Export Competitiveness and Dynamics of Indonesian Cassava to International Market

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ABSTRACT

Cassava is a staple food commodity in Indonesia that has successfully penetrated the international market even though the export volume fluctuates. This paper aims to assess the competitiveness of Indonesian cassava exports and compare to cassava exports from other countries. We used time series data spanning from 2012 to 2023 collected from Trade Statistics for International Business Development (Trade Map) with HS code 071410 for cassava. The analysis of this study uses Revealed Comparative Advantage (RCA) and Dynamic Revealed Comparative Advantage (DRCA) to understanding the Indonesian cassava exports position. Our findings state that the condition of Indonesian cassava exports is weak compared to its competitors, such as Thailand and Cambodia. The RCA average of Indonesian cassava from 2012-2023 is 0.52, indicates that Indonesia doesn't have a comparative advantage. Furthermore, the dynamics of Indonesian cassava exports are evaluated based on four periods. The best market position of Indonesian cassava exports in the international market occurred in period III (2017-2020), the rising star position, which indicates that Indonesian cassava exports have relatively rapid market share growth or the most ideal market position. In the following period, Indonesian cassava exports were in the lost opportunity position, which indicates an increasing market share, but cassava exports were not dynamic. Therefore, to become as a leading and competitive exporter of cassava, Indonesia needs to rise the export volume of cassava.

Keywords: *Export Competitiveness, Export Dynamic, Indonesian Cassava Export, Revealed Comparative Advantage (RCA)*

INTRODUCTION

Cassava (*Manihot esculenta*) is a type of plant that grows in subtropical and tropical areas. This commodity is a carbohydrate-rich food commodity that is important in realizing food security. Cassava is one of the important commodities in the agricultural sector, especially in food crops with 1 third largest production after rice and maize. Cassava has become the second most important source of carbohydrates after rice, particularly in tropical countries (1). Globally, Indonesia was among the top ten cassava producers with 13,574,000 tons of cassava in 2022. It makes Indonesia in 7th position for cassava producing countries in the world (2).

The Indonesian Ministry of Agriculture is targeting an increase in exports through the Gerakan Tiga Kali Ekspor (Gratieks) program for agricultural commodities including cassava (3). This is both an opportunity and a challenge for Indonesia in increasing the volume of cassava exports which are highly dependent on domestic production. However, the trend of cassava exports by Indonesia to one of the importer countries, namely South Korea and Malaysia, has experienced a fall in (4). Based on Table 1, compared to other exporting countries, Indonesian cassava

export volume is still relatively low and tends to decline.

Table 1 shows that the 10 largest cassava exporters in the world are dominated by ASEAN countries including Indonesia. Indonesian cassava position as a cassava exporting country in the world is 9th after the Netherlands while in the first position is Thailand, second is Lao People's Democratic Republic, and the third position is Cambodia. This condition appears to be inversely related to domestic cassava production in Indonesia. This condition is inversely proportional to domestic cassava production in Indonesia where Indonesia is the 3rd largest cassava producer in ASEAN after Thailand and Cambodia. This condition is inversely proportional to domestic cassava production in Indonesia where Indonesia is the 3rd largest cassava producer in ASEAN after Thailand and Cambodia. Indonesian cassava production in 2022 is 1357400 tons while only 1003 tons are exported or only about 0.01% (2). This is due to the high cassava consumption of Indonesian people, which is an average of 9.01 g per day per capita (5).

The market opportunity for cassava offered by Indonesia and other exporting countries leads to competition among them. Indonesia must be well-prepared with the suitable strategy to compete in the international market given Indonesia's high cassava production. The strategy must be planned according to information about Indonesian cassava export competitiveness and its dynamics.

Table 1 Export volume of cassava by main exporting countries in 2019-2023

Country	Export Volume (tons)						
	2019	2020	2021	2022	2023	Average	Rank
Indonesia	3111.00	16529.00	3476.00	1003.00	3859.00	5595.60	9
Thailand	2415175.00	3055751.00	5190919.00	5930702.00	4456225.00	4209754.40	1
Cambodia	28250.00	31250.00	119470.00	65725.00	5711613.00	1191261.60	3
Lao People's Democratic Republic	888686.00	1617880.00	1914658.00	1951687.00	1996405.00	1673863.20	2
Vietnam	411494.00	665969.00	851340.00	250050.00	816693.00	599109.20	4
Costa Rica	113448.00	127273.00	120417.00	110770.00	129913.00	120364.20	5
Netherlands	6743.00	6374.00	8860.00	11518.00	12462.00	9191.40	8
Myanmar	5173.00	1039.00	12008.00	17163.00	36816.00	14439.80	6
Uganda	10223.00	7671.00	5504.00	2041.00	22102.00	9508.20	7
Ecuador	5856.00	2030.00	1335.00	625.00	4768.00	2922.80	10

Source: (6)

A previous study that investigating the competitiveness of Indonesia cassava exports revealed that Indonesia does not possess a competitive edge or comparative advantage to China, South Korea, and Viet Nam based on RCA (Revealed Comparative Advantage) value. Although the cassava production by Indonesia is substantial, with a high output value, but the RCA remains low at 0.70 indicating a lack of competitive advantage in the international market. In contrast, other exporting countries like Thailand and Viet Nam exhibit high competitiveness in cassava export with RCA exceeding 1 that reflects their strong position in international market (7). In 2013, Indonesian cassava exports also lacked a comparative advantage as the RCA value below 1 (8). Furthermore, when compared to Thailand, Viet Nam, Cambodia, and Lao People Democratic Republic, Indonesia does not

possess a competitive advantage in cassava exports to China (9).

The studies that have been conducted are still limited to looking at comparative and competitive advantages and have not evaluated their dynamics in knowing the market position of cassava. So that the results can be utilized as an evaluation and formulation of cassava export development strategies. Therefore, this study seeks to evaluate Indonesian cassava export competitiveness, and its dynamics compared to nine other exporting countries.

MATERIAL AND METHODS

We used time series data from 2012 to 2023 collected from Trade Statistics for International Business Development (Trade Map) with HS code 071410 for cassava. The data also covered the total cassava export value of 10 exporting countries (Indonesia, Thailand, Cambodia, Lao People's Democratic Republic, Viet Nam, Costa Rica, Netherlands, Myanmar, Uganda, and Ecuador).

The competitiveness of Indonesian cassava exports to international market can be assessed using the Revealed Comparative Advantage (RCA) Index. RCA index is a tool used to assess a country's relative advantage in exporting a particular commodity by comparing the ratio of of a country's export share of a specific commodity compared to total exports of that commodity in the global market (10). Mathematically, the RCA index is formulated as follows.

$$RCAij = \frac{Xij/Xi}{Xwj/Xw}$$

Where,

RCAij = RCA value of cassava by country i

Xij = export value of cassava by country i to international market (1000 US$)

Xi = total of export value all commodities by country i to international market (1000 US$)

Xwj = world cassava export value to international market (1000 US$)

Xw = total export value of all commodities from all countries to international market (1000 US$)

The RCA will show the level of cassava exports competitiveness among the 10 countries. The critical value of RCA is 1, if RCA value is greater than 1 indicates that a country has a comparative advantage in exporting commodities. Conversely, when the RCA values between 0 and 1 indicate that the country faces a comparative disadvantage, the export performance in that commodity is weaker relative to other countries (11).

Furthermore, the Dynamic Revealed Comparative Advantage (DRCA) used to analyze the dynamic of RCA's change by isolating the factors that contribute to its growth (12). The principal benefit of the Dynamic Revealed Comparative Advantage (DRCA) is its capacity to discern the advantages of products over time while elucidating their positioning within the export destination market. Consequently, the DRCA offers a more nuanced explanation of variations in competitiveness compared to the traditional Revealed Comparative Advantage (RCA), particularly in identifying which commodities are undergoing an increase or a decline in market share. In essence, the DRCA has the potential to furnish policy recommendations for specific commodities by considering the prevailing conditions of the export market (13).

We conducted the DRCA analysis across four periods. The initial interval encompasses the years 2012 to 2014, the second interval spans from 2015 to 2017, the third interval covers the period from 2018 to 2020, and the final interval includes the years 2021 to 2023. Mathematically, the DRCA is formulated as follows.

$$DRCA = \frac{\Delta RCAij}{RCAij}$$

$$DRCAij = \frac{\Delta\left(\frac{Xij}{\sum_j Xij}\right)}{\frac{Xij}{\sum_j Xij}} - \frac{\Delta\left(\frac{Xwj}{\sum_j Xwj}\right)}{\frac{Xwj}{\sum_j Xwj}}$$

Where,

DRCAij = DRCA value of cassava by country i

Xij = export value of cassava by country i to international market (1000 US$)

Xwj = world cassava export value to international market (1000 US$)

$\sum_j Xij$ = total export value all commodities from country i (1000 US$)

$\sum_j Xwj$ = total export value all commodities from all countries (1000 US$)

A commodity performing an increasing RCA value may be considered as a "falling star" which mean the rise in RCA is accompanied by a decrease in the destination market share which in turn reflects a decline in its overall market presence (13). The export competitiveness position is presented in the table below.

RESULT

A. EXPORT COMPETITIVENESS OF CASSAVA

The competitiveness of cassava exports from the top 10 exporters in the world shows the performance of cassava exports by the exporting countries. Table 3 shows that the competitiveness of cassava in the 10 major exporting countries in the world has a majority RCA value> 1 which means a country has a comparative advantage. The country with the highest RCA value is Lao People's Democratic Republic (RCA=228.31) while Indonesia's average RCA value is below 1 (RCA=0.52) which means it does not have a comparative advantage as well as the Netherlands (RCA=0.24).

Table 2. Dynamics of export market position

RCA	Δ Share of commodity j in country-i's exports		Δ Share of commodity j in world exports	Market positioning of exports	Exports evaluation
Increase	↑	>	↑	Rising stars	Successful restructuring
	↑	>	↓	Falling stars	Poor restructuring
	↓	>	↓	Lagging retreat	Poor restructuring
Decrease	↓	<	↑	Lost Opportunity	Poor restructuring
	↓	<	↓	Leading retreat	Successful restructuring
	↑	<	↑	Lagging opportunity	Poor restructuring

Source: (14,15)

Table 3. RCA value of cassava's main exporters 2012-2023

Year	Exporting Countries									
	Indonesia	**Thailand**	**Cambodia**	**Lao People's Democratic Republic**	**Vietnam**	**Costa Rica**	**Netherlands**	**Myanmar**	**Uganda**	**Ecuador**
2012	0.60	49.17	13.80	36.11	51.09	55.48	0.27	7.01	0.21	0.54
2013	1.78	58.24	19.68	26.77	29.60	57.48	0.24	6.47	2.67	0.50
2014	1.03	60.69	30.86	53.12	23.74	56.73	0.14	2.33	2.47	0.53
2015	0.14	57.15	20.57	73.74	19.46	58.77	0.13	0.01	6.02	0.53
2016	0.51	52.88	21.84	202.81	14.78	80.35	0.16	0.04	7.15	0.70
2017	0.18	50.29	17.49	196.99	14.71	85.98	0.23	0.01	12.87	0.54
2018	0.19	54.39	15.28	201.43	9.54	120.69	0.30	3.45	25.98	0.88
2019	0.54	47.37	3.77	342.37	6.78	189.55	0.44	1.27	17.30	4.81
2020	0.89	44.46	3.19	473.18	7.51	119.82	0.26	0.20	3.83	1.42
2021	0.11	54.14	16.18	429.91	7.56	78.06	0.20	4.83	1.79	0.58
2022	0.04	57.44	3.68	391.17	6.54	79.04	0.25	5.14	1.97	0.26
2023	0.20	35.20	272.00	312.09	4.58	69.43	0.23	8.12	7.05	1.35
Average	**0.52**	**51.79**	**36.53**	**228.31**	**16.32**	**87.62**	**0.24**	**3.24**	**7.44**	**1.05**

Indonesia had a comparative advantage in cassava exports to international markets in 2013 and 2014 with RCA values of 1.78 and 1.03. In subsequent years, the RCA value of Indonesian cassava exports was always below 1 and tended to decline. While Thailand as the largest cassava's exporter during 2012-2023, the RCA value tends to be stable compared to other countries. Cambodia experienced fluctuations in RCA value, the lowest RCA occurred in 2022 (RCA = 3.19) and the highest RCA occurred in 2023 (RCA = 272.00).

The highest RCA value in 2021 was experienced by Lao People's Democratic Republic (RCA=429.91) and became the highest compared to other countries and tends to increase. While other countries such as Uganda and Ecuador tend to experience a decline in 2019. Viet Nam experienced the highest RCA decline in 2013, and Costa Rica experienced the decline in 2021 after previously experiencing an increase in 2018.

B. DYNAMICS OF CASSAVA'S EXPORT MARKET POSITION

Further analysis using Dynamic Revealed Comparative Advantage (DRCA) reveals that the comparative advantage of cassava exports among the top 10 exporting countries fluctuates over time. This condition reflects the changing dynamics of each country's position. In this study, the export market position is seen from four periods. Table 4 shows the average DRCA value in each period.

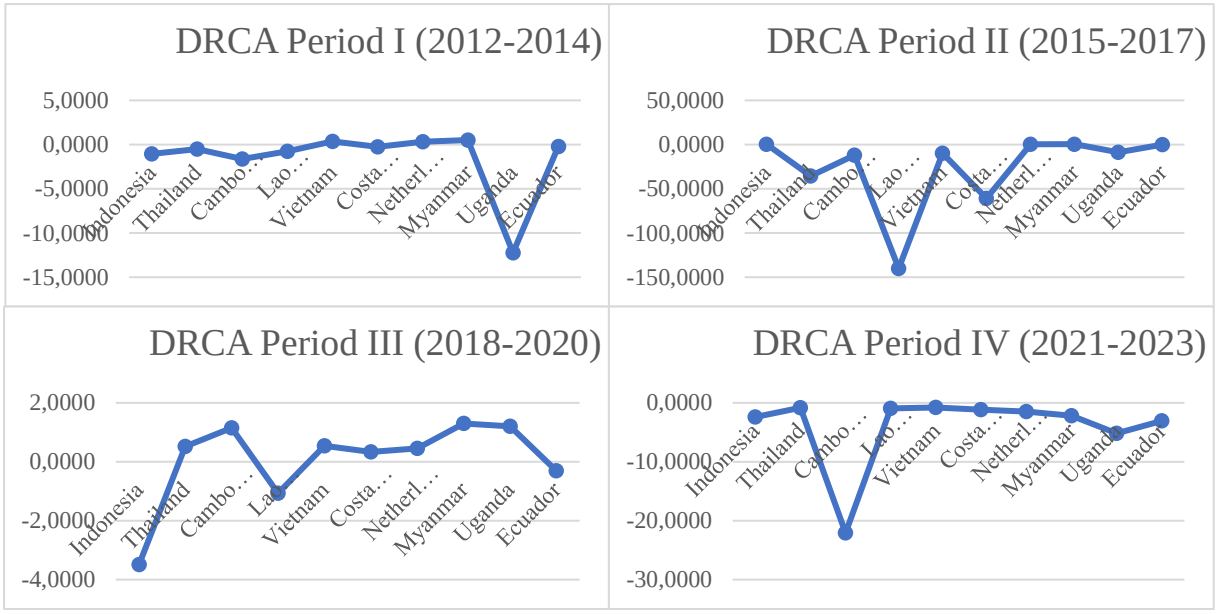

Figure 1. DRCA value of cassava from main exporters

In period I (2012-2014), Myanmar's average DRCA value of cassava was the highest among other countries while Indonesia was in 7th place after Cambodia while Uganda was the lowest in this period. In period II (2015-2017) the average DRCA value of Myanmar's cassava was the highest again followed by Indonesia in 2nd place. In period III (2018-2020) Myanmar again had the highest average DRCA value while Indonesia was the lowest in this period. In period IV (2021-2023) all countries have a negative average DRCA value with Cambodia being the lowest.

The export market position of cassava in the main exporting countries in the world varies greatly in each period. Table 3. shows the different export market positions of cassava starting in four periods.

Table 4. Dynamics of cassava's market position

Countries	Market Positioning of Exports			
	Period I (2012-2014)	Period II (2015-2017)	Period III (2018-2020)	Period IV (2021-2023)
Indonesia	falling stars	leading retreat	rising stars	falling stars
Thailand	falling stars	falling stars	lost opportunity	lagging retreat
Cambodia	falling stars	falling stars	lost opportunity	falling stars
Lao People's Democratic Republic	falling stars	falling stars	lagging opportunity	lagging retreat
Viet Nam	lagging retreat	falling stars	lost opportunity	lagging retreat
Costa Rica	falling stars	falling stars	lagging opportunity	falling stars
Netherlands	leading retreat	leading retreat	lost opportunity	falling stars
Myanmar	leading retreat	leading retreat	lost opportunity	falling stars
Uganda	falling stars	falling stars	lost opportunity	falling stars
Ecuador	falling stars	leading retreat	rising stars	falling stars

In the first period, the export market position of cassava in main exporting countries was categorized as falling stars, namely Indonesia, Thailand, Cambodia, Lao People's Democratic Republic, Costa Rica, Uganda, and Ecuador. It indicates that the seven countries experienced an increase in cassava exports and positive growth but at the same time the market experienced a decline. While Viet Nam, Netherlands, and Myanmar are in the leading retreat category. This indicates that these three countries were able to enhance the competitiveness of their cassava exports despite a decline in global cassava exports between 2012 and 2014.

In the second period Indonesia, Netherlands, Myanmar, and Ecuador were in the leading retreat category. The situation indicates that the four countries were able to increase the competitiveness of cassava amid declining world cassava exports in 2015-2017. While other countries experienced an increase in cassava exports and positive growth but under the same conditions the market experienced a decline (falling stars).

III Indonesia and Ecuador are in the rising stars category which indicates that cassava exports from Indonesia and Ecuador have relatively fast market share growth or are referred to as the most ideal market position. Other countries such as Thailand, Cambodia, Viet Nam, the Netherlands, Myanmar, and Uganda are in the lost opportunity category which indicates an increasing but not dynamic loss of market share. Costa Rica and Lao People's Democratic Republic faced lagging opportunities in this period. After being in the rising starts category, in period IV Indonesia faced falling stars as well as Cambodia, Costa Rica, Netherlands, Myanmar, Uganda, and Ecuador. While Thailand, Viet Nam, and Lao People's Democratic Republic faced lagging retreat.

DISCUSSION

The value of RCA indices implies how strongly or poorly a country is performing their export commodities, the nation will exhibit specialization in certain commodities with high RCA value (16). The average RCA of Indonesian cassava is below 1, which means that cassava exports from Indonesia does not have a comparative advantage. The findings of this study align with the prior research, which state that the average RCA of Indonesian cassava is below 1. Even other research said that the RCA of Indonesian cassava to China was less than 1 and became the lowest compared to other countries, such as Thailand, Viet Nam, Cambodia, and Lao People's Democratic Republic (9).

This condition is because the quality of Indonesian cassava was still inferior to competitor countries such as Thailand and Viet Nam, which have larger diameter cassava. In addition, competitor countries also use more modern technology while Indonesia is still on a home scale industry (7). In addition, the ratio of the amount of cassava exported to total cassava production is very low compared to other countries, which is still below 1% (17). This indicates that cassava production in Indonesia is mostly consumed domestically. The increasing consumption of cassava by Indonesians is due to the fact that tubers are no longer seen as inferior products (18).

The results of the DRCA analysis state that Indonesia has been in the position of rising stars in period III (2018-2020). In this period, the largest export destination country was Taiwan with a contribution of 61.79% (19). Whereas a few years earlier, Indonesian cassava exports to Taiwan were

only around 9% (20). This condition indicates an increase in export demand from Taiwan. However, in other periods it was in the position of falling stars and leading retreat. This condition is also similar to other cassava exporting countries, the majority of which are in falling stars, which means that exports are increasing but the international market is sluggish.

Therefore, the Indonesian government needs to prioritize whether to increase cassava exports or develop cassava domestically considering that Indonesian consumption of cassava is very high (5) To enhance the competitiveness of Indonesian cassava exports, the government must be prioritized on improving the quality of cassava. The government should focus on providing education and training for cassava farmers to meet the export standard requirements such as packaging techniques (21) and the use of improved cassava variety (22).

CONCLUSION

The study utilizes time series data from 2012 to 2023 and employs the Revealed Comparative Advantage (RCA) and Dynamic Revealed Comparative Advantage (DRCA) methods for analysis. The findings indicate that Indonesian cassava exports have a weak competitive position, with an average RCA of 0.52, reflecting a lack of comparative advantage compared to competitors such as Thailand and Cambodia. The analysis identifies that the peak performance of Indonesian cassava exports occurred during the period from 2018 to 2020, while subsequent periods showed signs of lost opportunities. To strengthen its position as a leading exporter, the article emphasizes the need for Indonesia to increase its cassava export volume. Overall, the research highlights both the potential for growth in the cassava sector and the challenges posed by competition in the international market. The government should establish clear policy priorities for cassava, deciding whether it will be developed primarily for export or prioritized for domestic needs.

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REFERENCES

1. Widodo Y. Cassava productivity for eradicating hunger and poverty in rural areas of indonesia. *Rural Sustainability Research*. 2018;39(334):32–40.
2. FAO. FAO. 2024 [cited 2024 Sep 23]. Cassava Production Quantity. Available from: https://www.fao.org/faostat/en/#data/QCL
3. Pusat Data dan Sistem Informasi Pertanian. Outlook Ubi Kayu. Jakarta: Pusat Data dan Sistem Informasi Pertanian Sekretaris Jenderal Kementerian Pertanian RI; 2019.
4. Baroh I, Yanti LE. Export Trend of Indonesian Cassava to The Republic of Korea and Malaysia. In: 4th International Conference on Food and Agriculture Resources [Internet]. Atlantis Press; 2018. Available from: http://www.wits.worldbank.org.

5. Mota-Gutierrez J, O'Brien GM. Cassava consumption and the occurrence of cyanide in cassava in Vietnam, Indonesia and Philippines. Vol. 23, Public Health Nutrition. Cambridge University Press; 2020. p. 2410–23.
6. Trade Map. International Trade Centre. 2024 [cited 2024 Oct 11]. List of exporters for the selected product (Product: 071410). Available from: trademap.org/Index.aspx
7. Yudha EP, Salsabila A, Haryati T. Analisis Daya Saing Ekspor Komoditas Ubi Kayu Indonesia, Thailand, dan Vietnam di Pasar Dunia. Jurnal Maneksi. 2023;12(2).
8. Pramesti FS, Rahyu ES, Agustono. Analisis Daya Saing Ubi Kayu Indonesia di Pasar Internasional. SEPA: Sosial Ekonomi Pertanian dan Agribisnis. 2017;14(1):1–7.
9. Sukpanich S, Wang W. Analysis of the Export Competitiveness of Thai Cassava in the Chinese Market (2010-2020). Open Journal of Business and Management. 2022;10(01):337–49.
10. Balassa B. Trade liberalisation and "revealed" comparative advantage. The manchester school. 1965;33(2):99–123.
11. Oelgemöller J. Revealed comparative advantages in Greece, Ireland, Portugal and Spain. Intereconomics. 2013;48(4):243–53.
12. Hossain Md, Dechun H, Zhang C, Van V. Dynamics of comparative advantage and competitiveness of textile and apparel industry: an empirical analysis for China and Bangladesh. British Journal of Economics, Management & Trade. 2017;16(1):1–19.
13. Suparmono, Suandana E, Ilmas F. Determining competitiveness of Indonesian export commodities using revealed comparative analysis. Jurnal Ekonomi & Studi Pembangunan. 2022;23(1).
14. Ekmen-Özçelik S, Erlat G. Turkey's Comparative advantages and dynamic market positioning in the eu market. Topics in Middle Eastern and African Economies. 2013;15(2).
15. Edwards L, Schoer V. Measures of competitiveness: a dynamic approach to South Africa's trade performance in the 1990s. South African Journal of Economics. 2002;70(6):1008–46.
16. Laursen K. Revealed comparative advantage and the alternatives as measures of international specialization. Eurasian Business Review. 2015;5(1):99–115.
17. Hutabarat NAP, Huang WC, Chang WI. The export performance of indonesian dried cassava in the world market. Agricultural Socio-Economics Journal. 2017;17(3):134–9.
18. Wijayati PD, Harianto N, Suryana A. Permintaan Pangan Sumber Karbohidrat di Indonesia. Analisis Kebijakan Pertanian. 2019;17(1):13.
19. Pusat Data dan Sistem Informasi Pertanian. Analisis Kinerja Perdagangan Ubi Kayu. Mas'ud, Wahyuningsih S, editors. Vol. 12. Jakarta: Pusat Data dan Sistem Informasi Pertanian Kementerian Pertanian; 2023.
20. Asriani PS. Indonesia Cassava Trade in World Market. AGRISEP. 2010;9(2).

21. Paksi AK, Azizah RZH, Putri AHA. From Local to Global: A Comprehensive Strategy to Boost Cassava Export from Indonesia s Rural Regions. In: E3S Web of Conferences. EDP Sciences; 2023.
22. Syafrial, Toiba H, Rahman MS, Retnoningsih D. The effects of improved cassava variety adoption on farmers' technical efficiency in Indonesia. Asian Journal of Agriculture and Rural Development. 2021;11(4):269–78.