps to some of the cultivars. Even with information gaps for some cultivars, based on the favorable characteristics for table, vegetable and processing types, each cultivar has been given scores to determine their potential for the markets.

Besides identification of suitable cultivars, technological packages for grafting selected superior varieties and diversification of processed products have been developed. There are already 9 companies involved in producing processed and canned jackfruit products for the domestic and export market, including as vegan meat substitute.

Dr. Prakash continued with the current trends and opportunities for jackfruit which include the nutrition benefits, involvement of big players, as vegan meat substitute, taking advantage of supermarket distribution channels and the positive outlook of the fresh market. While the status of the jackfruit in India has progressed well, there are still areas such as suitable agro-techniques, farm practices, and market prospects that need to be enhanced. The future of jackfruit in India now is based on selecting superior cultivars, perfecting production technologies, up-scaling and marketing of processed products by medium and small-scale entrepreneurs and to promote jackfruit nurseries as an enterprise. There is also the need to develop mechanized machines for postharvest and processing, use of research to validate ITKs (Indigenous Technical Knowledge), identify custodian jackfruit farmer and substantiation of health benefits of the fruit through clinical trials. Dr. Prakash summarized his presentation with a balance sheet on the future of jackfruit on the various parameters such as, what is expected of the statistics, clinical data on benefits, identifying best cultivars, and focused upscale and awareness programs, before concluding with the imperative link between the challenges of research and related policies to develop the fruit further.

4.2. Initiatives to develop the jackfruit as a crop for income generation in Malaysia'

- Mr. Christopher Biai, Director, Crop Industry Development Division, Department of Agriculture, Malaysia

Mr. Christopher reported that in 2020, the total area cultivated with jackfruit in Malaysia was 4,675 ha which represented 2.5 percent of total fruit area. Production during the same year was 35.62 metric tons. The popular varieties are J32 (Mantin), J33 (Tekam Yellow) and J37 (Mastura). The Self Sufficiency Ratio of jackfruit is currently close to 110 percent. Retail price of the J33 varieties has risen slightly from USD 1.00 in 2017 to 1.35 in 2021, corresponding to the slight increase at the farmgate level (USD 0.50 in 2022). Exports of jackfruit made up only 16 percent of total produced in 2020 at 5,650 mtons valued at USD 3.38 million. Most of the fruit were exported to Singapore (86 %) and other destinations including Hong Kong (7.7 %), Czech Republic (1.2 %), United Kingdom (0.9 %) and Netherlands (0.6 %). Currently Malaysia is negotiating on market access for fresh jackfruit with China, Japan, USA and New Zealand. Malaysia also imports small amounts of the fruit from Thailand (212 mtons) and Indonesia (14 mtons) in 2020. Other than used for fresh consumption, jackfruit is also processed into jackfruit

juice, ice cream, jackfruit chips and eaten as a vegetable. Among initiatives from the Department of Agriculture to develop the fruit is the Permanent Food Production Park which involved the leasing of government land to commercial entities to venture into food production activities. Forty two percent of 1,963 hectares of jackfruit are now grown in these food production parks involving 215 participants. In the 12th Malaysia long term crop development program, jackfruit has been selected among others to be given emphasis in the program to increase production and exports. Among ongoing initiatives is the use of Individual Quick Freezing (IQF) method to improve shelf life. Besides using jackfruit for fresh consumption and as a vegetable, there are also companies that use jackfruit as raw material to produce plant-based meat alternatives.

4.3. 'Developing the jackfruit as major fruit crop in Indonesia'

- Dr. Mohamad Reza Tirtawinata, Fruit Researcher, Head of Yayasan Durian Nusantara Indonesia

Dr. Mohamad Reza Tirtawinata, began with a general observation of the different ways jackfruit is utilized as a fresh dessert or prepared and cooked as a vegetable in the different areas of the country. This also includes the cempedak (*Artocarpus champeden*), breadfruit (*Artocarpus altilis*) and breadnut (*Artocarpus camansi*), including other less known indigenous species that are found mostly in Kalimantan (Borneo). Most of the jackfruit grown in Indonesia are seedlings cultivated in backyards or mixed orchards. Grafted plants of selected varieties such as 'kandel', 'dulang', 'prabu', merah', 'mini' and 'Nangkadak' are now popular. One of the best varieties is the 'kandel' which has crisp, sweet pulp, high brix content, and thick flesh, while 'nangkadak' is a hybrid between the 'mini' jackfruit variety and the local cempedak. The hybrid is suitable as a table fruit since it is small (less than 5 kg), rounded, thick fleshed, moderately sweet and heavy bearing.

Dr. Reza said that in 2019, almost 700,000 mtons of jackfruit were produced in an estimated area of 50,000 hectares, which was fifth after mango, rambutan, banana and durian. Currently, most of the fresh consumed fruits are minimally processed, chilled and frozen. Jackfruit is also processed into chip using the vacuum fry technology and juices. The jackfruit industry in Indonesia is growing at a slow pace due to the focus on other more popular fruit types, very few commercial farms that produces quality fruits and inadequate quality standards, inconsistent pricing structure and lack of promotion. Perhaps research may be needed to explore the possibility of using the jackfruit to reduce the impact of climate change.

4.4. 'Situation of production, market and food safety on jackfruit in Vietnam'

- Dr. Tran Thi My Hanh, Deputy Director/Senior Researcher, Plant Protection Division Southern Horticultural Research Institute (SOFRI), Vietnam

More than 38,000 ha or 50 percent of the jackfruit area are in the Mekong Delta region from a total of 72,000 hectares. The yield is an average of 16 mtons per hectare in 2021. Popular varieties include Dua, MD06, La Bang, Sieu som, vien Linh, and To Nu, based on selection and hybrid varieties. The La Bang variety is specially for processing, MD06 for both fresh consumption and processing while the Tu Nu and red flesh variety are for fresh consumption. All cultivated plants are grafted. Production is controlled by flowering control and pruning of young fruits. Important pests of jackfruit are fruit fly (*Bactercea umrosa*), fruit borer (*Glyphodes caesalis*), stem borer (*Bactocera rufomaculata*), mealybug (*Dymicoccus brevipes*). Common diseases

include gummosis (*Phytophthora palmivora*), stem canker (*Erwinia carotovora*), bacterial fruit rot (*Dickeya* sp.), and flesh rot disease (*Lasiodiplodia* sp). Pest controls include bagging, using light traps and protein baits. For gummosis disease, control includes phosphonate injections, lime painting on tree trunk, and using SOFRI-trichoderma with organic fertilizer to control soil fungi. Jackfruit in Vietnam is harvested from May to November with peaks in June to July. Proper postharvest handling allows for the fruits to be exported to China and Cambodia.

Besides being minimally processed for fresh consumption, jackfruit in Vietnam is also processed into air dried and vacuum fried chips, frozen dried, dehydrated and jam products. Unripe fruits are eaten as vegetables. Other use of jackfruit includes feed for livestock and composting. In terms of export value, jackfruit is fourth after dragonfruit, mango and banana. Ninety percent of fresh fruit export is to China, following protocols, production unit codes and grading categories that are set by importers. Other markets with smaller amounts are Australia and Japan. Dr. Hahn concluded that to develop the fruit further, there needs to be focus in breeding programs to improve quality, innovations in postharvest technologies, processing technologies for high value products, best farm practices and develop a network with other producing countries, with initiatives from TFNet.

4.5. 'Jackfruit – prospects as a plant-based meat alternative'

- Mr. Ahmad Syafik Jaafar, Co-founder / Head of Strategy, IRA NOAH LLP (MY), IRA NOAH Pte Ltd (SG), Malaysia

Mr. Ahmad Syafik, co-founder of Ira Noah, a company producing plant-based meat alternative, began by comparing the goodness and healthy attributes of plant-based proteins to red meats. He also highlighted the normalizing of a plant-based alternative protein diet to provide for healthy diets and self-reliance, and the untapped opportunities that are available for this food segment. Plant-based diet is defined as that consisting mostly or entirely of plant-based foods that can replace or lower consumption of animal products in varying amounts. Jackfruit has been identified as one that contains fibers, proteins, minerals, and vitamins and is most suitable for as a plant-based substitute for meat formulations. He compared an 80 g plant-based meat patty which contains almost 30 percent daily fiber requirement with almost 21 percent protein, to 8 – 15 percent fibre and 12 – 20 percent protein in meat patties respectively. Mr. Syafik also said that there are abundant supplies of raw jackfruit in Malaysia that can be used for processing such products, citing 2.1 kg of jackfruit can result in 53 patties of plant-based meat. The products also seem to satisfy the consumers' preference for taste, affordability, nutrition, localization and versatility. The USP or unique selling propositions are related to use of mechanical methods, all year-round inexpensive jackfruit supply, retort process for longer shelf life, healthier plant-based product and locally scalable processes. Products produced by the company include Ready-to-eat (RTE), high value ingredient (HV), Ready-to-heat meals (RTH) and Ready-to-cook meats. Mr. Syafik believes the market potential for plant-based meat substitute is enormous with Asia as the fastest growing region at a rate of 11.6 percent. Currently the company's products are exported to Japan and Singapore.

4.6. ‘The commercialization of jackfruit in the Philippines’

- Ms. Brenda J. Pepito Chief, Agribusiness and Marketing Division (DA-AMAD), Department of Agriculture, Eastern Visayas, Philippines

Ms. Pepito reported that jackfruit cultivation in the Philippines is mainly in E. Visayas, with large scale cultivation and trading of jackfruit concentrated around Leyte province, where the fruit is grown more for fresh consumption. The regional EViARC Sweet variety is the best among the many varieties, which has been selected and developed for its good commercial qualities like sweetness, thickness of pulp and yield. The variety has opened up commercialization for the fruit and a potential to improve farmers’ incomes. EViARC Sweet begins fruiting in 3.5 years and is moderately tolerant to strong winds and salinity. Yields are 30 – 40 fruits per year with an average weight of 12 kg per fruit.

Besides for fresh consumption and used as a vegetable, jackfruit is also processed into dehydrated, vacuum fried and made into juices, jellies and jams. Ms. Pepito proceeded to explain the jackfruit value chain for both fresh and fresh products, which involve players such as farmers, farmers associations, wholesalers, traders and retailers along the stages from production to consumption. There has also been substantial distribution of jackfruit planting material from 2014 to 2021, mostly in Leyte province to encourage the cultivation of selected varieties.

To continue expanding the industry, steps taken include the distribution of accredited, grafted planting materials, strengthening the supply of inputs such as fertilizers, capacity building of farmers, establishment of model farms, rehabilitation of damaged farms, public private partnerships, continuing research on development on production and processed products and improvement of infrastructures. This has to be complemented with a private sector lead initiative, improvement of quality, standards and packaging, and improvement of processing infrastructure and equipment.

5.0. PANEL DISCUSSION: ‘CHALLENGES AND OPPORTUNITIES IN DEVELOPING JACKFRUIT FOR THE GLOBAL MARKET’

Moderator: Yacob Ahmad, International Tropical Fruits Network (TFNet)

Panel discussion moderator began by briefly going through some of the questions posted by participants. Some of the comments were:

- a. Dr. Prakash described that the extent of fruit rot during storage of jackfruit was between 15-19%. He also responded to a query on the control of fruit borer in jackfruit, for which he detailed some management options commonly practiced which included clipping and destroying attacked shoots, usage of light traps for destroying gravid females, covering fruits to prevent the laying of eggs, the spraying of neem oil (10 ml/L water + soap solution 5g/L), and the spraying of dimethoate (2.5 ml/L water or cypermethrin @ 1.0 ml/L water or quinalphos @ 0.05% or, blitox 2 g/L).
- b. Dr. Hanh’s response to the use of low pesticides includes the use of bagging to prevent borers, protein bait trap for fruit flies, and organic fertilizer with trichodermin to control root diseases.

On the two main characteristics for fruit types, Dr. Hanh explained that it depends on the fruit size and utilization. Big fruits for both fresh and processed is one category while the other category is for fruits that are smaller and only for fresh consumption.

All the fruits grown commercially in Vietnam are grafted.

- c. Mr. Christopher responded to a query on frozen fruit and pulp for export and reported that fruits or pulp are cooled up to minus 17.8 degrees before being exported. Quality of fruit such as brix is also not affected by Individual Quick Freeze (IQF). On a question related to the small amount of fruit imports from Thailand and Indonesia, he explained that this happened during the season with low availability in Malaysia.
- d. To a question whether soy or nuts are added to the plant-based meat produced by Mr. Syafiq's company, he replied that very little soya is used as binders and no nuts are used.
- e. From a comment there is a data gap on the total global planted area of jackfruit, a response from FAO clarified that data on minor fruits is available, including jackfruit which is categorized according to harmonised a group of fruit types including starfruit.

The moderator continued that to bring jackfruit to another level, more must be done in terms of promotion and consumption. It is a known fact that jackfruit is mostly consumed domestically in producing countries and those consumed in western countries are mainly by migrant populations.

The moderator also cited an example of how major fruits such as bananas, pineapples and mango took a long time to be globally traded. This was possible with the involvement of big companies or multinationals, which had the capacity to produce efficiently and were more market savvy. This later developed and expanded with the involvement of farmers' groups in the value chains. Admittedly, applying this rationale to jackfruit and other minor fruits to be 'internationally acceptable' is still very challenging. However, with the current trend of increased travel and tourism, more disposable income, improved logistics and more consumers seeking exotic and healthy nutritious food, and focused R and D efforts by producing countries, there is much optimism for the future of jackfruit, to be developed for global acceptance. A good shift would be identifying a few superior varieties, and focused R and D in aspects production, pests and disease management and postharvest management including improving shelf life for exports. Some minor fruits such as the dragonfruit, kiwifruit or even durian are already making headways in this direction.

Presenters summed up their views of the challenges to improve 'visibility' of jackfruit as follows. On research focus on jackfruit, Dr. Prakash reiterated that research focus should be in line with the consumers preference and demand in relation to variety, quality, taste, product type and other supportive technologies that are requested for activities along the value chain.

Mr. Christopher, citing Malaysia as an example added that with an SSL of more than 100%, supplies are sufficient for the country, and there is still capacity to expand production due to the monocropped plantation style that has been adopted. However, efforts are ongoing to secure export markets to the US and the Middle East. A recent promotion conducted in Dubai was mentioned.

Dr. Reza added that jackfruit is a smallholders' fruit crop and that it would serve well as one of the 'agroforestry' / fruit tree mixed ecosystem, considering its hardiness, wood quality and tasty fruit.

Dr. Hahn mentioned about having more suitable varieties in Vietnam and more value-added products to boost jackfruit consumption.

Ms. Pepito hopes information and technologies on improving jackfruit production and markets that has already been adopted by producing countries to be shared in future meetings.

Mr. Ahmad Syafiq added that rather than competing, producing countries should collaborate to enhance the global visibility of jackfruit.

6.0. SUMMARY AND CONCLUSION

Main takeaways from the webinar were:

- a. All five countries have been developing jackfruit, mostly for the fresh market. The fruit is also popularly consumed cooked as a vegetable or processed into products. Countries have also developed and commercialized their own cultivars. In addition, research and development focus are on pests and disease management, best farm practices, planting material production and distribution, processed products and protocols from fresh consumption. Generally, all countries have their indigenous and commercial cultivars with India topping the list with more than 1300 ascensions.
- b. Most jackfruit growers are smallholders practicing backyard mixed fruit cultivation, however, in some countries such as Malaysia, besides mixed orchards systems, mono-cropped plantation style farms are also developed on government leased land for commercial growers.
- c. Common processed products developed are vacuum fried chips, jams and juices. The former is popular especially in Philippines, Vietnam and Indonesia. The packaging and minimal processing of raw jackfruit for use as vegetables is widespread in all countries.
- d. Most of the common pests and diseases that afflict jackfruit in all countries are similar including fruit borer, bacterial fruit rot, phytophthora stem rot and bacterial wilt disease. Management of some of the pests and diseases include the use of light traps, protein baits, soil treatments, and bagging.
- e. With the current vegan fad, jackfruit now is a choice fruit used as a plant-based meat alternative. This will further enhance the utilization of jackfruit as providing health benefits.
- f. Fresh jackfruit is still preferred by many, and clearly there is a big potential for expansion. Research is needed to minimize postharvest losses, improve packaging to extend shelf life, protocols for safe minimally processed jackfruit pulp. Freezing which maintains freshness and tastes of fresh jackfruit pulp is an area to be explored for export purposes.

There is already awareness on the importance of minor tropical fruit types to add diversity and as sources of nutrients for food security. The presentations and discussion presented an optimism in the growth of jackfruit as a potential 'global fruit crop' with aggression promotion of the jackfruit for export markets.

The webinar has also opened opportunities for players in the jackfruit industry to share information, and establish a network, that is expected to expand. A jackfruit and other *Artocarpus* sp. conference or congress could be one that is forthcoming.

7.0. APPENDICES

7.1. Opening remarks by Chairperson of International Tropical Fruits Network (TFNet)

- 1) Distinguished experts, resource persons and participants. I am pleased and honoured to welcome you to the international webinar series on “Developing and expanding consumption and global markets of minor tropical fruits,” with the first in the series today focused on jackfruit. I also bring warm greetings from the Ministry of Agriculture and Food Industries, MALAYSIA.
- 2) Tropical fruits are major contributors to food and income security. Grown largely in developing countries, tropical fruit cultivation contributes to the nutritional requirements and livelihoods of smallholders in these producing countries.
- 3) Food security is now a global agenda. It is certainly an opportune time for nations to diversify their food baskets. Agriculture is experiencing a remarkable transformation, and it is no longer wise to be dependent on a select few crops. Commodities such as major and minor tropical fruits present a wealth of opportunities to be developed into critical sources of food and income.
- 4) The significance and importance of tropical fruit consumption became more evident and necessary in the last two years when the Covid-19 pandemic hit the global population the hardest. Trade volumes of major tropical fruits, dominated by pineapple, avocado, mango and papaya, chartered a positive performance in 2021, with FAO’s provisional data indicating a record volume of USD 10.5 billion in value, despite the significant bottlenecks affecting global supply chains. The exceptional rise in volume has been attributed to the ample supplies from production areas, in tandem with rising consumer demand, and greater export opportunities.
- 5) While major tropical fruits persist to dominate the global fruit trade, there is a growing recognition on the contribution of lesser-known minor tropical fruits, which are frequently destined for domestic markets, and possess a smaller market share in global trade.
- 6) The FAO-UN reports that data on the global trade of minor tropical fruits remain scant. However, indications from 2017 pointed to a growing trade volume for minor fruits such as guava, mangosteen, rambutans, passionfruit, durian and jackfruit. While FAO maintains a cautious outlook for the global trade of minor tropical fruits given the smaller quantum of market share, there is an optimism among industry players that these minor fruits have the commercial potential to be developed as major export crops.
- 7) Often considered a localised and insignificant commodity in global markets, recently the trade of minor tropical fruits is gaining traction and moving steadily towards mainstream trading largely due to the growing travel and tourism industry, migration, changing consumer trends, expanding middle class, aggressive promotional efforts by producing countries and recognition from health-conscious consumers. Greater market opportunities are beginning to open for minor tropical fruits.
- 8) The tropical fruit industry remains a competitive one. To compete with the producers of other fruit types and traditional major tropical fruit trade giants especially those involved in cavendish bananas and avocados, and expand to the international marketplace, minor tropical fruit industry players will need to be equipped with knowledge and skills of modern post-harvest handling, technologies for prolonging shelf life, in addition to compliance to stringent export requirements, and international trade standards especially to penetrate into regions such as Europe and the USA.

- 9) The emerging opportunities to expand the markets for minor tropical fruits, have prompted many producing countries to embark on research and development programs in pertinent areas such as varietal improvements, best field practices, increasing productivity, improving quality, better postharvest management and highly marketable processed products. The production of selected minor tropical fruits also presents a more feasible option for smallholder farmers to be integrated into the value chains.
- 10) Hence, this series of international webinars serve to provide the strategic platform by bringing together global experts from both the national research organizations, industry players and other stakeholders to discuss and deliberate on challenges and opportunities to improve the status of minor tropical fruits in the global fruit trade.
- 11) Discussions will centre on efforts that have been undertaken to develop minor fruits in the region, including research and development priorities, selected varieties, production, markets, processed products and steps taken to expand exports.
- 12) For the first webinar in this series, the limelight will fall on the jackfruit or the 'Jack of all tastes', a versatile minor fruit, consumed fresh or as a vegetable, and is of great potential and significance to this region. The fruit has been shown to play a key role in nutrition security in many nations, given its rich micronutrient profile. Previously, often reported to be the most wasted fruit, the jackfruit is now experiencing a revival of all sorts and stands to be a promising source of food and income. In recent years, the production and trade of jackfruit have also witnessed favourable growth.
- 13) I have been informed that in today's webinar, experts from Malaysia, Vietnam, India, Indonesia, and the Philippines will be sharing their experiences in developing this humble fruit. In addition, there will be an industry perspective on developing the jackfruit as a plant-based meat alternative.
- 14) I appreciate your participation and interaction in today's webinar and I hope the session will be of value and provide you with insights on the way forward to enhance the visibility of jackfruit, in the domestic and global markets.
- 15) In the coming months, the webinar series will also explore the potential of other fruits such as the guava, rambutan, mangosteen and passion fruit. The sharing of information on current developments and actions from producing countries on trade expansion are certainly commendable while also crucial for boosting the significance of minor tropical fruits.
- 16) I would like to commend the joint organizers of this webinar - the International Tropical Fruits Network (TFNet), and the Department of Agriculture, Malaysia for taking the step to spur this timely discourse. I would also like to thank the presenters for their valuable contributions to infuse experience, perspectives, and ideas into the webinar.
- 17) Wishing you successful deliberations and I look forward to receiving forward-looking recommendations which will encourage future regional cooperation on minor tropical fruits among partners and countries.
- 18) It is therefore a great honour and pleasure for me to officially open the international webinar series on 'Tropical fruits that have the potential to be developed and expanded for global markets' with the first webinar in this series on jackfruit.

Thank you.

HE Dato' Haslina binti Abdul Hamid

Chairman of TFNet's Board of Trustees,

Secretary General, Ministry of Agriculture and Food Industries, MALAYSIA

7.2. Webinar program

Date: 21 July 2022. Time: 2.00 pm (Kuala Lumpur, Manila), 11.30 (Delhi,) 11.00 am (Dhaka), 1.00 pm (Ho Chi Minh City, Jakarta), 7.00 pm (Suva), 9.00 am (Riyadh, Kampala)

Program:

Time	Content
2.00 – 2.15 pm (Opening)	Introduction Opening remarks by HE Dato' Haslina Abdul Hamid, TFNet Chairperson / Sec. General, Ministry of Agriculture and Food Industries, Malaysia
2.15 – 4.30 pm (Presentations)	
Dr. Prakash Patil Indian Council for Agricultural Research (ICAR), India	Status of the jackfruit industry in India
Mr. Christopher Biai Dept. of Agriculture Malaysia	Initiatives to develop the jackfruit as a crop for income generation in Malaysia
Dr. Reza Tirtawinata Yayasan Durian Nusantara Indonesia	Developing the jackfruit as major fruit crop in Indonesia
Dr. Tran Thi My Hanh Southern Horticultural Research Insitute (SOFRI) Vietnam	Situation of production, market and food safety on jackfruit in Vietnam
Ms. Brenda J. Pepito Department of Agriculture, Philippines	The commercialization of jackfruit in the Philippines
Mr. Ahmad Syafik Jaafar IRA NOAH LLP Malaysia	Jackfruit – prospects as a plant-based meat alternative
4.30 – 4.50 pm (Panel discussion)	Challenges and opportunities in developing jackfruit for the global market

7.3. PHOTOS

Fig. 1: HE Dato' Haslina Abdul Hamid, Chairperson TFNet Board of Trustees Chairperson delivering her opening address.



Fig. 2: Dr.Prakash Patil, ICAR, Bangaluru, India

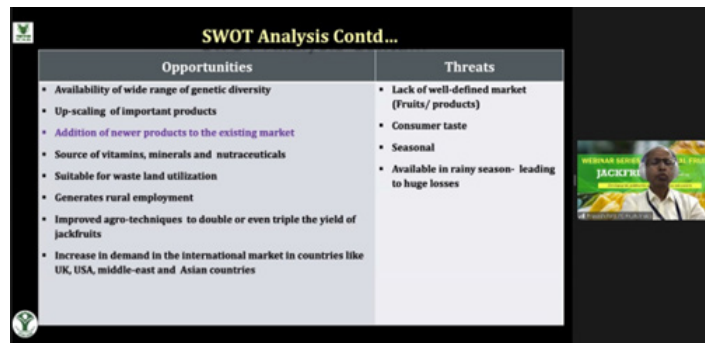


Fig. 3: Mr. Christopher Biai, Department of Agriculture, Malaysia



Fig. 4: Dr. Reza Tirtawinata, Yayasan Durian Nusantara, Indonesia



Fig. 5: Dr. Tran Thi My Hanh, SOFRI, Vietnam

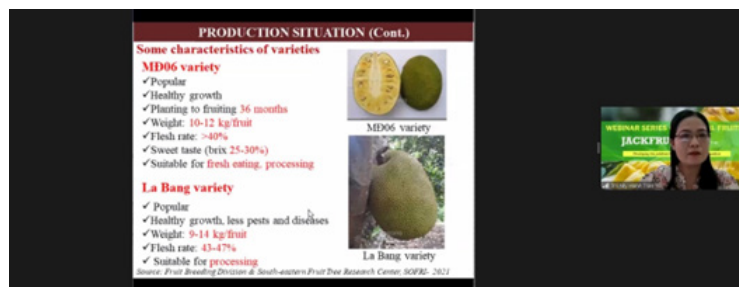


Fig. 6: Mr. Ahmad Syafiq Jaffar, IRA NOAH LLP, Malaysia



Fig. 7: Ms. Brenda J. Pepito, Department of Agriculture, Philippines

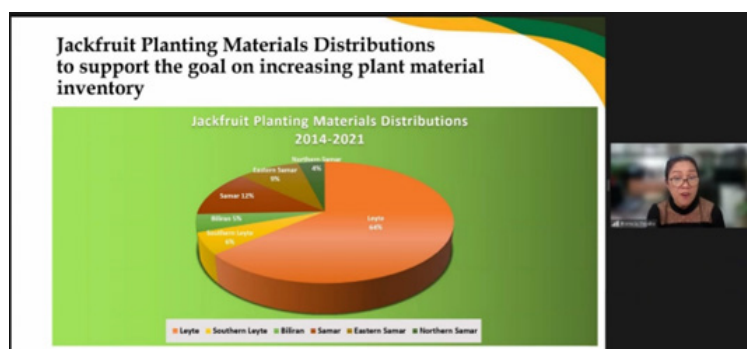
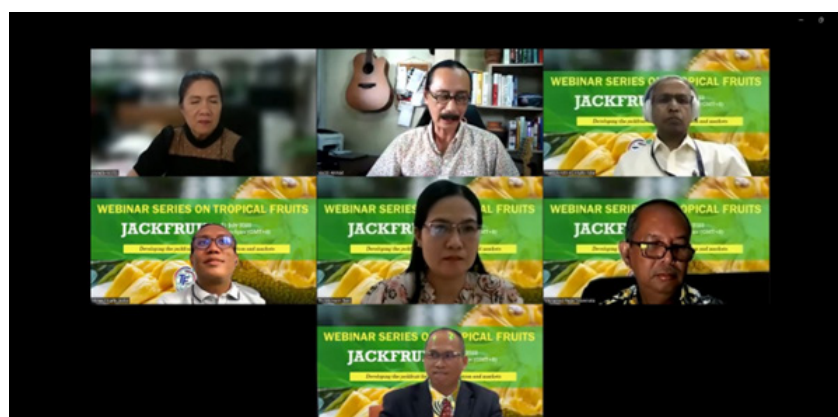


Fig. 8: Q and A session and panel discussion with presenters



Status of the jackfruit industry in India

Dr. Prakash Patil
Project Coordinator (Fruits)
ICAR-IIHR, Bengaluru, India
pcfruits.iihr@icar.gov.in

1

Outline

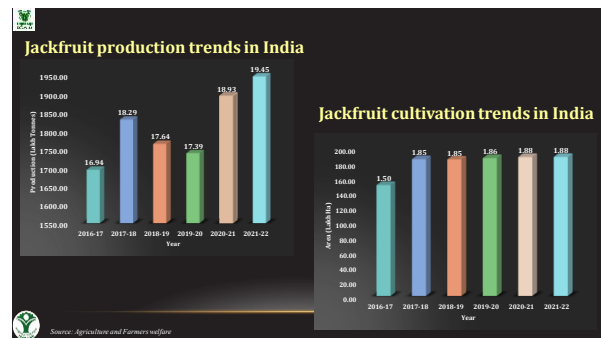
- Background
- Production trends and Market share
- SWOT Analysis
- PGR Status
- Crop Improvement
- Agro-techniques
- Value addition and diversification
- Industry Outlook
- Future Thrusts
- Conclusion

2

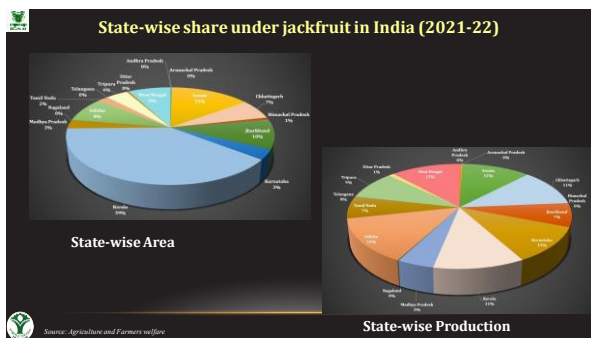
Background - Jackfruit

- Indigenous to and grows wild in the rain forests of the **Western Ghats of India**
- The primary economic product of jackfruit is the fruit which is used both when **mature and immature**.
- The jackfruit is extremely versatile and sweet tasting fruit that possesses **high nutritional value**
- The pulp of the jackfruit is starchy and fibrous, and is a source of **dietary fibre**
- Jackfruit gives **greater yield/tree** than most of the fruit crops but is still not classified as a commercial fruit and is rarely grown on regular plantation scale.
- It is one of the most hardy fruit crop and traditionally it is a **farmer's household fruit**

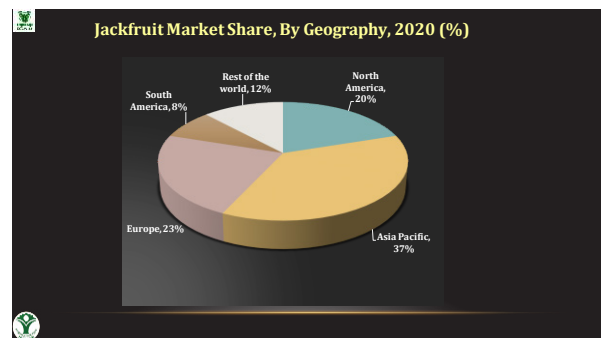
3



4



5



6

Status of the jackfruit industry in India

Dr. Prakash Patil
Project Coordinator (Fruits)
ICAR-IIHR, Bengaluru, India
pcfruits.iihr@icar.gov.in

1

Outline

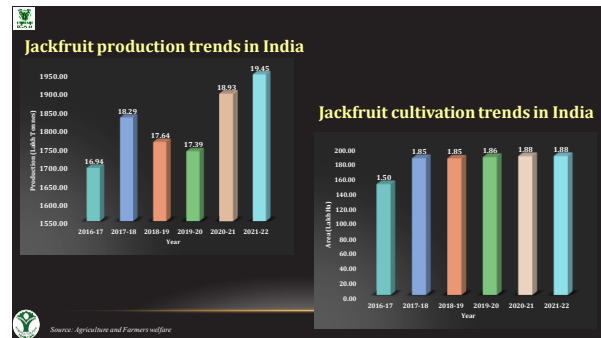
- Background
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2

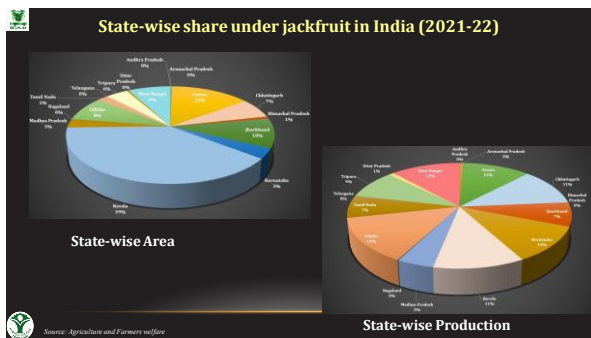
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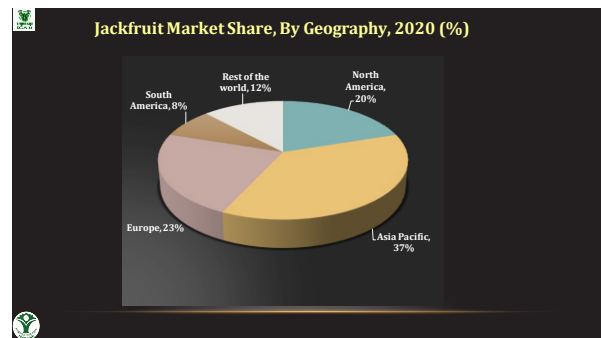
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6




Sindoor




PPI Jack

Characters	Sindoor	Characters	PPI Jack
Organization	KAU (2016)	Organization	TNAU (1996)
Pedigree	Clonal selection	Pedigree	a clonal selection from Ulagumoodu local near Pechipparai
Bearing habit	Tree trunks and branches	Bearing habit	tree trunks
Annual yield per tree	25 fruits/tree 300 kg/tree 11.00 to 12 kg	Bearing season	April-June
		Off season bearing	November - December
		Annual yield per tree	105 fruits/tree, 1785 kg/tree, 17kg/fruit
		Special character	commercial planting and home gardens

13




Selection G-65




Selection G-11a

- Low latex type
 - Light yellow flakes of 39g/flake
 - Medium sized fruits (10 - 13 kg)
 - More flakes/fruit (140)
 - Flakes to fruit ratio of 0.40
 - High TSS (25°B)
- Medium latex exudation
 - Coppery red flakes of 44g/flake
 - Medium sized fruits (9.5-10 kg)
 - Thick flakes (1.1 cm)
 - Flake to Fruit ratio of 0.48
 - High TSS (23°B)
 - Acidity of 0.4%
 - High carotenoids (3.5 mg/100g)

14



Siddu Halasu



Kachehalli

Characters	Siddu Halasu	Fruit shape	Elipsoid / elongate
Organization	Farmers Variety - IIHR (2017)	Fruit weight	20-25 kg
Pedigree	Clonal selection	Flakes/fruit	300-350
Earing habit	Tree trunks and branches	Flake colour /other characters	Coppery red, thick, firm, fibreless
Annual yield per tree	450 fruits/tree 1098 kg/tree 2.00 to 2.5 kg	Flake weight (without seed)	30-35 g/flake
		TSS	32°B
		Registration	GI

15

Region	Cultivars	Attributes	Source/Ref
South India	Rudrakshi	<ul style="list-style-type: none"> • Large pummelo size fruit • Smooth rind and less spikes • Produce off-season crop (September to December) 	Ghosh, 2000
	<ul style="list-style-type: none"> • Palur-1 jack or P.L.R.-1 • PPI Jack • Konkan prolific • P.L.R()-2 • Swarna • Sindoor • Kachehalli • Burliar, Velpala • Lalbhag Madura, Lalbhag Raja, Bairachandra, Kempu Rudrakshi (RX), Yellow Rudrakshi (YX), Small Rudrakshi (Sirs), Baramasi, Tubagere jackfruit, Janagere jackfruit, Sadananda jackfruit 	<ul style="list-style-type: none"> • Suitable for HDP • Commercial planting and home gardening • Bearing from 6 to 7 years of planting • Big fruits • Thick flakes and very thin rind (<1 cm) • Coppery Red coloured flakes • Excellent fruit quality • Suitable for table purpose • Suitable for table purpose 	PC Ghosh, 2000 Ghosh, 2000

16

Region	Cultivars	Attributes	Source/Ref
South India	Sompady Gumless	<ul style="list-style-type: none"> • Low latex jackfruit 	PC
	Siddu jackfruit Muttam Varikka	<ul style="list-style-type: none"> • Red flaked small fruited jackfruit • 7.0 kg fruits with flakes of 3.6 g • Crispy pulp, fleshy, non-fibrous, golden yellow, Very good edible quality 	APAARI, 2012
North India	NJT1, NJT2, NJT3 & NJT4	<ul style="list-style-type: none"> • Table purpose, Large fruits, Excellent pulp quality 	APAARI, 2012
	NJ1, NJ2, NJ3 & NJ4	<ul style="list-style-type: none"> • Better culinary purpose 	APAARI, 2012
North-Eastern Hilly Region	Puakikhua Khoja Baromahia	<ul style="list-style-type: none"> • Soft pulp, Firm pulp • Fruiting 2-3 times a year (January-February, April-May and June-July) 	APAARI, 2012

17

Information Gap					
Characters	Palur-1 Jack or P.L.R. 1	PPI Jack	Konkan Prolific	PLR (I)-2	Swarna
Organization	TNAU (1992)	TNAU (1996)	FRFS,DBSKV (2004)	TNAU (2007)	UAS (2010)
Pedigree	Clonal selection	clonal selection		Clonal selection	
Bearing habit	Not available	tree trunks	Fruit bears in bunches	tree trunks	trunk, 1 st branches and also on 2 nd branches
Bearing season	March-June	April-June	January – February flowering	Not available	Not available
Off season bearing	Oct- Dec	Nov - Dec	Not available	Not available	Not available
Annual yield	80 fruits/tree 900 kg/tree, 12 kg/fruit	105 fruits/tree 1785 kg/tree, 17kg/fruit	73 fruits/tree 450 to 550 kg/tree 5.70 kg	95-110fruits/tree 1800 kg/tree 16.00 to 19.50 kg	6-8kg
Flakes/fruit	115-120	Not available	Not available	Not available	Not available
Flake colour	Golden yellow firm flakes	Not available	Not available	Not available	Not available
TSS	19°B	Not available	25°B	Not available	25 to 26°B
Acidity	Not available	Not available	Not available	Not available	Not available
Special character	Suitable for HDP	commercial planting and home gardens	bearing from 6 to 7 years of planting		Thick flakes and a very thin rind (< 1 cm)

18

Information Gap Contd...

Characters	Sindoor	Sidda	Swarna
Organization	KAU (2016)	Farmer- IHHR (2017)	UAS (2010)
Pedigree	Clonal selection	Clonal selection	Not available
Bearing habit	Not available	Not available	Trunk, 1 st branches also on 2 nd branches
Bearing season	Bear fruits twice/ year	March-July	Not available
Off season bearing	Not available	Not available	Not available
Annual yield	25 fruits/ tree / year	450 fruits	6-8kg
Flakes/fruit	11-12 kg	1098kg/year	25 to 26 th B
Flake colour	Not available	30	Not available
Flake colour	sunset orange flakes	Deep coppery red colour flakes	Not available
TSS	Not available	31 th B	25 to 26 th B
Acidity	Not available	Not available	Not available
Special character	Table purpose	Homesteads and commercial	Thick flakes and a very thin rind (< 1 cm)

19

Desired traits considered for different purpose

Table Purpose	Vegetable purpose	Processing purpose
<ul style="list-style-type: none"> Flake quality Latex exudation Fruit weight 	<ul style="list-style-type: none"> Fruit maturity period Cooking quality Tenderness 	<ul style="list-style-type: none"> Dry matter content Flake fibre content Flake quality (colour, taste & texture) Carotenoid content TSS Flakes/fruit ratio Fruit size Latex exudation Fruit rind thickness
<ul style="list-style-type: none"> Yield Flakes/kg fruit (<20) Flakes/fruit ratio (>0.50) TSS Fruit rind thickness Flake thickness (>0.2mm) 	<ul style="list-style-type: none"> Flake fibre content Fruit rind thickness Browning (phenol content) Latex exudation Seedlessness/seed softness Shelf life after minimal processing Bearing habit and season Picking quality Small size 	<ul style="list-style-type: none"> Fruit rind thickness Fruit thickness Shelf life - storability of flakes
<ul style="list-style-type: none"> Fruit shape Bearing habit and season Seeds/kg fruit (<120g) Vivipary Shelf life Flake type Earliness Extended cropping period Off season bearing Dwarf canopy 		

20

Score card for evaluation of jackfruit variety/selection for table purpose

Sl. No	Characteristics	Max. Mark	Grading					
			Magnitude	Score	Magnitude	Score		
1	Flake quality	10	Magnitude	5	deep yellow	4	Yellow	3
			Score	5	Coppery red	4	Creamy white	2
2	Flake crispness*	5	Firm	5	Medium firm	3	Soft	1
			Score	5	Slimy	1	Strong	2
3	Aroma*	10	Weak	10	Intermediate	5	Strong	2
			Score	10	Yield (kg/tree)	5	15-20	4
4	Fruit weight (kg)	5	> 1000	10	500-1000	6	<500	4
			Score	5	> 0.5	5	0.5-0.4	4
5	Flake/fruit ratio	5	>6	5	5-6	4	<4	2
			Score	5	Flake thickness (mm)	5	>6	5
6	Flake thickness (mm)	5	<20	5	20-25	3	>25	2
			Score	5	TSS (°B)	8	>25	8
7	Latex exudation*	10	Low	10	Medium	5	High	2
			Score	10	Fruit rind thickness (cm)	5	<0.5	5
8	Bearing habit	8	On whole stem including trunk	8	mainly on trunk, 1 st and 2 nd branches	6	mainly on trunk and 1 st branches	4
			Score	8	Fruit attractiveness	9	uniform round/cylindrical	3
9	Shape*	3	Green	3	Greenish yellow	2	Brown	1
			Score	3	Spines*	3	Sparse	3
10	Reaction to insect-pests	5	Resistant	5	Tolerant	3	Susceptible	1
			Score	5	Reaction to diseases	5	Resistant	5
11	Total	100	Resistant	5	Tolerant	3	Susceptible	1
			Score	5	Reaction to diseases	5	Resistant	5

21

Agrotechniques

ROOTSTOCK AGE (2, 3 & 4 Months Old Seedling - MOS) | **SUCCESS: 54.5% SOFTWOOD Grafting**

Epicotyl grafting in Jackfruit | **Patch budding in jackfruit**

22

Major /Cosmopolitan pest reported

Fruit borer

23


Major disease reported

Fruit Rot (*Rhizopus artocarpus*) | **Foot rot/ collar rot (*Phytophthora sp.*)**


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Value addition and diversification

Arka Mechanized Raw Jackfruit Peeler



Jackfruit products



- Can process 4-5 kg weighing jackfruit (less than 5 minutes)

25

Value addition and diversification



- Dehydrated Raw jackfruit slices
- Jackfruit mixture
- Jackfruit candy
- Jackfruit papad
- Jackfruit jelly
- Jackfruit leather
- Jackfruit cake
- Jackfruit RTS
- Jackfruit pickle
- Jackfruit wine
- Jackfruit jam
- Jackfruit Chips





26

Jackfruit Industry Outlook:

Sl. No	Jackfruit companies	Products	Turn over	Description
1	Anna Food Product (Miniones)	Green jackfruit flour, Cookies, Jack nutri food, Dehydrated green jackfruit, Green jackfruit flour, Jack n ginger cookies, Jack pickle		
2	Artocarpus Foods Pvt Ltd (Wonder Jack)	Tender jack fruit, Teriyaki jackfruit, Indian curry jackfruit, BBQ jackfruit, Jackfruit pulp, Ripen jackfruit,		




27

Jackfruit Industry Outlook:

Sl.No	Jackfruit companies	Products	Turn over	Description
3	Island valley delights LLC	Home of jam & jelly	-	
4	Jackfruit 365	Jackfruit 365	-	
5	Madam Sun	Jackfruit jam	-	
6	Mother Dairy Fruit Vegetable Pvt. Ltd. (Safal)	Frozen jackfruit	NA 1.3 Billion USD	

28

Jackfruit Industry Outlook:

Sl.No	Jackfruit companies	Products	Turn over	Description
7	Natureloc	Jackfruit Varatty, Dried jackfruit slice/Sun dried Jackfruit, Jackfruit flour, Jackfruit seed flour	Operating revenues range is Under INR 1 cr for 2020	
8	Nutty Yogi	Nutty yogi healthy jackfruit pickle, Nutty yogi nutri jackfruit powder, Nutty yogi fresh jackfruit chips, Gluten free sugar lite atta, Oats & chickpea cheela mix	\$407K (3.25 Crores) as on Dec 31, 2020	
9	The Jackfruit Company	Lemon garlic jackfruit, Lightly seasoned jackfruit, BBQ jackfruit, Tex-Mex jackfruit, Teriyaki jackfruit, curry jackfruit, bulk naked jackfruit	-	

29

Jackfruit Market Drivers

- Increase in the Involvement of Food Manufacturers is Projected to Drive Market Growth.
- Rise in the Use of Jackfruits as Vegan Meat Substitute is Projected to Boost Demand.

Jackfruit Market Challenges

- Low Shelf-Life is Anticipated to Hamper Market Growth.
- Covid-19 related restrictions can curb the growth in demand for jackfruits

30

Jackfruit Market - Trends and Opportunities

- Rising awareness about jackfruit's immunity-boosting and nutritional characteristics is the key growth driver for the global jackfruit market.
- Increased production of jackfruit-flavored products by leading players is expected to bolster the growth in the jackfruit market.
- Increased deployment of jackfruit as a substitute for vegan meat is expected to fuel product demand, in the coming years.
- The supermarket distribution channel segment is expected to make the largest contribution to the overall jackfruit market due to their increasing penetration in developing economies such as India and Thailand.
- The fresh consumption application segment is anticipated to contribute the most to the overall market owing to increased product consumption due to its sweet flavor.

31

Status of Jackfruit

Present	Status
Documenting the Diversity	Good Success
Propagation	Good Success
Varietal wealth	Average
Rootstock	Average
Agro-techniques	Below Average
Plant protection	Average
Value addition	Very Good Success
Market linkage	Average
Awareness programmes	Good (campaigns, publications and mass media programmes)
Lessons learnt	??????
Way-Forward	??? What should be the productivity

32

Future Thrusts

- *Enriching the diversity and developing/ identifying suitable varieties (Chips/vegetables/table)*
- *Demand for organized cultivation : Need to perfect the production technology*
- *Up-scaling and marketing of diversified products (small entrepreneurial groups)*
- *Promote jackfruit tree nurseries as an enterprise*

33

Future Thrusts Contd.....

- *Need for mechanised flake separation machine. Alternatively, post-harvest practices to remove the latex*
- *Collect, document and consolidate ITKs on jackfruit and validate them through research*
- *Identifying the custodian farmers of jackfruit*
- *Clinical data - well-designed human clinical studies to substantiate the health claims*

34

Balance Sheet for Future

Present	Future
Background	Assumptions
Statistics	What is expected
Uses/ Benefits	Clinical data
Progress – PGR (NARES)	Which diversity to look
Varietal wealth (NARES)	Which variety to propagate
Value addition	Which are fit for upscaling
Growers Association	What steps
Awareness programmes	Awareness programmes

35

Conclusion

- Researchable Matters**
 - Challenges & Vision & Vision
- Policy Matters**
 - Jackfruit Board/Mission
- Developmental Matters**
 - How to bridge the link

36



Acknowledgement

- Indian Council of Agricultural Research (ICAR)
- Collaborative organization of SAU's and ICAR Institutes
- Project scientific staff, officer in-charges and nodal officers
- Project staff at Project Coordinator's unit @IIHR, Bengaluru
 - International Tropical Fruits Network (TFNet)



37



38

INITIATIVES TO DEVELOP THE JACKFRUIT AS CROP FOR INCOME GENERATION IN MALAYSIA

● ● ● ● ●

Director,
Crop Industry Development Division,
Department of Agriculture, Malaysia

1

Content

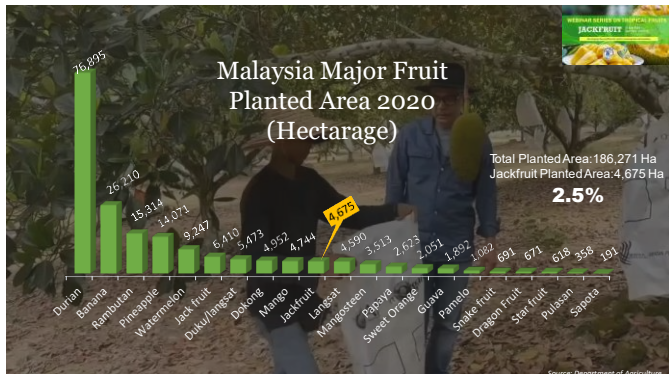
- Overview Development of Jackfruit Industry in Malaysia
 - Planted area
 - Production
 - Jackfruit consumption
 - Self-sufficiency ratio
- Jackfruit Market
 - Price
 - Export
 - Import
 - Downstream products
- Initiative
 - Jackfruit Development Project
 - Advisory Services to Entrepreneurs
 - Expand market

2

Overview Development of Jackfruit Industry in Malaysia

Initiatives To Develop The Jackfruit As Crop For Income Generation In Malaysia

3



4



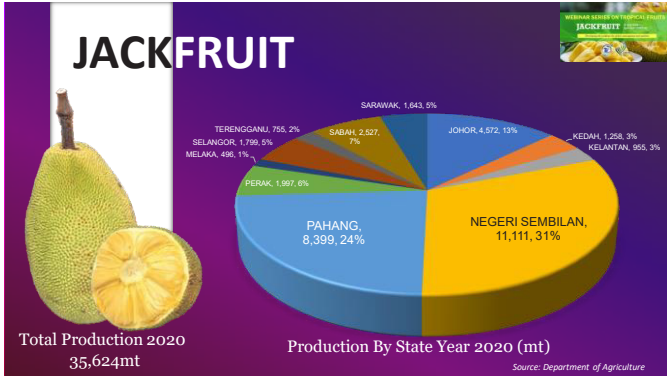
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Popular Varieties
(16 Varieties registered)

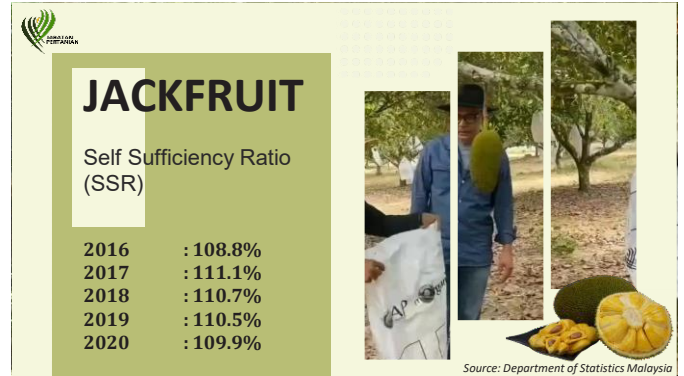
- Mantin (J32), N.Sembilan, 1997
- Tekam Yellow (J33), Jerantut, Pahang, 2004
- Mastura (J57), P.Pinang, 2005

Source: Department of Agriculture

6



7



8



9

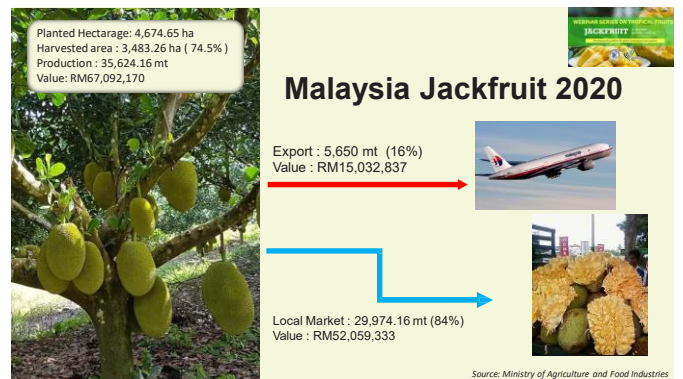
Jackfruit Market

Initiatives: To Develop The Jackfruit As Crop For Income Generation In Malaysia

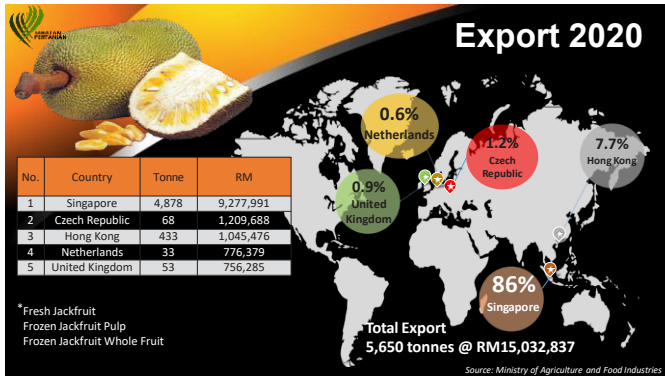
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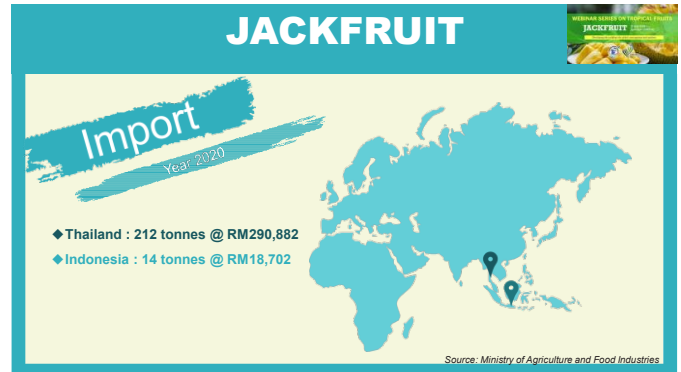
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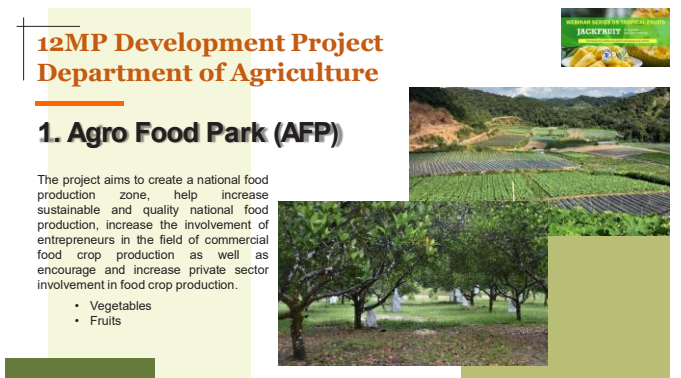
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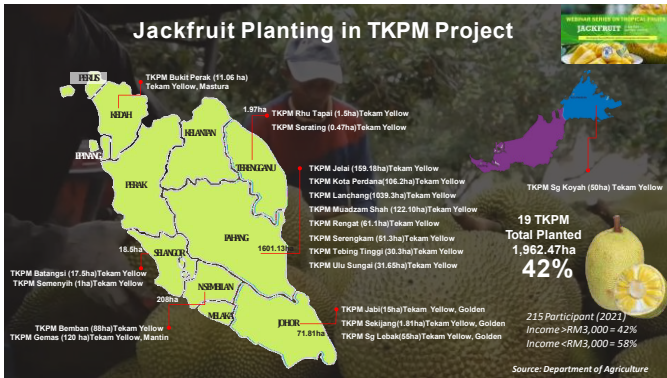
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17



18



19

Entrepreneurs

Johor

- Xin Long Enterprise (TKPM Sg. Lebak 10 Ha)
- Chon Yan Trading (TKPM Sg. Lebak 10 Ha)

Negeri Sembilan

- Fruits Plus Sdn. Bhd. (TKPM Gemas 20 Ha)

Pahang

- KB Food Industries Sdn. Bhd. (TKPM Jelai 23 Ha)
- Koperasi Bernas Berhad (TKPM Jelai 11.37 Ha)
- MBR Hidayah Enterprise (TKPM Jelai 8.23 Ha)
- Kuala Medang Bio Farm (TKPM Jelai 8.2 Ha)
- Syarikat Alpha Plantation Sdn. Bhd. (TKPM Lanchang 11 Ha)
- Syarikat Barqat Plantations (TKPM Lanchang 10.5 Ha)
- Syarikat Simplex Deluxe Sdn. Bhd. (TKPM Lanchang 13 Ha)

Source: Department of Agriculture

20

12MP Development Project Department of Agriculture

2. Long Term Crop Development Project

Durian, Jackfruit, Mango, Mangosteen, Star fruit etc.

Objective

Increase production for export and reduce import dependence

- 3,000 participants
- 3,000 hectare
- 600 Post-harvest facilities
- 3,000 Participants on Transfer Technology

21

Initiative Department of Agriculture

Advisory Services to Entrepreneurs

Initiatives To Develop The Jackfruit As Crop For Income Generation In Malaysia

22

The Headline Of A Newspaper Clipping

NANGKA MADU J33 @ TEKAM YELLOW

ISI Besar Besar

Pemasaran nangka madu ditingkat

AGROPERTANIAN

HOME - NANGKA TEMERLOH TERBANG KE LONDON

NANGKA TEMERLOH 'TERBANG' KE LONDON

Blog belajar bertani dan

Fenomena nangka madu

Ekspor nangka, nanas ke China

Silapa sangka Buah Nangka (*Artocarpus heterophyllus*) kini boleh diterbar London sebagai satu komoditi yang boleh dibanggakan dari Malaysia? Beliau beberapa buah akhbar lembaran yang dipetik daripada Semasa p 1 Julai 2019. Penulis blog yang pernah bertugas sebagai Pengarah Pesta Pahang amat berbangga dengan kenyataan media ini selepas beberapa Taman Kekal Pengeluaran Makanan (TKPM) Lanchang yang terletak di dilaksanakan ini mencapai tahap yang membanggakan. Artikel bernama "Nangka Temerloh 'terbang' ke London" pada penulis blog amat sesuai di

23

Individual Quick Freezing (IQF)

The Future Of Tropical Fruits

Source: Sun Fresh Sdn. Bhd.

24



Product Plant Base - Jackfruit



Source: Sun Fresh Sdn. Bhd.

25



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Initiative

Initiative
Department of Agriculture
Market Expand

Initiatives: To Develop The Jackfruit As Crop For Income Generation In Malaysia

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Source: Malaysia Agriculture Food Industry

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Market Access

	Jackfruit Category	Market
1	Chilled Pulp	Indonesia Vietnam Taiwan
2	Freeze Dried	China
3	Fresh	Canada
		China
		Japan
		New Zealand
		USA
		*Under negotiation
4	Frozen	Japan
5	Minimally Processed	Australia
		China
		Japan
		New Zealand
		USA
		*Under negotiation

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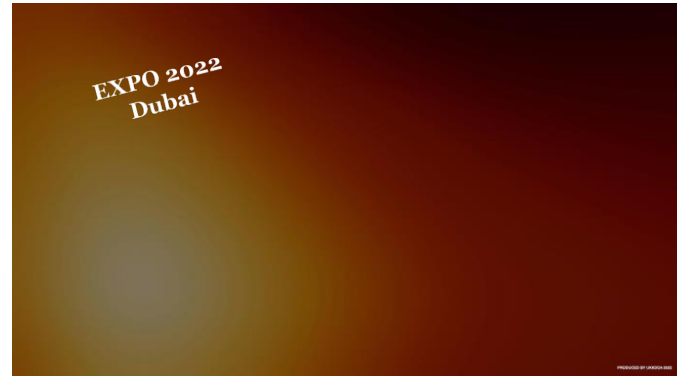
Market Access

	COMMODITY	COUNTRY
1	All Types of Fruits (All Forms)	Singapore
		Hong Kong
		Middle East Countries
		European Union (EU) Countries
		United Kingdom (UK)
2	All Types of Fruits – except banana (Frozen - all forms)	Australia

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Initiatives To Develop The Jackfruit As Crop For Income Generation In Malaysia

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Developing the Jackfruit as a Major Crop in Indonesia

By:
Dr. Ir. Mohamad Reza Tirtawinata, MS

Fruit Researcher, Consultant, and
Head of NUSANTARA Durian Foundation
Bogor, INDONESIA



1

Brief Curriculum Vitae

Name: **Dr. Ir. Mohamad Reza Tirtawinata, MS**

Education:
SMA Negeri XI (High School), Jakarta (1977)
Ir.: IPB University, Bogor (1982), thesis on guavas
MS: Padjadjaran University, Bandung (1988) on durians
Dr.: IPB University, Bogor (2003) on mangosteens

Job Experiences:
Ministry of Agriculture (1982-1992), fruit researcher
Mekarsari Fruit Garden (1993-2014), R&D director
Nusantara Durian Foundation (2014-....), Head/Founder
Nusantara Avocado Foundation (2017-....), Founder

2

Jackfruit in the daily lives of Indonesian people:

- A well-known fruit throughout the archipelago
- Known for its highly productive trees, big fruits, sweet and crisp yellow flesh
- More popular as a vegetable (boiled young fruits), used daily as a vegetable mix in various Indonesian cuisine, i.e.:
 - *Gado-gado* (Jakarta),
 - *Gudeg* (Yogyakarta),
 - *Sayur asem* (West Java),
 - *Nasi Padang* (West Sumatra), etc.
- Together with its relative the Cempedak, the pulp is deep fried with flour for afternoon snacks.
- The seeds are also boiled for snacks, called 'beton'.

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The Jackfruit Family:

- The *Artocarpus* genus consists of a lot of species other than the jackfruit itself (*A. heterophyllus*), which is mostly found in Kalimantan (Borneo).
- The nearest relatives of the jackfruit that are familiar to the people are:
 - Cempedak (*A. champeden*, *A. integer*),
 - Breadfruit (*A. altiss*), and
 - Breadnut (*A. camansi*)
- Jackfruit and Cempedak are mainly consumed as fresh fruit due to its sweetness, while Breadfruit and Breadnut are more often cooked as a source of carbohydrates and as a substitute of staple food.

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Other species that are less known outside its habitat:

- *A. anisophyllus*
- *A. blancoi*
- *A. elasticus*
- *A. lanceifolius*
- *A. limpatu*
- *A. odoratissimus*
- *A. rigidus*
- *A. sericicarpus*,
- *A. tamaran*
- *A. teysmannii*
- *A. tomentosulus*

(Source: Hanif Wicaksono, 2016)



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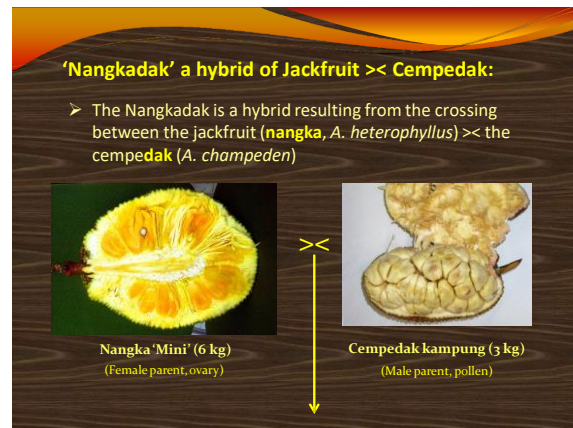
The Jackfruit Tree:

- Grows easily and almost everywhere from dry lowland (10 meters a.s.l.) to humid mountaineous areas (<1,000 meters a.s.l.) while still being productive.
- Found as wild trees in the jungle, to the cultivated trees in the backyards or orchards.
- Estimated >95% trees are from seedlings, only a small percentage are trees grown vegetatively from budding, marcotting, or graftings.
- Mostly grown naturally without any *Good Agricultural Practices*.
- Some of the selected varieties that has commercial value are: 'Kandel', 'Dulang', 'Prabu', 'Merah', 'Salak', 'Madu', 'Mini', 'Bola' and 'Nangkadak'.

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FRUIT PRODUCTION IN INDONESIA

No.	FRUIT	Production (tonnes)	No. of Trees (total)	Population (trees/ha)	Area (hectares)	Productivity per hectare
01	BANANA	7.299.266	88.728.150	1000	88.728	82,3
02	MANGO	2.178.826	19.750.191	100	197.502	11,0
03	ORANGES	1.744.330	19.247.615	400	48.119	36,3
04	PINEAPPLE	1.729.600	316.155.994	25000	12.646	136,8
05	DURIAN	995.729	7.255.856	100	72.559	13,7
06	SALAK	965.198	47.112.296	2000	23.556	41,0
07	RAMBUTAN	882.694	10.722.932	100	107.229	8,2
08	PAPAYA	851.528	9.287.024	1000	9.287	91,7
09	JACKFRUIT	699.487	4.991.820	100	49.918	14,0
10	AVOCADO	382.537	2.435.242	100	24.352	15,7

Source: BPS 2019

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Fresh Fruit:

- Fresh fruits are difficult to sell wholly because of its gigantic size, therefore it is often sliced into 3-5 kg chunks.



- Or for instant consuming, the pulps are peeled of its skin, but still leaving the seeds inside.

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Chilled and Frozen:



- Price range between Rp 30,000 – Rp 45,000 (USD 2-3) per kg

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Processed Jackfruit:



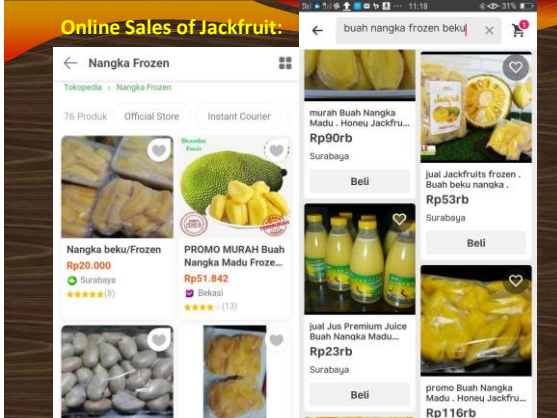
JACKFRUIT CHIPS

In Malang city (East Java) 150 tonnes of jackfruit chips are being produced each year from 3,000 tonnes of fresh jackfruits. The industry also produces other kinds of fruit chips.

CANDY

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Online Sales of Jackfruit:



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Conclusion and Suggestion:

- The jackfruit industry in Indonesia is still growing but at a slow pace, due to:
 - A lot of choices of other popular tropical fruits
 - The lack of jackfruit orchards to produce uniform high quality raw material for the processing industry
 - The lack of standard quality, no standard pricing, and no big advertising.
- The jackfruit market will still grow as a vegetable produce, as it is needed for daily consumption and traditional cuisines that already exists.
- Research might be needed to explore the benefits of the jackfruit tree for environmental issues, as it is a sturdy tree that can cope with climate change.

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Thank you & Have a Fruitful Day!



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SITUATION OF PRODUCTION, MARKET, AND FOOD SAFETY ON JACKFRUIT IN VIETNAM



Tran Thi My Hanh, Nguyen Thanh Hieu, Nguyen Huy Cuong,
 Nguyen Thanh Tung, Nguyen Van Hoa, Vo Huu Thoai
 Southern Horticultural Research Institute (SOFRI), Vietnam
 Email: hanhcaq7@gmail.com



VIỆN CÂY AN QUẢ MIỀN NAM (SOFRI)
 Địa chỉ: Long Bình - Cầu Ông Thìn - Thủ Đức - Hồ Chí Minh. Điện thoại: 028.3521.2021 - Fax: 028.3521.2022

1

Outline

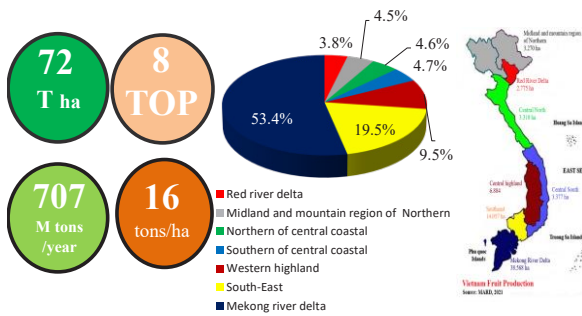
- INTRODUCTION
- PRODUCTION SITUATION
- HARVEST & POST-HARVEST
- MARKET: CHALLENGES & DEMAND
- TASKS IN THE FUTURE



VIỆN CÂY AN QUẢ MIỀN NAM (SOFRI)
 Địa chỉ: Long Bình - Cầu Ông Thìn - Thủ Đức - Hồ Chí Minh. Điện thoại: 028.3521.2021 - Fax: 028.3521.2022

2

INTRODUCTION



(*) Department of Crop Production, 2021

3

PRODUCTION SITUATION (con.)

Varieties

- Two groups:
 - Ta jackfruit (Nghe, Dua, La Bang, MD06,...)
 - To Nu jackfruit (To Nu, To Tay, Ma Lai,...)
- Popular varieties: Dua, MD06, La Bang, Siu som, Vien Linh, To Nu,...
- Varieties were recommended based on:
 - Elite clonal selection
 - ✓ in natural populations
 - ✓ From Fruit and Food Safety Contests that SOFRI hold every year since 2000 to now
- Hybrid varieties



The Fruit and Food Safety Contests in HCMC and Hau Giang, Vietnam, 2019

4

PRODUCTION SITUATION (Cont.)

Some characteristics of varieties

MD06 variety

- ✓ Popular
- ✓ Healthy growth
- ✓ Planting to fruiting 36 months
- ✓ Weight: 10-12 kg/fruit
- ✓ Flesh rate: >40%
- ✓ Sweet taste (brix 25-30%)
- ✓ Suitable for fresh eating, processing



MD06 variety



La Bang variety

La Bang variety

- ✓ Popular
- ✓ Healthy growth, less pests and diseases
- ✓ Weight: 9-14 kg/fruit
- ✓ Flesh rate: 43-47%
- ✓ Suitable for processing

Source: Fruit Breeding Division & South-eastern Fruit Tree Research Center, SOFRI - 2021

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PRODUCTION SITUATION (Cont.)

Some characteristics of varieties

Red flesh variety

- ✓ New variety, not popular
- ✓ Flesh: Orange
- ✓ Selling at very high price
- ✓ Suitable for fresh eating



Red flesh variety

To Nu variety

- ✓ Popular
- ✓ Small fruit (0.6-1.5 kg/fruit)
- ✓ Flesh very soft and sweet (brix 25-32%)
- ✓ Available all year round
- ✓ Suitable for fresh eating



To Nu variety

Source: Fruit Breeding Division & South-eastern Fruit Tree Research Center, SOFRI - 2021

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PRODUCTION SITUATION (Cont.)

Vegetative propagation

- Propagated by **grafting** using a **rootstock** which develops from seedling and **scion** from the expected variety must be taken from healthy mother tree.



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PRODUCTION SITUATION (Cont.)

Density planting

- In the Mekong delta, very high density, **3 x 3 m**
- In the Central highland, lower density, **6 x 4 m**



High planting density

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PRODUCTION SITUATION (Cont.)

Flowering treatment

- Jackfruit flowers around **January to March**, must be dry a **month** before by stopping watering
- The time to stop watering is about **20 days** in combination with spraying foliar fertilizers with high **K** content, then watering **3-4 times** for flowering.



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PRODUCTION SITUATION (Cont.)

Pruning fruit

- Remove young fruits and keep only **5-6 fruits** on the tree.
- Prune fruit near the soil surface
- Should keep the fruits have **large, short, bright yellow stalk**, stalk attachment to fruit in good developed.



Large, short, bright yellow stalk

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PRODUCTION SITUATION (Cont.)

Pests in jackfruit



Fruit fly *Bactrocera umbrosa*

Fruit borer *Glyphodes caesalis*



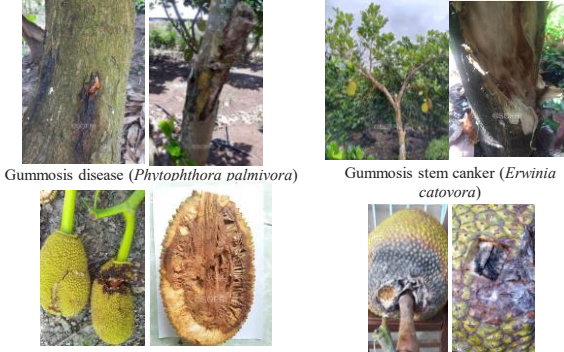
Stem borer *Batocera rufomaculata*

Mealybug *Dysmicoccus brevipes*

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PRODUCTION SITUATION (Cont.)

Diseases in jackfruit



Gummosis disease (*Phytophthora palmivora*)

Gummosis stem canker (*Erwinia catovora*)

Bacterial Fruit Rot Disease (*Dickeya* sp.)

Flesh rot disease (*Lasiodiplodia* sp.)

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PRODUCTION SITUATION (Cont.)

Pest management

- Cover the young fruits to prevent fruit borers, fruit flies
- Set up light traps to attract fruit borer adults

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PRODUCTION SITUATION (Cont.)

Pest management

- Use SOFRI-Protein, SOFRI-tru ruoi bait, SOFRI-Paecilomyces to control fruit flies

Spray position SOFRI-protein on the tree to kill fruit fly adults

Set up SOFRI-tru ruoi trap to attract fruit fly adults

Paecilomyces lilacinus parasitized fruit fly pupae in the soil

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PRODUCTION SITUATION (Cont.)

Diseases management

- To control gummosis disease:
 - ✓ Phosphonate injection into tree
 - ✓ Lime painting on the trunk base
 - ✓ Use SOFRI-Trichoderma combined with organic fertilizer to control the fungi in the soil.

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PRODUCTION SITUATION (Cont.)

Harvesting

- From flowering to harvesting 130-140 days, depending on the growth status
- Harvesting must be conducted by careful handling to prevent fruit damage
- Should not be harvested when it rains or wet condition
- Divided into 5-6 times harvests in the season
- May to November (peak period June to July).

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PRODUCTION SITUATION (Cont.)

- Apply GlobalG.A.P/ VietGAP/organic standards in jackfruit production

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HARVEST & POST-HARVEST

Post-harvest handling

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HARVEST & POST-HARVEST (Cont.)

Storage



(Source: Post harvest technology Department, SOFRI - 2021)

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HARVEST & POST-HARVEST (Cont.)

Value added products

- Fresh fruit used as
 - ✓ ready to eat (available at rest stops, supermarkets, local markets,...)
 - ✓ ice-cream
 - ✓ Juice



- Unripe fruit used as vegetables



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HARVEST & POST-HARVEST (Cont.)

Value added products

- 60% by-product
- Fiber and skin of jackfruit are used as
 - ✓ the main food source for animals by silage method
 - ✓ Compost.



Table. Feed ingredients for animal feed industry in Vietnam from 2017-2019 (Unit: Million tons)

Import	2017	2018	2019
Soybean meal	5.8	6.2	6.4
Corn	5.7	9.0	10.3
Wheat	2.6	1.8	2.5
Other meal	2.2	2.5	2.7
Total	16.3	19.5	21.9

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HARVEST & POST-HARVEST (Cont.)

Processing products

- Dried product (chips)
- Fresh-cut
- Dehydrated product
- Canning product
- Frozen product
- Jam product
- Confectionery products



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HARVEST & POST-HARVEST (Cont.)

Value added products

- Seeds used as
 - ✓ new starch to replace
 - ✓ Snack

Some of the main ingredients of jackfruit seeds

Element	Seed	Starch
Humidity (%)	50.25	9.40
Ash (%)	1.46	0.08
Protein (%)	27.16	3.80
Lipid (%)	0.94	0.19
Carbohydrate (%)	17.63	86.23
Raw fiber (%)	2.78	0.17



Source: Le Dang Truong et al., 2022

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MARKET: CHALLENGES & DEMAND

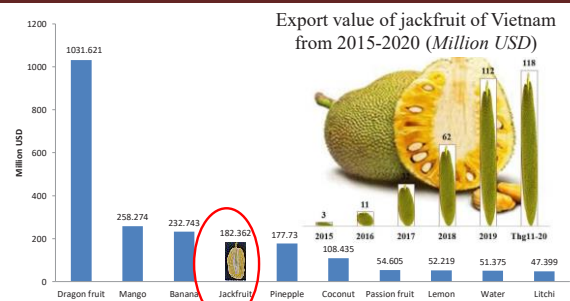
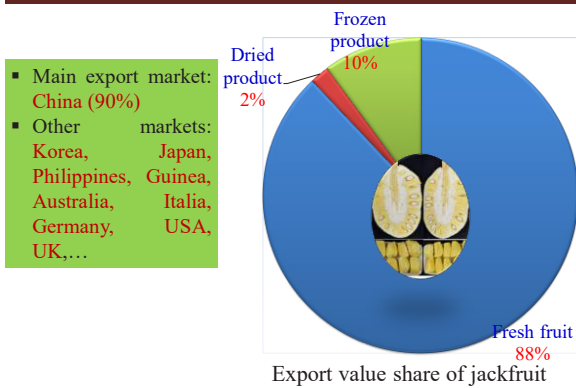


Fig.: Export value of some types of fruit of Vietnam, 2021

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MARKET: CHALLENGES & DEMAND (Cont.)



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MARKET: CHALLENGES & DEMAND

Market Access: China

- Production Unit area (PUC) and packing-house code (PHC)
- Pest quarantine certificate (from PPD)
- Quarantine Pests for Import Plants to China: *Batrocera* spp., *Planococcus lilacius* Cockerell, *Planococcus minor* Maskell, etc.
- Carton pack: Chinese or English; traceability
- Container tempt. storage: 5-10°C, humidity 50-60%



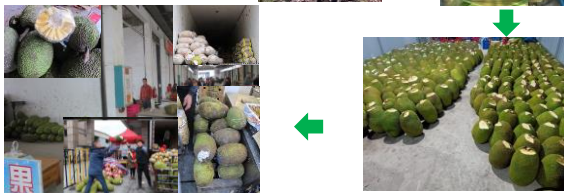
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MARKET: CHALLENGES & DEMAND

Market Access: China

Grading and sorting:

- Grade 1: ≥ 9 kg/fruit
- Grade 2: 6 – 8 kg/fruit
- Grade 3: ≤ 5 kg/fruit



Vietnamese jackfruit at Nanning wholesaler market (2017)

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MARKET: CHALLENGES & DEMAND

PPD, Vietnam has issued 173 production unit codes for jackfruit exports to China (2020)

No. of PUC	Area (ha)	Location
173	18,165	Tien Giang, Hau Giang, Tay Ninh, Dong Nai, Dong Thap, Lam Dong, Gia Lai, Binh Phuoc, Binh Duong, Ben Tre, Vinh Long,...

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MARKET: CHALLENGES & DEMAND

Other markets: Australia & Japan

- Australian firm VINREC is purchasing and processing approximately 1,000 tonnes of Vietnamese jackfruit into 200 tonnes of frozen jackfruit products for export to its market (Vietnamese Trade Office in Australia, 2022)



Frozen jackfruit exported to Australia



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MARKET: CHALLENGES & DEMAND

Challenges



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MARKET: CHALLENGES & DEMAND					
List of some exporters of jackfruit in Vietnam					
Sr. no	Companies	Export product			Export market
		Fresh	Frozen	Processed (Dry)	
1	Viet Han Import-Export Trading Joint Stock Co.		X		Korea
2	Mit International Co., Ltd		X		Philippines
3	Friendship Investment Joint Stock Co.		X		Korea
4	An Van Thinh Food Co., Ltd		X		U.K
5	Phuc An Minh Trading Co., Ltd	X			China
6	Da Hop Nhat Da Food Co., Ltd		X		Philippines
7	Hoang Vegetable Import Export Joint Stock Company (HOANG CORP)	X			Italia
8	Lafooco			X	China

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TASKS IN THE FUTURE
<ul style="list-style-type: none"> Develop plant breeding program to improve quality that meet market requirement (fresh eating, processing, etc.). Research development on innovation of post harvest technology (storage) for address issues/challenges - long transportation (sea freight) of international market; Develop advance technologies of process and up-scale industry for high value product; Improve farming practices, widely approach GlobalGAP, VietGAP, organic standards on farms and others requirements for each target market; Develop the JFNet - Knowledge sharing and science cooperation among TFNet member countries as potential collaborate in the future.

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Acknowledgments

We would like to thanks TFNet, SOFRI and others to give us the opportunities to share our experiences to the Webinar.

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THANK YOU FOR YOUR ATTENTION!



Southern Horticultural Research Institute (SOFRI)

<https://sofri.org.vn>
phongkhoaahocvhtqtsofri@gmail.com
sofrivn.contact@gmail.com

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2

BRENDA J. PEPITO
Chief Agriculturist
Agribusiness and Marketing Division
Department of Agriculture- Eastern Visayas




EVIARC Sweet Jackfruit of the Philippines

- Jackfruit (*Artocarpus heterophyllus*), also known as jack tree, jackfruit, or sometimes simply jack is a species of tree in the fig, mulberry and breadfruit family (Moraceae). It is a medium-sized evergreen tree up to 20 meters tall and 80 cm in diameter.
- It produces about 100 to 200 fruits in a year, depending on the variety, which are green or greenish yellow when ripe.
- A well-developed fruit may contain up to 500 seeds, each weighing 3-6 grams. Jackfruit is a long-lived tree with a life span of 60 to 70 years.




3



EVIARC Sweet Jackfruit of the Philippines

- A grafted EVIARC Sweet jackfruit starts to bear fruits at 3.5 years after planting (YAP) and will reach peak production at the 7th to 8th YAP. In 20-30 years, the tree would start to diminish its productivity. Well-maintained trees tend to reach its diminishing production later than less maintained trees.
- Warm and humid climates below 1,000 MASL are the characteristics where jackfruit can grow best. It has poor cold, drought and flooding tolerance but has moderate tolerance to wind and salinity. It favors an annual rainfall of 1,500 mm or more without pronounced dry season. The fruit tree can grow on various types of soil but prefers deep, well-drained, alluvial, sandy or clay loam soils with pH range of 6.0 to 7.5.



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EVIARC Sweet Jackfruit of the Philippines

	Background	Skin characteristics
	NSIC Registration Number: NSIC 2006 JF 05	Color: Yellowish green
	Year Approved: 2006	Texture: Rough
	Address of Originator: Abuyog, Leyte	Thickness: 14.42 mm. Weight: 2,500 g.
Tree characteristics	Flesh characteristics	
Height: 7 m.	Color: Golden yellow	
Growth Habit: Spreading	Texture: Smooth and crispy	
Fruiting season: Jun-Aug, Dec-Feb	Fibers: None	
Yield: 30-40 mature fruits	Juiciness: Juicy	
Whole fruit characteristics	Aroma: Strong	
Weight: 12,066.67 g.	TSS (Brix): 25.14	
	Flavor: Sweet	
	Thickness: 5.38 mm.	





5



EVIARC Sweet Jackfruit of the Philippines

BACKGROUND:	
Botanical Name	: <i>Artocarpus heterophyllus</i>
Origin	: Unknown
Name of Originator	: RIARC Satellite Abuyog
Address of Originator	: Balinasayao, Abuyog, Leyte
FRUIT CHARACTERISTICS:	
Whole Fruit	
Size	
Weight	: 12,066.67 g
Length	: 401.67 mm
Width	: 283.33 mm
Shape	: ovoid
Skin	
Color	: Yellowish green
Texture	: rough
Thickness	: 14.42 mm
Weight	: 2,500 g
Flesh	
Thickness	: 5.38 mm
Color	: Golden yellow
Texture	: smooth & Crispy
Juiciness	: juicy
Aroma	: strong
TSS	: 25.14%Brix
Flavor	: sweet
Seed	
Number	: 162.67
Weight	: 7.84 g
Length	: 34.63 mm
Width	: 21.02 mm
Shape	: reniform
Edible portion	
Fresh Latex	: Moderate
Fruitlet Size	: 40.75 g

6



PRODUCT FORMS

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NATURE AND STRUCTURE OF THE INDUSTRY



PRODUCT FORMS

1. Fresh Jackfruit

All provinces in the Eastern Visayas region produces jackfruit either for ripe fruit or for vegetable purposes. It is in the province of Leyte and few in Southern Leyte and Samar provinces where large jackfruit planting areas and trading are present.

In major producing areas/municipalities in the three provinces mentioned, around 90-100% of jackfruit are intended for ripe fruit while only a small percentage are utilized for vegetable.

The major producing areas in Leyte are Ormoc City, Baybay City, Mahaplag and Inopacan. In Southern Leyte, only Sogod is the major producing area while in Samar, it is only the city of Calbayog with significant production. All of these major producing municipalities have an organized association of jackfruit growers.

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NATURE AND STRUCTURE OF THE INDUSTRY

2. Processed Jackfruit

10% of the total volume of jackfruit goes to the processing:

- Dehydrated jackfruit
- Vacuum fried jackfruit
- Jackfruit jams & marmalade
- Tart



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NATURE AND STRUCTURE OF THE INDUSTRY

Processed Jackfruit

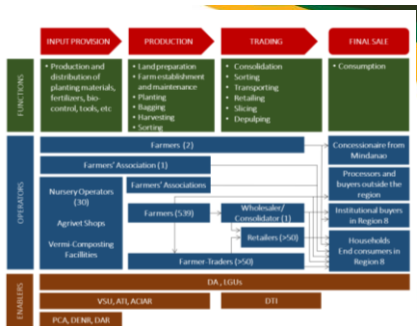
Vacuum fried and dehydrated jackfruit processors are located in Leyte province. These two forms are traded only within the region aside from instances of national trade fairs in Manila and ordered purchases. Its market outlets are direct from display area of processing center, technomarts, pasalubong centers, in airports and in LGU offices. Around 20% of these processed products are reserved by their respective LGUs to be used as tokens to guests as part of the promotion.

Processor-buyers of the region's jackfruit in Pampanga and Cebu use the stocks in making langka pastillas and dehydrated jackfruit, respectively. These are then marketed both locally and internationally.



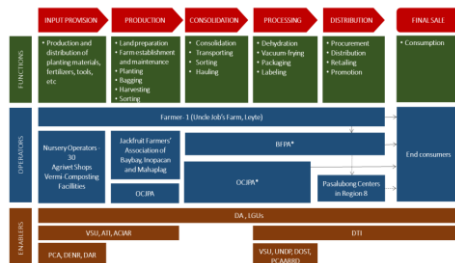
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**VALUE-CHAIN MAP
Fresh Jackfruit**



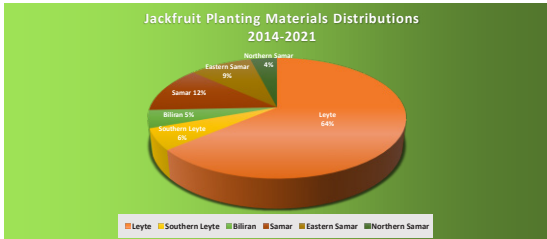
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**VALUE-CHAIN MAP
Processed Jackfruit**



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Jackfruit Planting Materials Distributions to support the goal on increasing plant material inventory



13

COMPETITIVENESS DIRECTION of Jackfruit Industry

- Expand local capacity to produce quality grafted planting materials through conduct of capacity building, TOT and accreditation for nursery propagators and strengthening of existing nurseries
- Strengthen supply base of fertilizers and other inputs
- Capacity building of farmers on jackfruit production technologies
- Establishment of model farms as learning sites and distribution IEC materials
- Rehabilitation of damaged farms

9/19/2022 2:39 PM

DA Special Projects FY 2021 Year-End Assessment



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COMPETITIVENESS DIRECTION of Jackfruit Industry

- Partnership with government (PCA, DENR, DAR) and private sectors to unify efforts for jackfruit
- Continued conduct of R&D for production and processing; and dissemination of results
- Strengthen associations for better access to support services and information
- Upgrading of farm-to-market roads
- Improvement of trading facilities

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DA Special Projects FY 2021 Year-End Assessment



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COMPETITIVENESS DIRECTION of Jackfruit Industry

- Development of local capacity of processors
- Improvement of processing infrastructure through fabrication of machines, construction of FDA-compliant facilities, installation of 3-phase power
- Improvement of product quality through upgraded packaging, longer perishability, and standardized products/quality control
- Creation of a private sector-led jackfruit industry organization

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DA Special Projects FY 2021 Year-End Assessment



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Thank You!

9/19/2022 2:39 PM

DA Special Projects FY 2021 Year-End Assessment



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We are

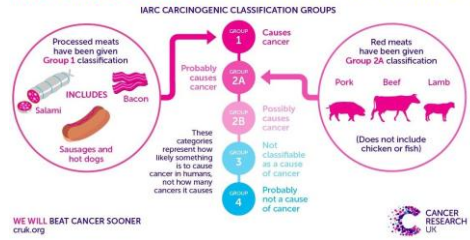


From foodies to food techies.

1

The big PROBLEM

MEAT AND CANCER HOW STRONG IS THE EVIDENCE?

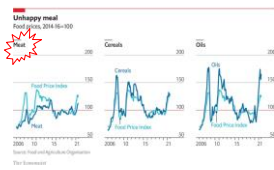


2

The big PROBLEM

Daily chart
High food prices are here to stay

Disruptions from covid-19 are not the only reason it is costing more to fill stomachs



3

How do we solve this?



4

BCG The Untapped Climate Opportunity in Alternative Proteins

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The Untapped Climate Opportunity in Alternative Proteins

Food for Thought

2022-07-08

By Benjamin Brink, Maria Deason, Jürgen Rupp, Michael Bött, Uli Schulte, Nico Dohring, Marisa Papp, Veronika Topp, Tamara Borch, Christian Schuler, Axel Ruchner, Edin Wito, Philipp Ols, Sanku Harkunah, Frederik Geiser-His, and Oskar Sjö-Nilsen Muel

T f in v e

Our latest research shows that consumers are embracing alternative proteins and that protein transformation is one of the best tools available to combat the climate crisis.

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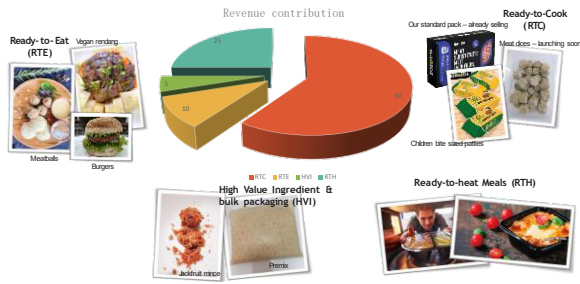
Plant-based diet

A plant-based diet is a diet consisting mostly or entirely of plant-based foods. Plant-based diets encompass a wide range of dietary patterns that contain low amounts of animal products and high amounts of plant products such as vegetables, fruits, whole grains, legumes, nuts and seeds. They do not need to be vegan or vegetarian but are defined in terms of low frequency of animal food consumption.

W More at Wikipedia

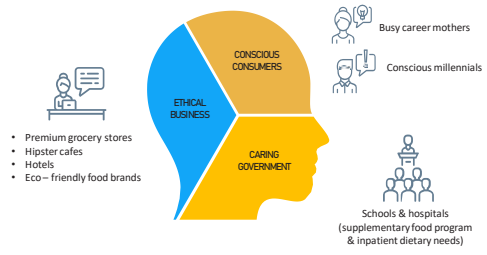
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Our products



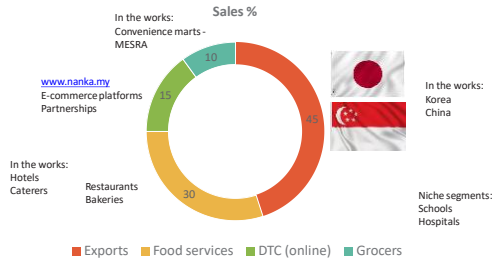
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Our customers



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Our revenue sources



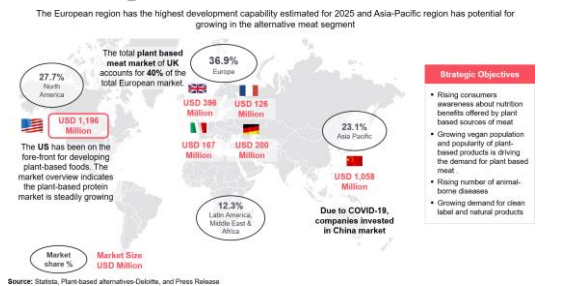
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Market potential



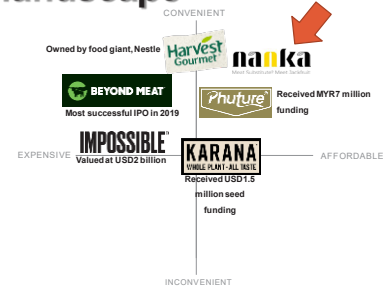
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Market potential



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The MY landscape



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Our traction



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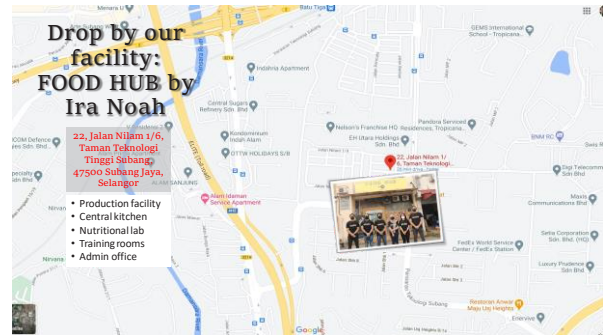
Our affiliations



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The world is going meat-less.

Are you  ?

IRA NOAH PTE

Ira Noah LLP
 22, Jalan Nilam 1/6, Subang High Tech Park, Subang Jaya 47500 Selangor

Ira Noah PTE LTD
 160 Robinson Road, #14-04 Singapore Business Federation Centre

+6013 2096322
syafik@iranoah.in
www.nanka.in

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INTERNATIONAL TROPICAL FRUITS NETWORK

P.O. Box 334, UPM Post Office
(Block C8, MARDI Headquarters)
43400 Serdang, Selangor
Malaysia

Tel. No.: 603-8941-6589
Fax No.: 603-8941-6591
Email: info@itfnet.org
Website: www.itfnet.org

