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LIBERICA COFFEE SUPPLY CHAIN PERFORMANCE IN KAYONG UTARA DISTRICT

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ABSTRACT

Coffee is one of Indonesia's export commodities which is quite important as a foreign exchange earner of the country. Coffee production in North Kayong Regency is quite high with the fourth highest position. The priority of supply chain performance is related to the production and distribution process of Liberica coffee products. Therefore, this research was conducted to determine the very important priorities in assessing the performance indicators of the Liberica coffee supply chain in North Kayong Regency in order to carry out improvement or handling efforts in order to meet the objectives of the supply chain. The method used in this study is a descriptive method with qualitative and quantitative data.This research combines the Supply Chain Operation Reference (SCOR) model approach with the Fuzzy-Analytical Hierarchy Process (F-AHP) method. The results shows that the main priority on the performance indicators of the Liberica coffee supply chain in North Kayong Regency at the farmer level for level 1 is SOURCE with a weight of 0.233, level 2 is Reliability with a weight of 0.312, and level 3 is orders customers are sent on time (OCT) with a weight of 0.242. While the main priority at the merchant level for level 1 is PLAN with a weight of 0.313, level 2 is Responsiveness with a weight of 0.245, and level 3 is packaging time (PkT) with a weight of 0.286. Implications of this research is the improve the availability and quality of liberica coffee products better, to reduce delays in meeting customer demands.

Keywords: *coffee products, f-ahp, scor, supply chain*

BACKGROUND

Coffee is a commodity that has high economic value among the types of plantation commodities in Indonesia. As a commodity with high economic value, coffee is starting to be widely considered to be cultivated on a massive scale by the Indonesian government and people so that it can increase state income. Therefore, coffee is also one of Indonesia's export commodities which is quite important as a foreign exchange earner and a source of income for coffee farmers in Indonesia (Rahardjo, 2012 in Christa, 2017). According to International Coffee Organization (ICO), Indonesia's position in the world is the fourth largest coffee producer and exporter after Brazil, Vietnam and Colombia. The development of coffee for production, consumption, export and import of coffee in Indonesia fluctuates slightly, and on average increases every year (Abdoellah, 2021).

Indonesia's coffee bean production has increased over the last 6 years, from around 663 thousand tons to 793 thousand tons in 2022, with 35% (277,550 tons) to meet domestic needs and 65% (515,450 tons) to meet international market needs. Indonesian coffee consumption also increases every year from 249 thousand tons to 369 thousand tons with an average growth of 8.4% per year.

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Vol 7 (3): 632-642, November 2023

The export value of coffee ranges from 31% to 18% and the average value of coffee imports is 57% from 25 thousand tons to 16 thousand tons (Directorate General of Plantation. Ministry of Agriculture, 2021).

West Kalimantan Province has quite high potential in developing coffee, with an area of 11,575 ha of coffee plantations (BPS, 2021). The area of coffee plantations in North Kayong Regency is 661 ha and production reaches 493 tons. As the smallest region in West Kalimantan, coffee production in North Kayong Regency is quite high with the fourth highest position compared to other districts in West Kalimantan. The types of coffee developed in North Kayong Regency are Arabica and Robusta, but currently there is one type of coffee that is being developed and will be used as a typical West Kalimantan coffee, namely liberica which has a distinctive aroma. Liberica coffee is able to bear fruit throughout the year and is easy to grow in lowlands with peaty land (Panggabean et al., 2019). This is one of the advantages in developing Liberica coffee in North Kayong Regency, because it is suitable for the type of land in West Kalimantan which is predominantly peat. Apart from that, North Kayong Liberica coffee still has problems, especially those related to guaranteeing the continuity of the quality of the coffee produced by farmers, the minimum amount of supply, and the timeliness of delivery as well as difficulties when harvesting and post-harvest arrive. This is because many coffee farmers have switched to other crops such as palm oil, so coffee production is decreasing from year to year. This complex problem will cause a decrease in product value and competitiveness, as well as result in the performance of the coffee supply chain in the area becoming less efficient.

Good supply chain performance refers to achieving goals more effectively and efficiently. Effectiveness refers to the range of abilities in achieving predetermined goals or standards. Meanwhile, efficiency refers to the relationship of sacrifices that have been made and estimated to achieve previously agreed goals (Masram and Mu'ah, 2015). Evaluation in determining supply chain performance requires several attributes/indicators adapted from the SCOR (Supply Chain Operations Reference) model, namely: Reliability, Responsiveness, Agility, Costs, and Asset Management (Marimin et al., 2013). The latest research was carried out to determine supply chain performance priorities using the Fuzzy-Analytical Hierarchy Process (F-AHP) method. Supply chain performance priorities relate to the production and distribution processes of Liberica coffee products. Therefore, this research was conducted with the aim of determining very important priorities in assessing the performance indicators of the Liberica coffee supply chain in North Kayong Regency in order to carry out improvement or handling efforts in order to meet the objectives of the supply chain.

RESEARCH METHODS

The research location is in Podorukun Village, Seponti District, North Kayong Regency, West Kalimantan Province. Determining the research location was carried out purposively with the consideration that the location is an area that has Liberica coffee which is famous for its high taste, as well as being an opportunity for Micro, Small and Medium Enterprises (MSMEs) if it continues to be developed starting from the local and national markets to international. The research was carried out with a data collection period of approximately 1 month, starting from November to December 2021.

The method used in the research is a descriptive method with qualitative and quantitative data. The population in the study consisted of Liberica coffee farmers and traders in Podorukun Village

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Vol 7 (3): 632-642, November 2023

with a population of 22 farmers and 10 traders. The sample in the research initially used the snowball sampling technique, but in the end the number of respondents was known based on data obtained from the field using the sampling technique.*probability sampling*. The number of samples is 10 farmers and 4 traders consisting of 1 collecting trader, 1 wholesaler, and 2 retail traders.

The variables used in the research were adapted from Supply Chain Council (2012) in Paul (2014)**,** namely the SCOR attribute variable which consists of Reliability, Responsiveness, Agility, Costs, and Asset Management. This is in line with research from Azmiyati and Hidayat (2016); Winanto and Santoso, (2017); Bubun et al., (2018); Siswandi et al., (2019); and Septarianes, (2020), that the variables used are from the SCOR attribute to determine priorities in assessing supply chain performance indicators. Data processing is carried out using the Fuzzy-AHP method with the help of online Fuzzy-AHP software. Fuzzy-AHP was chosen as a data analysis method with the following processing steps:

1. Develop a hierarchical structure for the performance of the Liberian coffee supply chain consisting of 3 points of view, namely business process objectives, performance variables/attributes, and performance indicators.
2. Determine the value at each level with pairwise comparison based on a preference scale, namely a scale of 1-9 as a tool for prioritizing main performance indicators.

Table 1. AHP Fuzzy Scale

Code	Linguistic Variables	L	M	U
1	Equally important	1	1	1
2	Intermediate value between 1 and 3	1	2	3
3	Slightly important	2	3	4
4	Intermediate value between 3 and 5	3	4	5
5	Important	4	5	6
6	Intermediate value between 5 and 7	5	6	7
7	Strongly important	6	7	8
8	Intermediate value between 7 and 9	7	8	9
9	Extremely important	9	9	9

Source: Fuzzy AHP Online, 2021

RESULT AND DISCUSSION

Liberica Coffee Production Process

Liberica coffee is the most special type of coffee in North Kayong Regency, specifically in Podorukun Village, Seponti District. The coffee produced is in the form of wet coffee fruit (called coffee cherries) and dry coffee fruit (called green beans) with an average production of 2 tons/ha/year. The price of coffee cherries ranges between Rp 2,500-Rp 3,000/kg, and the price for green beans from farmers is Rp 22,000-Rp 26,000/kg while the price for green beans from traders is Rp 25,000-Rp 40,000/kg.

Liberica coffee in Podorukun Village is divided into two grades, namely special and commercial. Special grade consists of two types, namely A and B, grade A is the best coffee category with the largest size, while grade B is the good category with medium size. Commercial grade consists of two types, namely C and D, grade C is a pretty good category with a smaller size than grades A and B, while grade D is a grade that is very smaller in size than grades A, B and C. The price of

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Vol 7 (3): 632-642, November 2023

Liberica coffee is determined by farmers based on the highest grade, namely Rp 26,000/kg which is usually sold directly to coffee shops and other traders. Meanwhile for grade B it is Rp 25,000/kg, for grade C it is Rp 24,000/kg, and for grade D it is Rp 22,000-Rp 23,000/kg. These three grades are usually sold to collectors, wholesalers, retailers and final consumers.

Figure 1. Differences in Liberian Coffee Based on Grade A, B, C, and D
Source: Researchers Documentation, 2021

Liberica coffee plants in Podorukun Village experience several problems, including being easily attacked by pests, diseases and even parasites. This is caused by a lack and excess of protective plants, if the coffee plant lacks protective cover it will be easily attacked by pests which are indicated by the appearance of white fungus and if there is an excess of protective cover it will trigger the appearance of parasites on the coffee plants. The form of effort made by farmers to overcome this problem is by trimming the tips of branches that are attacked by pests and scraping off parasites in the form of white spots that stick to the trunk of the coffee tree. Apart from that, farmers are also trying to anticipate the growth of pests and parasites by providing protective plants used for liberica coffee in Podorukun Village in the form of sengon trees, jengkol trees and petai trees, but it would be better if the coffee protective plants were durian trees because they can affect the taste and aroma.

Figure 2. Pests and Parasites on Liberica Coffee
Source: Researchers Documentation, 2021

The liberica coffee production process goes through several stages. The first stage is a drying process which can be carried out outside or inside a solar house for several days with favorable weather. If it is rainy season then the drying process can take longer up to one month, so the results

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 7 (3): 632-642, November 2023

of drying the coffee beans will be more optimal if this is done in a solar house because apart from speeding up the drying of the coffee, it can also affect the taste and color. The next stage is the grinding process using a pulper and huller machine, then continued with the stage of separating the coffee beans using a sorting and grading machine. The final stage is packaging the coffee into two forms of packaging with a capacity of 50 kg and 5 kg for distribution to consumers at a predetermined price.

Liberica Coffee Supply Chain Performance Structure

Supply chain is a network consisting of suppliers, manufacturing or production of goods, warehousing and distribution networks (Marimin et al., 2013). This network organizes purchasing raw materials, converting raw materials into final products, and distributing final products to customers. The supply chain structure is an arrangement of activities procuring goods or services that collaborate and are interconnected with each other to create and distribute goods or services (Aripin et al., 2020). The performance structure of the Liberica coffee supply chain in Podorukun Village consists of 6 channels which are presented in the following figure.

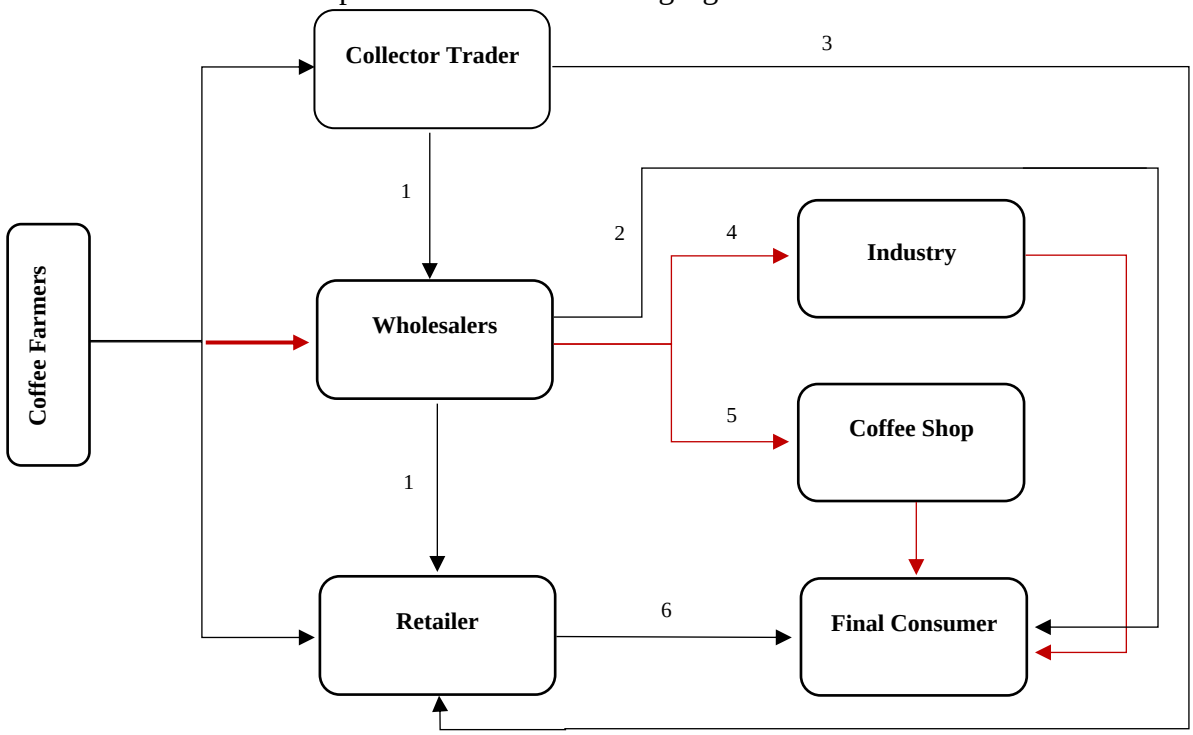

Figure 3. Coffee Supply Chain Channels

In Figure 3, it can be seen that the supply chain channel for Liberica coffee in Podorukun Village, namely farmers distribute their products directly to collectors, wholesalers and retailers. Next, the collecting traders send their products to local wholesalers (channel 1) and those in Sambas (channel 2), then the local wholesalers distribute their products to local retailers and those in Pontianak, while the products sent to Sambas are then sent abroad. countries namely Malaysia and Arabia as final consumers (channel 2). The next channel, namely collecting traders (channel 3), directly distributes their products to retail traders in Rasau. Furthermore, large traders from farmers (channel 4 and channel 5) send their products to cafes and outside the province, namely Sulawesi and Java, even overseas, namely Canada and Egypt, then each of them continues to send the product to

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 7 (3): 632-642, November 2023

the final consumer. In the final channel (channel 6), farmer retailers distribute their products directly to final consumers. Supply chain actors from these six channels have their own priorities which influence each other. The channel that is the main priority in determining the performance indicators of the liberica coffee supply chain in Podorukun Village is channel 1 as the longest channel of the six existing channels.

Liberica Coffee Supply Chain Performance Priorities

Priority determination was carried out in order to improve supply chain performance for liberica coffee in Podorukun Village. The program used to determine priorities in assessing the performance indicators of the Liberian coffee supply chain is with the help of online Fuzzy AHP software, to reduce doubt and uncertainty in deciding the level of importance of supply chain performance indicators.

Based on the results of data processing using Fuzzy AHP, the performance priority for the liberica coffee supply chain at level 1 at the farmer level is source. This is in accordance with field conditions that the procurement of liberica coffee in Podorukun Village at the farmer level in the business process is very important, where the resulting liberica coffee production must be available for distribution by suppliers to meet customer demand. Meanwhile, at level 1, the trader level is planning, according to field conditions, planning is very important in the performance of the liberica coffee supply chain in Podorukun Village, where planning must be carried out systematically starting from the procurement stage until the product is sold out by balancing customer demand.

The main priority for the performance of the liberica coffee supply chain at level 2 at the farmer level is reliability, according to field conditions, the reliability attribute in assessing the performance of the liberica coffee supply chain is very important because the indicators of the reliability attribute can work well in terms of quantity and quality. Meanwhile, at level 2, the trader level is responsiveness, according to field conditions, the attribute of responsiveness or speed of ability in carrying out liberica coffee supply chain activities in Podorukun Village is in the very important category for assessing the performance of the liberica coffee supply chain.

The main priority for the performance of the Liberian coffee supply chain at level 3 in the reliability attribute for the farmer level is that customer orders are sent on time (PPT), according to field conditions, it is very important that customer orders are sent on time so that they are fulfilled directly and in accordance with customer requests. Meanwhile, at the trader level, namely free damage/defects to the product (BK), according to field conditions, the indicator of free damage/defects to the product is very important, where the product produced must have good quality when the product is ready to be distributed.

The main priority for the performance of the liberica coffee supply chain at level 3 in the responsiveness attribute for the farmer level is production time (WPr), in accordance with field conditions that the production time for liberica coffee in Podorukun Village is very important, starting from the harvesting process until the product is ready to be distributed to customers, where the process it can run efficiently. Meanwhile, at the trader level, namely packaging time (Wge), according to field conditions, the packaging time for liberica coffee in Podorukun Village is very important, where packaging needs to be done to maintain the quality of liberica coffee products so that they are free from damage.

The main priority for the performance of the Liberian coffee supply chain at level 3 in the agility attribute for the farmer level and trader level has the same priority, namely supplier availability

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 7 (3): 632-642, November 2023

(KP), according to field conditions, the availability of liberian coffee suppliers is very important where the resulting production must be able to meet demand. customers.

The main priority for the performance of the Liberica coffee supply chain at level 3 in the costs attribute for the farmer level is production costs (BPr) and raw material costs (BBB), in accordance with field conditions that production costs and raw material costs are very important because the costs incurred by the majority of farmers liberica coffee reaches Rp 1,000,000-Rp 3,000,000. Meanwhile, at the trader level, namely sales costs (BPj) and transportation costs (BTr), according to field conditions, sales costs and transportation costs are very important because the costs incurred by liberian coffee traders are quite large.

The main priority for the performance of the liberica coffee supply chain at level 3 in the asset management attribute for the farmer level is the range of days for payment of receivables (RHp), according to field conditions, the range of days for payment of receivables is very important because it influences the process of supply chain activities such as procurement of coffee production inputs. liberica, transportation and other activities. Apart from that, the longer the receivable payment period, the more it will hamper the process of supply chain activities.

Based on the overall results, the consistency ratio was obtained at each level at the farmer and trader level. If the consistency ratio is > 10% then repetition must be carried out, but if the consistency ratio is ≤ 10% then processing can be continued to the next stage to get the weighting value.

Table 2. Consistency Ratio

Levels	1	2	3	CR	Information
Farmer	0.036	0.036	0.037	CRm	Consistent
	0.088	0.087	0.089	CRg	
Trader	0.033	0.036	0.028	CRm	
	0.087	0.084	0.073	CRg	

Description: Consistent ≤ 10% or 0.1
Source: Primary data analysis, 2021

In the data analysis in Table 2, it shows that the consistency ratio at each level for the liberica coffee supply chain actors as a whole is consistent, which means acceptable.

Value Weights of Liberica Coffee Supply Chain Performance Indicators

The weight value is obtained after passing the consistency ratio test on the Fuzzy AHP software with pairwise comparison. The following are the weighting values at levels 1 to level 3 in the performance indicators of the Liberian coffee supply chain at the farmer level and trader level.

Table 3. Level 1 Weighting (Business Process)

Weight	Plans	Source	Make	Delivery	Return	Amount
Farmer	0.231	0.233	0.207	0.205	0.124	1
Trader	0.313	0.271	-	0.269	0.148	1

Source: Primary Data Analysis, 2021

Data analysis in Table 3 shows that the main priority from level 1 at the farmer level is source with a weight of 0.233 and at the trader level is planning with a weight of 0.313. This is not in line

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 7 (3): 632-642, November 2023

with research from Ariani et al., (2017), that the main priority in the supply chain performance business process is processing with a weight of 0.534. Study from Yuni et al., (2019), also talk that the main priorities in the supply chain performance business process are processing and delivery with a weight of both 0.243. Research from Liputra et al., (2018), tell that the main priority in the supply chain performance business process is make with a weight of 0.499.

Table 4. Level 2 and Level 3 Weighting at Farmer Level

Attribute	Weight	Indicator	Weight	Global Weight
Reliability	0.312	PPT	0.242	0.076
		WPP	0.205	0.064
		WPB	0.195	0.061
		BK	0.126	0.039
		K.S	0.233	0.073
Responsiveness	0.262	WPr	0.345	0.090
		WPy	0.113	0.030
		Wge	0.233	0.061
		Wgi	0.309	0.081
Agility	0.179	PTP	0.201	0.036
		ATT	0.157	0.028
		KP	0.341	0.061
		F.P	0.301	0.054
Costs	0.173	BPr	0.329	0.057
		BBB	0.315	0.054
		BPn	0.191	0.033
		BPj	0.165	0.029
Asset Management	0.074	RHP	0.424	0.031
		JP	0.403	0.030
		L.P	0.174	0.013
Total Weight				**100%**

Source: Primary Data Analysis, 2021

Data analysis in Table 4 shows that the main priority of level 2 at the farmer level is reliability (0.312). This is in line with research from Liputra et al., (2018), that the main priority in supply chain performance attributes is reliability.

Table 5. Level 2 and Level 3 Weighting at Merchant Level

Attribute	Weight	Indicator	Weight	Global Weight
Reliability	0.221	PPT	0.268	0.059
		WPP	0.137	0.030
		Kindergarten	0.057	0.013
		BK	0.317	0.070
		K.S	0.221	0.049
Responsiveness	0.245	WPy	0.189	0.046
		WTr	0.242	0.059
		Wge	0.286	0.070
		Wgi	0.283	0.069

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Vol 7 (3): 632-642, November 2023

Attribute	Weight	Indicator	Weight	Global Weight
Agility	0.198	KP	0.514	0.102
		F.P	0.486	0.096
Costs	0.157	BPb	0.243	0.038
		BPn	0.221	0.035
		BTr	0.262	0.041
		BPj	0.274	0.043
Asset Management	0.179	RHU	0.199	0.036
		RHP	0.392	0.070
		JP	0.352	0.063
		L.P	0.056	0.010
Total Weight				100%

Source: Primary Data Analysis, 2021

Data analysis in Table 5 shows that the main priority of level 2 at the trader level is responsiveness (0.245). This is in line with research from Alfaliansyah & Maswadi, (2021), that the main priority in supply chain performance attributes at the trader level is responsiveness. The results of the data obtained as a whole for the most important priorities in each hierarchy for the liberica coffee supply chain actors are as follows:

Table 6. Most Important Priority Results for Supply Chain Actors

Performance Attributes	Farmer Level Indicators	Weight	Indicator Merchant Level	Weight
Reliability	PPT	0.242	BK	0.317
Responsiveness	WPr	0.345	Wge	0.286
Agility	KP	0.341	KP	0.514
Costs	BPr	0.329	BPj	0.274
Asset Management	RHP	0.424	RHP	0.392

Source: Primary Data Analysis, 2021

There are 24 indicators for the performance attributes of the Liberica coffee supply chain in North Kayong Regency for supply chain actors which receive their respective weights. Liberica coffee supply chain indicators consist of timely order fulfillment (PPT), order payment time (WPP), customer complaint level (TK), free of damage/defects (BK), conformity with quality standards (KS), raw material fulfillment time (WPb), production time (WPr), storage time (Wpy), transportation time (WTr), packaging time (Wge), delivery time (Wgi), unexpected alternatives (ATT), supplier availability (KP), flexibility in preparing products (FP), product costs (BPr), costs raw materials (BBB), purchasing costs (BPb), order receiving costs (BPn), transportation costs (BTr), sales costs (BPj), range of payables payment days (RHU), range of receivables payment days (RHP), amount of inventory (JP), and length of inventory (LP). The global weight assessment in this research is obtained from the product of attribute weights and indicator weights to obtain a total weight of 100%, with different priorities for each level.

Based on the findings in this research, there are several policy implications that must be implemented. First, to reduce delays in meeting product demand by customers, it is necessary to increase production of Liberica coffee to procure products that are ready to be distributed so that they are more abundant with better planning, so that the availability of liberica coffee increases and

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 7 (3): 632-642, November 2023

customer demand can be met more directly. Second, to improve product quality, the liberica coffee supply chain actors need to provide sufficient protective plants to protect the liberica coffee plants so that they are not susceptible to pest attacks and parasites do not appear.

CONCLUSION AND SUGGESTION

Based on the results obtained from the research, it can be concluded that:

1. The consistency ratio value at each level for the Liberian coffee supply chain actors as a whole is consistent, which means acceptable.
2. The main priority for North Kayong Regency liberica coffee supply chain actors at the farmer level for level 1 is source with a weight of 0.233, level 2 is reliability with a weight of 0.312, and level 3 is level 3, namely timely order fulfillment with a weight of 0.242.
3. The main priority for North Kayong Regency liberica coffee supply chain actors at the trader level for level 1 is planning with a weight of 0.313, level 2 is responsiveness with a weight of 0.245, and level 3 is packaging time with a weight of 0.286.

The efforts that can be made to improve supply chain performance are as follows:

1. For liberica coffee supply chain actors in North Kayong Regency, it is hoped that they will further increase their production to procure liberica coffee fruit ready for distribution so that it is more abundant, starting with better planning to a systematic production process so that the availability of liberica coffee increases and customer demand can be met more directly.
2. It is hoped that the government can provide assistance that can improve the performance of supply chain actors, such as improving transportation access, facilitating coffee machines, and providing fertilizer subsidies. Because in the performance of supply chain actors, transportation access is quite hampering the process of selling coffee, and the majority of supply chain actors in producing coffee can only rely on their labor manually without the help of machines. The subsidy is to reduce production costs so that it is easier for supply chain actors to obtain fertilizer and increase coffee production.
3. For future researchers:
   a. Future researchers can use this research as a reference or as further research and it is hoped that they can further develop this research.
   b. Future researchers can conduct research using a performance assessment method based on KPIs which is expected to produce even better performance priorities.
   c. In future researchers, it is hoped that they will look for more sources and references that can become references in research related to supply chain performance so that the research results can be even better.

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