

Analyzing the Impact of the Covid-19 Pandemic on the Indonesian Briquette Industry Performance

Syarif Hadiwijaya^a, Ferly Norman^{a,*}, Fergyanto E. Gunawan^a

^a Industrial Engineering Department, Binus Graduate Program, Bina Nusantara University, Jakarta, 11480, Indonesia

Corresponding author: *ferly.norman@binus.ac.id

Abstract— This study intends to analyze the impact of COVID-19 on the briquette industry in Indonesia and provide recommendations for mitigating problems that arise. To the best of the authors' knowledge, this kind of topic has not been studied yet. The research method used a questionnaire to briquette business actors and interviews with the management of the Indonesian Coconut Charcoal Entrepreneurs Association (PERPAKI). Respondents received 24 questions encompassing seven dimensions according to their situation. The results of the questionnaire were then analyzed using descriptive qualitative statistics. The study results show that 29% of business operators experienced contract cancellations, 38% experienced temporary closings, and 59% experienced decreased sales. In addition, 97% of business operators experience supply chain disruption due to scarcity of raw materials; the farmers prefer to sell fresh coconuts for export rather than processing them domestically. Lower domestic prices for Copra caused it as the main derivative product and higher prices for fresh Coconut and Coconut Shell Charcoal (CSC) for export due to increased global market demand. For the mitigation and recovery of briquette companies from the impact of the Covid-19 pandemic, the authors recommend three strategic agendas. In the short term, focus on solving shortages of raw materials and improving the Company's cash flow. In the medium term, focus on pioneering the development of supply chains and the national briquette business ecosystem. The last is long-term, focus on improving product quality and the performance of the national briquette industry to make it better and more efficient in a sustainable manner.

Keywords— Pandemic COVID-19; briquettes; coconut; supply chain.

Manuscript received 4 Dec. 2020; revised 6 May 2021; accepted 24 Jun. 2021. Date of publication 31 Oct. 2021.
IJASEIT is licensed under a Creative Commons Attribution-Share Alike 4.0 International License.



I. INTRODUCTION

As a tropical country, Indonesia has high production potential coconut. Coconut plants are widespread both in the yard and plantations in almost all parts of Indonesia. Coconut area in 2018 reached 3,417,951 hectares, of which approximately 99% or an area of 3,385,085 hectares cultivated by small farmers (smallholder plantations) cultivated in monoculture or intercropping with other plants involves about three fruits million farmer households [1]. Indonesia should utilize coconut processed products as a source of food, medicine [2], and alternative energy with such excellent prospects. As a plentiful renewable energy source, bioenergy greatly contributes to increasing energy diversity and reducing carbon emissions [3].

The community rarely develops coconut derivative products with high economic value and are coconut shells. Shells are solid waste from processed coconut, which has been taken by meat to get Copra. Shells are generally used for

fuel, household purposes, or crafts. It can be used as raw material for CSC and activated carbon. Charcoal from shells can be further processed into briquettes (see Fig. 1), which have a more attractive appearance and packaging and have high economic value to be used as daily alternative energy. Shell waste that is sold directly without processing has a price range of IDR1,000-1,500 per kg. On the other hand, the processed shells CSC are sold at IDR6,500 per kg. As for the briquette product, the selling price is higher at IDR20,000 per kg.

Charcoal briquettes have an economic advantage because they can be produced in a simple process, having high heat value and readily available raw materials for the whole year, for different uses outside agricultural areas, enabling them to compete with other types of fuels [3]. When charcoal briquette is burned, it produces a small amount of smoke. However, briquette charcoal has better quality than traditional charcoal, which is widely used for cooking purposes. Briquettes are one of the compaction technologies in the densification category.

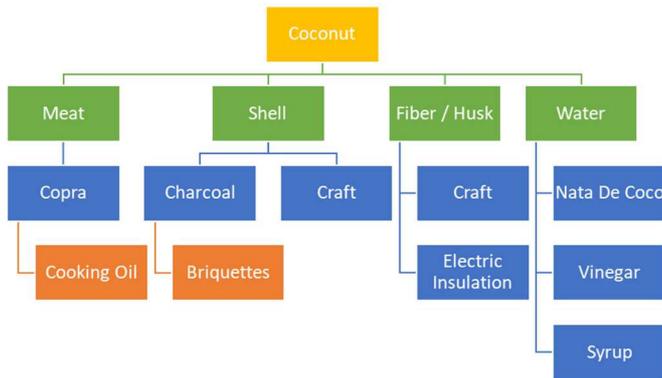


Fig. 1 Coconut and several derivative products

Based on data from the Central Statistics Agency processed by the Directorate General of Estate, Ministry of Agriculture in 2018, CSC exports amounting to 200,229 tons with an export value of USD155,655,760. Indonesian CSC products are mainly exported to China, Iraq, Saudi Arabia, Sri Lanka, Malaysia, Lebanon, Jordan, Vietnam, India, Brazil, the US, Japan, and Turkey [1].

COVID-19 was first reported in late 2019 in Wuhan, China. By September 15, 2020, over 29 million people were infected, and approximately 927,000 people had died. The COVID-19 pandemic has created significant uncertainty in all areas of life, supply chains (SC) in particular. SCs experience unprecedented vulnerabilities in lead times and order quantities, disruptions in network structures, and severe demand fluctuations [5].

The COVID-19 pandemic outbreak is an event with a significant global impact in a short period. Although supply chains (SC) across the globe have been already suffering from epidemics and pandemics, they have recently been seriously hit by an unprecedented, far-reaching disruptive epidemic outbreak, namely COVID-19 [6]. The COVID-19 is considered as a new type of highly contagious coronavirus, with destructive impacts [7].

A. Disruption SC solvable with the mixed term

Lesson learns from massive disruption supply-chain due to disaster in Japan shows that those sorts of problems are solvable with the right interventions. A Japanese technology manufacturer's experience in recovering from the 2011 Tohoku earthquake, tsunami, and nuclear disaster illustrates the critical elements. Many technology companies near the earthquake's epicenter applied a mix of short- and mid-to-long-term responses that allowed it to restore all production within a month while building flexibility and resilience against further shocks [8].

In the short term, the priority for technology companies today is to restart and ramp up production. The first step is building a central "nerve center" to create the transparency required for agile decision-making and oversee the implementation of strategic and tactical actions. They convert the nerve center into a midterm risk-management process in the medium term, with business continuity regularly tested to build a more resilient supply chain. Furthermore, the companies invest in two interconnected, longer-term supply-chain realignments in the long term: managing supply-chain-footprint risk while increasing supply-chain-planning agility.

B. SC's Focus Under Epidemic Outbreaks

One paper performing a systematic literature review related to the operation and supply chain management (OSCM) under pandemics and epidemic outbreaks has an emerging research agenda on OSCM under pandemics and epidemic outbreaks Fig 2 [9]. Those are five research agendas as follows. The first is preparedness and pre-allocation of resources and emergency distribution planning. The second is the digital focus, related to cutting-edge technologies like blockchain and AI techniques for improved response traceability.

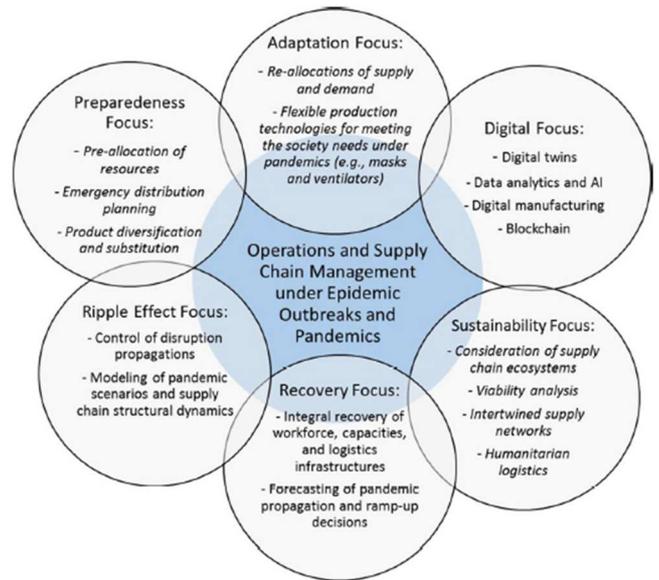


Fig. 2 Emerging research agenda on OSCM under pandemics and epidemic outbreaks (Queiroz et al., [9]).

It is fundamental to provide robust, resilient supply chain (SC) models. The third is the adaptation and recovery of the focus. Managers and practitioners need to monitor SCs continuously, as no stage of epidemics' impacts should be left unturned before any recovery plan is implemented correctly and managed. Therefore, the OSCM should operate from the resilience perspective. The fourth is the aspect of the ripple effects.

According to Dolgui *et al.* [10], the ripple effect "refers to structural dynamics and describes a downstream propagation of the downscaling in demand fulfillment in the supply chain as a result of a severe disruption." These definitions imply that the ripple effect refers to multi-stage networks and triggering failures in the network elements as a domino effect.

Finally, the fifth is the sustainability aspect. It builds around consideration of SC ecosystems and viability. An SC can be considered viable if it can maintain itself and an ecosystem balance. Intertwined supply networks (ISN), i.e., "the entirety of interconnected supply chains which, in their integrity secure the provision of society and markets with goods and services."

C. Research Question

The impact of the Covid-19 pandemic has also been felt by 40 companies that are members of PERPAKI. From a quick internal phone survey in June 2020, more than 50% of companies experienced severe impact. There has been a decrease in production capacity until the temporary closure, reducing working hours to terminating employment [11].

In this study, the authors attempted to elaborate on PERPAKI's internal survey by asking two research questions. What impact will the COVID-19 pandemic have on the briquette industry in Indonesia? What are the recommendations to mitigate the pandemic impact and recover the briquette industry?

II. MATERIALS AND METHOD

This study used a research framework, as shown in Fig. 3, starting with setting a research topic, reviewing literature related to SC disruption under pandemic, and designing a research methodology to conduct the study. Then created a questionnaire, distributed it to respondents, and analyzed the incoming data.

In order to get an inside from business actors regarding SC disruption caused by the Covid-19 pandemic, the authors conducted in-depth interviews with five briquette entrepreneurs. All data from questionnaires, interviews, and other sources were re-analyzed, then concluded the critical problem and made recommendations based on the chosen literature approach.

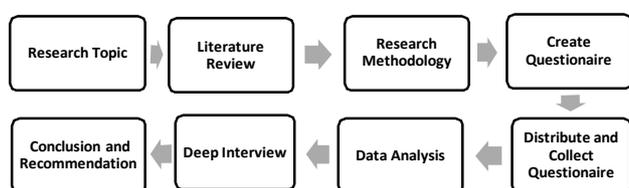


Fig. 3 Research framework

The sampling technique in this study used the Slovin formula to determine the minimum number of representatives of the entire population from a particular area [12]. The number of briquette industry companies in Indonesia that are members of the PERPAKI total of 40 companies throughout Indonesia. For the population size (N), the recommended sample size (n) is 28.57 based on the formula $n = N / (1 + Ne^2)$ at the precision level of 10%.

Based on the rounding of the calculation results above, the minimum number of respondents is 29 people. Then the questionnaires were distributed using the Google forms link to facilitate data collection.

There are 22 questions adopted from a study done by the Department of Economic Research and Regional Cooperation of the Asian Development Bank with the title "The Impact of Covid-19 on Micro, Small and Medium Enterprises in Indonesia: Results of a Quick Survey" [13]. The list of questions in the ADB study is the primary reference for measuring the impact of the COVID-19 pandemic on the performance of the briquette industry in Indonesia (questions number 1 - 22).

The reasons for the adoption of the ADB study for the questionnaire were the following. It was conducted by a credible and trusted international organization, namely ADB, which has become one of the most trusted information for government officials.

The study was relatively recent conducted on April 17-May 22, and the full report was released in June 2020. The respondents are relatively the same in terms of company size,

involving small and medium-sized companies, which are also the primary profile of briquette companies in Indonesia.

For question number 22 (Policy expectations from stakeholders), respondents were asked 21 policies expected from the Government or financial institutions during this pandemic and gave weight to each of these policies using a 5-points Likert scale (1 - Strongly disagree and 5 - Strongly agree).

The Likert scale is commonly used in survey research using primary and secondary data to measure the respondent's attitude by asking how they agree or disagree with a particular question [14].

TABLE I
QUESTIONNAIRE

Pillar	No	Question
Company Demography	1	Company size by total employee
	2	Company location by province
	3	How many years has the Company been established
	4	Company category based on revenue
	5	Market destination
	6	Export destination
	7	Direct Customer
	8	Raw material source
Supply Chain Condition	9	Experiencing delivery delays in product
	10	Experiencing disruption of production or supply chain
	11	Contract Cancellation
	12	Temporary closure of the Company
Sales and Revenue Condition	13	Sales condition
	14	Revenue condition
Working Condition	15	Job opportunities condition
	16	Working time condition
	17	Payrolls condition
Financial and Business Condition	18	Financial condition
	19	Funding condition
Expected Policy	20	Business condition
	21	Actions considered
Proposal for Industry and Association Improvement	22	Expected policies from the stakeholders
	23	Proposals to improve the briquette industry in the future
	24	Proposals to improve the briquette entrepreneurs association in the future

Then the answers are ranked from largest to smallest based on the total number of answers strongly agree and agree. Then some key policies are chosen in which respondents vote strongly agree and agree with at least 80% aggregate.

For a more comprehensive study, the authors added two questions (numbers 23 and 24) to find out: a. What policies or efforts are taken to increase the export of the Indonesian briquette industry in the future, what the respondents expect to the role and function of PERPAKI as an association. b. The theme of each question is shown in Table 1.

III. RESULTS AND DISCUSSION

A. Respondents Demography

The questionnaire was distributed to 40 respondents of PERPAKI members in October 2020. The number of respondents who filled out the survey was 34 respondents (85% response rate) with demographics as Table II.

TABLE II
COMPANY DEMOGRAPHY

Company Size by Total Employee	
Small (5-19)	9%
Medium (20-99)	59%
Big (> 100)	32%
Company Location by Province	
Central Java	55,9%
West Java	23,5%
East Java	5,9%
West Kalimantan	5,9%
North Sulawesi	5,9%
Jakarta	2,9%
How many years has the Company been established	
< 5 years	50%
5 - 10 years	41%
> 10 years	9%
Company Revenue	(Rp billions/ month)
< 1	44%
1-5	44%
>5	12%
Market Destination	
Local only	3%
Export only	71%
Both	26%
Export Destination	
Europe	70,6%
Asia	61,8%
America	52,9%
Australia	14,7%
Africa	11,8%
Direct Customer	
Foreign Trader	94,1%
Local Trader	20,6%
Raw Material Source	
Supplier	82,4%
Farmer	44,1%
Own Plantation	5,9%

The majority of the respondent came from medium-sized companies (59%), located in Java Island (88.2%), companies established for up to 10 years (91%), companies with revenue less than IDR 5 billion per month (88%), companies with the export destinations of Europe, Asia, and America continent, companies with the foreign trader as their direct primary customer (94.1%), and companies with raw material from supplier or trader (82.4%). Just 44% of respondents sourced raw material directly to coconut farmers, and only 5,9% has own coconut estate. For questions 5-7, the respondents can answer more than one selection.

B. Supply Chain Condition

The main finding in this section is that respondents have had an enormous impact of the Covid-19 pandemic on their operations, most notably the scarcity of raw materials. This situation caused them to postpone product delivery to close the Company temporarily. From the data, we conclude: Respondents were constrained by delays in products (88%);

Experienced disturbances due to scarcity of raw materials (97%); Respondents experienced contract cancellation (29%); Experienced temporary company closures (38%).

C. Sales and Revenue Condition

In aggregate, respondents experienced decreased sales and revenue by 59% and 53%, respectively. There was no change in sales and revenue by 6% and 21% and increased sales and revenue by 36% and 26%, respectively (see Fig. 4 and 5). The data above shows that most companies experienced a decrease in sales and revenue. However, on the other hand, there were also briquette companies that experienced an increase in sales and revenue by 36% and 26%, respectively.

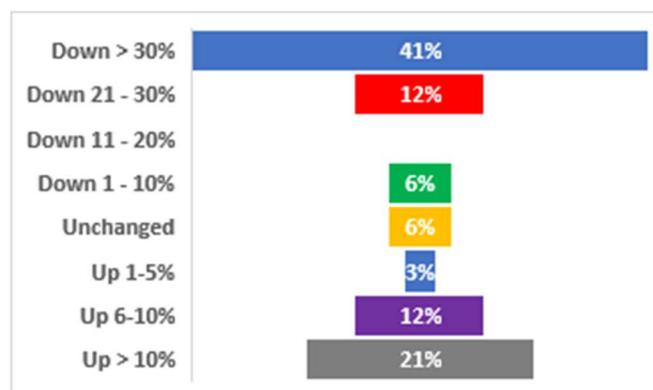


Fig. 4 Sales Condition on June-July 2020 Period

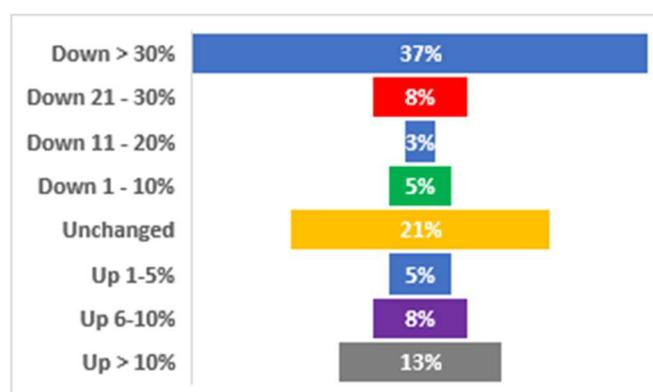


Fig. 5 Revenue Condition on June-July 2020 Period

In conclusion, even though there was a disturbance in the SC system during a pandemic, briquette companies experienced the increased sales and revenue. This unique situation can be happened due to a shortage of raw materials from the second (Philippines) and third (India) coconut producing countries in the world due to the national lockdown policies from March until the current time [15], [16].

In 2018, Indonesia was the largest coconut producer globally, accounting for around 18.55 million metric tons, followed by the Philippines with around 14.32 million metric tons, and India in third place with around 11.71 million metric tons of global production volume [17]. The shortage of raw materials in the Philippines and India triggered an increase in global demand for coconut and its derivative products such as CSC and briquettes from Indonesia. From the data, the coconut and CSC export volume until Q3 2020 is increased sharply compared to the past year. Coconut and CSC volume export until September 2020 was equivalent with 162% and

89% respectively the whole year 2019 volume [18]. This surge in demand also made product prices rise as well. Compared to last year, the price per kg of coconut and CSC in Q3 2020 had increased by 12% and 17%, respectively [18].

D. Working Condition

The respondents reported a substantial disruption in the working conditions due to the scarcity of raw materials impacting many company operations. As a result, 44% of respondents reduced the number of employees, 59% reduced the working time, and 32% reduced the salary paid.

E. Financial and Business Condition

As expected, the disruption in the SC and operations of companies also affects their finances. Many briquette companies have limited access to financial institutions. Only 53% of companies have savings, current assets, and other sudden budgets to survive, but 35% of companies have no cash or run out within one month. In this part of the question, the respondent may choose more than one answer.

For sustaining the business, the briquette industry relies more on internal sources of funding (70.6%), borrowing from family or friends (20.6%), and obtaining financial support from business partners (14.7%). While access to informal financial services is relatively limited, only 5.9% of companies get loans from banks for working capital. In general, the business conditions of the briquette companies, 82% experienced production, supply chain, or business network disruption, and 26.5% experienced a lack of working capital to maintain or restart a business.

F. Expected Policy

The top three measures considered by respondents during the COVID-19 pandemic were the tax holiday by the Government provides tax delays (44.1%), the delayed debt payment to the financial institutions (35.3%), and the reduction of the number of employees (26.5%). The respondents were asked to assess 21 types of policies expected by stakeholders on a 5-points Likert scale. The goal is that companies can survive the crisis due to the Covid-19 pandemic. Here are the top six policies expected as follows. A total of 91% of respondents strongly agreed and agreed with the interest-free loan policy. A total of 85% strongly agreed and agreed with tax relief, tax deferral, or tax reduction policies.

A total of 85% strongly agreed and agreed with the Government to establish a one-stop service institution for briquette export services. A total of 85% strongly agreed and agreed to provide subsidies for business recovery such as cash transfers or grants. A total of 85% strongly agreed and agreed with the comprehensive information platform for government assistance programs. A total of 80% strongly agree and agree with the Government to provide support to the upstream sector, namely coconut farmers as producers of raw briquettes.

G. Proposal for Future Briquette Industry

Our proposals for the future of the briquette industry are the following. The first is for the Government, regulators, and policymakers. They should issue regulations to restrict coconut exports and CSCs, forbid foreign nationals to invest in briquette factories in Indonesia (included in the negative

investment list), and facilitate and make the export of the product easier.

The second is related to the improvement of the product quality and establishing a national supply chain by developing product quality standardization (SNI), building a system to ensure the availability of raw materials, forming a marketing consortium, and doing direct sales abroad to increase the bargaining power of entrepreneurs in front of buyers.

The third is by improving the business ecosystem involving businesspeople who expect an association to be solid in uniforming the provisions in the coconut industry from upstream to downstream and synergize with the Government both at the district to the central level and to regulate the ceiling price for CSC.

H. Proposal for Role and Function of Association

From the submitted proposals, the respondents show high expectations of the future roles and functions of the association. Therefore, the authors divide those roles and functions into four categories as follows.

First, the association should strengthen the organizational functions to external parties to bridge the PERPAKI association with the Government in terms of policies and regulations, synergize with other associations such as suppliers of raw materials, shipping services, and others. Second, the association should help companies improve product quality and the national supply chain, become a forum for information and technology exchange, standardize raw material prices and standardize quality. Third, the association should facilitate business units in improving sales and marketing strategies, forming a direct sales consortium, having a special financial team, and standardizing export prices.

I. Interview with briquette entrepreneurs:

To understand the pandemic's effects on businesspeople in the briquette industry, authors conducted in-depth interviews online with five entrepreneurs with different demography, as shown in Table III.

TABLE III
COMPANY DEMOGRAPHY OF THE BUSINESS ACTORS IN THE ONLINE INTERVIEW

Entrepreneur	Companies Demography		
	Location	Size	Long Established
A	West Java	Big	< 5 years
B	West Java	Medium	5-10 years
C	Central Java	Big	5-10 years
D	Central Java	Small	< 5 years
E	West Java	Big	< 5 years

From the interview, we identify the following main problems. Raw materials from suppliers have been drastically reduced, thus disrupting company productivity. Sales during the pandemic have increased up to 50%, but producers cannot absorb this demand due to scarcity of raw materials. Businesspeople have been relying on finances and funding themselves, their families, and business partners. However, only a few get funds from banks because not all businesspeople have bankable assets, and the risk of bad credit is still a big concern for business actors. The businesspeople expect Government and banks to regulate

export restrictions for coconut, to facilitate another dialogue with the coconut farmer association to find equitable joint solutions, and to relieve, delay or reduce corporate tax payments due to during this pandemic production capacity decreased. At the same time, the burden remained (disrupted financial circulation).

J. Study Summary

Overall, the business conditions of briquette companies were affected by the Covid-19 pandemic, including 82% experienced disruption in production, supply chains, and business networks mainly due to shortages of raw materials. Furthermore, 59% of respondents acknowledged that sales had decreased, 29% experienced contract cancellations, 38% temporarily closed their companies, and 35% of companies had no cash or would run out within one month.

Using the framework from Queiroz et al. [9], the authors conclude that three focus problems occur due to the Covid-19 pandemic. The first is sustainability. The SC briquette company is very fragile, as the downstream side cannot secure the supply of raw materials from upstream (97% of respondents experienced disturbances due to scarcity of raw materials). Only 5.9% of respondents own their estate, and most respondents highly depend on intermediate traders to buy raw materials.

In securing raw materials, there is no strategic partnership between briquette business actors and coconut farmer groups. The second is digital technology. The briquette companies still operate traditionally and separately, not in a network. Therefore, no adoption of information technology is used to form a transparent, flexible, agile, and efficient supply chain.

The third is the ripple effect. The ripple effect is a situation in which one event produces effects that spread and produce different effects. The Covid-19 outbreak made a shock to SC briquette Indonesia; global demand suddenly increased.

However, paradoxically, Indonesian briquette producers were unable to serve this spike demand due to a combination of the following four factors:

- The high demand for processed fruit and vegetables due to COVID-19 in developed countries [19]. Bottled and canned coconut water are among the products in high demand in the US as uncertainty swells around the coronavirus outbreak [20].
- The second and third largest coconut-producing countries in the world (Philippines and India) implemented the lockdown policy [16] [17].
- The disparity in the price of coconut at home and abroad, so farmers choose to sell coconuts without further processing [18].
- The Government in its 5-year policy (2019-2024) encourages exports of commodities, including coconut, with an ambitious target of three times by 2024 [21]. The four factors above, directly, and indirectly, make the supply of coconut and coconut charcoal as raw materials for briquettes scarce.

K. Recommendation for Stakeholders:

In making recommendations, the author uses a McKinsey framework presented in Chenneveau *et al* [8]. Based on the results of surveys and interviews, information from literature, there are three strategic agendas, namely the short, medium,

and long term. As for the short-term agenda, the focus on how to solve shortages of raw materials and improve the Company's cash flow including adopting information technology and building "Nerve Center," the business association formed an Information Center for Raw Material Procurement which accommodates all the raw material (CSC) needs of each briquette company, complete with delivery times, company locations, specifications, and prices. With this data transparency, the coconut farmer association can see the actual demand in real-time and allocate coconut or CSC. A traceability system is a key success factor in global food trade [22].

The second solution is to encourage the Government to issue regulations on the ban on the export of round coconuts and regulations on the prohibition of foreign nationals from establishing similar industries in Indonesia. The third solution is to give businesspeople more access to funding at financial institutions with special requirements during a pandemic situation. Governments could respond to the pandemic using a wide variety of fiscal policy tools.

Fiscal policies are adopted to provide financial support to significantly reduce the impact of a pandemic. Fiscal policies are implemented to offer financial assistance to the most directly affected private firms, households, individuals, and subnational and foreign governments [23]. There is a stimulus for relief, delay, or reduction in corporate tax payments to reduce cash flow burden.

As for the medium-term agenda, companies should focus on building a more resilient supply chain by pioneering the development of supply chains and the national briquette business ecosystem. Companies should comprehensively integrate information and technology systems between raw materials suppliers or suppliers with business actors in the coconut and coconut derivative products industry. And establish a national confederation consisting of farmers, suppliers, distribution or tracking logistics, Copra, CSC, shipping lanes, and other supporting federations. Developing the mathematical model can be used as an excellent tool to support a decision-making for the production planning of the supply chain [24].

Its main objective is to realign the long-term interconnected supply chains and increase the agility of supply chain planning establishment of a coconut processing industry cluster (agro-industrial complex) in an integrated national coconut producing area. The integrated area can achieve high efficiency in economic scale, but it also leads to sustainable way [25].

This cluster involves stakeholders such as central and local governments, investors, and business actors in the coconut industry and its derivative products. For a successful optimal scenario, the digital modernization agro industry can be implemented, particularly for managing demand and supply information [26].

Finally, the research identifies the need for product standardization to maintain product quality to retain customer satisfaction, which significant effect on customer loyalty [27]. Conducting research and development to improve product quality for keeping Indonesian coconut charcoal briquettes continue to dominate the global market. The Research also can improve briquette product and manufacturing process more sustainable way on consuming energy, using clean

energy, and utilizing efficient material. Agro industry sustainability results from interaction technology, land suitability, environment, and management practices [28].

IV. CONCLUSION

The Covid-19 pandemic had a major impact on Indonesia's briquette industry, which is predominantly export-oriented. In general, 82% of the respondents' businesses have problems with production, SC, business networks, and 26.5% experienced a lack of working capital to maintain or restart a business. This problem occurs not because of a decline in global demand, but 97% of respondents said due to scarcity of raw materials in domestic. This scarcity is due to the ripple effects of the global pandemic: increased demand in developed countries, shortages of supply due to lockdown policies in the Philippines and India, increased coconut prices and CSC in international markets, in addition to the government policies which targeting increasing exports of coconut commodities in 2019-2024. These four factors encourage farmers to sell coconut and CSC to the global market instead of selling to the processing industry in Indonesia. To reduce the impact of the pandemic, the authors recommend several actions taken by all coconut industry stakeholders in the short, medium, and long term.

REFERENCES

- [1] Directorate General of Estate Ministry of Agriculture, "Tree Crop Estate Statistics of Indonesia 2018-2020 (Coconuts)," Jakarta, Indonesia, December 2020, [Online] Available: <https://drive.google.com/file/d/19wDhqBN7ypGwtDx7PkQVpumU13cqGjZl/view>.
- [2] S. Sankararaman, T. Sferra, "Are we going nuts on coconut oil?," *Current nutrition reports*, 7.3: 107-115, 2018.
- [3] S. Wu, et al., High-strength charcoal briquette preparation from hydrothermal pretreated biomass wastes," *Fuel Processing Technology*, 171: 293-300, 2018.
- [4] Suttibak, S., & Loengbudnark, W., "Production of charcoal briquettes from biomass for community use," in IOP Conference Series: Materials Science and Engineering, Bangkok, Thailand ,2018, Vol. 297 p. 012001.
- [5] D. Ivanov, A. Dolgui. "OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications," *International Journal of Production Economics*, 232: 107921, 2021.
- [6] S. Boccaletti, W. Ditto, G. Mindlin, A. Atangana, "Modeling and forecasting of epidemic spreading: The case of Covid-19 and beyond," *Chaos, Solitons & Fractals*, 135, 109794, 2020.
- [7] D. Ivanov, D., "Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak," *Transportation Research*, Part E, 136(March), 101922, 2020.
- [8] D. Chenneveau et al., Coronavirus and technology supply chains: How to restart and rebuild," McKinsey & Company, April. 1, 2020. [Online]. Available: <https://www.mckinsey.com/business-functions/operations/our-insights/coronavirus-and-technology-supply-chains-how-to-restart-and-rebuild>.
- [9] M. M. Queiroz et al., Impacts of epidemic outbreaks on supply chains: mapping a research agenda amid the COVID-19 pandemic through a structured literature review," *Annals of Operations Research*, 1-38, 2020.
- [10] A. Dolgui, D. Ivanov, M. Rozhkov, "Does the ripple effect influence the bullwhip effect? An integrated analysis of structural and operational dynamics in the supply chain," *International Journal of Production Research*, 58(5), 1285-1301, 2020.
- [11] PERPAKI, "An internal phone survey of Covid-19 pandemic impact". Jakarta, Indonesia, June.2020.
- [12] P. Kimani, et al., Actors' perceptions of government performance in support of value chain development in marine small-scale fisheries in Kenya," *Marine Policy*, 122: 104221, 2020.
- [13] S. Shinozaki, "Dampak Covid-19 pada Usaha Mikro, Kecil dan Menengah di Indonesia: Hasil Survei Cepat," *Asian Development Bank*, Jakarta, Indonesia, June. 2020.
- [14] L. Eberle et al., "New services development: a study in the context of a health organization," *International Journal of Quality and Service Sciences*, 2018.
- [15] Wikipedia, "COVID-19 community quarantines in the Philippines," 2020, [Online]. Available: https://en.wikipedia.org/wiki/COVID-19_community_quarantines_in_the_Philippines.
- [16] Wikipedia, "COVID-19 pandemic lockdown in India," 2020, [Online]. Available: https://en.wikipedia.org/wiki/COVID19_pandemic_lockdown_in_India.
- [17] Statista, "Global leading producers of coconuts 2018," 2020, [Online] Available: <https://www.statista.com/statistics/1040499/world-coconut-production-by-leading-producers/>.
- [18] International Coconut Community, "Weekly Price Updated," 2020, [Online], Available: https://coconutcommunity.org/statistics/weekly_price_update.
- [19] CBI, "High demand for processed fruit and vegetables due to COVID-19," 2020, [Online], Available: <https://www.cbi.eu/news/high-demand-processed-fruit-vegetables-due-covid-19>.
- [20] CNN, "The pandemic's newest shortage? Coconut water," 2020, [Online] Available: <https://edition.cnn.com/2020/03/18/business/coconut-water-vita-coco-sales-coronavirus/index.html>.
- [21] Katadata, "Encouraging Production, Ministry of Agriculture Aims Exports of Estate Products to Increase 3 Times", 2020, [Online], Available: <https://katadata.co.id/marthathertina/berita/5e9a4c3b0d21b/dorong-produksi-kementan-bidik-ekspor-hasil-kebun-naik-3-kali-lipat>.
- [22] I. Gunawan, et al., Typical traceability barriers in the Indonesian vegetable oil industry," *British Food Journal*, 2020.
- [23] C. Chen, et al., A Cross-Country Comparison of Fiscal Policy Responses to the COVID-19 Global Pandemic," *Journal of Comparative Policy Analysis: Research and Practice*, 23.2: 262-273, 2021.
- [24] C. Limpianchob, "Integrated of harvesting and production planning in aromatic coconut supply chain using mixed-integer linear programming," *International Journal of Operational Research*, 30.3: 360-374, 2017.
- [25] F. Egea, et al., An efficient agro-industrial complex in Almería (Spain): Towards an integrated and sustainable bioeconomy model," *New biotechnology*, 40: 103-112, 2018.
- [26] O. A. Kosareva, et al., Global trends of digitalization of agriculture as the basis of innovative development of the agro-industrial complex of Russia," *Eurasian Journal of biosciences*, 13.2: 1675-1681, 2019.
- [27] L.A. Kasiri, et al., Integration of standardization and customization: Impact on service quality, customer satisfaction, and loyalty," *Journal of Retailing and Consumer Services*, 35: 91-97, 2017.
- [28] D.D. Dong, et al., Restructuring toward a modernized agro-food value chain through vertical integration and contract farming: the swine-to-pork industry in Vietnam," *Journal of Agribusiness in Developing and Emerging Economies*, 2020.