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Exploring the Challenges and Opportunities of Mango Export from Indonesia: Insights from Stakeholder Interviews

Adhitya Marendra Kiloes
School of Agriculture and Food Sustainability, The University of Queensland, Australia and National Research and Innovation Agency (BRIN), Indonesia, adhi015@brin.go.id

Daryl Joyce
Horticulture and Forestry Science, Department of Agriculture and Fisheries, Australia, d.joyce@uq.edu.au

Ammar Abdul Aziz
School of Agriculture and Food Sustainability, The University of Queensland, Australia, a.abdulaziz@uq.edu.au

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Abstract

Despite being one of the world's primary producers, Indonesia faces challenges in increasing mango exports. The government has been promoting mango exports to boost economic growth in the agricultural sector. The purpose of this study is to identify opportunities and challenges that are associated with increasing mango exports from Indonesia. We conducted a qualitative assessment through in-depth interviews with 20 Indonesian mango exporters and government officials, to identify opportunities and challenges associated with increasing mango exports from Indonesia. Our findings reveal that the physical qualities demanded by export markets do not significantly differ from those required by modern domestic markets. We also found that despite global mango markets typically favouring red and yellow mango, there is potential for Harumanis, a sweet green mango variety primarily grown in Indonesia, to be exported to East Asia and several Eastern European countries, which also do not require strict non-physical requirements for imported mangoes. However, the shortage of export-quality mangoes from the on-farm level hinders this effort, together with the lack of advanced postharvest and logistics management, and the absence of quality certification. We recommend to improving physical quality and meeting non-physical requirements, such as certification, at every level of the mango industry value chain.

Keywords

challenges, in-depth interviews, Indonesian mango export, opportunities, qualitative analysis

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Exploring the Challenges and Opportunities of Mango Export from Indonesia: Insights from Stakeholder Interviews

Adhitya Marendra Kiloes[1,2], Daryl Joyce[1,3], and Ammar Abdul Aziz[1]
[1]School of Agriculture and Food Sustainability, The University of Queensland, Australia
[2]Research Centre for Behavioural and Circular Economy, National Research and Innovation Agency (BRIN), Indonesia
[3]Horticulture and Forestry Science, Department of Agriculture and Fisheries, Australia

Despite being one of the world's primary producers, Indonesia faces challenges in increasing mango exports. The government has been promoting mango exports to boost economic growth in the agricultural sector. The purpose of this study is to identify opportunities and challenges that are associated with increasing mango exports from Indonesia. We conducted a qualitative assessment through in-depth interviews with 20 Indonesian mango exporters and government officials, to identify opportunities and challenges associated with increasing mango exports from Indonesia. Our findings reveal that the physical qualities demanded by export markets do not significantly differ from those required by modern domestic markets. We also found that despite global mango markets typically favouring red and yellow mango, there is potential for Harumanis, a sweet green mango variety primarily grown in Indonesia, to be exported to East Asia and several Eastern European countries, which also do not require strict non-physical requirements for imported mangoes. However, the shortage of export-quality mangoes from the on-farm level hinders this effort, together with the lack of advanced postharvest and logistics management, and the absence of quality certification. We recommend to improving physical quality and meeting non-physical requirements, such as certification, at every level of the mango industry value chain.

Keywords: challenges, in-depth interviews, Indonesian mango export, opportunities, qualitative analysis

Introduction

World mango exports have increased over the last few years, further strengthening the mango's position as one of the most consumed fresh fruits in the world (Evans et al., 2017). Over the 2000-2013 period, world mango export volume increased by more than 160%, from 0.62 to 1.65 million tons. Within this period, mango exports had an average annual increase of around 26% in total value in USD (Evans et al., 2017). Furthermore, mango export volumes have continued to grow by approximately 2.4% annually during the 2014-2018 period (Roberts et al., 2019). Recent data shows that in 2020, the world mango export volume reached more than 2.3 million tons, with a total value of more than USD 3.2 billion (FAOSTAT, 2021).

A limited number of countries are involved in the world mango trade. The ten biggest mango exporters are Mexico, India, Thailand, Peru, Brazil, Netherlands, Pakistan, Ecuador, Yemen, and the Philippines. These countries contribute approximately 85% of total world mango exports (Evans et al., 2017). On the other hand, the three biggest mango importers are the United States, the Netherlands, and Saudi Arabia. These three countries, together with the

United Kingdom, Germany, Malaysia, United Arab Emirates, France, Spain, and Belgium, are the ten major importing countries that import more than 75% of the mangoes traded in international markets. It is worth noting that some countries solely re-export mangoes from other countries. For instance, despite being a significant exporter of mangoes, Mexico is not a leading fruit producer and instead imports a significant amount of mangoes to meet export demand. Similarly, the Netherlands does not produce mangoes and relies entirely on imports from other countries, which it then exports to other destinations.

World mango exports are only approximately 4% of total world mango production (Evans et al., 2017). High consumption in producing countries' domestic markets is one reason for the low export volume (Reardon et al., 2012, 2015). However, the increase in world mango exports over the last decade indicates that demand and consumption for mangoes in many importing countries are also increasing. This condition presents an opportunity for many producing countries to improve their mango export performance. Unfortunately, several developing countries that are major mango producers have yet to fully capitalize on this opportunity, as they struggle to meet the stringent quality standards required by export markets (Sun et al., 2011). The highly competitive nature of the global mango trade further underscores the importance of quality in securing market access (Araujo & Garcia, 2012).

Indonesia is one of several producing countries that still struggle to increase its mango export performance. Although it is one of the major producing countries, after India, China, and Thailand, Indonesia is not a significant mango exporting country (Evans et al., 2017). The country's production reached over 2 million tons in 2019, but Indonesian mango exports only constituted around 2000 tons in the same year (Indonesian Statistics, 2020). This export volume is equivalent to less than 1% of Indonesia's national mango production (Sulistyowati & Natawidjaja, 2016). Moreover, the calculation of Revealed Comparative Advantage, an index that measures the comparative advantage of a country in a particular product by comparing its national export and world export value, shows that Indonesia does not have a comparative advantage in the international mango market (Arifin, 2013; Ayyaz et al., 2019; Firmansyah et al., 2017; Soesilowati et al., 2016).

Several studies have shown that the export market is not the primary market for Indonesia's locally produced mangoes. There is high domestic consumption in a country of over 260 million people, which represents a huge market for all agricultural products, mangoes included (Qanti et al., 2017; Reardon et al., 2015). However, increasing the export performance of an agricultural product can be a crucial component in the macroeconomic development plan of a country (Staehr, 2021). For this reason, the Indonesian Ministry of Agriculture has designated mango as a priority in the fruit production sector (Arifin, 2013; Aziz & Andri, 2016; Natawidjaja et al., 2014; Qanti et al., 2017), targeting Indonesian mango exports to increase by 300% in 2023 (Directorate General of Horticulture, 2019).

The limited number of mangoes exported from Indonesia can be attributed to a lack of information and limited market research activities at the export destinations (Arifin, 2013; Firmansyah et al., 2017). This is a common problem because market studies on mangoes are still mainly focused on the domestic market of producing countries (Kiloes et al., 2021). To bridge this gap, this study was conducted, to analyze the opportunities and challenges that are associated with increasing mango exports from Indonesia, as a reference for the Indonesian mango industry to increase its export performance. It will provide insights that support the efforts to improve Indonesia's mango export performance. As such, this study could contribute to the existing literature on improving a country's agricultural exports, which could have implications for many other countries beyond Indonesia.

This research could also have implications for the broader goals to ensure the well-being of local communities. In the case of Indonesia, the research could be particularly important as it could help the country further develop and enhance its position as a leading

producer of mangoes in the world. Therefore, apart from discussing agricultural exports and the role of exporters in the agricultural value chain, which will be explained in the literature review section, this paper will reveal findings regarding the opportunities and challenges of increasing Indonesian mango exports. This includes export trends in its market destinations, export requirements, export capacity and facilities needed by exporters, and current limitations of mango exports.

Literature Review

The importance of agricultural export

In supporting the economic growth of a country, agricultural exports play a vital role by providing income, creating jobs, and stimulating economic growth, particularly in rural areas (Arifah & Kim, 2022; Henneberry & Khan, 1999; Kuzminov, 2017). Agricultural export also improves food security, as countries' ability to produce sufficient food is not the only indicator of food security (Porkka et al., 2013). By exporting agricultural products, countries can earn the foreign currency they need to import food and other goods they cannot produce (Brigham, 2011). Agricultural export also helps integrate countries into the global economy. It allows resource sharing and technology transfer (Maertens & Swinnen, 2015). It also helps to promote good relationships between countries by fostering economic interdependence (Kuzminov, 2017; Naveed et al., 2022). Exporting agricultural products can also indirectly help to improve the quality of agricultural products due to specific requirements from the trading partner. In order to do this, farmers and other agricultural producers are forced to meet high standards for quality, safety, and sustainability (Arifah & Kim, 2022; Gereffi et al., 2005; Safitri et al., 2022).

Export is one of the modern market channels in the Indonesian mango industry, in addition to other channels such as processing and modern retailing (Qanti et al., 2017). However, the small number of mango exports from Indonesia is in contrast to its production performance which continues to increase, although this commodity has been proclaimed to be one of the leading export commodities by the government of the Republic of Indonesia (Directorate General of Horticulture, 2019). Therefore, increasing exports is very important, not only for the Indonesian mango industry but can also contribute to increasing Indonesia's agricultural exports in general.

Understanding challenges and opportunities in agricultural export

Considering the importance of agriculture export, it is essential to understand the challenges and opportunities in agriculture export. A lack of knowledge about these factors in increasing mango exports can lead to unmet market demand conditions (Araujo & Garcia, 2012). Therefore, it is essential to identify challenges and opportunities to increase Indonesia's mango exports to provide input for value chain actors and policymakers in increasing the industry's performance.

Understanding challenges and opportunities help value chain actors identify potential markets for their products, as the effectiveness of exports is determined by a wisely chosen market destination (Miečinskienė et al., 2014). Value chain actors can be benefited from understanding the demands, trade barriers, regulatory environment, and infrastructure requirements of different countries and regions. It helps them tailor their production and marketing strategies to comply with the targeted markets' needs and requirements (Balyan et al., 2015; Kiloes et al., 2021; Safitri et al., 2022). In addition, it also helps governments and trade organisations in the country to develop supporting policies and programs to boost the

export of agricultural products. This can include policies to improve the competitiveness of domestic producers and formulating initiatives to negotiate better market access (Balyan et al., 2015; Natawidjaja et al., 2014).

Role of exporters in the agricultural value chain

Export is an agricultural marketing channel that is relatively short and conducted directly with few-more capable intermediaries such as exporters (Lee et al., 2012; Qanti et al., 2017). Nevertheless, they play an essential role in this improved market channel. This role is not only in terms of ensuring the smooth flow of goods from upstream to downstream but also in several essential functions in the agricultural value chain.

As one of the intermediaries in the agricultural value chain, exporters connect farmers and other actors in the country with international markets (Lee et al., 2012; Maertens & Swinnen, 2015). This role can be in the form of communicating market requirements to other value chain actors to ensure tighter vertical coordination at various nodes in the value chain regarding product quality (Maertens & Swinnen, 2015). Buyers in targeted markets are increasingly purchasing from supplier lists with whom they have contracted to ensure product quality and safety. Being on this list is becoming increasingly crucial for exporters in developing countries to gain and maintain market access (Maertens & Swinnen, 2015). This becomes a challenge in the Indonesian mango industry because communication regarding mango quality from downstream to upstream is still often constrained (Natawidjaja et al., 2014). Furthermore, with intensive communication, exporters can work with farmers and other value chain actors to develop products that meet the needs and standards of those markets (Lee et al., 2012).

Exporters also have a role in coordinating the logistics of exporting agricultural products (De Matta et al., 2015; Pérez-Mesa et al., 2020). It includes arranging the transportation of products from the farm or processing facility to the port and negotiating with freight forwarders and shipping companies to ensure that products are transported promptly and cost-effectively (Salam & Khan, 2016). In addition, some exporters also have a role in arranging the necessary documentation and inspections required for export (De Matta et al., 2015). These roles are essential to ensure the export process runs efficiently and effectively.

Market modernisation is expected to increase production quality, leading to an increase in mango export performance from Indonesia (Qanti et al., 2017). However, several challenges are faced by the Indonesian mango industry. For instance, the dominant mango varieties grown in Indonesia are often considered unsuitable for the export market because their color remains green even when ripe. Meanwhile, market preferences in export destination countries require mangoes with a reddish yellow colour (Musa et al., 2010). Therefore, gathering information on the opportunities and challenges from the exporters' perspective as critical actors in the modern market is essential to increase exports from Indonesia.

Researchers profile

Given the background and the extant literature, it is imperative to approach the enhancement of mango exports from Indonesia with a multidisciplinary perspective. Adhitya Marendra Kiloes, the primary author of this research, is a seasoned agribusiness and food systems researcher at the Research Centre for Behavioural and Circular Economics within the National Research and Innovation Agency (BRIN) of Indonesia, having previously dedicated over a decade to research at the Research Centre for Horticulture Research and Development under the Indonesian Ministry of Agriculture. With a keen interest in horticultural commodities, particularly mangoes, he is committed to fostering their export potential and

recognises that collaborative efforts among the authors are pivotal for addressing this challenge effectively.

The co-authors of this study are renowned experts within their respective domains and also serve as supervisors for Adhitya's doctoral research. Ammar Abdul Aziz, an associate professor in agribusiness at the University of Queensland, Australia, brings expertise in value chain intricacies, food system modelling, and sustainability in smallholder production systems, emphasising adaptability, resilience, and local economic contributions. Daryl Joyce, a professor and principal horticulturist at Queensland's Department of Agriculture and Fisheries, specialises in horticulture, particularly technical aspects related to supply chains like agronomy and post-harvest processes. Their combined expertise augments the localised challenges within the Indonesian mango industry addressed by the lead author.

Methods

Research design

To explore the factors that contribute to the success of Indonesian mango exports, we used a convergent mixed-method approach that combines quantitative secondary data analysis with in-depth interviews with key stakeholders in the industry. The secondary data, including information on Indonesian fresh mangoes' export volume, value, and export destination over the period of 2012-2020, was obtained from several databases provided by the Indonesian Ministry of Agriculture and Indonesian Statistics. The primary qualitative data was collected through in-depth interviews with relevant stakeholders. The research employed a mixed-method approach due to limited resources and Covid-19 restrictions, which prevented the conducting of consumer surveys in targeted export markets. Instead, to understand the preferences of export markets regarding mango quality, Indonesian mango export firms were used as intermediaries and were interviewed as representatives for consumers in targeted export countries. A study adopted a similar approach to understanding the potential of Brazilian mango exports to the European Union market (Araujo & Garcia, 2012).

Research participants

We conducted in-depth interviews with representatives from the Ministry of Agriculture and Indonesian mango export firms. We conducted purposive sampling to ensure that the respondents we interviewed truly represented the industry and were able to answer the research questions. We purposively selected two officials from the Ministry of Agriculture. One official was a representative of the Directorate General of Horticulture, the authorisation body in charge of the administration of mango exports, and the other was a representative from the Indonesian Center for Agricultural Postharvest Research and Development. Interviews with these officials were conducted to provide insight regarding challenges and opportunities from the government's perspective and to complement responses from mango export firm representatives.

We also selected 20 mango export firms from several cities in Jakarta, West Java, East Java, and Bali provinces. The study identified participants by obtaining details of mango export firms from the 2019 Indonesian exporters' directory. This directory, which the Indonesian Statistics agency maintains, provides a comprehensive list of firms exporting mangoes from Indonesia (Indonesian Statistics, 2021) and the exporter database from the Directorate General of Horticulture, in the Indonesian Ministry of Agriculture. The mango export firms involved in this study had diverse backgrounds, with some firms having extensive experience in exporting mangoes for over 15 years and others being new to the business with only two years of experience. Their export capacity also varied, with some exporting more than 100 tons annually

and others only exporting a small amount of two tons per year. In addition, these firms exported a variety of mango types to different destination countries.

Qualitative data collection and analysis

The approval of human research ethics is a critical step in any study involving human subjects, as it ensures that the rights, dignity, and well-being of participants are protected throughout the research process (Guillemin & Gillam, 2004). In light of this, we obtained institutional approval for human research ethics prior to conducting the research, in order to ensure that our study adhered to ethical guidelines and standards. This approval process involved submitting our research proposal to the appropriate ethics committee, which carefully reviewed and assessed our study to ensure that it complied with ethical principles and guidelines. By obtaining approval for human research ethics, we were able to conduct our research in a manner that respected the rights and welfare of our participants and ensured the integrity and credibility of our findings. The institutional human research ethics approval was obtained from The University of Queensland, Australia, with the approval number 2019002935, which explains the purpose of conducting this research and the rights of the research participants. Before the interview, all research participants consented to anonymous data collection, either verbal (recorded) or written. The participants in this study were provided with unique coded identifiers that were reflective of their role in the value chain and their location. This measure was taken to facilitate the analysis of the collected data.

An in-depth interview guide was prepared to assist with data collection. The guide was structured around four major themes: export destination, important attributes and characteristics, export capacity, and current limitations concerning Indonesian mango exports (**Figure 1**).

Figure 1

Themes and sub-themes of the in-depth interview to export mango firms' representative

Each theme consisted of several sub-themes that were used to elicit detailed information from the participating firms. The list of mango attributes developed by Kiloes et al. (2021) was used to identify important mango attributes for the export market. In-depth interviews were conducted either in-person or remotely through phone or video communication platforms like Zoom or Google Meet as a solution to restrictions on in-person interviews due to Covid-19. The interview was conducted in Bahasa Indonesia, the local language of Indonesia, so that participants could better articulate and freely express their opinion. All the interviews were recorded, transcribed and translated into English.

The qualitative data analysis of the in-depth interviews in this study adhered to a thematic analysis approach, following the guidelines of Miles et al. (2018). Conceptually, thematic analysis involves identifying patterns and themes within the data to gain a comprehensive understanding of the research focus. Operationally, the first, step encompassed the meticulous transcription and translation of all recorded interview data, laying the groundwork for subsequent analysis. We then explored and summarised the important points from each transcription and coded them to identify specific patterns and themes. A validation process was also conducted to ensure the accuracy of the interview results by comparing them to existing secondary data and identifying any correspondences or discrepancies (Safitri et al., 2022), for example, comparing interview results regarding export destination countries to see whether they match the available secondary data. This methodological choice was justified by the aim to enhance the credibility and accuracy of the findings, ensuring a robust analysis. Finally, we re-classified the analysis results based on predefined themes and presented them in a meaningful and organised narrative descriptive. The decision to employ this thematic framework was grounded in its suitability for capturing diverse perspectives, aligning with the research focus on understanding the experiences of mango exporting firms. Information obtained from quantitative data analysis of export volume and destination were then combined with qualitative analysis on the first theme. This was influenced by the desire to triangulate data sources for a more robust analysis, following the principles advocated in the methodological literature. Finally, a more comprehensive description of the research participants' perspectives is presented in the selected significant interview quotes throughout the results section (Kendall, 2014). These express the perspective of the mango exporting firms in relation to the four themes developed for this study.

Results

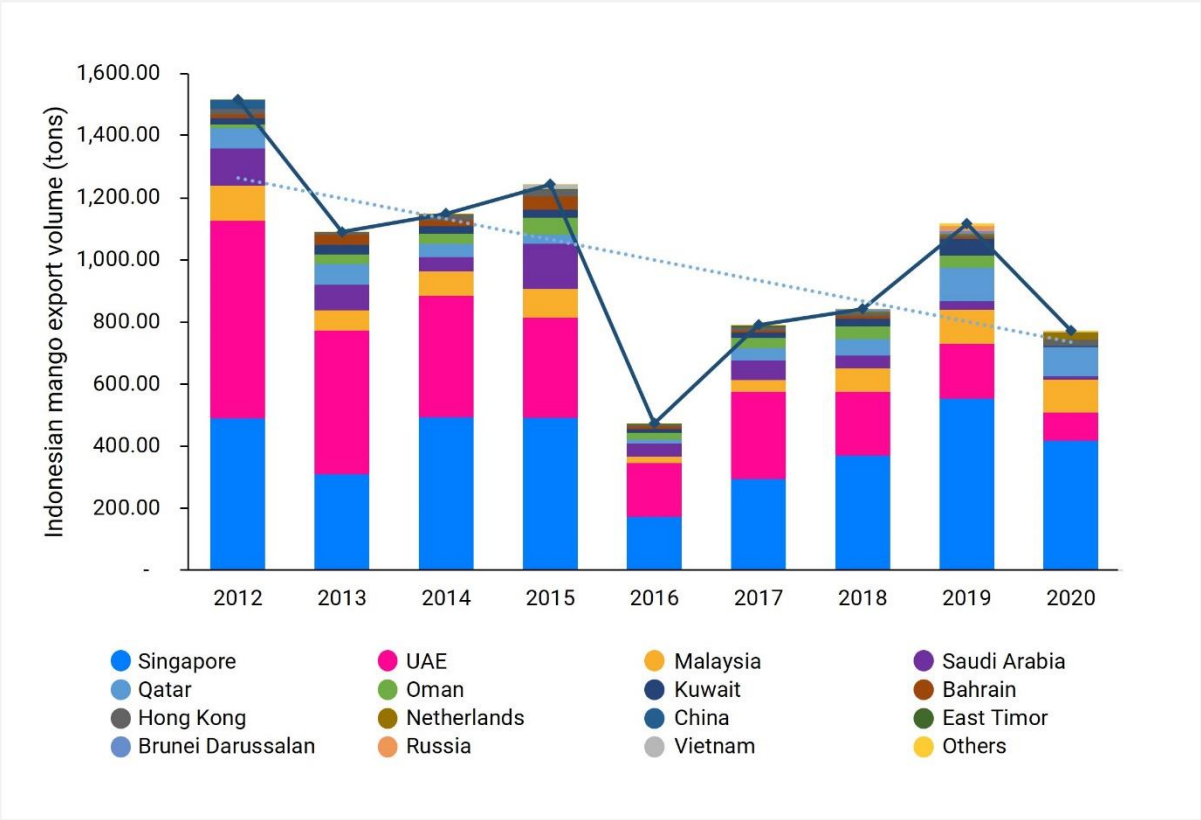
Export trends and destination countries

This section presents the results of the secondary quantitative data analysis regarding the trends in Indonesian mango exports, including destination countries. Additionally, it incorporates pertinent qualitative insights gathered through interviews with stakeholders. There were fluctuating trends in Indonesian mango exports over the 2012-2020 period (**Figure 2**). The highest exports were in 2012, at approximately 1,500 tons. Exports declined in the following year and then increased slightly until 2015. This was followed by a sharp decline in 2016 due to reductions in national mango production. Export volumes then grew from 2016 until 2019. In 2020 the trend in Indonesia's mango exports began to decline. According to mango export firms, this was due to limited transportation during the Covid-19 pandemic.

Mango export data from Indonesia's Ministry of Agriculture show that over the 2012-2019 period, Indonesian mangoes were exported to 29 countries across all continents, except for Africa. However, most mango exports still went to Asian countries. The nine primary export destination countries over the 2012-2020 period were Asian countries such as Singapore, United Arab Emirates, Malaysia, Saudi Arabia, Qatar, Oman, Kuwait, Bahrain, and Hong

Kong. During the same period, Singapore, UAE, Malaysia, Saudi Arabia, Qatar, Kuwait, and Hong Kong became regular export destinations for Indonesian mangoes, receiving annual shipments. It is interesting to note that the export destinations have remained the same, as confirmed by two previous studies conducted by Arifin (2013) and Sulistyowati and Natawidjaja (2016).

Figure 2
Indonesian mango export volume and destination countries



Singapore is Indonesia's primary mango export destination, with an average volume of approximately 400 tons. However, there are indications that most exports to Singapore, which is not a mango producer, are re-exported. Data obtained from the FAO show that mango exports from Singapore reached an annual average of 200 tons over the 2012-2015 period (FAOSTAT, 2021). This export volume averaged around 50% of the total Indonesian mangoes exported to Singapore. However, these could also be mangoes re-exported from other producing countries around Singapore, such as Malaysia, Thailand, and the Philippines. During 2016-2018, mango exports from Singapore were even higher than the volume of Indonesian mangoes exported to Singapore (FAOSTAT, 2021).

Several countries in Europe and North America have also become Indonesian mango export destinations. The Netherlands ranks as the tenth major export destination for Indonesian mangoes, based on export volume. In addition to the Netherlands, some mango exporters have also successfully exported mangoes to other European countries. Data from the Ministry of Agriculture shows that countries such as Russia, Germany, Switzerland, the Czech Republic, France, and Italy have also imported mangoes from Indonesia, along with the United States and Canada. All these countries are not regular importers of Indonesian mangoes and only import small quantities. However, there is potential to increase the volume of Indonesian

mangoes exported to these countries, but this will require an understanding of these potential markets' consumer needs and key requirements.

Export requirements

This section presents the qualitative analysis of the Indonesian mango exporters' interview results related to export requirements. Each export destination country has its own quality requirements, which will affect exporters' capacity to supply good-quality agri-food products (Fernández-Olmos & Díez-Vial, 2014). Therefore, it is important to understand the quality expected in these markets (Kiloes et al., 2021), which is related to the intrinsic and extrinsic attributes of the produce (Badar et al., 2015; Roberts et al., 2018; Yaseen et al., 2016). Intrinsic attributes are related to physical product specifications and extrinsic attributes are related to non-physical specifications. According to the exporters interviewed, the physical quality requirements of mangoes for export are more or less the same as the quality requirements for mangoes sold in the modern domestic retail market. The widely mentioned attributes are appearance, size, uniformity, shape, and level of ripeness.

Mangoes that are exported must have a good appearance. They need to be free from damage, defects, and pest infestations. They also need to be of uniform size and have the normal shape associated with a particular variety. Exporters prefer a ripeness of around 70-80%. This is related to the climacteric nature of the mango, which continues to undergo a ripening process during the shipping period. However, perfect ripeness is preferred by most exporters who use air freight to export mangoes. Apart from size, the specific characteristics of mangoes can also affect market acceptance (Kiloes et al., 2021).

Many mango varieties, both commercial and non-commercial, are available in Indonesia. Six out of 20 of the exporters interviewed indicated that they had exported some non-commercial mango varieties for specific purposes. For example, a mango exporter from Cirebon West Java mentioned that they had exported non-commercial local mango varieties from West Java several times to cater for requests from Indonesian citizens abroad. These were in small quantities, about five boxes containing 10 kg of mangoes per box per shipment. A mango exporter from Malang, East Java, also sent local non-commercial mango varieties from East Java overseas, with approximately 10 boxes per shipment. Another exporter from East Java also exported about two to three boxes of new, improved mango varieties. This last export was in association with the Ministry of Agriculture, to promote the new-improved mango varieties that were the result of breeding programs undertaken by ministry researchers. This promotion received positive responses from buyers in some export destination countries. However, almost all exporters mentioned that of the many mango varieties in Indonesia, Gedong and Harumanis are the primary varieties that are exported, and there are always repeat orders from buyers.

Gedong is one of the most promising Indonesian mango varieties for export (Arifin, 2013). This variety is one of the Indonesian commercial varieties of *Mangifera indica,* specific to West Java Province. Since this variety is naturally small, export fruit needs to be at least 250-300 grams. Exporters who have exported this variety say that Gedong is preferred in almost all export destination countries due to its attractive appearance, in particular the skin colour. Gedong is harvested less than 90 days after flowering. It will then be ripened off the tree, and the colour will change from light green to yellow. The variety is known as Gedong Gincu when harvested 90-100 days after flowering is complete. At this stage, the fruit will develop a red blush colour as the overall colour changes from light green to yellow—Gincu means lipstick in *Bahasa*. Gedong Gincu is preferred over Gedong, particularly in terms of colour. It also achieves a higher price, approximately 30-50% higher than Gedong. However, Gedong Gincu's shelf life is limited due to its higher ripeness level. It can only keep its quality

if it is exported via air freight so that the fruit is not overripe when it arrives in the destination country.

Besides Gedong, almost all exporters interviewed in this study also mentioned Harumanis or Arumanis as one of the primary commercial mango export varieties. This variety is not only grown in Indonesia but also in Malaysia (Musa et al., 2010; Zakaria et al., 2018). The export market prefers this variety to achieve a minimum size of 350 grams. This information is consistent with previous studies that analysed the export potential of Malaysian Harumanis mangoes to Japan, which mentioned 300-400 grams as the size requirement in this market (Musa et al., 2010). Harumanis is the green, sweet mango variety commonly marketed in the Indonesian domestic market and exported mainly to Malaysia, Singapore, and several East Asian countries. The Harumanis exporters we interviewed stated that consumers in these countries place more importance on the sweet taste of mangoes than on any other attribute. In addition, although it is not commonly found in the European market, Harumanis also has the potential to be exported to this region. The mango exporters who have experience exporting Harumanis to several export destination countries in Europe confirm this statement with positive responses from European buyers.

> I have received good feedback from importers in Europe. They say that the Harumanis mango is unique. Even though it is green and looks like it is not ripened yet, when it is peeled, it smells good, and when it is consumed, it tastes very sweet. (E-EJ12)

In addition to physical attributes, several export destination countries require additional documentation to export mangoes to their countries. Some export destination countries have strict requirements, especially regarding food quality and food safety. On the other hand, some other countries have no strict requirements. General documentation requirements are related to phytosanitary documents. These are issued by a competent export authority and prove that the exported product is free from pests and diseases and is eligible to be sent to the destination country (Gupta et al., 2019). The Republic of Indonesia also has this requirement to maintain the quality of the exported mangoes. The Agriculture Quarantine Agency is the Indonesian Ministry of Agriculture institution that issues phytosanitary documents.

The Good Agricultural Practices (GAP) certificate is required by several countries. Malaysia, one of the closest Indonesian mango export destinations, requires a GAP certificate from Indonesia, although Malaysia does not have strict requirements regarding physical quality. Exporters with experience in exporting to Malaysia mentioned that there is indications Malaysia is trying to protect their own mango production from Indonesian imports by implementing import barriers. This is due to the need to maintain prices when large volumes of Indonesian mangoes are coming into the country. Harumanis is the usual variety imported, which is also produced by Malaysia (Musa et al., 2010; Zakaria et al., 2018). Harumanis have high value in the Malaysian domestic market (Azizan et al., 2019). Unlike Malaysia, European countries require the Global GAP certificate, a more advanced GAP certification. In addition, several additional documents are required, such as the Certificate of Origin and a phytosanitary document stating that Vapor Heat Treatment (VHT) has been carried out.

In addition to regular export destinations, several countries have also become targets for export firms to expand their business, such as Australia and Japan. Several exporters in East Java are interested in exporting mangoes to Australia because it is a market destination relatively close to Indonesia. However, the requirements set by Australia are high. For example, treatments such as irradiation and VHT need to be documented in phytosanitary certificates (Australian Government Department of Agriculture and Water Resources, 2015). This was confirmed by the Indonesian Ministry of Agriculture representative, who stated this

requirement is a part of the agreement between Indonesia and Australia to prevent the spread of pests, especially fruit flies. Japan is another country with strict requirements. Apart from all previously mentioned requirements, mango exports to Japan require an additional minimum residual level certificate to ensure that exported mangoes are safe from pesticide residues. These requirements may have resulted in the absence of Indonesian mango exports to Japan in the 2012-2021 period. However, even though the requirements are stringent, several mango export firms are extremely interested in exporting mangoes to this country due to the promising prices.

However, there are other potential markets for Indonesian mangoes that do not have such high requirements. For example, we interviewed exporters who had delivered Indonesian mangoes to Eastern European countries such as the Czech Republic and Russia. The interviewees stated that these countries do not demand such complicated conditions to be met. Importers from these countries only require appropriate physical specifications, like those required by the modern retail market in Indonesia. The exporters who have experience exporting mangoes to these countries also state that both Harumanis and Gedong are acceptable in these markets. **Figure 3** shows mango export requirements to several destination countries based on the experience of Indonesian mango export firms.

> Export requirements to Eastern European countries are less stringent than other European countries. The important thing is that the product specifications match their demands (E-WJ9).

Figure 3.
Mango export requirements to several destination countries based on the experience of Indonesian mango export firms

Export capacity and facilities needed

This section reveals the export capacity of Indonesian mango exporters and some of the facilities needed to improve the performance of these actors. Almost all mango exporters also export other fruits and agricultural commodities in addition to mangoes. Several experienced exporters can export up to 100 tons of mangoes in a year. These traders stated that they could still increase their mango export capacity, so long as a supply of export-quality mangoes is available. They believe that the mango market in importing countries is still wide open, and there are many potential new destination countries for Indonesian mangoes. The exporters explained that in the 2015-2019 period, the trend of mango exports from their companies was increasing. Demand also continues from importers in many destination countries. A representative of the Directorate General of Horticulture confirmed this and mentioned that the number of new mango exporting firms, who have only been in the market for two to three years, indicates that Indonesia's mango export business is growing. Currently, a small number of mango export firms, especially those just starting their business, have only exported a maximum of five tons in a year. However, these new mango exporters stated that they are ready to contribute to improving Indonesian mango export performance and are confident that their mango export capacity can be increased.

Most exporters use air freight, especially to reach countries a long distance from Indonesia. Mango exports from production centres in West Java mostly go through the airport in Jakarta, and mango exports from production centres in East Java and its surrounding areas are primarily exported via Surabaya. Most exporters book a minimum quantity of one ton or multiplications thereof.

Air freight shipments are currently preferred over sea freight, for several reasons. First, air freight can reach distant markets, such as European and Middle Eastern countries, in a short time. Mango quality can be maintained without using specific treatments because it takes a maximum of two days to reach most European countries. Some exporters also said they prefer air freight shipping because sea freight poses risks due to time delays, which has the potential to cause damage to mangoes if treatments are not used. The second reason is that sea freight is inefficient when used for small quantities because sea freight containers require at least 20 tons of mango supply. During the in-depth interviews, the mango exporters said that it was difficult to achieve an efficient amount of export quality mangoes via sea freight. The third reason is that buyers in several market destination countries prefer mangoes to be shipped by air to adjust their trade schedule and maintain quality.

However, shipping by air freight faces some limitations. Air freight is expensive, constituting approximately 70-80% of total export costs in addition to the costs of quarantine, packaging, and other export requirements. Air freight schedules are often disrupted, and delivery is often limited, especially when using flights to countries that do not have direct flights from airports in Indonesia. Exporters felt that the 2020 decline was due to the COVID-19 pandemic, which caused flights to be limited. They hope they will be able to increase their mango exports when the flight schedule is back to normal.

Several exporters mentioned that specialised equipment was needed to increase Indonesian mango exports. The need for a VHT facility is particularly important, due to destination countries requiring special treatment for exported mangoes. This facility is costly for exporters to procure for themselves. These businesses therefore expect that the Indonesian government, through the Ministry of Agriculture, could facilitate the procurement of this facility. The facility could then be shared by farmer groups and exporters' associations in a production centre.

Several exporters also mentioned the need for better packaging to facilitate transportation and distribution, minimise loss, and for aesthetic purposes. Officials from the

Ministry of Agriculture stated that this information was not previously recognised during the policy-making process. In recent times, Indonesian mango export firms exported mangoes using standard cardboard packaging. However, some exporters state that standard cardboard packaging is only suitable for short-distance domestic shipments. This packaging can become limp on arrival at the destination port, especially if the delivery time is longer than expected. This is related to the mango ripening process, which continues during shipping and produces gas and ethylene (Warsiki et al., 2020). In addition to maintaining fruit quality, more attractive packaging is also required to add value. Packaging also influences the acceptance or rejection of a food product in the market and the development of aesthetic standards related to food quality (Mazhar et al., 2011). Several exporters discussed experiences where mangoes exported from Indonesia lost out in appearance compared to those exported by other countries with better packaging. It is also important to note that the cardboard packaging price should not be so high that it erodes profitability. Cardboards specifically made to transport fruits are available in Indonesia, but some mango export firms feel that the price is still too high.

> I experienced it myself when I had a business meeting with my buyer in one of the export destination countries in Arabia. My buyer even asked for a discount from me because he compared the mango packaging I sent with mangoes from other countries, which were better packaged (E-WJ5).

In-depth interviews also revealed that mango exporters wanted mango exports to be conducted via sea freight. This shipment method could reduce export costs by approximately 70% when compared to air freight. An interview with mango postharvest researchers at the Ministry of Agriculture revealed that sea freight technologies for mango export are available and ready to be applied. The availability of these technologies and innovations has been communicated to exporters by the Ministry of Agriculture and some exporters already use sea freight for mango exports to Singapore and Malaysia. An exporter in Cirebon, West Java, has participated in a Ministry of Agriculture trial of shipping mangoes by sea to the Middle East. However, most of the exporters felt that adequate supply of export quality mangoes was more important than technology and innovation for transportation by sea. The availability of innovation and technology for transportation without an adequate supply of quality mangoes will only make mango exports inefficient. Due to this circumstance, exporters who have tried sea freight shipment have finally returned to using air freight for mango exports.

Current limitations to exporting Indonesian mangoes

Apart from the facilities mentioned above, which are required to improve Indonesia's mango export performance, a supply of export-quality mangoes is essential. This section discusses the current limitations faced by the Indonesian mango industry when exporting mangoes from the perspective of exporters. A significant limitation is the lack of mangoes with appropriate physical attributes, especially related to size, appearance, ripeness, and chemical residue levels. In addition, even though buyer feedback is positive, limited production means that the export of new varieties with potential cannot be fulfilled by exporters. Furthermore, exporters feel that the need for administrative documents such as GAP certificates cannot be met by smallholder growers.

Size and appearance also still fail to fulfil export requirements. Exporters feel that mango size has been less than that required. Gedong, a widely offered variety in many export destination countries, is regarded as too small. The same problem applies to Harumanis. Many exporters felt that despite being the most widely produced variety in Indonesia, it is still difficult to find supplies of Harumanis in sizes required for export. Mango appearance is often

the next problem faced when the size requirements have been met. Defects, lack of cleanliness, and pest attacks such as anthracnose and stem end root, are the source of these appearance-related issues.

The difficulty in obtaining mangoes with the desired ripeness level is also a problem for Indonesian mango exporters. Indonesian mango value chain actors mostly use bulk harvesting practices, which results in uneven ripeness as harvesting is not based on the ideal level of mango ripeness. As a result, the exported mangoes are underripe and have a sour taste. This can reduce the trust of importers in export destination countries.

> Sometimes, the level of ripeness of mango is not quite right. But there are some exporters who still deliver these underripe mangoes to market destination countries. When they arrive at the destination country, the importer complains that the quality is not good, especially because of the sour taste. This could have a negative impact on Indonesia's mango exports as a whole. Importers in the destination country can generalise the condition of Indonesian mangoes sent by all Indonesian exporters (E-EJ13)

Chemical residues are also a concern. Practices such as bulk harvesting may lead to the use of calcium carbide for artificial ripening. Calcium carbide is often used at inappropriate doses, so it has the potential to leave residue on the fruit. This practice also occurs in several other developing countries that produce mangoes (Badar et al., 2015; Kumar et al., 2020). In addition, the excessive use of pesticides can also leave residues. This practice takes place because growers want to ensure that the pesticides given are able to eradicate pests and diseases effectively.

> Representatives of importers from Japan once visited the farmer group that I was fostering. They brought their own tools to measure pesticide residues in mangoes produced by our group. As a result, they cancelled their intention to import mangoes from our group because the pesticide residues were still above their regulatory threshold (E-EJ14)

Indonesian mangoes are mostly produced by smallholder growers who do not have proper documentation as proof of GAP implementation. Meanwhile, some export destination countries require a GAP certificate for mangoes imported into their country. In addition to some of the limitations already stated, several export representatives stated the need to promote Indonesian mangoes to introduce Indonesian varieties to export markets. Harumanis is one example. Although the Harumanis mango variety has received valuable feedback from several importers in destination countries, most Indonesian mango exporters feel that there is a need to promote the variety and to educate consumers about it. Some importers, especially in European countries, are still unsure about the ripeness level of Harumanis. This doubt arises because Harumanis remains green even when ripe. Exporters feel that promotion efforts are necessary because the variety has immense potential, has along with a superior taste when compared to other mango varieties.

Several mango exporters also supply mangoes to the domestic market, especially the modern retail market. For example, a mango exporter from East Java stated that it would be better to sell mangoes in the domestic market than export them to other countries with more complicated procedures. Export requirements, either from the destination country or related to export administration, are more complex than domestic market requirements, making the domestic market more attractive to these exporters. This is a dilemma for the exporters because deciding to become an exporter is an important factor in increasing their competitiveness, and

at the same time, it also affects the allocation of resources and entails more difficulties than distribution channels in the domestic market (Fernández-Olmos & Díez-Vial, 2014).

Discussion

This study offers an overview of how exporters, the downstream component of the Indonesian mango industry, provide information about the challenges and opportunities of the Indonesian mango export. This study is of great significance to policymakers in Indonesia as it provides current and relevant information on target markets and the industry's ability to meet export requirements. We shared the interview findings with the Ministry of Agriculture officials, who acknowledged that this study revealed several new findings previously unknown to them. This study also goes beyond previous research focusing solely on determining Indonesia's position in the world mango market by calculating the Revealed Comparative Advantage value (Arifin, 2013; Ayyaz et al., 2019; Firmansyah et al., 2017; Soesilowati et al., 2016). Instead, it offers more comprehensive information on the challenges and opportunities faced by Indonesian mango export firms based on both previous data and the experiences of these firms. The results of this study can provide valuable recommendations for policymakers to develop work programs that can increase Indonesia's mango exports. This is particularly important as promoting mango exports is critical in boosting producing countries' economies. Overall, this study is a valuable resource for policymakers in developing strategies to strengthen Indonesia's position in the global mango market (Araujo & Garcia, 2012). Findings can also be used as the initial basis for further specific studies, such as understanding Indonesian mango export parameters as they relate to specific countries and understanding consumer perceptions of Indonesian mangoes.

The increase in world mango exports over the last 20 years indicates that demand from importing countries has increased (Evans et al., 2017; Roberts et al., 2019). This presents an opportunity for Indonesia to enhance its mango export performance. The opportunity to increase Indonesian mango exports is still wide open. Increasing Indonesia's mango exports by 300% require approximately 3000-4000 tons of exports. This amount is still very small compared to Indonesia's annual mango production, which reached an average of around 2.3 million tons in 2012-2020, making the export target still less than 0.1% of national production. However, this study found that the Indonesian mango industry has many limitations when it comes to producing export-quality mangoes. This condition causes production and marketing inefficiency, which leads to uncompetitive prices in the international market. This was also found in a previous study that stated foreign demand, technology, and relative prices to be the main determinants of export performance (Bottega & Romero, 2021).

The objective of tripling mango exports by 2023, as set forth by the Ministry of Agriculture, presents opportunities and challenges. While the target may appear modest, attaining it will require significant cooperation and coordination among key stakeholders, including governmental authorities and other relevant actors. The findings of this study may offer valuable insights for the government of the Republic of Indonesia to enhance its mango export capabilities. Through a comprehensive analysis of relevant factors, this research provides suggestions that can inform policy and decision-making to improve the country's mango export performance. The facilitation of export facilities by the government is crucial, particularly concerning the provision of necessary treatments required to obtain phytosanitary certificates for various destination countries. Prioritising exports to countries with less stringent requirements, such as some Eastern European nations, presents a promising avenue for expansion. Another opportunity lies in the selection of mango varieties for export. Previously, the Indonesian government's efforts to increase exports were mostly focused on boosting the production of red and yellow mango varieties (Hardiyanto et al., 2020; Mansyah et al., 2020).

However, in-depth interviews revealed that the green Harumanis variety, which has a lengthy history of cultivation in Indonesia, may have potential as an export crop to diverse international markets. This finding aligns with a prior study that explored Harumanis' potential for export to East Asian countries (Musa et al., 2010). The present study emphasises the significance of adhering to specific physical quality criteria, as revealed by the results of our in-depth interviews. Therefore, by prioritising quality improvements for Harumanis mangoes, Indonesia has the potential to boost its mango exports in the short term.

In the medium and long term, the government can also intervene in the value chain process to increase Indonesia's mango exports. Efforts could be directed towards facilitating growers enhance the quality of mangoes, beginning with on-farm interventions such as providing input support and guidance on implementing Good Agricultural Practices. More advanced postharvest facilities can be provided to intermediaries or managed by farmer groups with a collective management system to increase postharvest management efficiency. Incentives for Indonesian mango export firms would also be significant, especially regarding increasing the adoption of advanced postharvest and transportation technologies to export mangoes. Moreover, it is vital to complement on-farm and off-farm interventions with increased promotion of Indonesian mangoes in export destination countries. The export potential can be further enhanced by raising awareness and generating demand for Indonesian mangoes, thereby benefiting growers and the broader agricultural industry.

While this research is specific to Indonesia, other mango-producing nations encountering comparable export barriers can adopt the methods described in this study to improve their export potential. With global mango exports comprising less than 5% of total production, this industry has considerable potential for growth. Replicating these strategies will depend on the specific conditions in each country. Beyond its implications for enhancing mango exports, the research methodology employed in this study may also have utility for improving the export performance of other products.

While the current study provided important insights into the challenges and opportunities facing Indonesian mango exporters and policymakers, it is important to note that these findings were based solely on the perspectives of these stakeholders. The study also revealed that there is a limited supply of export-quality mangoes being produced in Indonesia, suggesting that there are underlying issues on the upstream side of the industry that must be addressed. Therefore, it is necessary to conduct further research to gain a more comprehensive understanding of these issues and to gather information from the perspective of upstream value chain actors. It is also crucial to undertake thorough research aimed at gaining a deeper understanding of consumer preferences in the export destination countries. This will help to identify the root causes of the scarcity of export-quality mangoes and inform the development of effective interventions to address these challenges. Ultimately, a more comprehensive understanding of the Indonesian mango industry will be critical to maximising its potential and ensuring sustainable growth for all stakeholders involved.

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Author Note

Adhitya Marendra Kiloes is a researcher at the Indonesian National Research and Innovation Agency (Badan Riset dan Inovasi Nasional-BRIN in Bahasa Indonesia). He got his PhD at the School of Agriculture and Food Sustainability, University of Queensland, Australia. Adhitya's research interests are agribusiness, agricultural marketing, and systems thinking in value chain analysis. Please direct correspondence to adhi015@brin.go.id

Daryl Joyce is Principal Horticulturist at the Queensland's Department of Agriculture and Fisheries. He is also an Honorary Professor at the School of Agriculture and Food Sustainability, University of Queensland, Australia. His expertise is in horticulture crops management and postharvest. Please direct correspondence to d.joyce@uq.edu.au

Ammar Abdul Aziz is an Associate Professor and Director of High Degree Research at the School of Agriculture and Food Sustainability, University of Queensland, Australia. His expertise is in agribusiness, sustainable agriculture, and remote sensing and spatial analysis. Please direct correspondence to a.abdulaziz@uq.edu.au

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