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Cocoa Agro-industry Development through the Role of Actors in Supply Chain in West Sumatra

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Abstract— **Supply chain management is crucial in meeting consumer demand for raw materials and finished products. Effective supply chain processes aim to distribute products efficiently and at the right time, place, and cost to meet all requirements at every level. In the cocoa supply chain, the roles of actors such as cocoa farmers, collectors, wholesalers, agro-industry, and exporters are very important. While the availability of cocoa in the upstream sector is essential for the long-term viability of the cocoa agro-industry, the uncertainty of cocoa prices for farmers can threaten its sustainability. To overcome this problem, this study aims to examine the role of each supply chain actor in the cocoa pricing system. Descriptive and qualitative research methods were used. Interviews with cocoa supply chain actors in Pasaman, West Pasaman, and Padang Pariaman Regencies provided research data sources. According to the research findings, the price-fixing method, cocoa at the farmer and trader level, has been used thus far as the value pricing method received by consumers, which means that the price is based on consumer perceptions of the value of the cocoa being sold. Agro-industry product pricing is based on markup costs for the products produced. Meanwhile, cocoa pricing for exporters is adjusted to reflect the current global cocoa price. So, it is necessary to have a government policy that regulates the role of supply chain actors in determining cocoa prices at the farm level to improve the welfare of farmers, thus ensuring the development of a sustainable cocoa agro-industry.**

Keywords— **Supply chain; agroindustry; cocoa; role of actors.**

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I. INTRODUCTION

The development of the cocoa agro-industry depends on the roles and actions of actors in the cocoa supply chain. Supply chain management aims to meet consumers' demands for raw materials and finished products. The distribution of cocoa products at the right time, place, and cost is essential to minimize costs and meet the requirements of all actors at every level of the supply chain. Factors that affect supply chain management consist of the complex structure of actors in the supply chain, uncertainties, and risks in the supply chain [1]. The various supply chain actors all have different and potentially conflicting interests. As a result, supply chain complexity influences supply chain management decision-making and creates supply chain uncertainty [2]–[6]. The price of raw materials is one of the supply chain uncertainties [7]–[9].

Supply chain management is the integration of planning and coordination of all business processes to produce higher product value for consumers to meet the needs and satisfaction of stakeholders in the supply chain system. It is closely related to the company's competitive advantage, characterized by satisfactory consumer satisfaction in quality, quantity, and delivery time [10]–[14]. Supply chain management aims to improve the trust and collaboration of multiple supply chain partners, visible inventory improvements, and the speed with which inventory increases. Inventory is the starting point for supply chain management, and it must be addressed to improve system performance measurements from various stakeholders' perspectives. The supply chain activities are divided into three levels: strategic, tactical, and operational [1].

The strategic level is concerned with decisions that have long-term implications for the company, such as strategic networks, strategic partners with suppliers, information technology infrastructure, make or buy decisions, and expanding the organization's overall strategy with a supply strategy. The tactical level includes decisions typically updated quarterly to annually, such as purchasing, production, forecasting demand or sales, inventory policies, and transportation strategies. Daily decisions are made at the operational level, such as scheduling, determining transportation routes, determining lead times, and loading trucks [15]. Pricing is a tactical supply chain activity. Price uncertainty is one of the supply chain uncertainties that can be reduced by collaboration among supply chain actors to obtain better prices. Before making a risk response decision based on price uncertainty, it is critical to identify, measure, and categorize the existing risk sources [16]–[19].

The exchange rate that equates money or other goods to a person or group for a good or service at a specific time and place is known as the price. The term price is used to assign an economic value to a product, expressed in dollars and cents or other monetary exchanges, where price refers to an amount of money (which may be supplemented by goods) to obtain a variety of combinations of goods and services. Price can also be defined as the monetary value of goods or services. A power or company is willing to transfer the goods or services it owns to another party based on this value. This means that the price is the monetary unit or other measures (including goods and services) exchanged to obtain the right to own or use goods or services [20]. Based on the above, it can be concluded that price is the only element of the marketing mix that generates revenue compared to the other marketing mix elements (product, promotion, and place of distribution). Meanwhile, other features incur costs and are an important variable consumers use for various reasons. The first is economic, implying that low prices or always competitive prices are critical variables in improving marketing performance; the second is psychological, implying that price is frequently regarded as an indicator of quality [21]–[24].

Cocoa is grown on plantations, and numerous actors are involved in the cocoa supply chain. The participants include cocoa farmers, collectors, wholesalers, agro-industries, and exporters. Farmers are the most important players in the cocoa agro-industries supply chain because their output is the raw material for the cocoa agro-industries. The availability of cocoa from farmers can help the cocoa agro-industries to be more sustainable. The uncertainty of cocoa prices among farmers can disrupt cocoa availability and threaten the sustainability of cocoa agro-industries. Due to trade protection implemented by the Chinese government, the former Indonesian price policy set a benchmark price for cocoa product exports from Indonesia to China. It was claimed that China discriminated against cocoa from Indonesia by imposing a 10% import duty [25]. More institutional policies are being implemented in the Caribbean to create joint rules at various levels of the supply chain. India is making greater use of supply chain actors to influence existing agricultural policies. Based on this context, it is very important to examine the role of each supply chain actor in terms of the pricing system in the cocoa agro-industry.

II. Material and Methods

This study was conducted in Pasaman, Padang Pariaman, and West Pasaman Regencies. Purposive sampling was used to select these areas, with the three regions being the largest cocoa producers in West Sumatra. This study employed descriptive and qualitative research methods. This study's data sources are both primary and secondary. Purposive sampling was used to collect primary data from cocoa farmers, coca traders, and the cocoa agro-industry. The sample comprises 292 farmers, 30 traders, and three cocoa agro-industry representatives. A structured interview method is used to determine the price of cocoa for each actor in the supply chain system in West Sumatra. The interviews were exploratory, focusing on each actor in the cocoa agro-industries supply chain's existing pricing system. The steps to establishing the pricing system [20] are to discover how cocoa agro-industry supply chain actors choose target prices, determine demand, estimate production costs, analyze supply and prices of competitors (what factors influence it), select a pricing method, and determine the final price.

III. Result and Discussion

A. Supply Chain Channels of Cocoa Agro-industries in West Sumatra

According to survey respondents, the supply chain channel of the cocoa agro-industry in West Sumatra can be divided into three marketing channels. According to the first channel, farmers sell their cocoa to collectors, who then sell it to wholesalers. Wholesalers will no longer sell cocoa to exporters. Typically, farmers sell cocoa to collecting traders by picking up cocoa from collecting traders. Collectors typically deliver their cocoa to wholesalers. Large traders do the same thing and sell their cocoa to exporters. The second channel states that the farmers sell their cocoa to the collecting traders, and the cocoa collectors sell it to the agro-industry. Henceforth, in the cocoa agro-industry, it will be processed into processed cocoa products sold to end consumers. The process of selling cocoa from farmers to collecting traders is usually done by picking up cocoa from collecting traders. As for the agro-industry, the collecting traders usually deliver the cocoa. According to the third channel, farmers sell cocoa to a nearby agro-industry, which assists the farmers.

Furthermore, it will be processed into processed cocoa products sold to end users in the cocoa agro-industry. Cocoa farmers usually deliver the process of selling cocoa from farmers to agro-industry. Figure 1 depicts the supply chain channel of the cocoa agro-industry in West Sumatra.

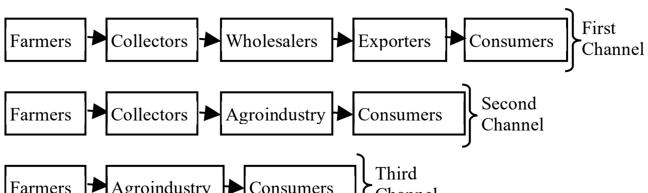

Fig. 1 Cocoa agro-industry supply chain channels in West Sumatra

B. System for Every Actor in the Cocoa Agro-industries Supply Chain

1) Farmers

As the first supply chain actors, cocoa farmers incur operational costs, including raw materials and labor. Usually, farmers estimate the costs incurred in cocoa farming based on the area of cocoa land they have. The cost of raw materials incurred by farmers is around IDR 3,000,000 to IDR

6,000,000 per year. In addition to the cost of raw materials, farmers also incur labor costs of around IDR 10,800,000 to IDR 18,000,000 per year. In general, the technology used by farmers is still traditional and uses local cocoa seed varieties with side grafting techniques. Cocoa buyers from farmers are collectors and agro-industries. Selling cocoa from farmers to collectors can be picked up by collectors or farmers delivering cocoa to collectors. The farmers who sell cocoa to the agro-industries usually provide it to the farmers.

Collectors and agro-industries determine the pricing system for cocoa for farmers. Based on research data, the price of cocoa at the farm level is around IDR 15,000 to IDR 30,000. The price difference between farmers is usually determined by the buyer, namely the collector trader or the cocoa agro-industry, by looking at the condition of the cocoa beans. Cocoa farmer respondents said that various factors affect the price of cocoa beans. These factors include the quality of the cocoa beans and the moisture content of the cocoa beans to be sold. In addition, the weather factor is also essential when farmers want to dry their cocoa before selling it to collectors or agro-industries. Farmers also mentioned that the availability of cocoa beans would also affect the price of cocoa. In producing cocoa, farmers never estimate the demand from traders or agro-industries. In general, farmers will sell whatever amount of cocoa they make.

2) Collectors

Different things happen in pricing at the level of the collectors. Operational costs charged by cocoa collectors consist of purchasing cocoa from farmers, labor, and transportation. The cost of buying cocoa from farmers ranges from IDR 18,000,000 to IDR 54,000,000 per year. The collectors usually give labor wages based on how many kg of cocoa they work. The pay period varies from daily to weekly. The labor costs incurred reach IDR 24,000,000 to IDR 63,000,000 per year. The following operational cost is transportation costs. This cost is in the form of fuel oil costs for the transportation used to pick up cocoa from farmers or deliver it to wholesalers or agro-industries. This transportation fee is around IDR 10,800,000 to IDR 12,000,000 per year. Buyers of cocoa from traders are wholesalers and agro-industries. The process of selling cocoa begins with traders buying cocoa from farmers and then selling it by delivering it to wholesalers or agro-industries.

The results showed that the purchase price of cocoa from farmers was around IDR 15,000 to IDR 30,000. Furthermore, the collectors are sold to wholesalers or agro-industry who have become subscriptions to the collectors. The selling price of cocoa from traders to agro-industries and exporters ranges from IDR 17,000 to IDR 35,000. Collectors rarely forecast demand. The buyer determines the cocoa price fixing system for collecting traders, namely wholesalers or agro-industry. The selling price of cocoa is determined based on the quality of the cocoa, including the moisture content of the cocoa beans, the cleanliness of the beans, the integrity of the beans, and the fermentation process carried out. In addition, the weather factor is also essential when traders want to dry their cocoa again before selling it to wholesalers or agro-industries.

3) Wholesalers

Operational costs incurred at the cocoa wholesaler level include purchasing costs from cocoa collectors, labor, storage, and transportation costs. The price of cocoa from collectors ranges from IDR 61,200,000 to IDR 210,000,000 annually. Wholesalers pay between IDR 72,000,000 and IDR 210,000,000 in labor costs annually. In general, the wholesalers usually pay wages based on the type of work, such as loading and unloading, and drying costs, and calculated per kg of cocoa they work. The pay period varies from day to day or weekly. Another cost wholesalers incur is storing cocoa in warehouses before selling cocoa to exporters. These storage costs include warehouse rental costs, electricity costs for storage warehouses, or warehouse building depreciation costs. The storage fee ranges from IDR 30,000,000 to IDR 65,000,000 per year. The following operational cost is transportation costs. These costs are in the form of transport rental fees or costs of fuel oil for the mode of transportation used to bring the cocoa from the wholesaler's warehouse to the exporter. This transportation fee is around IDR 72,000,000 to IDR 240,000,000 per year. The results showed that the buying price of cocoa from collectors was around IDR 17,000 to IDR 35,000. Furthermore, from wholesalers, cocoa is sold to exporters who have become customers of these wholesalers. The selling price of cocoa from wholesalers to exporters ranges from IDR 29,000 to IDR 40,000.

Cocoa buyers from wholesalers are exporters. The process of selling cocoa involves wholesalers who buy it from collectors and then sell it by delivering it to exporters. Buyers, namely exporters, determine the cocoa pricing system for wholesalers. The selling price is determined based on fluctuations in world cocoa prices, dollar prices, bean quality (bean integrity, cleanliness, fermented or not), and the moisture content of the cocoa being sold. In addition, the weather factor is also important when wholesalers want to dry their cocoa again before selling it to exporters. Sometimes, if the selling price of cocoa is still low, the big traders tend to store their cocoa, waiting for the market price to increase again. So, there are also large traders who say that the availability of cocoa beans will affect the cost of cocoa. Apart from these factors, there is also competition between exporters, which can affect the price of cocoa beans. The next factor affecting the coffee price includes the export demand for cocoa beans. Traders rarely forecast the market, and sometimes wholesalers will ask the exporter how much cocoa is needed. The tendency that often occurs is the demand for cocoa will increase when the price of cocoa increases. Traders also usually estimate from last year's buyer demand or see market demand from social media.

4) Cocoa Agro-industries

The cocoa processing industry, also known as the cocoa agro-industries, participates in the supply chain for this commodity. In this study, there were three cocoa processing businesses in West Sumatra were the research respondents. They are the Chokato in Payakumbuh, the Malibo Cocoa, and the Gapoktan Bungus Agro. The Chokato cocoa processing business is one of the agro-industries in South Payakumbuh City, founded in 2011. Chokato is one of the government's assistance through the 2011 Budget Development Grant Program through the West Sumatra Plantation Office. Chokato is a factory managed by the Tanjung Subur farmer group, which was established at the end of 2011 and started production in February 2012. This cocoa processing business has produced various products, from processed cocoa beans in cocoa powder, 3-in-1 chocolate powder, cocoa butter, and milk chocolate bars.

The Chokato factory obtains raw materials from the farming results of the Tanjung Subur cocoa farmer group, other farmer groups, and the surrounding community. The factory receives fermented and raw cocoa beans, which will be fermented by members of the farmer groups who manage the factory, especially in the fermentation section. Farmers who sell cocoa beans to Chokato are already fermented, with a price range of IDR 35,000 – IDR 38,000 per kg. Meanwhile, cocoa beans that come from non-partner farmers are sold to Chokato in general, which are still unfermented, with a price range of IDR 30,000 per kg. Production capacity at Chokato is currently around 100 to 150 kg per year. In addition to raw material costs, other operational costs are labor costs. Incentives for members of farmer groups who manage factories are around IDR 1,500,000 per month. In determining the selling price of its products, Chokato calculates it based on operational costs incurred. The selling price of Chokato cocoa powder is currently around IDR 250,000 per kg. Products processed by Chokato are marketed to Jakarta, Bandung, Medan, and Pekanbaru. Determining Chokato's request is based more on previous purchase estimates.

In addition, another agro-industry respondent is in the Malibo Chocolate cocoa processing business. This business was founded 12 years ago. Ms. Usnaiti leads Malibo Chocolate with milky powder and chocolate bars products. The purchase price of cocoa from farmers is around IDR 35,000 – IDR 36,000 per kg. The amount of cocoa produced is around 100 tons yearly, and the total production capacity is 200 tons yearly. In the meantime, the number of requests is about 200 tons per year. The cost of raw materials incurred by Malibo Brown is around IDR 500,000,000 per year; other expenses, such as labor costs, are around IDR 96,000,000 per year, and transportation costs are IDR 50,000,000 per year. The way to market Malibo Chocolate products is more to distributors. The marketing of Malibo Chocolate products covers the Padang, Bekasi, Pekanbaru, and Medan areas.

Another respondent is the cocoa processing business at Gapoktan Bungus Agro. The managing director of the Gapoktan is Mr. Atril. This Gapoktan comprises four farmer groups: Villa Saiyo, Gebang Sari Dua, Pinang Sinawa, and Salam Setia Perdana. One farmer group usually consists of 20-25 farmers. Gopoktan Bungus Agro, one of the players in the cocoa agro-industry, buys raw chocolate materials from farmers and traders in the Padang and Payakumbuh supply chains. Some natural cocoa materials have been fermented or not, and the price of unfermented and fermented cocoa is IDR 35,000 – IDR 40,000 per kg. The capacity of the existing machines in Bungus Agro's Gapoktan is around 100 kg per month, but only 80 kg of cocoa is processed weekly. In addition to the cost of raw materials, the labor costs that Gapoktan must incur are around IDR 19,600,000 annually, and transportation costs are around IDR 4,800,000 annually. The products produced by Bungus Agro's Gapoktan include chocolate candy, chocolate bars, cocoa powder, and cocoa butter. The selling price of each product is different. The selling price of cocoa butter products is 200,000 per kg, cocoa powder 85,000 per kg, dark chocolate bars 45,000 per 250 grams, milk chocolate 15,000 per 250 grams, and cocoa powder 25,000 per 250 grams. The marketing process at Bungus Agro Gapoktan is more about online promotion and participating in exhibitions.

5) Exporters

The following supply chain actor is cocoa exporters. According to information from the Department of Industry and Trade of West Sumatra, there are only a few cocoa exporters in West Sumatra, such as CV Hasil Bumi Raya, CV Mekar Jaya, and PT KEI. On the occasion of conducting research in the field, the author only managed to obtain information on CV Mekar Jaya. Cocoa exported is cocoa beans. The cocoa purchase price is around IDR 29,000 to IDR 40,000 per kg. The amount of cocoa shipped so far is around 150 tons per year. The determination of the selling price to exporters considers the world market cocoa price and the dollar price. Meanwhile, the price of cocoa from traders depends on the cocoa quality and the cocoa's water content.

Based on the previous results, it is possible to conclude that the stages of the pricing system in the entire cocoa agro-industry supply chain are:

1) Cocoa agro-industry supply chain actors choose the target price.

The pricing strategy is determined mainly by decisions concerning the placement of market positions. The target price can be selected based on profit, sales revenue, and market share, including survival, highest current profit, highest current revenue, highest sales growth, full market launch, and product quality leadership [20]. For cocoa farmers, the target price chosen is to survive. Farmers try to stay as the main target of farmers if they face difficulties caused by meeting the daily needs of farmers. For cocoa traders, the target price chosen is the maximum sales growth. Cocoa traders want to maximize their cocoa sales units to exporters, believing that high sales volume leads to lower unit costs and profits in the long run. As for the cocoa agro-industry, the target price chosen is product quality leadership. The cocoa processing business is a leader in the quality of its products. Meanwhile, exporters prefer to choose target prices based on maximum current profits.

2) Cocoa agro-industry supply chain actors determine demand

Each fixed price leads to different demand and thus affects marketing objectives differently. The demand schedule describes the number of units the market will buy in a given period at alternative prices that can be determined in that period. In standard cases, the relationship between demand and price is the opposite, the higher the price, the less the need for the product. Determining the market can be done by forecasting demand schedules or paying attention to price elasticity [20]. Cocoa farmers never estimate the demand from collectors as buyers. In general, farmers will sell whatever they produce. Sometimes, the farmers will also ask how much cocoa is needed directly from the traders. The tendency that often occurs demand for cocoa will rise when the price of cocoa increases. The same situation happened to cocoa traders. Cocoa traders rarely make demand forecasts. Sometimes, traders will ask how much cocoa is needed directly from the agro-industries or exporters. Traders also usually estimate from last year's buyer demand or see market demand from social media. The cocoa agro-industries use purchase data that has already occurred to estimate the demand for existing products. In other words, the cocoa agro-industry places more emphasis on previous demand experience. A similar situation occurs for exporters; exporters determine demand based on last year's purchase data.

3) Cocoa agro-industry supply chain actors estimate production costs

In general, companies want to set prices that cover the costs of manufacturing, marketing, and selling their products, including an acceptable return for the company and the risks involved. These costs include variable costs as well as fixed costs. In determining production costs, companies can pay attention to cost behavior at various production levels per period or cost behavior as a function of the accumulative [20]. Production costs for cocoa farmers include raw materials, labor, and transportation. Meanwhile, for cocoa collectors, production costs include purchasing costs for cocoa, labor costs, and transportation costs. For wholesalers, production costs include purchasing costs for cocoa, labor, storage, and transportation costs. As for cocoa agro-industries, production costs include variable costs (costs influenced by the amount of output of processed cocoa products) and fixed costs (fixed or not affected by the amount of processed cocoa products produced). The same situation for cocoa exporters' costs is in the form of variable and fixed costs.

4) Cocoa agro-industry supply chain actors analyze competitors' offers and prices

While market demand establishes the highest price and cost is the lowest price that can be set, the prices of competitors' products and possible price reactions assist the company in determining what prices are likely. The company must study the price and quality of each competitor's offerings, and it can be used as an orientation point for self-pricing. However, companies must pay attention to possible changes in competitors' prices in response to company prices [20]. Conditions in cocoa farmers only accept the selling price of cocoa determined by the trader. So, the competitor's price is almost the same for all cocoa farmers. Collectors and wholesalers usually choose the purchase price of cocoa based on the moisture content and quality of the cocoa beans.

Meanwhile, the agro-industry and exporters choose the selling price of cocoa from traders. The agro-industry has generally paid attention to competitors' prices and offers. Usually, the agro-industry looks at the market price and sets its processed cocoa products' selling price far from the competitor's. For exporters, the price is determined by the world cocoa price and dollar rate.

5) Cocoa agro-industry supply chain actors choose a pricing method

The three primary considerations in setting prices include the 3C's, namely the customer demand schedule, the cost function, and the competitor's price. The price problem is solved by choosing a method that includes one or more of these considerations. The pricing method will then lead to a specific price. The method of pricing determination is based on markup, return target, accepted value, current rate, and closed bid pricing [20]. For cocoa farmers, the pricing method applied so far is the accepted value pricing method. This is because traders determine the price of cocoa from farmers based on the assessment of the cocoa sold. The value is based on the moisture content of the cocoa beans and the quality of the cocoa beans (whole or not, clean or lots of dirt). So, it can be stated that the consumer's perception determines the price, that is, cocoa traders, not the sellers that are cocoa farmers in this case, the cocoa trader's perception, not the seller's cost, in this case, the cocoa farmer. Farmers use non-price variables in the marketing mix to create the value marketers want, and prices are set to match the resulting value. The same happens in determining cocoa's selling price from traders to agro-industries or exporters.

Determining the value received is applied to the selling price of cocoa from traders to agro-industries and exporters. This value is seen from the criteria for water content and quality of the cocoa beans. In cocoa agro-industries, the pricing is based on markups or the target return price. All selling prices of processed cocoa products in the cocoa agro-industries usually use markup pricing, which is the most basic price setting by adding a markup to the standard production cost. In addition, some agro-industries use return target pricing. Usually, agro-industries determine the price that will produce the target rate of return on investment (ROI). For exporters, the selling price of cocoa is determined based on the current price of the world cocoa market and usually follows an increase in the dollar price.

TABLE I
ANALYSIS OF THE ROLE OF SUPPLY CHAIN ACTORS IN THE COCOA PRICING SYSTEM IN AGRO-INDUSTRY DEVELOPMENT IN WEST SUMATRA

No	Price Setting Stages [20]	Cocoa Agro-industry Supply Chain Actors			
		Farmers	**Collectors and Wholesalers**	**Agro industry**	**Exporters**
1	Determining the price	Accepting the price that the buyer determines	Maximum sales growth	Product quality	Current maximum profit
2	Determining demand	Never forecast demand	Estimate demand by asking about potential buyers' needs	Perform demand forecasts based on previous purchase data experience	Perform demand forecasts based on the last demand data
3	Estimating production costs	Raw material costs, labor costs, and transportation costs	Cocoa purchasing costs, labor and storage costs, and transportation costs	variable costs and fixed costs	Variable costs and fixed costs
4	Analyzing competitors' offers and prices	Not done because dealers determine the price of cocoa.	Not done because the agro-industry or exporter sets the price of cocoa.	Examining the market price for each processed chocolate good, it produces is usually done.	Not done because the cocoa price is determined by the world cocoa price and the dollar price
5	Choosing a pricing method	Accepted value pricing method	Accepted value pricing method	Markup pricing or return target pricing method	Current prices in the world's cocoa market

Source: processed results of research observations

Analysis of the role of supply chain actors in the cocoa pricing system in the development of agro-industry in West Sumatra is depicted in Table 1. Only agro-industry players and exporters use pricing methods that benefit sellers, leaving cocoa farmers at a competitive disadvantage when selling cocoa. Price is the only one that generates revenue compared to other marketing mix elements besides products, promotions, and distribution sites [26]. Whereas in the cocoa agro-industry, the correct pricing method was used, as in Hoffman [27], the selling price must cover total costs plus a reasonable profit, also known as a markup. In addition, Haidar and Damodaran [28] and Maderson [29] stated that sales price is the amount of money a commercial unit charges buyers or customers for goods or services sold or delivered. This means that supply chain actors in the cocoa agro-industry should calculate all costs incurred to be borne by buyers for the processed cocoa they sell.

Barrera et al. [30] reveal the factors that influence and must be measured in pricing, namely internal and external factors. The external conditions that need to be considered are what kind of market is related to the cocoa commodity, including the market's nature and demand. In the real world, in everyday life, conditions of perfect market competition never occur or are fully realized, where market players cannot influence prices (price takers), and price levels are determined by supply and demand. Producers and consumers have knowledge or skills, perfect information about the cost of products and inputs sold in the market, and ease of entering and exiting the market. An imperfect competition market is often found where demand and supply are often imbalanced (excess supply or excess demand), and there is one dominant actor in influencing prices or as a price maker. If we look at the conditions in the field, the cocoa market is in an oligopsony market. Market conditions in which several business actors control the receipt of supplies or become the sole buyer of goods in a commodity market. The oligopsony market in cocoa causes the bargaining power of farmers to be low. Even that price is determined by collectors, wholesalers, cocoa agro-industry, or exporters. Buyers in an oligopsony market are buyers of factors of production or raw materials.

Discussion on pricing methods for cocoa agro-industry supply chain actors in West Sumatra: According to Tjiptono [26], cocoa farmers use demand-based pricing that emphasizes price on factors that influence tastes and decisions like or dislike cocoa traders as cocoa buyers from farmers. This method ignores factors that usually affect demand, such as costs, profits, and competition. The same applies to traders using demand-based pricing. Another situation is the cocoa agro-industry that uses cost-based pricing methods. In some agricultural industries, the price is determined by production and distribution costs plus a certain amount for direct costs, overheads, and profit. The purpose of this method is to balance income and cost in prices. This effort is carried out based on a specific profit volume target or expressed as a percentage of sales or investment.

IV. Conclusion

This study concludes that pricing for each supply chain actor has stages: choosing a target price, forecasting demand, managing production costs, analyzing competitors' offers and fees, and pricing methods. The pricing method applied so far is the received value pricing method. Cocoa prices at the level of farmers and traders are determined by consumer perceptions based on the evaluation of the cocoa sold. Product pricing in agro-industries is based on markup costs for the products produced. Meanwhile, cocoa pricing for exporters is adjusted to the prevailing world cocoa price. The suggestion in this study is that there is a need for a government policy that regulates the role of supply chain actors in determining cocoa prices at the farm level to improve the welfare of farmers, thereby ensuring the development of a sustainable cocoa agro-industry.

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References

[1] K. Katsaliaki, P. Galetsi, and S. Kumar, *Supply chain disruptions and resilience: a major review and future research agenda*, vol. 319, no. 1. Springer US, 2022.

[2] J. El Baz and S. Ruel, “Can supply chain risk management practices mitigate the disruption impacts on supply chains’ resilience and robustness? Evidence from an empirical survey in a COVID-19 outbreak era,” *Int. J. Prod. Econ.*, vol. 233, p. 107972, 2021, doi: 10.1016/j.ijpe.2020.107972.

[3] M. M. S. Sodhi and C. S. Tang, “Supply Chain Management for Extreme Conditions: Research Opportunities,” *J. Supply Chain Manag.*, vol. 57, no. 1, pp. 7–16, 2021, doi: 10.1111/jscm.12255.

[4] L. M. Fonseca and A. L. Azevedo, “COVID- 19 : outcomes for Global Supply Chains,” *MMCKS*, vol. 15, no. Special Issue, pp. 428–438, 2020, doi: 10.2478/mmcks-2020-0025.Introduction.

[5] C. Barbosa and A. Azevedo, “Assessing the impact of performance determinants in complex MTO/ETO supply chains through an extended hybrid modelling approach,” *Int. J. Prod. Res.*, vol. 57, no. 11, pp. 3577–3597, Jun. 2019, doi: 10.1080/00207543.2018.1543970.

[6] S. Chopra, M. M. Sodhi, and F. Lücker, “Achieving supply chain efficiency and resilience by using multi-level commons,” *Decis. Sci.*, vol. 52, no. 4, pp. 817–832, 2021, doi: 10.1111/deci.12526.

[7] X. Feng, Y. Rong, Z. J. M. Shen, and L. V. Snyder, “Pricing during Disruptions: Order Variability versus Profit,” *Decis. Sci.*, vol. 53, no. 4, pp. 646–680, 2022, doi: 10.1111/deci.12494.

[8] A. Hafezalkotob and S. Zamani, “A multi-product green supply chain under government supervision with price and demand uncertainty,” *J. Ind. Eng. Int.*, vol. 15, no. 1, pp. 193–206, 2019, doi: 10.1007/s40092-018-0271-9.

[9] C. S. Singh, G. Soni, and G. K. Badhotiya, “Performance indicators for supply chain resilience: review and conceptual framework,” *J. Ind. Eng. Int.*, vol. 15, pp. 105–117, Dec. 2019, doi: 10.1007/s40092-019-00322-2.

[10] M. Fatima, M. Asim, and S. Manzoor, “The Impact of Flexible Supply Chain Mangement Practices on Customer Satisfaction,” *J. Bus. Strateg.*, vol. 15, no. 1, pp. 01–24, 2021, doi: 10.29270/JBS.15.1(21).01.

[11] D. Singh and A. Verma, “Inventory Management in Supply Chain,” in *Materials Today: Proceedings*, 2018, vol. 5, no. 2, pp. 3867–3872, doi: 10.1016/j.matpr.2017.11.641.

[12] P. Becerra, J. Mula, and R. Sanchis, “Sustainable Inventory Management in Supply Chains: Trends and Further Research,” *Sustain.*, vol. 14, no. 5, 2022, doi: 10.3390/su14052613.

[13] K. Salas-Navarro, P. Serrano-Pájaro, H. Ospina-Mateus, and R. Zamora-Musa, “Inventory Models in a Sustainable Supply Chain: A Bibliometric Analysis,” *Sustain.*, vol. 14, no. 10, 2022, doi: 10.3390/su14106003.

[14] A. O. Dundar and R. Özturk, “the Effect of on-Time Delivery on Customer Satisfaction and Loyalty in Channel Integration,” *Bus. Manag. Stud. An Int. J.*, vol. 8, no. 3, 2020, doi: 10.15295/bmij.v8i3.1520.

[15] D. S. Levi, *Designing and Managing Supply Chain*. Singapore: The MSGraw-Hill Company, Inc, 2003.

[16] Y. Peng, X. Yan, Y. Jiang, M. Ji, and T. C. E. Cheng, "Competition and coordination for supply chain networks with random yields," *Int. J. Prod. Econ.*, vol. 239, Sep. 2021, doi: 10.1016/j.ijpe.2021.108204.

[17] Y. Shi and F. Wang, "Agricultural Supply Chain Coordination under Weather-Related Uncertain Yield," *Sustain.*, vol. 14, no. 9, 2022, doi: 10.3390/su14095271.

[18] T. Chen, C. Liu, and X. Xu, "Coordination of Perishable Product Supply Chains with a Joint Contract under Yield and Demand Uncertainty," *Sustain.*, vol. 14, no. 19, pp. 1–20, 2022, doi: 10.3390/su141912658.

[19] F. Wang, A. Diabat, and L. Wu, "Supply chain coordination with competing suppliers under price-sensitive stochastic demand," *Int. J. Prod. Econ.*, vol. 234, Apr. 2021, doi: 10.1016/j.ijpe.2020.108020.

[20] T. Abdullah and T. Francis, *Manajemen Pemasaran*. Jakarta: Rajagrafindo Persada, 2018.

[21] A. Albari and A. Kartikasari, "The Influence of Product Quality, Service Quality and Price on Customer Satisfaction and Loyalty," *Asian J. Entrep. Fam. Bus.*, vol. 3, no. 1, pp. 49–64, 2019.

[22] A. Hinterhuber, M. Kienzler, and S. Liozu, "New product pricing in business markets: The role of psychological traits," *J. Bus. Res.*, vol. 133, pp. 231–241, Sep. 2021, doi: 10.1016/j.jbusres.2021.04.076.

[23] R. Jimenez Mori, "It's not price; It's quality. Satisfaction and price fairness perception," *World Dev.*, vol. 139, Mar. 2021, doi: 10.1016/j.worlddev.2020.105302.

[24] H. Imkamp, "Should Prices of Consumer Goods Be Better Indicators of Product Quality?," *J. Consum. Policy*, vol. 41, no. 1, pp. 77–81, 2018, doi: 10.1007/s10603-018-9367-2.

[25] K. F. Egbadzor, J. Akuaku, and M. K. Aidoo, "Potentials of baobab: A Complement to Cocoa Production," *J. Agric. Food Res.*, vol. 11, 2023.

[26] Tjiptono, *Manajemen Pemasaran dan Analisa Perilaku Konsumen*. Yogyakarta: BPFE, 2001.

[27] M. P. Hoffman *et al.*, "Fertilizer management in smallholder cocoa farms of Indonesia under variable climate and market prices," *Agric. Syst.*, vol. 178, 2020.

[28] T. Haidar and A. Damodaran, "Identifying market power of retailers and processors: Evidence from coffee supply chain in India," *IIMB Manag. Rev.*, vol. 34, no. 3, pp. 286–296, 2022.

[29] S. Maderson, "Co-producing agricultural policy with beekeepers: Obstacles and opportunities," *Land use policy*, vol. 128, p. 106603, 2023.

[30] C. J. G. Barrera, E. M. M. Garcia, and A. D. M. Amariz, "Theoretical model of territorial agro-industrial development through multi-focus research analytics," *J. Rural Stud.*, vol. 94, 2022.