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Feasibility Analysis of Applying Appropriate Technology and Business Processes in the Small and Medium Coffee Industry

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ABSTRACT
This study was conducted to see the feasibility of the coffee industry through the application of appropriate technology and business processes. The research method used was descriptive quantitative. Data collection was done through observation, documentation, and a literature study. The data analysis technique used was data reduction, data presentation, and data interpretation. The results showed that the availability of raw material in the form of coffee yields had an increasing trend both nationally and in South Sumatra. In addition, the area of coffee plantations also tended to increase. The type of coffee product from South Sumatra with the highest possible commercialization opportunity was Robusta coffee. Several types of coffee products from home industries in various Regencies/Cities in South Sumatra had excellent taste and aroma so they had commercialization opportunities. The coffee industry in South Sumatra, especially in Pagaralam City was feasible to be built based on abundant raw materials and financial analysis. Raw materials from local farmers had relatively stable production and tended to increase. Suggestions and recommendations can be given to the Regional Government and the community to pay attention and intensively foster the process of cultivating wild civet coffee (Paradoxurus hermaphrodites) from various Regencies/Cities in South Sumatra by the Regional Government to have competitive commercialization opportunities.

INTRODUCTION

South Sumatra is the largest coffee producer in Indonesia and the second in the world. This is due to the coffee plantation area in South Sumatra reaching more than 280 hectares. According to data from the Ministry of Agriculture in 2020, coffee production in South Sumatra reached 199,324 tons. Meanwhile, in 2021, it reached around 201,400 tons. Coffee production in South Sumatra was more than a quarter of the national coffee production (773,410 tons) (Tresia et al., 2021).

Badan Pusat Statistik (BPS) showed coffee production in Indonesia was 774,600 tons in 2021. This number increased by 2.74% compared to the previous year of 753,900 tons(Badan Pusat Statistik, 2022). South Sumatra tops the list as the largest coffee producer in Indonesia. Coffee production in the province reached 201,400 tons in 2021. The majority of coffee types in South Sumatra are robusta, around 70% (Prasmatiwi & Abidin, 2022). The coffee plantations are in Pagar Alam, Lahat, Muara Enim, Empat Lawang, Ogan Komering Ulu, and Musi Rawas.

The next largest coffee producer is Lampung with a production of 118,000 tons, then, North Sumatra and Aceh with 76,800 tons and 74,200 tons, respectively. Subtropical and tropical regions are good locations for coffee cultivation. Therefore, the dominant coffee-producing countries in the world are South America, Africa, and Southeast Asia.

Al Farisi and Fasa (2022) showed several strong reasons underlying the importance of small and home industries in the Indonesian economy. Most of the small and household industries are located in rural areas, so if it is associated with the fact that agricultural land is decreasing, then small industries and households in rural areas can absorb labour in rural areas (Aryani, 2022). Then, small industries and household activities use raw materials from the surrounding environment so that production costs are low. The relatively low-income level of the community and the low prices of small industrial and household products will provide an opportunity to survive. The demand for non-mass-produced products is also an opportunity.

Coffee production in South Sumatra has existed in the community for generations but is still traditionally managed by the community. Based on these conditions, the formulation of the problem in this study is whether processed coffee products can develop commercially in South Sumatra until this study is carried out. This study aims to find out the feasibility of the coffee home industry as a producer of commercial products in South Sumatra.

This research is important because the results of the study can be used as a reference for the small and medium coffee industry to implement business planning in the face of similar industry competition from other regions. The importance of this research is to see the feasibility and availability of various sources for sustainable coffee production in South Sumatra through the application of appropriate technology and business process improvement.

The novelty of this research is to reveal the description of the data on the feasibility of the coffee industry in South Sumatra from various aspects including farm area, the percentage growth of coffee farm area, total production of coffee farm types, comparison of coffee yields between national data and districts/cities in South Sumatra. This study was conducted to see the feasibility of the coffee industry through the application of appropriate technology and business processes.

METHOD

The study was carried out in the Regencies and Cities of South Sumatra Province. The data required were primary data and secondary data. Primary data were obtained from observations of coffee entrepreneurs and farmers who own coffee plantations in Pagaralam City. Secondary data were obtained from Regional Government and BPS data. The research method used in this study was descriptive. Data collection in this study was carried out through observation, documentation, and a literature study. The data analysis technique used in this study was data reduction, data presentation, and data interpretation.

Feasibility analysis of the coffee industry was carried out by analyzing data descriptions and observation forms. Several aspects related to the establishment of a coffee business were carried out on the availability and sustainability of coffee berry raw materials, markets and marketing, and the availability of technology. If the establishment of a coffee business is considered feasible, then the

analysis is continued on the organization and management, environmental analysis, and legality.

The availability of raw materials identified the potential for primary coffee products outside the coffee growing area in South Sumatra through secondary data and primary data. Secondary data were derived from government documents as well as data from BPS and primary data from information provided by coffee farmers through observation. The selected equipment should be following the criteria for the availability of the tools and could be made and operated by considering the specifications of the equipment to produce optimum products according to market demand.

Types of coffee processing products with commercial value were observed in various Regencies/Cities in South Sumatra Province in household, small, and medium-sized businesses, where the processed coffee products had developed nationally and internationally. The feasibility of a coffee business was related to the demand for the product by the local, national, or international market. In addition, the processing and production processes were related to the availability of raw materials which of course intersect with other farming businesses in South Sumatra, especially oil palm and rubber farming.

RESULTS AND DISCUSSION

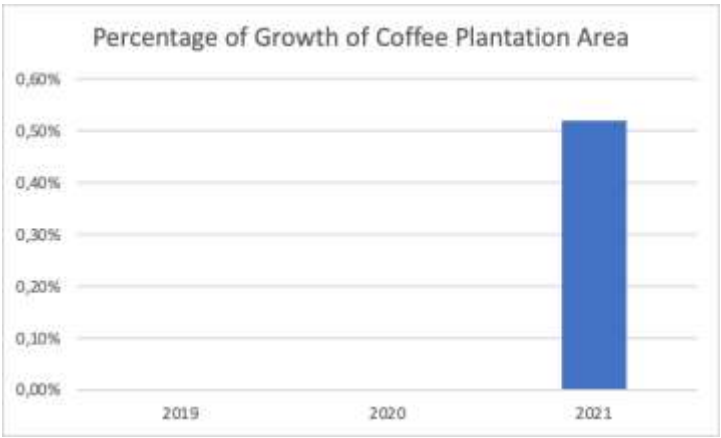
Availability of Raw Materials

The most produced type of coffee in South Sumatra is Robusta coffee. Robusta grows and thrives in dry areas. The quality of Robusta coffee berries is lower than Arabica coffee but higher than Liberica coffee. The average plantation area of South Sumatra is more than 250,000 hectares or above the national average.

Table 1
Average Coffee Plantation Area

Category	South Sumatra			National		
	2019	**2020**	**2021**	**2019**	**2020**	**2021**
Average Plantation Area (Thousand Hectares)	250.2	250.2	251.5	1245.2	1242.8	1258.8
	Average			**3-years Average**		
	36.6	36.6	37.0	36.7		

Source: processed data, 2022



Source: processed data, 2022

Fig. 1 *Growth Percentage of Average Coffee Plantation Area in South Sumatra*

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Based on Table 1, South Sumatra experienced an increase in coffee plantation area starting from 2019 with a total of 250.2 thousand hectares to 251.5 thousand hectares in 2021. Nationally, it showed a nearly similar trend from 1245.2 thousand hectares in 2019 to 1258.8 thousand hectares in 2021. The average coffee plantation area in South Sumatra exceeds the national average of 36.6 thousand hectares in 2019 and 2020 and 37 thousand hectares in 2021 with a 3-year average of 36.7 thousand hectares.

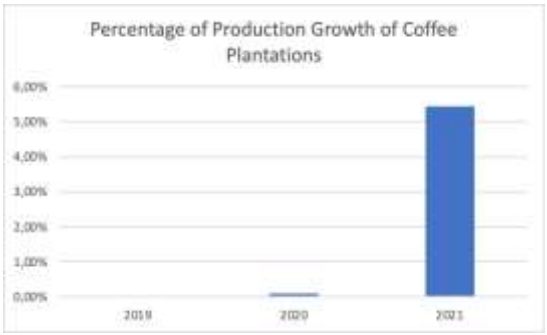
Fig. 1 showed that 2020 had stagnation in the growth of coffee plantation land area. Meanwhile, in 2021, the land area for coffee plantations had an increase of 0.52% compared to 2019 and 2020.

Table 2
Coffee Plant Production

Category	South Sumatra			National		
	2019	2020	2021	2019	2020	2021
Plantation Crops Production (Thousand Tons)	191	191.2	201.4	752.5	753.9	774.6
	National Average			3-years Average		
	22.1	22.2	22.8	22.4		

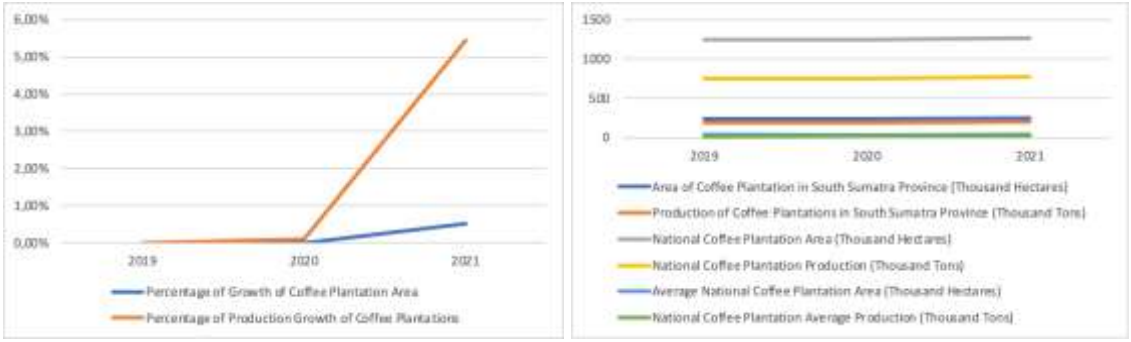
Source: processed data, 2022

Total coffee production in South Sumatra had an increase from 2019 to 2021 to reach 10,000 tons. This is also in line with the increase in the number of national coffee production by 752,500 tons to 774,600 tons in 2021 (Table 2). Total coffee production in South Sumatra exceeded the average national production rate per province, namely 22,100 tons in 2019, 22,200 tons in 2020, and 22,800 tons in 2021.



Source: processed data, 2022

Fig. 2 *Growth Percentage of Average Coffee Production in South Sumatra*



Source: processed data, 2022

Fig. 3 *Comparison of Coffee Production and Plantation Area Growth in South Sumatra and National*

Fig. 2 showed the increase in the number of coffee production in 2021. Coffee production in 2021 increased by 5.45% and in 2020 increased by 0.10%.

Based on the comparison shown in Fig. 3, coffee in South Sumatra has an increasing trend both in terms of production and land area. Coffee production in South Sumatra exceeds the national average every year.

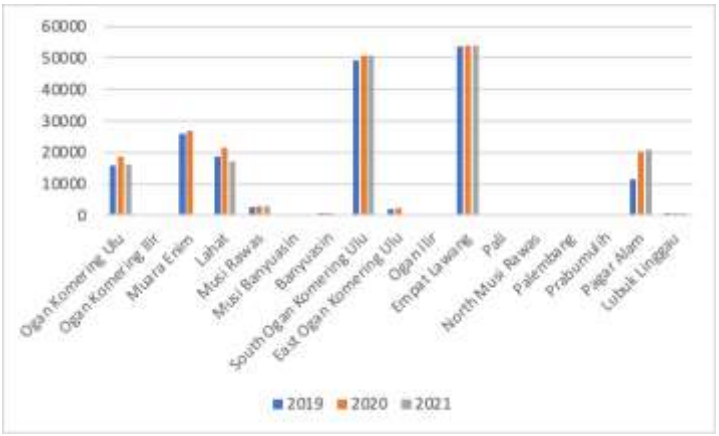


Figure: processed data, 2022

Fig. 4 *Coffee Yield in Regencies/Cities of South Sumatra*

Fig. 4 showed that coffee is grown in almost all regencies and cities in South Sumatra. The most dominant coffee producers are in South Ogan Komering Ulu Regency, Empat Lawang Regency, Muara Enim Regency, Lahat Regency, Ogan Komering Ulu Regency, and Pagar Alam City. Meanwhile, in other regencies and cities, the area of coffee plantations is usually less than 1,000 ha. The community in general still manages coffee plantations traditionally because they have not received meaningful guidance and facilities from the Regional Government.

An industry can grow and develop if it is supported by several characteristics, namely Business Status, Labor, Capital, and Raw Materials(H Nasir Asman, 2021). Raw materials are materials used as basic ingredients in production to produce semi-finished goods and finished goods (Iryanie & Handayani, 2019). Usually, the industry grows and develops for various reasons, including the relationship between local raw materials and hereditary expertise (Ramdhani & Hendrani, 2020).

Raw materials used in production activities need to consider matters relating to the amount of raw material needed for a period, the feasibility of raw material prices, continuity (sustainability, continuity) of inventory, quality of raw materials, and transportation costs. In the absence of raw materials in the industry, the production process will not run. The production process will run again when the raw material already exists or it can be said that the production process is influenced by raw material (Dewi, 2019).

Distribution and Marketing

The price of a coffee with small beans is more expensive than large ones, small coffee beans are preferred by people over large ones. One of the small coffee beans is Robusta coffee. Coffee prices in South Sumatra are generally not too high. The price of coffee in South Sumatra ranges from Rp. 15,000 to Rp. 23,000/kg.

Coffee cultivated by the community is only for family consumption because interest in commercial cultivation has decreased. Luwak coffee is also found in Pagaralam City. People know this coffee as expensive coffee, so people have understood and commercialized the existence of civet coffee. Civet coffee in Pagaralam City has been traded and handled specifically because it is known as good coffee

(Kurniawan et al., 2021). The existing coffee company is a family business from parents to children and their grandchildren. Although the coffee industry, according to the owner, is experiencing a decline, this industry still survives (Febriantoko et al., 2020).

Coffee production in South Sumatra has an increasing trend. The problem with coffee cultivation at the farm level is the incompatibility of the selling price with the costs incurred to process coffee into ground coffee, or the selling price of coffee is too low so it is not attractive for commercial production. Communities need appropriate technology as a solution to post-harvest coffee processing problems (Febriantoko et al., 2019).

Appropriate Technology

The coffee processing process carried out by the people in South Sumatra is still traditional. Coffee berries are peeled, fermented, and dried in the sun. People generally know the fermentation process to remove mucus after being peeled. The technique used to remove peels is usually done by roasting followed by pounding coffee beans until all the peels are broken. Roasting is the process of heating coffee beans until they coffee beans emit an aroma and make the peel easy to break and throw away. Roasting takes at least 1 hour with heat energy obtained from biomass fuel (wood burning). Roasting is done manually by placing the coffee beans in a metal cylinder with a stem. During heating, the cylinder is rotated so that the heat can be spread evenly over the coffee.

Farmers in Kota Pagaralam are trying to develop equipment and machines for coffee grinders or pulpers because peeling is time-consuming if done manually (Hendradinata et al., 2018). Based on information from an observational study in Pagaralam City, some factories only do roasting services, receive coffee, and return it in the form of roasted coffee beans. Employers only receive wages for roasting services. Roast capacity is about 750 kg/day with wood burned.

Farmers have the awareness to take care of their coffee plants because it is profitable for them. The value of coffee production can compete with rubber and oil palm plantations. Even farmers who own coffee plantations often hire other people to help with the harvesting process.

The coffee factory, which has been operating for 20 years, is a family business. A common problem encountered is the non-independence of the processing process. Raw materials mostly come from local coffee products or farmers in the region. Gift shops in Pagaralam City and traditional markets accept coffee beans or ground coffee produced by the community. However, several sources state that there are coffee products originating from Lampung Province. A common complaint at the farmer level is that the price of the coffee itself often does not reach the desired price. Although coffee from the South Sumatra region is quite good, it must still compete with corporate coffee companies from outside the region.

Most of the coffee industries in various Regencies/Cities in South Sumatra are still home industries. The equipment and machines used are still home industry scale and have not adopted an integrated business system.

Coffee bean production in South Sumatra is mostly produced by farmers. Farmers besides planting and picking, farmers also peel, dry, and grind to obtain coffee beans.

Farmers have difficulty harvesting because the trees are too tall so they are difficult to pick. If the berry cannot be picked, then the berry is left to ripen on the tree and wait for it to fall to the ground to be picked up. The coffee industry in South Sumatra is generally on the home industry scale, so some of them are not required to obtain a business license. This industry obtains a lot of raw materials from regencies/cities in South Sumatra. The dominant type of coffee is Robusta.

The coffee berry processing process carried out in South Sumatra is as follows: after the coffee berry is picked from the tree, it is peeled using a simple homemade machine, then dried for 2 days, or the coffee berry is directly dried together with the peel. Drying coffee berries together with the peel is usually done for 4 to 5 days, then grinding to remove the peel. Peeling is also usually done by machine for Rp 500/kg to Rp 700/kg. After peeling, the bean is then dried in the sun to remove the peel in the bean. Drying is usually for 2 days. After the coffee is dried, it is ground using a mortar. After that, the coffee is cleaned from the dirt attached by winnowing and then dried again to get coffee beans. This coffee bean is usually sold directly to the store. This production process is semi-mechanical because some of it is done manually, so it needs attention and improvement (Amrin et al., 2019).

The acceleration of the harvesting process resulted in low-quality coffee mostly caused by the raw material coming from coffee beans a mixture of old and young beans, or even more young beans. Because the harvesting process carried out by farmers is outside the control of the ground coffee processing company. The low quality of the product competes with other factory products that enter South Sumatra. However, improvements at the level of producers and farmers in South Sumatra are always increasing.

Several types of equipment and machines used to process primary types of coffee in the form of coffee beans and secondary coffee products in the form of processed products from coffee beans into various types have been widely researched and always developed. One of them is a pulper with several capacity and price specifications, including modifications to the roller and peeler plate. The coffee berry peeler machine is quite effective in peeling coffee berries with a working capacity of 494.04 kg/hour, an increase from the previous capacity of 285.82 kg/hour, with a yield of 76.06% which was previously 53.41% (Evanjelina, 2022).

The fermentation process is generally carried out for Arabica coffee processing and is not widely practised for Robusta coffee processing. The purpose of the fermentation process is to remove the mucus layer remaining on the surface of the coffee beans after the peeling process. In Arabica coffee, fermentation aims to reduce the bitter taste and encourage the formation of a "mild" impression of the brewed taste. Generally, the fermentation time of coffee beans for Arabica is between 12 and 36 hours while for Robusta it is shorter (Baihaqi et al., 2022). Washers have been produced with several specifications, including a capacity of 100 kg/hour driven by a 5.5 PK gasoline motor, a capacity of 500 kg/hour driven by a 10 – 12 PK diesel motor, and a capacity of 1,000 kg/hour driven by a 20-22 PK diesel motor or electric motor 16-20 PK. Washing is used to remove the remaining mucus still attached to the peel from the fermentation. Several peeling machines are used to separate coffee beans from the peels to get coffee beans, such as roasters and grinders to obtain finely ground coffee grains, as well as packaging machines to maintain the aroma and taste of ground coffee during transportation and distribution to consumers and while being sold in shops or the market (Islamadieni, 2021).

Financial Analysis

Based on the feasibility analysis of the business process for 20 years, it is feasible to establish a coffee factory. Several feasibility criteria used include Gross B/C, IRR, and NPV feasible. The IRR value is above the interest rate and the NPV value is positive. In the feasibility analysis, it is assumed that a 1-year deposit interest rate of around 6%.

CONCLUSIONS

The type of coffee product from South Sumatra with the highest possible commercialization opportunity was Robusta coffee. Several types of coffee products from home industries in various Regencies/Cities in South Sumatra had excellent taste and aroma so they have commercialization opportunities. The coffee industry in South Sumatra, especially in Pagaralam City was feasible to be built based on abundant raw materials and financial analysis. Raw materials from local farmers had

relatively stable production and tended to increase. Suggestions and recommendations can be given to the Regional Government and the community to pay attention and intensively foster the process of cultivating wild civet coffee (*Paradoxurus hermaphrodites*) from various Regencies/Cities in South Sumatra by the Regional Government to have competitive commercialization opportunities. It takes the role of various elements to introduce the quality of the coffee product. In addition, the Regional Government needs to re-establish techniques for the cultivation and management of coffee farming, especially in civet coffee-producing areas making it a source of income for rural communities in South Sumatra.

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