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Efficiency and Productivity of Coffee Agroindustry in Sungai Penuh City; Dea Approach And The Malmquist Index

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Abstract

The coffee agroindustry's progress in Sungai Penuh city is still not optimal because of human resources' low ability and lack of knowledge and authority about technology. It ultimately impacts the level of efficiency and productivity value of the coffee agroindustry in Sungai Penuh City. This study aims to look at the general efficiency of coffee agroindustry in Sungai Penuh City from 2017-2021 by data envelopment analysis method and measure each coffee agroindustry's productivity level Malmquist index method. The results showed from the quadrant efficiency value and productivity level of Sungai Penuh city coffee agroindustry from 2017-2021 there are three coffee agroindustries in the category of High Efficiency, High Productivity, while the other four coffee agroindustries are in the category of High Efficiency, Low Productivity, there is no coffee agroindustry in the category of Low Efficiency, High Productivity, then found there are three coffee agroindustries in the category of Low Efficiency, Low Productivity.

Keywords: Efficiency, Productivity, DEA, Malmquist, and Coffee Agroindustry

Abstrak

Kemajuan agroindustri kopi di kota Sungai Banyak masih belum maksimal karena rendahnya kemampuan sumber daya manusia serta kurangnya pengetahuan dan penguasaan terhadap teknologi. Hal tersebut pada akhirnya berdampak pada tingkat efisiensi dan nilai produktivitas agroindustri kopi di Kota Sungai Banyak. Penelitian ini bertujuan untuk melihat efisiensi umum agroindustri kopi di Kota Sungai Banyak tahun 2017-2021 dengan metode analisis data envelopment dan mengukur tingkat produktivitas masing-masing agroindustri kopi dengan metode indeks Malmquist. Hasil penelitian menunjukkan dari nilai kuadran efisiensi dan tingkat produktivitas agroindustri kopi kota Sungai Banyak tahun 2017-2021 terdapat tiga agroindustri kopi yang masuk dalam kategori Efisiensi Tinggi, Produktivitas Tinggi, sedangkan empat agroindustri kopi lainnya masuk dalam kategori Efisiensi Tinggi, Produktivitas Rendah, tidak terdapat agroindustri kopi yang masuk dalam kategori Efisiensi Rendah, Produktivitas Tinggi, kemudian ditemukan terdapat tiga agroindustri kopi yang masuk dalam kategori Efisiensi Rendah, Produktivitas Rendah.

Kata Kunci: Efisiensi, Produktivitas, DEA, Malmquist, dan Agroindustri Kopi

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INTRODUCTION

Sungai Penuh City is an area that has the potential to develop local economic resources among local economic sources that have the potential to be a source of economic growth for Sungai Penuh City is the development of processed coffee products. As one of the trades and economic centers in Jambi Province, Sungai Penuh City with such potential will have opportunities in the development of coffee agroindustry because it is supported by the availability of raw materials, as well as human resources and also has a comparative advantage in addition to being able to meet the needs in its own region can also be exported outside the region.

In general, agroindustry is an activity of industrial activities that aim to provide added value in the form of utilization of primary agricultural commodities into processed products, both intermediate

products and finished products ready to be consumed or further processed into new products and other industrial raw material products. Therefore, the development of the coffee agroindustry sector is important for Sungai Penuh City's economic growth because of its role in terms of; (1) Increase Regional Gross Domestic Product, (2) Preparation to industrial-based areas in support of industrialization of agricultural products. (3) Increasing employment opportunities, (4) Increasing coffee market share, and (5) Increasing the income of farmers and coffee industry actors in Sungai Penuh City, so that to lead to sustainable agroindustry conditions, the agricultural sector must also be strengthened because all agroindustry products are sourced from raw materials provided in the agricultural sector (Timisela, Leatemia, Polnaya, & Breemer, 2017).

Efforts to develop coffee agroindustry activities in the city of Sungai Penuh began in 2015. At first, there were ten agroindustry actors who carried out coffee agroindustry activities in the form of small-scale industrial activities was carried out because the added value obtained from coffee derivative products such as the type of ground coffee is much higher and more profitable than the added value obtained from the value of coffee beans that are only sold without processing.

With the development of the coffee agroindustry in Sungai Penuh City, in 2019, the Government of Sungai Penuh City, together with coffee agroindustry actors and other coffee communities, declared Sungai Penuh as a coffee city. However, in general, the development and progress of the Coffee agroindustry in Sungai Penuh city is still not optimal because of the low ability of human resources and lack of knowledge and authority about technology so that it ultimately impacts the level of efficiency and productivity value of coffee agroindustry in Sungai Penuh City.

The main problem in agroindustry based on superior regional products is the inability to optimize the resources owned by agroindustry players and manage the business environment to impact the low productivity, quality, and competitiveness of agroindustry. It is necessary measures to measure the coffee agroindustry's performance so that agroindustry actors can improve productivity, quality, and business competitiveness.

Reviewed from several previous studies showed that no one has specifically examined the coffee agroindustry level of efficiency and productivity value. Previous studies have discussed coffee agroindustry related to institutional aspects, financial aspects, production aspects, certification systems, human resource aspects, supply chain and environmental aspects (Romano, 2009; Almqvist, 2011; Fadhil et al., 2017; Timisela et al., 2017)

Performance efficiency measurement is an essential benchmark in measuring the quality of agroindustry. One method for measuring the coffee industry's performance efficiency is to use the DEA approach (Data Envelopment Analysis). DEA measurement can be used to evaluate the performance of a responsible decision-making unit using several inputs to obtain a targeted output. Put simply, agroindustry performance efficiency measurements are expressed by the ratio between the output and the input, a unit of measurement that can be expressed partially or in total.

One of DEA's advantages is that it can handle a variety of inputs and outputs and does not

require assuming a functional relationship between input and output variables. While the Malmquist Index analysis is part of the DEA method that looks explicitly at each business unit's productivity level, there will be a change in efficiency and technology based on predetermined inputs and outputs. Therefore, in this study, the Malmquist Index will be used to analyze the coffee agroindustry's productivity level in Sungai Penuh City.

The advantages of the Malmquist index to be used to measure productivity include. First, the Malmquist index does not require assumptions about production units' economic behavior, such as minimizing costs or maximizing profits, so it is beneficial to have different or unknown goals. Second, this index is a nonparametric method, so it does not require specifications of production functions. Third, the calculation of this index does not require price data that is often unavailable. Fourth, the Malmquist index can be broken down into two components: efficiency changes and technological changes. According to Avenzora Ahmad (2008), this is very useful because the analysis can be done more specifically based on its components. Meanwhile, Ascarya et al.(2009) revealed the shortcomings of Malmquist index measurement; among others, this method requires balanced panel data not to be used for time-series data.

Based on existing literature studies, the study on measuring the coffee industry's efficiency and productivity value using the dea approach and Malmquist index is still relatively limited in agroindustry studies in Indonesia. Generally, DEA is widely used to measure the level of technical efficiency, scale, and economy of the banking industry and other financial institutions. As has been done by Rusydiana et al. (2019), Yonnedi et al. (2019). Over time, DEA methods also began to be widely used in measuring non-bank efficiency levels, such as hospitals, small and medium enterprises, educational institutions, and nonprofits ; (Manongga, 2014; Quayes, 2014; Fatimah et al. 2017; Rustyani et al. 2018; Suryani et al. 2019; Fathurrahman et al. 2019; Permatasari et al. 2019; Ariyani, 2020)

The purpose of this research is First, looking at the general efficiency of the coffee agroindustry in Sungai Penuh City from 2015-2019. Second, measure the productivity level of each coffee agroindustry. At the same time, we will map all the coffee agroindustry objects in 4 quadrants of efficiency value and productivity level. This paper will then be divided into four parts. The first section presented an introduction that became the background of the problem of this research. The second part consists of the basis of theory, methodology, and research framework. In the third part, the results and discussion comprise three stages, namely the set of measurement of agroindustry efficiency using the DEA method, then followed by the size of the Malmquist index and quadrant of efficiency value productivity level of the coffee industry. At the end of the writing will be closed with conclusions.

The Foundation Of Theory

Efficiency Measurement

In general, the concept of efficiency comes from the concept of microeconomics, namely

producer theory. The theory of manufacturers trying to maximize profits or minimize costs from a manufacturer's point of view means manufacturers tend to maximize profits and reduce costs. Therefore, according to Timisela *et al.*(2017), performance efficiency assessment is needed to maximize profit and produce maximum output with low-cost inputs. Meanwhile, according to Hadi et al. (2012), performance efficiency assessment will provide important information about the financial condition and management performance that can be useful for regulators, managers, and investors.

In economic theory, there are two types of efficiency, namely technical efficiency, and economic efficiency. Technical efficiency has a microeconomic picture, and economic efficiency has a macro-economic view. (Rusydiana et al., 2019). While in Cooper (2013) corporate perspective divides efficiency into several parts: technical efficiency, scale efficiency, cost efficiency, and local efficiency. (indicative efficiency). Technical efficiency reflects the industry's ability to achieve optimal output levels using a certain level of input. This efficiency measures the production process to produce a certain amount of output by minimizing inputs. (Porcelli, 2009). In other words, an agroindustry player is said to be technically efficient compared to other agroindustry actors who suppose the use of the same type and number of inputs obtained. In that case, the physical output is higher because the efficiency level becomes a benchmark against the management of production factors during the coffee agroindustry activities.

Local efficiency is the industry's ability to optimize the use of input factors through price structure and technology. Pareto efficiency is often equated with local efficiency to develop efficiency in exchange (Timisela et al., 2017). Economic efficiency is a combination of technical efficiency and local efficiency. Implicit economic efficiency is the smallest concept of production cost (Coelli, 1996). For a certain level of output, a production industry is economically efficient if it can minimize the use of costs per unit of output. (Ascarya et al., 2009). In other words, for a certain level of output, a production process is said to be economically efficient if no other process can be used to produce that level of production at the lowest cost per unit.

According to Ramanathan in Ascarya et al. (2009) explained, the efficiency of scale is related to the achievement of the unit's economic scale in carrying out its operations. Inefficiency in scale efficiency can only be overcome by adopting new technologies or production processes. On the other hand, technical efficiency is a managerial problem, where more output is required for a given number of resources. Efficiency can only be done by adopting new technologies or production processes.

However, it must be understood that technological differences can create economies of scale in the production process. Economies of scale is a term used to describe the reduction in unit costs due to additional units being produced. In microeconomics, economies of scale are cost savings companies get when they grow (Charoenrat & Harvie, 2014).

Data Envelopment Analysis

In this study, the method used was a nonparametric DEA method. DEA is a mathematical programming technique based on linear programs used to assess responsible decision-making units'

efficiency using several input factors to obtain the targeted output. According to Coelli (1996), The DEA method is used as a tool to evaluate the performance of activities on entity units (organizations) from now on referred to as Decision Making Units (DMU)

This measurement is expressed by the ratio: output/input, which is a measure of efficiency or productivity. In measuring efficiency using DEA, two models are often used: Constant Return to Scale (CRS) and Variable Return Scale (VRS). According to Cooper (2013), this model can show the technical efficiency value of profit efficiency for each DMU.

In many studies, approaches using this methodology have been successfully applied to measure the performance of a group of companies or industries that use the same variety of inputs to produce a similar range of outputs. The DEA principle was introduced by Farrel (1957), which was later developed by Charnes, Cooper, and Rhodes (1978).

There are two types of models in the Data Envelopment Analysis (DEA) method. The first model introduced was the DEA Constant Return To Scale (CRS) model or seen from the inventor's name, known as the Charnes, Cooper, and Rhodes (CCR) models, i.e., there is a linear relationship between the input and output, respectively. According to Hadi et al. (2012), the addition of inputs will result in a constant increase in production, meaning that the efficiency will not change in whatever production scale of a unit.

The second model is the DEA Variable Returns To Scale (VRS) model, commonly referred to as the Barnes, Charnes, and Cooper (BCC) models. The assumptions used in this approach where each input addition does not necessarily produce a constant and proportional output so that its efficiency can increase or decrease, meaning that in the DEA Variable Returns To Scale (VRS) model, there is no linear relationship between input and output (Cooper, 2013)

Based on the relationship between input and output variables with CRS (Constant Returns To Scale) models and VRS (Variable Returns To Scale) models, it can be concluded that the DEA CRS model indicates that addition to the production factor (input) will not have an impact on additional production (output).

Simultaneously, the DEA VRS model will show that any addition of several production factors (inputs) will impact increasing or decreasing production (output).

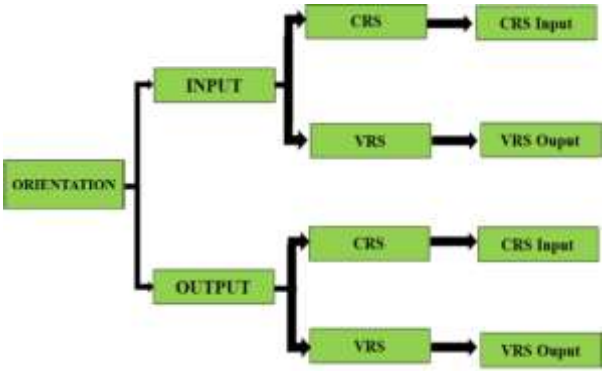


Figure 1. DEA Model Classifying

Source: (Yasar A. Ozcan, 2014)

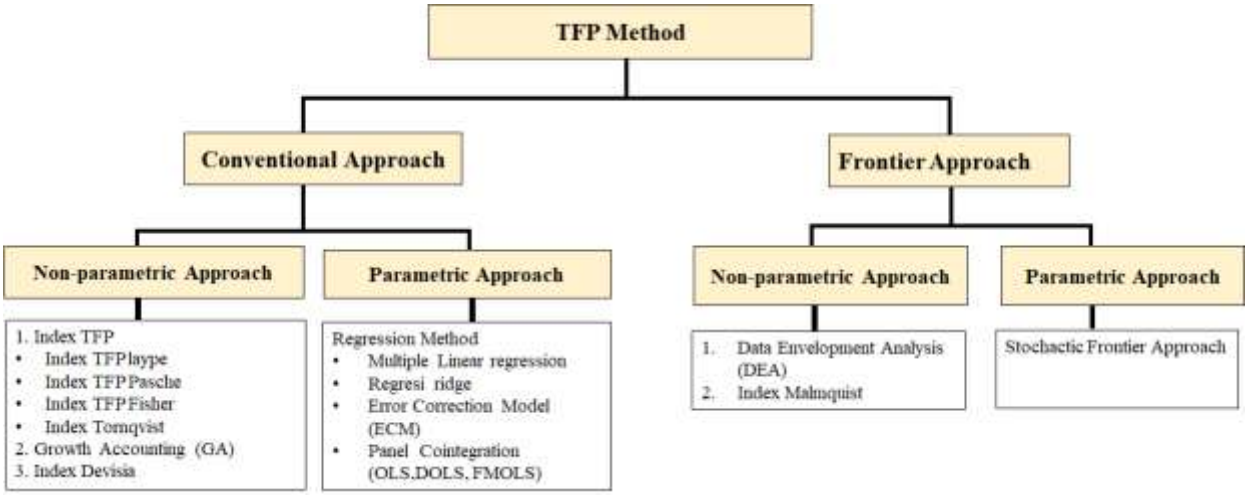
Productivity Measurement

Productivity is one of the aspects that determines the success and ability of companies or industries in increasingly competitive business competition. The company's productivity level will be an indicator of how efficient the company is in optimizing its current economic resources. (Manongga, 2014; Charoenrat, 2014; Yonnedi, 2019)

The measures to increase productivity must be appropriately planned and systematically to succeed when applied to a company. The measurement, evaluation, planning, and improvement stages must be adjusted to the conditions and characteristics of each company (Anis, 2007)

In its application, productivity can be measured partially as well as in total. Partial productivity is the relationship between output and one input, while total productivity or commonly referred to as Total Factor Productivity (TFP), is a relationship that measures between output and multiple inputs together (Rahmah Ismail, 2008; Charoenrat, 2014)

The relationship is expressed in the ratio of the output index to the aggregate input index. If the ratio increases mean more output can be produced using a certain amount of input, or a certain amount of production can be produced using fewer inputs. In productivity measurement, the most widely used method is total factor productivity (TFP). This measurement method is used to overcome the weakness of the efficiency calculation of more than one input and one output. TFP is measured using index numbers that can measure price and quantity changes over time. Standard indices used to measure TFP are Laspeyres Index, Fisher Index, Pasche Index, Tornqvist Index, and Malmquist Index (Timisela, 2012). In this study, which will be used to calculate productivity levels (TFP) is the Malmquist Index



Source: Coelly et al. (2003)

Figure 2. TFP Measurement Concept

Malmquist Productivity Index

Malmquist Index introduced by Caves et al .1982 in Rusydiana (2018) This index is a bilateral

index used to compare two economic elements' production technology. The Malmquist index is based on a production function concept that measures the maximum production function with predetermined input limits. In its calculation, this index consists of several results, namely: efficiency change, technological change, pure efficiency change, economic scale change, and TFP change.

According to Coelli (1996), two things are calculated in Malmquist index measurements: the catch-up effect and the frontier shift effect. The catch-up effect measures the rate of change in relative efficiency from period one to period two. Meanwhile, the frontier shift effect measures the pace of technological change, a combination of input and output from period one to period two. So the frontier shift effect is often also referred to as the innovation effect (Raphael, 2013).

Technology, productivity, and technology are different entities but interconnected, especially in the utilization of information technology, so that investment for the application of new technologies in a company will affect productivity improvement (Manongga, 2014; Octrina et al., 2020). Various studies on productivity show that increased productivity correlates with management, raw materials, costs, technology, and leadership systems

Research Framework

Based on the background of the problem and the basis of the theory, a research framework can be created that can be seen in the following image:

Figure 3. Research Framework

METHODS

The analysis method used to measure the coffee agroindustry's efficiency in this study is using Data Envelopment Analysis (DEA). Tools analysis will be assisted by using Software Max DEA 8, which aims to measure all Coffee Agroindustries' efficiency during the period 2017-2021. Analysis of the measurement of the efficiency of coffee agroindustry will be done with VRS (Variable Return to Scale) output approach.

The variable return to scale (VRS) output model is used in this research because of imperfect competition, differences, and limitations of inputs such as production capacity, production value, and raw material value in producing output. The output in this research is gross profit. Also, some coffee

agroindustry has not been efficient because the amount of input and output usage has not been by the target, so researchers use VRS assumptions.

This model assumes that the ratio between input and output addition is not the same, i.e., VRS (Variable Returns to Scale), which means that the addition of inputs by x times can be smaller or larger. Variable Return To Scale (VRS) formulas can be written with math programs as follows:

$$\max_{\mu_k, v_i} \quad \sum_{k=1}^{p} \mu_k y_{k0} - u_0$$

$$\text{s.t.} \quad \sum_{i=1}^{m} v_i x_{i0} = 1$$

$$\sum_{k=1}^{p} \mu_k y_{kj} - \sum_{i=1}^{m} v_i x_{ij} - u_0 \leq 0 \qquad j = 1, \ldots, n$$

$$\mu_k \geq \varepsilon, v_i \geq \varepsilon \qquad k = 1, \ldots, p$$

$$i = 1, \ldots, m$$

Source: Ramanathan (2003)

Y_{kj} : the amount of r output produced by agroindustry actors $_j$,

x_{ij} : number of inputs i used by agroindustry actors $_j$,

μ_k: the weight given to the output r, (r = 1 ,..., t and t is the number of outputs),

v_i : the weight is given to the input i, (i = 1, ..., m dan m is the number of outputs),

n : number of agroindustry actors

The value of such efficiency is always less or equal to 1. Agroindustry, whose efficiency value is less than one, means inefficiency, while agroindustry, whose value is equal to 1, means efficient. To measure the productivity level of the coffee agroindustry used the Malmquist Productivity Index, model.

Tools analysis Malmquist Productivity Index (MPI) model to measure the productivity growth of coffee agroindustry in Sungai Penuh City assisted by using DEAP 21 software. In the first generation model developed by Caves et al. in Ascarya et al. (2009), there were 2 (two) Malmquist Index models. The first is the 'Malmquist Input Quantity Index', and the second is the 'Malmquist Output Quantity Index.' Malmquist input quantity index for a production unit, at the time of observation t and t+1, for technology reference in periods k, k = t, and t+1. The Malmquist input quantity index only measures changes in the input quantity observed between t and t+1 times, where:

$$MI_k\,(y_k, x_t, x_{t+1}) = \frac{E_k^I\,(y_k, x_t)}{E_k^I\,(y_k, x_{t+1})}, k = t, t+1$$

Source: Caves (1982)

Table 1. Research Input and Output Variables

Input Variables	**((X1) Production Capacity** **(X2) Production Value**

	(X3) Raw Material Value
Output variable	**(Y1) Gross Profit**

Input and output variable data obtained from the development report of small and medium-sized industries of the Office of Industry and Trade of Sungai Penuh. Data in the form of time series from 2017 to 2021. The descriptive statistical summary of coffee industry input-output variables in Sungai Penuh City in 2017-2021 is presented in Table 2

RESULTS AND DISCUSSIONS

Table 2. Summary of Descriptive Statistics of Coffee Agroindustrial Input-Output Variables in Sungai Penuh City in 2017-2021 (in millions)

Variable	Number of Coffee Agroindustries	Mean	Standard Deviation	Minimum	Maximum
Production Capacity	10	13.124,860	4.977,603	122,000	75.800,000
Production Value	10	775.752,080	467.708,598	1.224,000	4.648.000,000
Raw Material Value	10	406.417,180	221.920,319	979,000	2.274.000,000
Gross Profit	10	374.323,860	244.591,799	50,000	2.374.000,000

Source: data processed (2020)

The analysis of coffee agroindustry efficiency in Sungai Penuh City in this study was conducted using DEA (Data Envelopment Analysis) and processed using Max DEA statistics program version 8. The efficiency calculation of each coffee agroindustry is calculated for each year.

After determining the input variables of the output and the value of each coffee industry variable, the model used in this study was Variable Return to Scale (VRS) with output approach. DEA efficiency scores range between 0 and 1 (or 0% and 100%), where 1 (100%) represents a fully efficient firm or a fully technically efficient company. Less than 100% represents an inefficient firm or a technically inadequate company. Therefore, the efficiency calculation results of each coffee agroindustry in Sungai Penuh City from 2015 to 2019 were obtained as follows.

Table 3. Efficiency Value of Coffee Agroindustry in Sungai Penuh City from 2017-2021

Name of Coffee Agroindustry	2017	2018	2019	2020	2021	Mean
Sixteen Coffee	0,921	0,796	0,825	0,708	0	0,650
Rindu Coffee	1,000	0,914	0,901	0,931	0,914	0,932
Putri Kembar Coffee	0,745	0,773	0,780	0,727	1,000	0,805
Kincai Coffee	0,736	0,796	0,723	0,541	0,907	0,741
Nur Coffee	0,366	0,978	1,000	1,000	0,978	0,865

Mak Coffee	0,016	0,014	0,019	0,015	0	0,013
Gantino Coffee	0,762	0,864	0,918	1,000	0,914	0,892
Cap Cangkir Coffee	0,744	0,914	0,941	0,831	0	0,686
Anisa Coffee	0,523	0,914	0,952	0,578	0,914	0,776
KLPA Coffee	0,735	0,913	0,859	0,923	0,913	0,869

Source: data processed (2020)

Table 3 describes a summary of the efficiency values of all coffee agroindustry of Sungai Penuh City throughout the research period from 2017 to 2021. Seen in 2017 only found one agorindustri that can achieve technical efficiency value with a value of 100 percent (efficient) namely rindu coffee agroindustry, furthermore, the following year no coffee agroindustry achieved efficiency value and only in 2017 there was one agroindustry that achieved the value of engineering efficiency with a value of 100 percent (efficient) namely Nur coffee agroindustry, efficiency improvement also occurred again in 2018 where there were two agroindustries that achieved technical efficiency value namely Nur coffee agroindustry and Gantino coffee agroindustry.

While in 2019, there was only one coffee agroindustry that achieved efficiency value, namely Putri kembar agroindustry coffee, and of the ten agroindustries that initially developed in Sungai Penuh City was found three coffee agroindustry finally closed for reasons, including; (1) Production quality and processing technology that has not been able to compete, (2). Business capital problems, and (3) Lack of consumers who buy coffee agroindustry products.

From the findings of this research seen from throughout the research period, that the coffee agroindustry of Sungai Penuh City is in the managerially incompetent condition in using input resources effectively even though they have operated on a reasonably optimal scale of operation, this can be seen as a relatively slow and low-efficiency increase among the coffee agroindustry group of Sungai Penuh City. There has been no research available on the efficiency of the coffee agroindustry that can be used as a direct comparison.

The development of agroindustry is influenced by several factors that have an impact on future growth. The production factor is one factor in producing a product, both physical and service. Production activities require resources: raw materials, machinery, supporting materials, labor, and energy (fuel and electricity). Many agroindustries went bankrupt due to rising production costs, while turnover or sales did not increase, resulting in decreased business profits. The amount of labor is large but lacks maximum performance and output, resulting in a waste of costs with wages.

The efficiency condition of the industry will affect the sustainability of the business in the future; many industries are out of business because the cost is greater than revenue; the more efficient the business will extend the breadth of the business, although external factors also affect the sustainability of the business such as taxes, inflation, rising prices of raw materials, labor, transportation, and logistics. While the relationship between the company's scale and efficiency is still

a contentious issue, and terms of the theory of the relationship between the scale of the company and efficiency are still unclear (Alinsunurin, 2014). However, Sukirno in Poerwokoesoemo, (2013) explained that the increasing number of companies would cause increased production to increase production capacity, and this increase in capacity will cause production activities to become more efficient.

Productivity Measurement of Coffee Agroindustries

To analyze the productivity growth rate of Agroindustry Coffee using the Malmquist Productivity Index model approach. Total productivity, commonly referred to as Total Factor Productivity (TFP), aims to measure the relationship between output and multiple inputs. The relationship is expressed in the ratio of the output index to the aggregate input index. If the ratio increases, more output can be produced using a certain amount of input, or a certain amount of production can be produced using fewer inputs.

Table 4. Productivity Level of Coffee Agro-industry in Sungai Penuh City from 2017-2020

Name of Coffee Agroindustry	2017-2018	2018-2019	2019-2020	Mean
Sixteen Coffee	0,863	1,037	0,859	0,920
Rindu Coffee	2,498	0,986	1,034	1,506
Putri Kembar Coffee	1,039	1,009	0,932	0,993
Kincai Coffee	1,090	0,911	0,747	0,916
Nur Coffee	2,500	1,033	1,000	1,511
Mak Coffee	1,500	1,333	0,667	1,167
Gantino Coffee	1,225	1,061	1,078	1,121
Cap Cangkir Coffee	1,253	1,046	0,882	1,060
Anisa Coffee	1,000	1,888	0,616	1,168
KLPA Coffee	1,250	0,947	1,074	1,090

Source: data processed (2020)

This study's findings were coffee agroindustries are grouped into 4 (four) quadrants based on the category of efficiency and productivity levels, namely high and low. Quadrant 1 includes agroindustry with high-efficiency and high-level value, so it can be considered the best coffee agroindustry compared to other quadrant groups. Quadrant 2 includes coffee agroindustry groups with high-efficiency values, but on the other hand, have relatively low-productivity values.

Quadrant 3 includes the coffee agroindustry, which has a low-efficiency value, but on the other hand, has a high-productivity value. The coffee agroindustry group in this group can be considered as a coffee industry with the ability to transform inputs into good output in terms of productivity in general, but not good in generating efficient performance.

On the other hand, Quadrant 4 is a coffee agroindustry group with equally low- efficiency and production values. Coffee agroindustry groups in this group can be considered coffee agroindustries

requiring improved performance from these two sides. The following in figure 4 is the division of coffee agroindustry group based on the calculation of efficiency level (VRS) with output approach achieved and productivity level, with two categories: efficiency figure on the y axis and average productivity value x-axis.

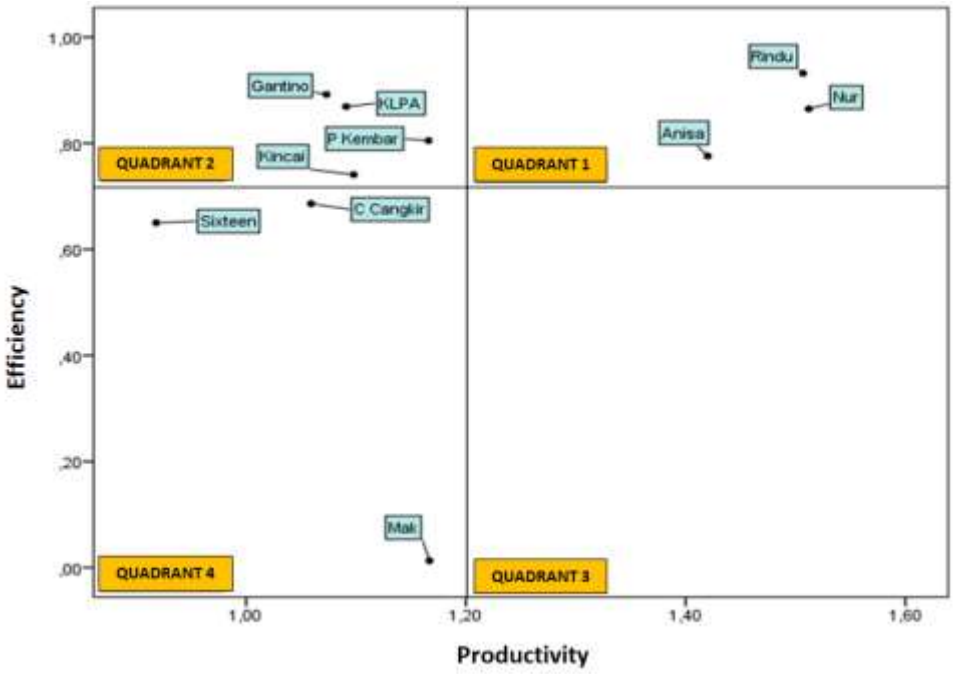


Figure 4. Quadrant of Coffee Agroindustry in Sungai Penuh City
Based on Efficiency Value & Productivity Level

Figure 4 shows that in the research period 2017-2021, there are three coffee agroindustries in quadrant I, then four coffee agroindustries located in quadrant II, but there is no coffee agroindustry in quadrant III, and there are three coffee agroindustries that fall into quadrant IV.

Quadrant I (High-Efficienc, High-Productivity) is a category of coffee agroindustry with high efficiency and level value. The coffee agroindustry in this category is (1). Nur coffee agroindustry with a mean efficiency value of 0.865 and has productivity mean value of 1.512; (2). Rindu coffee agroindustry has a mean efficiency value of 0.932 and productivity mean value of 1,507; (3). Anisa coffee industry has a mean efficiency value of 0.932 and productivity mean value of 1,507. Based on the mean value of efficiency and level, the coffee agroindustry Nur, Rindu, and Anisa are included in the coffee agroindustry with high efficiency and productivity value.

Quadrant II (High- Efficiency, Low -Productivity) is a category of coffee agroindustry that has relatively high- efficiency but has low productivity. Agroidustri coffee in quadrant two can be considered as coffee agroindustry with improved low production technology, but relatively capable of achieving a high level of efficiency. The coffee agroindustry in this category is (1). Gantino coffee agroindustry has a mean efficiency value of 0.892, and productivity means the value of 1.073; (2). Putri Kembar coffee industry has a mean efficiency value of 0.805, and productivity means a value of 1,166.; (3). Kincai coffee agroindustry has a mean efficiency value of 0.741, and productivity means

the value of 1.098 (4).KLPA coffee agroindustry has a mean efficiency value of 0.869, and productivity means the value of 1.091.

Group quadrant III (Low-Efficiency, High-Productivity) is a category of coffee agroindustry that has low efficiency and high. The coffee agroindustry group is considered coffee agroindustry with low catch up ability. Based on the results listed in the picture above, no coffee agroindustry falls into this category.

The last quadrant group, Quadrant IV (Low- Efficiency, Low -Productivity), is a group of coffee agroindustry with low efficiency and productivity levels. Agroindutri coffee in this category is (1). Mak coffee agroindustry has a mean efficiency value of 0.013 and productivity mean value of 1,167; (2). Cap cangkir coffee agroindustry has a mean efficiency value of 0.686 and productivity mean value of 1,059, (3). Sixteen coffee agroindustry has a mean efficiency value of 0.650 and productivity mean value of 0.918. Agroindustry groups in this group can be considered as agroindustries whose productivity progress is relatively stagnant.

From the observations of the 10 Coffee agroindustries in Sungai Penuh City, it is known that the causes of low levels of productivity of Coffee agroindustry include; Limited human resource capability in management and technology mastery resulting in low performance of coffee agroindustry; The production technology used is still simple which has an impact on low labor productivity. Some coffee agroindustry actors are also found to have limited processing technology still, so the production capacity is small, and processed products produced are less competitive with similar products.

CONCLUSION

This study analyzed the performance of coffee agroindustry in Sungai Penuh City from 2017-2021 with the VCR output approach as a basic model in DEA that aims to measure the efficiency value of coffee agroindustry in Sungai Penuh City from 2017-2021. At the same time, the Malmquist index is used to look at productivity levels, which are then displayed in the form of quadrants of coffee agroindustry group Sungai Penuh.

The results obtained from quadrants of the efficiency value and productivity level of coffee agroindustry in Sungai Penuh City from 2017-2021 show that in the agroindustry group of High-Efficiency category, High Productivity, there are three coffee agroindustries. For agroindustry group in High-Efficiency category, Low Productivity there are four coffee agroindustry while coffee agroindustry group in low-efficiency category, High Productivity in the research results found no coffee agroindustry that falls into that category Then found there are three coffee agroindustry in the type of Low-Efficiency, Low-Productivity due to low efficiency and productivity level of agroindustry, then in 2019 the three agroindustries closed and no longer run agroindustry activities.

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