DRIVERS AND BARRIERS FOR SUSTAINABILITY IN THE COCONUT SUPPLY CHAIN: AN EXPLORATORY CASE-BASED RESEARCH

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Abstract: This paper aims to investigate the current implementation of the coconut supply chain and identify barriers and drivers based on the perspectives of coconut stakeholders. Today, many organisations desire to deploy supply chain sustainability due to the growing research and conversation on the topic. However, specific organisations and businesses, particularly in the agro-industry, still need help implementing and evaluating their supply chain to identify accurate implications. This study emphasises the coconut supply chain, particularly in the provinces of Riau, Indonesia, which are known for their most significant coconut production worldwide, where the coconut industry is one of the most substantial economic sectors. A systematic literature review using PRISMA was implemented to find the drivers and barriers in supply chain implementation, and a qualitative analysis was executed using in-depth interviews involving 17 selected respondents of coconut supply chain stakeholders. It was discovered that the stakeholders encountered 19 drivers and 15 barriers. The results of this study will benefit the sustainability of the coconut industry's supply chain, help overcome existing obstacles, and motivate stakeholders to implement supply chain sustainability.

Keywords: sustainability, supply chain, barrier, drivers, coconut.

Introduction

In the past decade, adopting sustainability techniques in business has become a trending topic and a significant issue (Tate *et al.*, 2010). Many industry researchers and professionals are encouraged to research the sustainability of their businesses (Seuring & Müller, 2008). Food supply chain sustainability is carried out in large companies and small industries, either in developed countries or developing countries (Costa *et al.*, 2017; Jia, 2018; Sánchez-Flores *et al.,* 2020), especially in the coconut supply chain sector. Jakubovskis (2017) argued that food supply chain management and supply chain network design could help the agro-industry meet coconut demand.

Some researchers concentrated not only on the economic aspect but also on integrating economic, environmental, and social factors. Research on social aspects has been done by several researchers (Al-Esmael *et al.*, 2019; Hussain, 2018; Nazeer & Fuggate, 2019; Popovic, 2018). Considering economic and ecological factors in the supply chain can improve their performance. The economic, environmental and social factors must be increased to ensure sustainability. Various ideas and methodologies have been applied to study sustainable supply chain network research. Some academicians designed a network by employing multi-objective optimisation models that account for economic and environmental factors (Ehtesham Rasi & Sohanian, 2020; Gilani & Sahebi, 2020; Gital Durmaz & Bilgen, 2020; Jouzdani & Govindan, 2021; Wang *et al.,* 2021), Others design supply chain networks by implementing social, economic, and ecological factors (Isaloo & Paydar, 2020; Pahlevan *et al.*, 2021; Tirkolaee *et al.*, 2020; Vafaei *et al.,* 2020). The finding of this study reveals the importance of implementing the network design for plantation sectors by acknowledging the drivers and barriers of the supply chain.

Additionally, research on sustainable supply chain management has been conducted

in various sustainability areas of the food industry (Zhong *et al.*, 2016; Baba *et al.,* 2019).

A developing country like Indonesia is the largest coconut producer in the world, located in Riau Province; of course, it still needs to improve with low productivity, quality issues, unstable coconut prices, transportation, workforce, and information system. The research, however, focuses on the coconut sector, which still needs to be expanded and requires a lot of attention to make it sustainable (Gunawan *et al.*, 2022).

Regarding the quantity of coconut production, Indonesia ranks first among other countries worldwide, replacing Brazil in 2011. While in coconut quality, Indonesia is the best in the world due to the condition of soil, climate, and all the necessities to make coconut grow well. According to data from BPS-Statistics Indonesia, the national plantation for Coconut in Indonesia reached almost 3.343 thousand hectares in 2021 (BPS - Statistics, 2023). In 2020, nationally, the highest coconut contributor was Riau Province, with nearly 14.2% of the national plantation area for coconut trees. The other top four are North Sulawesi (8.9%), East Java (8.5%), North Maluku (7.5%), Central Sulawesi (7%), and Central Java (6%) (BPS - Statistics, 2021). The most significant contributor to coconut production in 2019 is about 87.6%, located in the Indragiri Hilir district, and the increment from 2018 to 2019 was 7.8% (BPS - Statistics, 2023).

The majority of coconut farmers are smallholders. This condition presents obstacles to the supply chain for collectors, traders, and producers. In addition, the older the coconut palm tree grows, the less productive it becomes. Furthermore, the farmers need more funds to replant them. This situation naturally leads to an unstable coconut supply (Gunawan *et al.,* 2022). This case is supported by the farm owners' statements and information about unstable coconut prices and the number of coconuts being overproduced. It makes the companies incapable of buying and influencing coconut farmers standing in line to sell their coconuts (Nur, 2021). The problems associated with

coconuts include supply discontinuity, such as logistic cost, product quality, low productivity, limited upstream industry, the absence of price incentives, ineffective and inefficient supply chain, and restricted (company) investment in a coconut plantation. In addition, limited commercial access, minimal utilisation of products and coconut waste, limited collaboration between farmers and industries, and difficulty in meeting the international requirements of the market are the challenges to getting more profit (United Nations Global Compact, CITES, Impact Investment Exchange Asia, 2019).

As the present sustainable supply chain continues to have limitations, some researchers discussed sustainable issues in Indonesia (Gunawan *et al.,* 2021), Export performance and competitiveness of Indonesian coconut oil and desiccated coconut (Purba *et al.,* 2021) and constraints of the coconut supply chain in the Philippines (Moreno *et al.,* 2020) however, no previous study has explored the drivers and challenges of the coconut supply chain in Indonesia. Therefore, a survey of the current practice that proposes a new implementation approach is necessary. This research contributes to the knowledge of sustainable coconut supply networks. A comprehensive study must be undertaken in this field by investigating sustainable business practices and their effects on the environment and society. Stakeholders may collaborate in a committed manner to support supply chain transformations. Then, this analysis can encourage stakeholders on which drivers and obstacles should be addressed when implementing a solution to improve the value added of coconut (Jalali *et al.*, 2022; Medeiros *et al.,* 2022). Birkel & Müller (2021) concluded that the high complexity of change within customers is inherent in conflicts in the economic, social, and environmental businesses. The demand for sustainable products is predicted to rise because educated and rich consumers become aware of product sustainability (Sánchez-Bravo *et al.,* 2021; Sarker *et al.*, 2021). Prioritising the drivers and barriers (Alqahtani & Makki, 2022) can help predict sustainability strategies. In addition, by realising sustainable principles,

Indonesian coconut sustainability can be increased following the demand (Alouw & Wulandari, 2020; Gunawan *et al.,* 2021).

Referring to the background, the objectives of this paper are to (1) investigate the supply chain of the coconut implementation in Riau Province, Indonesia, and (2) identify barriers and drivers related to the sustainability of the supply chain from literature and the opinion of the coconut's stakeholders.

Materials and Methods

In 1987, the concept of sustainability was defined in the Brundtland report. It was adopted by the United Nations' World Commission on Environment and Development (WCED): ''Sustainability means being able to satisfy current needs without compromising the possibility for future generations to satisfy their own needs''(Alzaman, 2014; World Commission On Environment And Development, 1987). Indonesia became the mandate of the National Industrial Development Master Plan (RIPIN), and the National Industrial Policy (KIN) to sustain industrial competitiveness. An operational strategy has been established with a planning approach (Public & Industry, 2015). The current business opportunity is explained as a coconut sustainability supply chain consideration. The challenges faced by stakeholders in predicting the future trend of the coconut industry are the lack of information on supply chain implementation, such as:

(a) Market situation

Covid-19 has changed consumer and market behaviour worldwide. Consumers are seeking food that can provide strength and endurance to avoid COVID-19. For instance, Vita Coco, a significant player in this market, has predicted a remarkable increase in online coconut sales. Consumers choose coconut milk for its health benefits, which is one of the main drivers of the market. Coconut water, collected from young coconuts, and virgin coconut oil, extracted from the meat of fresh coconuts, are increasing market segments (Intelligence, 2022).

(b) Changes in the demographic structure

Indonesia's coconut supply chain is complex. The consumer-driven downstream supply chain has several food and non-food coconut derivatives. The upstream supply chain is commodity-focused. Unproductive land is reducing coconut land. Thus, many growers switched to palm (Arif Gunawan, 2021).

(c) Coconut products and by-products

Following additional analysis, three potential items for integrated coconut development were identified. These include coconut oil, coconut sugar, and shell charcoal manufactured from various basic materials, namely coconut oil from the pulp, coconut sugar from "nira" (sap), and charcoal from the shell (Mardesci *et al.*, 2019).

(d) Coconut Production at the Indonesia Level

Indonesia has the highest coconut production in the world, followed by India and the Philippines (Shahbandeh, 2022). The highest production of coconut in Indonesia is located in Riau province from year to year, followed by North Sulawesi, East Java, North Maluku, Central Sulawesi, Jambi, Maluku, North Sumatra, and West Java (Alvin Theodora, 2021).

(e) Sustainability in the supply chain

The term sustainability is used more consistently to describe various aspects of sustainability. Terms such as corporate responsibility (CR), sustainable development, or corporate social responsibility are used with the same meaning (Slater, 2008). In addition to the inconsistent but ubiquitous usage, the term enjoys increasing popularity among academics and practitioners, encouraging many organisations and institutions to publish their sustainability definitions or metrics (Parris & Kates, 2003). Commonly, sustainability is stated in terms of three elements (or pillars): environmental, economic, and social (Purvis, 2018). Maturity considerations in sustainability are reviewed to investigate avenues for sustainability transformation and development. Insights are derived by reviewing several relevant concepts and models. A hierarchical comparison of sustainability

requirements is followed by a comparison of levels of sustainability and their relationships. Finally, sustainability performance is considered to concentrate on a hierarchy of sustainability indicators. Sustainability is the strategic, transparent integration and fulfilment of social, environmental, and economic goals in the systemic coordination of important inter-organisational business activities to improve the long-term financial performance of the company and its supplier chains. (Carter & Rogers, 2008).

(f) Sustainable supply chain dimension

Researchers have conducted studies on sustainable supply chains globally. Some researches focus on the economic dimension (Braccini & Margherita, 2019), environmental dimension (Dubey *et al*., 2017), social dimension (Ahmadi, 2017; Najjar *et al.*, 2020), economy and environmental dimensions (Narimissa et al., 2020), economic and social dimension, and others combine three dimensions i.e. economic, environmental and social (Hussain, 2018; Joshi, 2022; Kot, 2018; Kumar & Goswami, 2019; Narimissa *et al.,* 2020; Pahlevan *et al.,* 2021; Sopadang *et al.,* 2017). In addition, the dimension of the food supply chain was introduced (Latino *et al.*, 2021; Mores, 2018)..

(g) Sustainable in the coconut supply chain

Sustainable supply chains for smallholder coconuts are still not a concern for the government and stakeholders. The sustainability of coconuts is determined by long-term, medium- and short-term planning. The supply chain of coconut stakeholders mainly involves farmers, collectors, and companies. The farmers can also sell to local buyers who will export abroad. The current supply chain focuses on how coconuts are sold and has not yet involved how coconut is processed into products with better economic value. The supply chain process still uses the traditional system due to infrastructure issues.

(h) Drivers and Barriers in Sustainable Supply Chain

Many previous studies have covered sustainable supply chains. In designing a sustainable supply chain, the opportunities and obstacles are identified and all related stockholders must be aware of it. The drivers and barriers studied by researchers can be seen in Figure 1. However, the obstacles faced certainly need to be resolved. Therefore, the input from the literature review was used as a basis for interviewing some selected respondents to find out the crucial drivers and barriers that need to be prioritised.

A qualitative exploratory methodology was employed to examine the practices of the coconut supply chain in Indonesia. A literature review was conducted to get references on research about drivers and barriers in the sustainable supply chain (Dey *et al.*, 2021; Govindan & Hasanagic, 2018; Jia *et al.*, 2020; Mehmood *et al.,* 2021b; Mohseni, 2022)the circular economy (CE. The identified indicators were used as questions for profound interview purposes with stakeholders. This method helps authors deeply investigate the existing supply chain sustainability drivers and barriers before the interview process. The interview approach allows respondents to communicate what is important and share their experiences and expertise. It is believed that respondents' real information and experiences can be well investigated. Firstly, implementing a sustainable supply chain differs from country to country. Secondly, qualitative research can explore the real perception of the respondent by answering what, how or why questions (Creswell, 2014). Thirdly, it enables academicians to comprehend the motives and implementation of individuals based on their experiences, emotions, and perspectives in a complex social context, economy, and environment. To obtain input from previous research, a systematic review was conducted using PRISMA (Figure 2).

The Key Words: TITLE-ABS-KEY (barrier AND Driver AND sustainability AND supply AND chain. The query identified 137 articles from Science Direct and three articles from IEEE, after identification by filtering year and journal and processing 92 articles left. In the screening phase, each article was analysed with the title, abstract, and keyword to evaluate
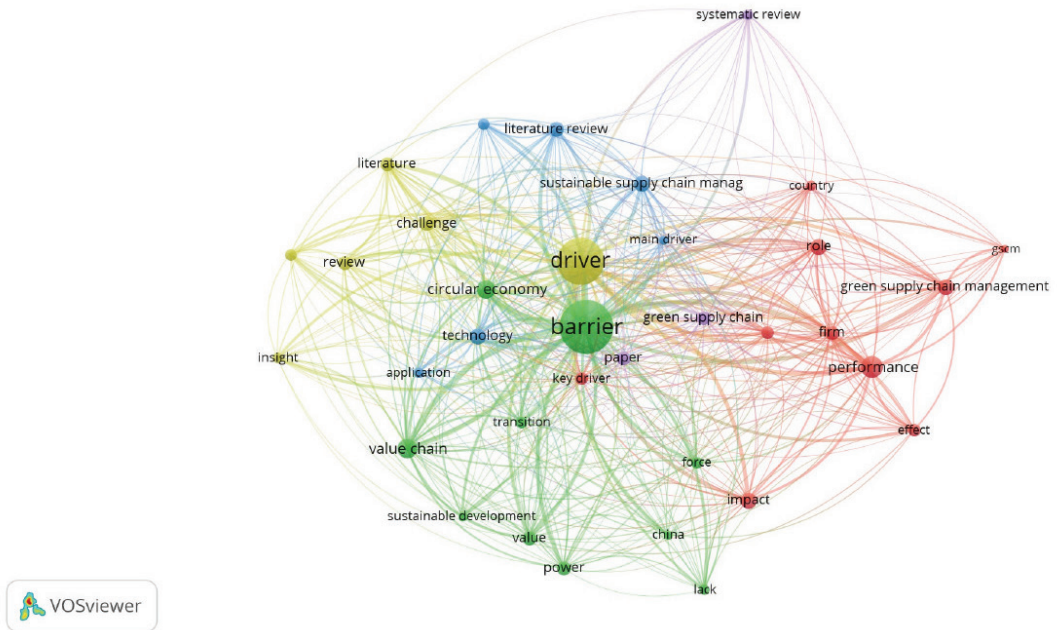
Figure 1: Drivers and barriers in the sustainable supply chain (networks)
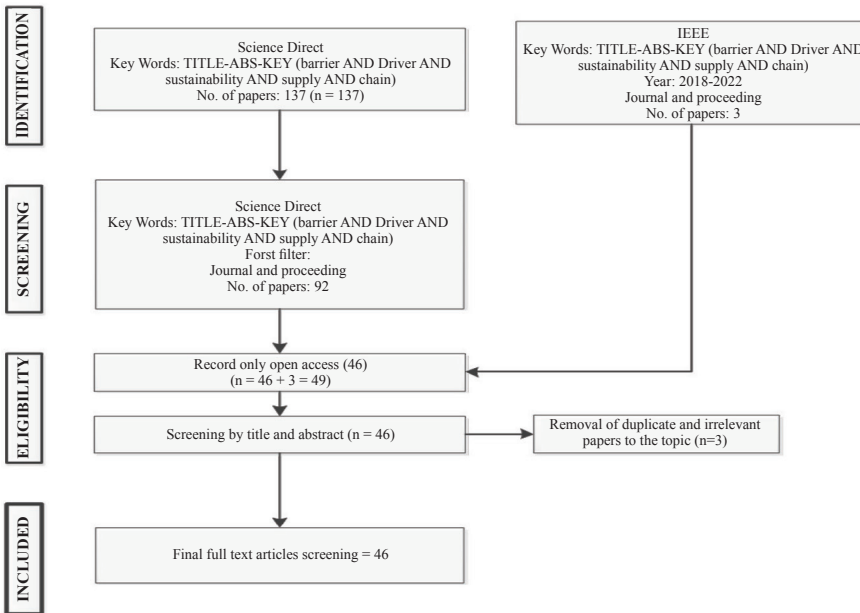Source: Developed by the author (VIOS Viewer output)

Figure 2: Systematic review process

the suitability of the topics. Open access was selected to get the full papers. A total of 46 articles passed through the eligibility phase. Of this, 46 papers were removed after reading the full texts and determined that they did not match the requirements for inclusion. A total of 46 articles are included for further analysis

Data Collection and Participant Selection

Primary data was gathered from January until September 2022. In this regard, qualitative approaches can effectively allow respondents to identify the most important indicators. The subsequent measures are taken to ensure the success of this exploratory study. Sampling and development of the interview guide, interview method and analysis were developed. There were seventeen respondents conducted for this research. The targeted respondent's criteria were more than 12 years of experience and current work related to the designation. The society introduced the shortlist of respondents and confirmed with the under-district officers. There are seven selected farmers, three collectors, three Drop Orders (DO), three local buyers, and one agro-industry officer (regulator). The participants were selected based on the determined criteria and purposive sampling.

The interview was conducted in Bahasa Indonesia and Bahasa Melayu; the interview process was recorded using a tape recorder. The researcher recorded the interview process and allowed respondents to give feedback based on the questions. The secondary information data was collected as follows: Firstly, part of the study included conducting a systematic literature review (Figure 2), document analysis, website review, and previous research on coconut and the sustainability of the agricultural supply chain. Secondly, study and documentation were used to comprehend the supply chain network. The information related to the participants, namely the Director of public relations of PT XYZ Group, the owners of direct buyers, collectors, and farmers (the owners of coconut farmlands), and government staff as a regulator.

Results and Discussion

Descriptive Analysis

A comprehensive list of all identified articles and their matched categories were collated into MS Excel files from multiple sources to simplify subsequent stages. The authors undertook many full-text reads and developed the taxonomy by classifying the articles. All comments have been stored within the text itself. Then, the summary, tabulation, and description of the primary findings were completed. The entire list of articles, associated source databases, summary and description tables, and categorisation tables were saved in MS Word, MS Excel, and Mendeley extracts.

Distribution of Papers by Year of Publication

The 46 papers identified in this paper were published between 2018 and 2022 (Figure 3). The publication number has increased from year to year from 2018 until 2022. The highest number of publications is in 2022, followed by 2021. This graphic indicates that the topic is still a hot issue and needs further research.

Geographical Distribution of Publications (continent-wise)

The majority of publications were from the United Kingdom (10), followed by Finland (6) and India (5), Spain (4), the United States (4), and the rest from other countries as shown in Figure 4.
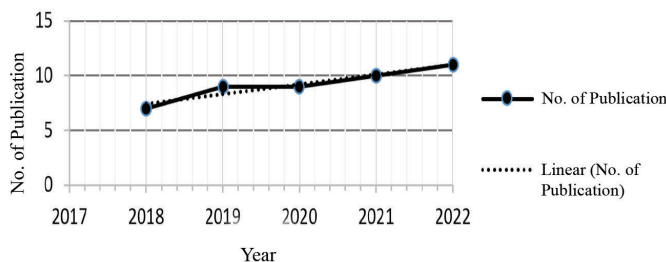
Figure 3: Papers by year of publication

Distribution of Publications by Journals

Eight papers were distributed in the Journal of Cleaner Production, which contributed the most, followed by Sustainability Switzerland (4) and articles in the IOP Conferences series material science and engineering (2), as shown in Figure 5.

Sector-wise Distribution

Of the 46 papers published, the field of engineering (22) was the most discussed sector during the five years, followed by environmental science (21), business management and accounting (17), and energy (16).
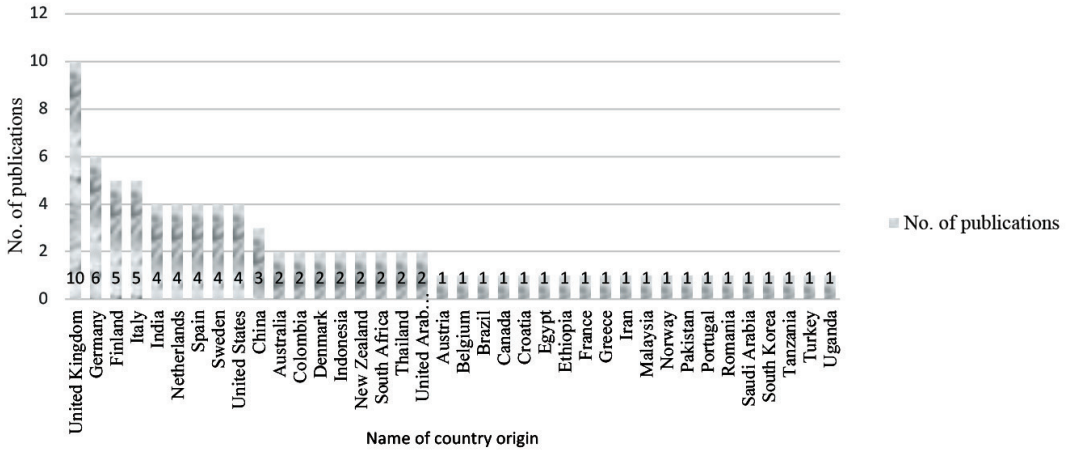
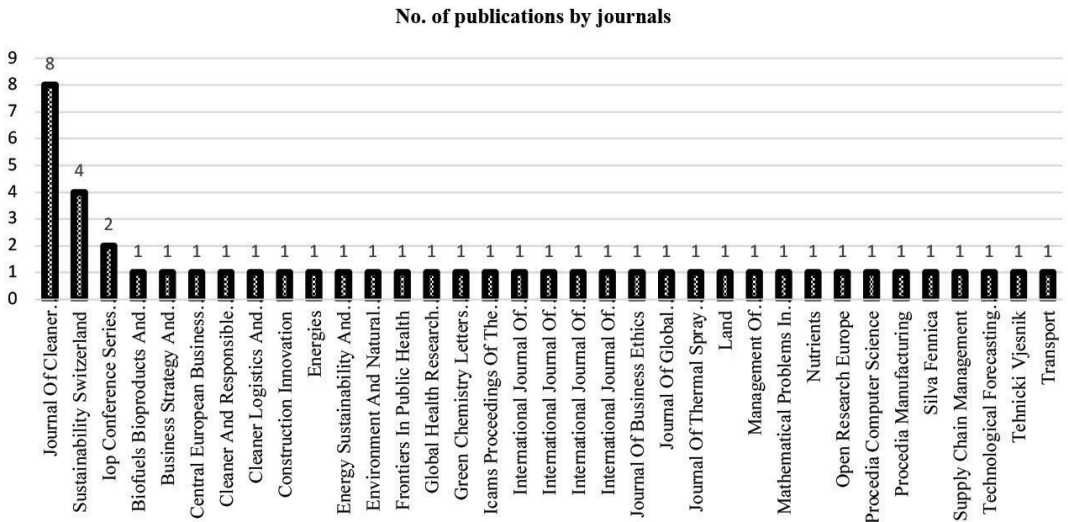Figure 4: Distribution of publications (continent-wise)

No. of publications by journals
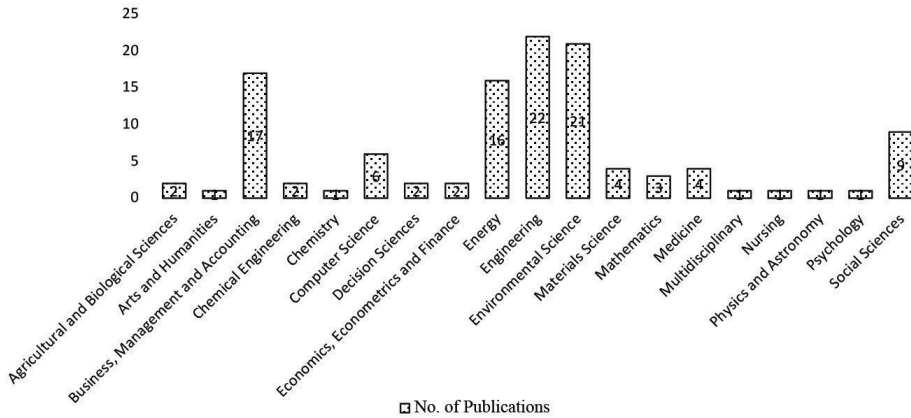
Figure 5: Publications by journals

Figure 6: Distribution of publications by subject Area

Document Type

Figure 7 shows that 78% of the papers were published as articles, and 11% were review and conference papers.

The respondents' input was filtered and shortlisted to get the main point of the interview results. The interview questions are shown in Table 1.
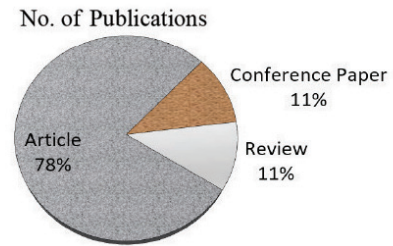

Figure 7: Document type

Table 1: Interview question

No.	Question	Respondent
1	In your opinion, what are the obstacles in doing coconut farming work (from coconut trees to selling points)?	Farmers
2	Is the sale price of coconut appropriate?	Farmers, DO, Collectors, Agro-industry, government
3	In your opinion, which of the processes of coconut is the hardest (hooking coconut, transporting, peeling, loading)	Farmers
4	What is the challenge for the coconut supply chain?	Farmers, DO, Collectors, Agro-industry, government
5	What should the government and coconut industries do for the sustainability of coconut farmers?	Farmers, DO, Collectors, Agro-industry, government
6	In your opinion, do farmers and collectors sell coconut products of the desired quality?	Agro-industry
7	In your opinion, can supply chain sustainability be applied in the coconut industry?	Farmers, DO, Collectors, Agro-industry, government
8	What do you say that the continuity of coconut raw materials lasts for a long time?	Farmers, DO, Collectors, Agro-industry, government
Etc.		

Sourced: Authors Noted: DO= Drop Order

The current coconut supply chain network still adopted the traditional supply chain flow, as shown in Figure 8. The company releases or informs the DO or farmers of the price of coconuts. Farmers sell coconuts depending on their experiences and the available infrastructure. Some farmers sell the coconut in unprocessed condition, and others sell it after some process, showing that they sell the coconut to the collector at a price determined by collectors and agribusinessmen.

The transaction process sometimes takes a little time for the seller to receive the payment. According to the stakeholders' comments, the barriers are complicated because of the many non-specific interrelationships. The processes of the coconut supply chain are:

(a) Farmer-collector-transportation-loading-local buyers-transportation-unloading-agro industry process- unloading-export

(b) Farmer-collector-transportation – loading-local buyers – export

(c) Farmer-collector-transportation-unloading-agroindustry process- unloading- export

Table 2 summarised the drivers identified from the literature, while Table 3 listed the problems faced by the coconut stakeholders based on interviews and observations. The issues the stakeholders face will undoubtedly reduce the supply chain's productivity. The transaction process sometimes takes a little time for the coconut supply chain and impacts welfare and the economy. The opportunities and challenges stakeholders face must be analysed and acted upon to increase added value to coconut sustainability.
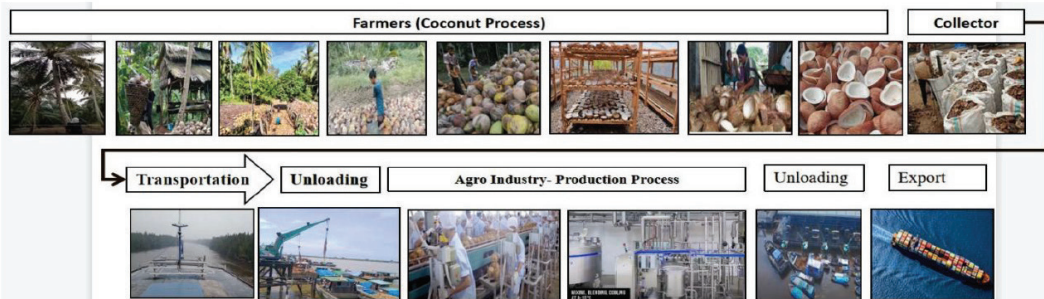
The current supply chain of coconut.
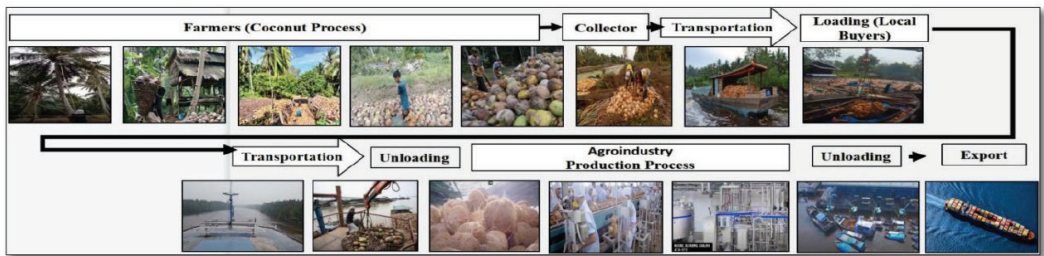
(a)

(b)

(c)

Figure 8: Current coconut supply chain (observation and interview)

Table 2: Overview of identified drivers and barriers synthesised from the literature review

References	Items Drivers	Items Barriers	Type	Research Method/How to collect data
(Tura, 2019)	**Environmental:** - Global movement to decrease negative environmental impacts - Scarce resources **Economic:** - Cost savings - Potential to create value from waste and production side streams - Potential for the establishment of new service businesses **Social:** - Growing awareness of sustainability needs - Increased external sustainability demand - Societal development projects - Sustainable development **Institutional:** - Directing laws and regulations - Create a demand for new solutions, - ISO-standard development **Technological and informational:** - Emerging process technologies aid CE business. - New services are enabled through improved information sharing and management. - Improve clarity and efficiency.	**Economic** - High initial investment costs - Scarcity of raw materials, assets, or infrastructure - The dominance of economic indicators in decision-making **Social** - Region-specific and (local) cultures hamper the implementation of new solutions - Conservativeness in business practices (e.g., waste management industry) - Societal **Institutional** - Region-specific laws and regulations against CE solutions - Conflicts of interest and fluctuations in taxes and governmental subsidies - high future uncertainty **Technological and informational** - Observed barriers Increased technical difficulty in handling CE material flows. - Lower homogeneity of raw material - Lack of compatible technologies and high technological - Uncertainty - Lack of practices and systems for collecting, sharing, and utilising - CE information	4 Company qualitative and exploratory	qualitative and exploratory,

Author	Drivers / Benefits	Barriers / Challenges	Context	Method
(Balasubramanian, 2020)	**Supply chain:** - Increasing the transparency of the supply chain - Increased availability of knowledge and technological resources through collaboration **Organisational** - company brand organisational structure strategy and culture to support the development of skills and capabilities for flexible decision-making and product/service development models	**Supply chain:** - Conflict of interest, values, and modes of operation between different Stakeholders - No clear responsibilities and ownership in CE projects - Validating and verifying all environmental effects is a challenge for transparency and analytics **Organisational** - Incompatibility Conflicts with existing business culture with existing (linear) operations and development targets	Compare small and big company	structured survey and structured interviews
(Dijkstra, 2020)	- Maintaining competitive advantage. - Accessing green customers - Collaborating with stakeholders and generating productivity gains **External** - Stakeholder pressure (supply chain) - NGO pressure - Consumer Pressure **Internal** - Environmental Commitment - Business benefits	**External** - External environmental barriers - Shortage of environmental professionals - Shortage of local environmental/ green suppliers **Internal** - Internal environmental barriers - High cost of implementation - Lack of knowledge and awareness - high costs, the complexity of new systems, supply chain lock-in, and low customer buy-in	Plastic companies	reviews
(Mohseni, 2022)	- Government development of AFSC legislation and policies - Joint efforts and cooperation of suppliers for AFSC planning - Producing sustainable products as a competitive advantage - Encourage and support nongovernmental and eco-friendly organisations	- Lack of understanding and awareness of managers about the agro-food supply chain (AFSC) - Performance appraisal problems in AFSC - Lack of expert staff in sustainable AFSC - High cost of deployment sustainable SC - Lack of government oversight and control	Food supply chain	Survey literature and interview

(Samper *et al.*, 2022)	General	- Inefficient of transparency, - security and cooperation in the use of data, - high research and development costs, - limited organisational culture and policies, - manifested in the lack of awareness of employees and actors in the chain, - The low-level resources, inadequate public policies, and lack of financial support inhibit their proper implementation. - Lack of transparency, - lack of financial support	- public policies that facilitate their development, - financial support for digital infrastructure, - and cultural aspects in organisations	- High cost of deployment sustainable SC - Consumer distrust of "green products" and "organic products" labels - Informing the community through the media - Entering the global market and exporting sustainable products	Bibliometric and Systematic Literature Review

Source: developed by the author based on literature review.

Barriers and Drivers

Many studies were conducted to identify the most influential drivers in the agro-food supply chain. Mehmood *et al.* (2021a) identified the highest drivers as environmental protection, followed by policy, economy, and financial benefit before social factors, product development, innovative solutions, and health.

On the other hand, the Ranking of barriers to sustainable practices in the Brazilian Coffee Supply Chain was identified as lack of government support, financial costs and lack of resources, high complexity, mindset, cultural changes, communication gaps and inadequate collaboration between parts (Medeiros *et al.*, 2022). This theme encompasses drivers such as rules and regulations concerning product recycling and economic growth and any government action mandating implementing a sustainable approach. Government authorities have activated rules and regulations in several nations to encourage cleaner production, consumption, and end-of-life management to safeguard resources, safety, and health(Govindan & Hasanagic, 2018). Implementation of sustainability in the Agro-food Supply Chain (AFSC) could enhance long-term revenue generation through recycling activities. Moreover, by providing credits and loans, the government can support enterprises transitioning from linear to CE pathways (Chauhan *et al.*, 2021).

To identify barriers and enablers (facilitators) of supply chain sustainability from the viewpoint of the coconut stakeholders, this research referred to the elements reported by Medeiros *et al.* (2022). Specifically, the top five are social well-being/social responsibility, Economic/productivity performance/improvement, innovation business model, Regulations and Competitive advantage/opportunity. Identification of drivers and barriers was found from the interview with the coconut supply chain stakeholders as shown in Table 3.

Table 3: Barriers from Stakeholders of Coconut

Code	Barriers	Farmers	DO	Collector	Local Buyers	Agro Industries	Government	Explanation	References of barriers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
B01	Quality Issues	*	*	*	*	*	*	All stakeholders	Int
B02	Lack of government support	*	-	*	*	*	-	Points 3 and 7 do not mention	LR & Int
B03	Lack of tools and technology	*	-	-	*	-	*	Points 3,4 and 6 do not mention	LR & Int
B04	Lack of financial and resources	-	*	*	*	*	*	Point 2 does not mention	LR & Int
B05	Mindset/cultural changes	*	*	*	*	*	*	All stakeholders	Int
B06	Lack of awareness & knowledge	*	*	*	*	*	*	All stakeholders	LR & Int
B07	Lack of commitment to sustainability	*	*	*	*	*	*	All stakeholders	LR & Int
B08	Lack of training and experience	*	*	-	*	*	*	Point 4 does not mention	LR & Int
B09	Policies & Regulations	*	*	*	*	*	*	All stakeholders	LR & Int
B10	Lack of innovation & research	*	*	*	*	*	*	All stakeholders	LR & Int
B11	Lack of infrastructure	*	*	*	*	*	*	All stakeholders	Int
B12	Resistance to Change	*	*	*	*	*	*	All stakeholders	LR & Int
B13	Uncertainty of demand	*	*	*	*	*	*	All stakeholders	Int
B14	Uncertainty of price	*	*	*	*	*	*	All stakeholders	Int
B15	Unsupported workers	*	-	*	*	*	*	Point 3 does not mention	LR & Int
B16	Conflict of interests	*	*	*	*	*	*	All stakeholders	Int
B17	Cost pressure	*	*	*	*	*	*	All stakeholders	Int
B18	Lack of organisational commitment to sustainability	*	*	*	*	*	*	All stakeholders	LR & Int
B19	Lack of availability of land	-	*	*	*	*	*	Point 2 does not mention	Int

Source: developed by the author combined with the author (Interview result)
LR: Literature Review, Int: Interview, *: Mention issue in an interview, -: Not mention the issue in an interview

Of the 19 obstacles shown, six barriers, namely code B02, B03, B04, B08, B015, and B019, were not 100% agreed by all stakeholders as elements that affect the supply chain business.

The prior review of relevant literature supports this result, and some authors considered quality, price, government support, and mindset to be crucial factors that encourage supply chain practices to achieve sustainability. These barriers become stakeholders' concerns and attention. The respondents' response to the drivers of coconut supply chain sustainability is summarised in Table 4.

It can be seen that all 15 drivers supported the adoption of sustainable practices.

Discussion

This research explores stakeholders' opinions on the coconut supply chain sustainability practice. The study is different from the previous ones for three main reasons. Firstly, some earlier studies do not consider all three factors, economic, environmental and social (Popovic, 2018) dimensions of sustainability, whereas the present study considers all these three dimensions in one (Papilo *et al.*, 2018; León-Bravo, 2021). Secondly, most of the research was conducted in developed countries. This study takes an integrated approach and explores the causal relationships among the drivers of sustainability and sustainable supply chain practice in the developing nation of Indonesia. Thirdly, the case study was conducted in a remote area. From the supply chain flow, as seen in Figure 8, it can be observed that the supply chain is ineffective and inefficient in terms of time, cost, and environment. The coconut process, which flows from coconut farmland to producers, takes a lot of time and involves many different methods. By selling only raw coconut, the economic value obtained is unstable, and the prices are lower. Therefore, there is a need for value-added coconut products to enhance the economy and profit.

The demand for coconut oil is continuously increasing. The growing market for the product has created export opportunities for coconut-producing countries, specifically Indonesia. Members of the supply chain for this coconut flesh processing unit consist of farmers, collectors, and intermediary traders, who process agro-industry and distribute to consumers. Farmers are the leading suppliers, while the shortage of materials for processing capacity is caused by collecting traders and/or intermediary traders from outside the central area. Processing agro-industry is a unit that transforms raw materials into desired products. This integrated coconut agro-industry was developed with a coconut processing unit that produces coconut oil. Coconut supplied by farmers will be directly processed or stored in the raw material storage warehouse before the transformation process is carried out. The resulting product is then stored in a product storage warehouse before being distributed to consumers. The by-products of the process are coconut water, coconut fibre, and coconut shell, which will be accommodated in a storage warehouse for further distribution to other processing units.

This research has successfully identified the challenges and opportunities of implementing sustainable supply chains in the coconut industry based on actual stakeholder input and the current coconut supply chain. The chance to make the coconut industry grow up is possible.

Table 3 shows that from the identified 19 barriers, there are 6 barriers were not found in the literature (31.58%) but were mentioned in interviews, namely B01, B05, B011, B013, B014, and B019, while 68.42% barriers were found in both in literature and interview.

Table 4 indicates that of the 15 drivers identified, 2 drivers (13.4%) were not mentioned during stakeholders' interviews (D14 and D15). The literature and interview mentioned 86.6% of the drivers (D01-D013). The study by Medeiros et al. (2022) compared 12 drivers and 13 barriers.

The findings indicate that the drivers and barriers of the supply chain toward sustainability still have a gap to be discussed and determined, especially for the coconut supply chain in

Table 4: Drivers from stack-holders of coconut

Code	Barriers	Farmers	DO	Collector	Local Buyers	Agro Industries	Government	Explanation	References of drivers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
D01	Education & Awareness	*	*	*	*	*	*	All stakeholders	LR & Int
D02	Fair Trade Practices	*	*	*	*	*	*	All stakeholders	LR & Int
D03	Innovation & Technological Advancement	*	*	*	*	*	*	All stakeholders	LR & Int
D04	Open Communication & Information Sharing	*	*	*	*	*	*	All stakeholders	LR & Int
D05	Stakeholders' influence	*	*	*	*	*	*	All stakeholders	LR & Int
D06	Human Resources Management and Development	*	*	*	*	*	*	All stakeholders	LR & Int
D07	Innovation & Technological Advancements	*	*	*	*	*	*	All stakeholders	LR & Int
D08	Open Communication & Information Sharing	*	*	*	*	*	*	All stakeholders	LR & Int
D09	Organisational Culture & Strategy	*	*	*	*	*	*	All stakeholders	LR & Int
D10	Policies & Regulations	*	*	*	*	*	*	All stakeholders	LR & Int
D11	Stakeholders' Partnerships & Collaboration	*	*	*	*	*	*	All stakeholders	LR & Int
D12	Workplace Improvements	*	*	*	*	*	*	All stakeholders	LR & Int
D13	Supply chain collaboration	*	*	*	*	*	*	All stakeholders	LR & Int
D14	Creating value from waste and production	*	*	*	*	*	*	All stakeholders	LR
D15	Transparency and efficient processes	*	*	*	*	*	*	All stakeholders	LR

Source: From the literature review and combined with the author (Interview result)

LR: Literature Review, Int: Interview *: Mention issue in an interview, -: Not mention the issue in an interview

developing countries. The respondent still has an opportunity to express their experiences and knowledge to make the sustainable supply chain can be implemented.

Conclusions

This exploratory study of the coconut sustainable supply chain has been conducted using systematic literature analysis and interviews involving stakeholders in the coconut supply chain. Fifteen drivers and nineteen barriers from the most common supply chain elements were investigated. To function sustainably at an acceptable level, the drivers and obstacles listed highlight the areas that must be prioritised and significantly improved. Setting priorities will enable stakeholders to concentrate their efforts and resources on the most critical areas. The coconut stakeholders prioritised 15 drivers and 19 barriers for sustainability implementation.

Limitation

Future Research and Direction

The research has focused on the coconut supply chain in Indonesia, which is located in the most significant coconut production in the world. The same instrument can be applied to more organisations and compared to the present study to show similarities and differences across companies of various sizes. The method used in this research was an exploratory study using interviews combined with review papers. It also involved collecting data from many companies. This study highlights stakeholders' sustainability indicators, although it contains weaknesses that could be addressed in future research. It uses questionnaires and interviews to learn more about the real condition. The research can be compared with other countries.

Implication

This study proves that the coconut sustainable supply chain is complicated and depends on future events, drivers, and implementation obstacles. It calls for further detailed analysis.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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