East Java Economic Journal Vol. 8 No. 2 (2024): 203-214

ejavec JOURNAL

EAST JAVA ECONOMIC JOURNAL

https://ejavec.id

WHAT IS THE LEVEL TECHNICAL EFFICIENCY OF DAIRY COOPERATIVE ASSOCIATION OF INDONESIA IN EAST JAVA PROVINCE DURING COVID-19?

Atik Purmiyati[*1]

Thea Safira[2]

[1]Faculty of Economics and Business, Airlangga University, Surabaya, Indonesia

[2]Laboratorium Pengembangan Ekonomi Pembangunan, Faculty of Economics and Business, Airlangga University, Surabaya, Indonesia

ABSTRACT

This research was conducted to analyze the level of technical efficiency of the Dairy Cooperative Association of Indonesia (GKSI) in East Java Province. This research used a non-parametric approach using Data Envelopment Analysis (DEA). The input variables used in this research are the number of farmers, the total population of dairy cows, and operational costs. The output variable used is total milk production. The results of this research show that the average technical efficiency level of GKSI member breeder cooperatives in East Java Province in 2019 was 74.8%, and there were nine efficient cooperatives, while in 2020, the average technical efficiency level of GKSI member breeder cooperatives in East Java Province was 85.6% and there are 11 efficient cooperatives.

Keywords: *Cooperatives, Data Envelopment Analysis, Dairy Cooperative Association of Indonesia, Technical Efficiency*

ABSTRAK

Penelitian ini dilakukan dengan tujuan untuk menganalisis tingkat efisiensi teknis pada Gabungan Koperasi Susu Indonesia (GKSI) di Provinsi Jawa Timur. Penelitian ini dilakukan dengan menggunakan pendekatan non parametrik yaitu dengan menggunakan Data Envelopment Analysis (DEA). Variabel input yang digunakan dalam penelitian ini adalah jumlah peternak, jumlah populasi sapi perah, dan biaya operasional. Variabel output yang digunakan adalah total produksi susu. Hasil penelitian menunjukkan rata-rata tingkat efisiensi teknis koperasi peternak anggota GKSI Provinsi Jawa Timur pada tahun 2019 sebesar 74,8% dan terdapat 9 koperasi yang efisien, sedangkan pada tahun 2020 rata-rata tingkat efisiensi teknis koperasi peternak anggota GKSI Provinsi Jawa Timur sebesar 85,6% dan terdapat 11 koperasi yang efisien.

Kata Kunci: *Koperasi, Data Envelopment Analysis, Gabungan Koperasi Susu Indonesia, Efisiensi Teknis*

JEL : C67; 012; O13; P13

ARTICLE INFO

Received: August 30th, 2024

Revised: September 22th, 2024

Accepted: September 24th, 2024

Online: September 30th, 2024

*Correspondance
Name: Atik Purmiyati

E-mail: atik-p@feb.unair.ac.id

Introduction

Cooperatives are fundamental to the Indonesian economy (Arifandy et al., 2020). Cooperatives in Indonesia have grown and developed into an economic institution that plays an important role in providing economic and social opportunities for various levels of society.

East Java Economic Journal, p-ISSN: 2597-8780, e-ISSN: 2830-2001, DOI:10.53572/ejavec.v8i2.145, Open access undera Creative Commons Attribution- 4.0 International Public License (CC - BY 4.0)
published by Kantor Perwakilan Bank Indonesia Provinsi Jawa Timur in Collaboration with Faculty of Economics and Business, Universitas Airlangga

Cooperatives in Indonesia cover various sectors, including agriculture, fisheries, industry, trade, and services, and have provided significant benefits in reducing economic inequality and improving the welfare of rural and urban communities (Timur & Dwiputri, 2021; Haryanti et al., 2020; Sembiring & Alfarizi, 2023). The Indonesian government also provides active support for the development of cooperatives through various policies and programs aimed at increasing the capacity and competitiveness of cooperatives and encouraging financial inclusion (Rasyidi, 2021). The existence of cooperatives in Indonesia not only plays a role in moving the wheels of the economy but also promotes social justice, active community participation, and sustainable development throughout the country (Kusumastuti, 2022).

In 2020, Corona Virus Disease 2019 (COVID-19) entered Indonesia and significantly impacted various aspects of life (Sofian & Lestarini, 2021; Kasnelly. 2020; Fikri & Gopar, 2021). The main impact felt was on public health, with many people infected and thousands losing their lives. Besides impacting the health sector, COVID-19 has decreased economic activity, especially in the tourism, hospitality, shopping, and transportation sectors. Many small and medium-sized businesses are experiencing significant economic hardship and rising unemployment. In contrast to businesses in general during the pandemic, many experienced losses or went bankrupt, cattle farming businesses during the pandemic did not experience losses (Damayanti, 2021; Novendra & Lambelanova, 2021; Erpurini & Alamsyah, 2021). The COVID-19 pandemic has changed people's lifestyles and consumption. During the pandemic, people's demand for fruit, milk, and multivitamins increased (Merita, 2020). This is an opportunity for dairy farmers and the Dairy Cooperative Association in Indonesia (GKSI) in East Java to provide an adequate supply of fresh cow's milk for the Milk Processing Industry and guarantee the economy of dairy farmers during the pandemic. The agribusiness system for dairy milk commodities in East Java mostly uses a vertical cooperation system. The chain in the dairy milk supply chain starts from dairy farmers and then cooperatives, after which it is handed over to the milk processing industry in East Java. This is based on research conducted by Ikhsan & Septiandika (2021), stating that the COVID-19 pandemic did not affect the market conditions of Village Unit Cooperative (KUD) Argopuro. However, during the COVID-19 pandemic, Nestlea Indonesian Ltd, as a partner of KUD Argopuro, is increasing its demand for fresh milk.

In supporting the high demand for milk, GKSI in East Java, as an institution that oversees cattle breeders, can consider the level of efficiency of the dairy farming business, which will ultimately affect the welfare of the breeders. Xaba et al. (2020) researched the efficiency of agricultural cooperatives in Mpumalanga, South Africa, using the DEA method, showing the results of 19 cooperatives as a whole had a total technical efficiency of 72%. Apart from that, Elinur and Vaulina (2019) also used the DEA method to study the efficiency of broiler chicken production in Riau Province. The results showed that chicken breeders had a technical efficiency of 40% and 12.5% allocative and economic efficiency. The use of production factors that are less than optimal makes broiler chicken breeders generally inefficient technically as well as allocatively and economically.

Given this background, researchers are interested in researching the level of technical efficiency to determine the performance of cooperatives that are members of GKSI in East Java Province because East Java has the highest number of cooperatives and dairy cattle population in Indonesia. In addition, this research was carried out to support the realization of the first and eighth Sustainable Development Goals (SDGs), namely ending poverty in all its forms everywhere and supporting inclusive and sustainable economic growth, full and productive employment, and decent work for all.

Literatur Review

Production Function

Production Function is an equation, graph, or table that shows the maximum goods produced per unit in a specified time for each combination of inputs (Salvatore, 1994). Sudarsono (1995) defines production as a process of changing inputs into outputs so that the value of the goods increases. Nicholson (2016: 297) writes the production function equation as follows:

$$Q=f(K,L,M,..) \quad (1)$$

Note:

Q = The level of output produced

K = Capital

L = Labor

M = Raw Material

The production function equation explains the relationship between output variables that input variables influence. The inputs used in the production process are capital, labor, raw materials, and other variables that support production activities.

Factors of Production

Factors of production are often known as inputs or resources. The factors of production available in a country's economy can determine the extent to which a country can produce goods and services in a period. The identified factors of production for carrying out the dairy cow milk production process according to Madau et al. (2017), are as follows:

1) Land

Land is the most determining production factor in raising and providing land for dairy cows. Dairy cattle farming highly depends on the size of the agricultural location because large farmland can accommodate more cows. In addition, a small area with a large number of cows causes the quality of the cow's living environment to be less comfortable due to the density of cows in the area being too dense, resulting in less than optimal milk production (Madau et al., 2017).

2) Labor

Labor is one of the factors of production that plays a very important role in the production of cow milking. Labor can be in the form of owners (traditional farmers) or ordinary laborers (commercial farmers/cooperatives). Labor is measured by the amount of labor used in one period, which indicates the effort required to produce cow's milk output.

3) Capital

In dairy farming, factors of production, according to Madau et al. (2017), are used to determine the capital investment (Capital Investment) used to produce cow's milk over a certain period. To measure the capital used in one period of milk production, Madau et al. (2017) used the farmer's depreciation value in one year to determine the utility of capital owned by farmers.

4) Livestock Unit

The livestock unit factor plays a vital role in supporting the success of cow's milk production. Using large numbers of dairy cows is the first step to achieving economic scale in cow's milk production. Dairy cows in large numbers tend to produce products with large quantities of milk so that they can achieve economic scale to cover fixed costs in the production process. The more dairy cows are used, the higher the cow's milk production will be. The calculation of livestock units is measured by the number of dairy cows farmers use in a certain period.

5) Variable Cost

Variable costs or non-fixed costs are supporting costs used to produce dairy cow milk over a certain period. Madau et al. (2017) explained that variable costs in the dairy cow milk production process can consist of animal feed in the form of concentrate and vitamins and supporting energy such as electricity and water.

Efficiency Theory

As stated by Farrell (1957), efficiency is the ability of an individual or a company to maximize the use of available resources to achieve a desired outcome, often by employing a scaling method. According to Farrell (1957) and Coelli (1998), efficiency can be categorized into three types: technical, allocative, and economic. Technical Efficiency (TE) refers to a company's ability to achieve the maximum possible output by utilizing inputs in the most cost-effective manner. In contrast, Allocative Efficiency (AE) is the capability of a company to allocate expenditures optimally according to prevailing prices and production technologies. When both technical and allocative efficiencies are achieved, the company attains economic efficiency, which reflects its overall or total efficiency in operations.

Data Envelopment Analysis (DEA)

The Data Envelopment Analysis (DEA) method is commonly utilized to measure the efficiency of performance evaluation within an organizational unit or entity. Building on the work of Farrell (1957), the DEA method assesses technical efficiency by evaluating the ratio of inputs to outputs, measuring relative efficiency across multiple input-output combinations. Two primary models exist to understand the relationship between inputs and outputs within DEA: the Constant Return to Scale (CRS) model and the Variable Return to Scale (VRS) model. The CRS model assumes that the rate of return for an economic unit will remain constant, meaning any proportional change in inputs will lead to an equivalent proportional change in outputs, implying that the economic unit operates at an optimal level that does not affect production efficiency (Cooper et al., 2006).

Dairy Cooperative Association of Indonesia (GKSI)

According to Article 1 of Law No. 25 of 1992, a cooperative is a business entity whose members consist of individuals or cooperative legal entities and is based on the principle of family. There are two main types of cooperatives: primary cooperatives and secondary cooperatives. Individual members form primary cooperatives, while secondary cooperatives, such as the Dairy Cooperative Association of Indonesia (Gabungan Koperasi Susu Indonesia or GKSI), are formed by primary cooperatives and other secondary cooperatives. As stipulated in Article 15 of Law No. 12 of 1992, secondary cooperatives are established to pursue common interests and efficiency goals, including cooperatives of the same or different types and levels.

These cooperatives must be formed by at least three primary or secondary ones recognized as legal entities. The primary purpose of secondary cooperatives is to enhance the efficiency, effectiveness, and capacity-building of primary cooperatives in fulfilling their roles and functions.

For this reason, their establishment must be justified by their ability to achieve these objectives. GKSI, as a secondary cooperative in the dairy sector, is deeply integrated into Indonesia's dairy agribusiness system. According to Prastyaningtyas (2016), one of GKSI's key objectives is to provide added value to farmers through guidance and consultation, alongside its primary role of ensuring market access to milk. Furthermore, dairy cooperatives such as GKSI facilitate farmers' access to essential production inputs, including feed, artificial insemination, and even soft credit facilities.

Method

This research uses primary data from a population of all members of the Dairy Cooperative Association of Indonesia (GKSI) in East Java; there are 41 members, and the research period is two years in 2019 and 2020. The sampling technique in this research uses a saturated sample; namely, the entire population in this research object is used as a sample. Because the population is less than 100, the entire population can be used as a research sample (Sugiyono, 2013).

This research uses Data Envelopment Analysis (DEA) which aims to measure the efficiency level members of GKSI in East Java with the assumption that the variable return scale (VRS) uses the output variable consisting of total milk production (O1) for variables input consists of the number of farmers (I1), total population of dairy cows (I2), and operational costs (I3). In the application of data envelopment analysis, it is formulated as follows:

$$h_k = \left[\frac{u_k y_k}{v_{rk} x_{rk}}\right] \quad (2)$$

Where :

h_k : technical efficiency of cooperatives

u_k : output weight produced by the cooperative k

y_k : the amount of cow's milk output produced by the cooperative k

v_{rk} : the input weight r used by cooperative k

x_{rk} : the amount of input r used by the cooperative k

The efficiency ratio (h_k) is then maximized with the following limitations:

$$\left[\frac{u_j y_j}{v_{rj} x_{rj}}\right] \leq 1; j = 1,2,3 \ldots., N \quad (3)$$
$$where\ u_j > 0,\ and\ v_{rj} > 0$$

This inequality shows that the level of technical efficiency is not negative and is not more than one (1). Then, a cooperative is said to have perfect efficiency if the ratio value is 1 or 100 percent, conversely, if the technical efficiency level shows a number close to 0, this indicates that there is inefficiency in the cooperative.

Results and Discussion

One cooperative in East Java that is currently developing rapidly is the livestock cooperative, which operates in the dairy sector. Dairy cooperatives established per the 1988 presidential decree are often found in the East Java region, including in Batu City, Malang, Blitar, and Pasuruan Regency. According to Cooperative Law No. 25 article 15, it is stated that there are two types of cooperatives, namely primary and secondary cooperatives. Primary cooperatives are formed and have members of at least 20 (twenty) people. Secondary cooperatives are formed from a combination of several organizations or primary cooperatives. There are 72 secondary cooperatives in East Java. Several secondary cooperatives in the East Java region include the Association of Indonesian Employees' Cooperatives (GKPRI), the Village Unit Cooperative Center (PUSKUD), and the Dairy Cooperative Association of Indonesia (GKSI).

Dairy Cooperative Association of Indonesia (GKSI) was first established in 1977 as a secondary cooperative operating in the dairy sector. GKSI has a role to serve and facilitate all needs related to dairy livestock. The facilities offered by cooperatives include concentrates, livestock health services, artificial insemination, and, at the same time, milk storage from farmers for sale to the Milk Processing Industry (IPS). East Java is the center of the dairy cattle population, followed by Central Java, West Java, and the Special Region of Yogyakarta. The dairy cow population in East Java 2017 was 273,881 heads, then increased by 8% to 295,809 heads the following year. in 2019, there was a decline in the dairy cow population by 2.81%, bringing the total dairy cow population in East Java to 287,482 heads. With a high population of dairy cows, cow's milk production in East Java certainly has a positive trend.

Cooperatives are a form of business entity that plays a vital role in developing community dairy farming businesses. Dairy cooperatives have an important role in meeting the need for fresh cow's milk in East Java. The agribusiness system for dairy cow milk commodities in East Java mostly uses a vertical cooperation system. The dairy milk supply chain starts with dairy farmers and then cooperatives, and after that, it is handed over to the milk processing industry in East Java, such as Nestle Indonesian Ltd, Indolakto Ltd, and Greenfields Indonesian Ltd. The development of cooperatives from year to year has increased the number of cooperatives and milk production.

At the beginning of 2020, the world faced a pandemic called Corona Virus Infectious Disease 2019 or COVID-19. The Covid-19 pandemic has been a difficult period for all countries experiencing it, including East Java. The pandemic has a direct impact not only on health but also on other aspects of life, such as economic and social aspects. The results of Merita's research (2020) concluded that the COVID-19 pandemic influenced the consumption habits of fruit, milk, and multivitamins in adults. This is also a good opportunity for dairy farmers and the role of GKSI member cooperatives in providing an adequate supply of fresh cow's milk for IPS and ensuring the economy of dairy farmers during the pandemic. The COVID-19 pandemic did not affect the market conditions of KUD Argopuro and actually increased the production of fresh cow's milk, which will later be supplied to Nestlea Indonesian Ltd is located in Pasuruan Regency.

Based on the descriptions above, this is certainly an opportunity for farmers who own a dairy business to increase their production to gain more profits. The role of cooperatives, in this case, is to accommodate farmers, starting from the care of livestock and availability of capital to the distribution of their production, which aims to improve performance and productivity by assessing the efficiency level. Efficiency can be interpreted as a comparison or ratio between production raw material input and production output. In this case, dairy

farmers can use a combination of production factors efficiently. Efficient use of production factors will result in prosperity for farmers thanks to the large amount of output produced. So that an efficient allocation of production factors will be able to achieve maximum production results.

The DEA method measures the level of technical efficiency in the range 0-1. A value of 1 describes the cooperative's ability to optimize all its resources. If the efficiency value is less than 1, the cooperative is considered less effective in optimizing its resources and has been unable to run its business optimally.

Table 1: Technical Efficiency of Members GKSI in East Java at 2019

	N	Average	Min	Max	Standard Deviation
TE-DEA VRS	41	0.748	0.437	1	0.181

*TE-DEA VRS = Techinical Efficiency-Variabel Return To Scale

Based on Table 1, which shows the results of DEA, the average value of level technical efficiency members of GKSI in East Java in 2019 is 0.748. This means that the average level of technical efficiency of members of GKSI in East Java is 74.8%, which is said to be inefficient, so it is necessary to improve the business by 25.2% so that members of GKSI in East Java can achieve technical efficiency of 100%.

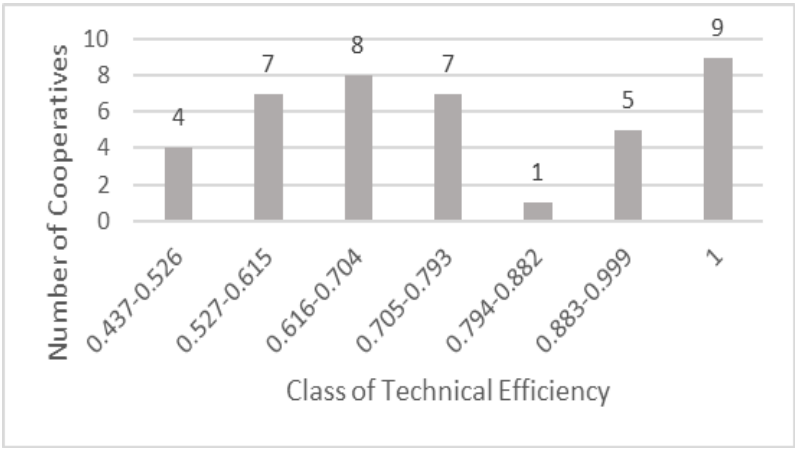
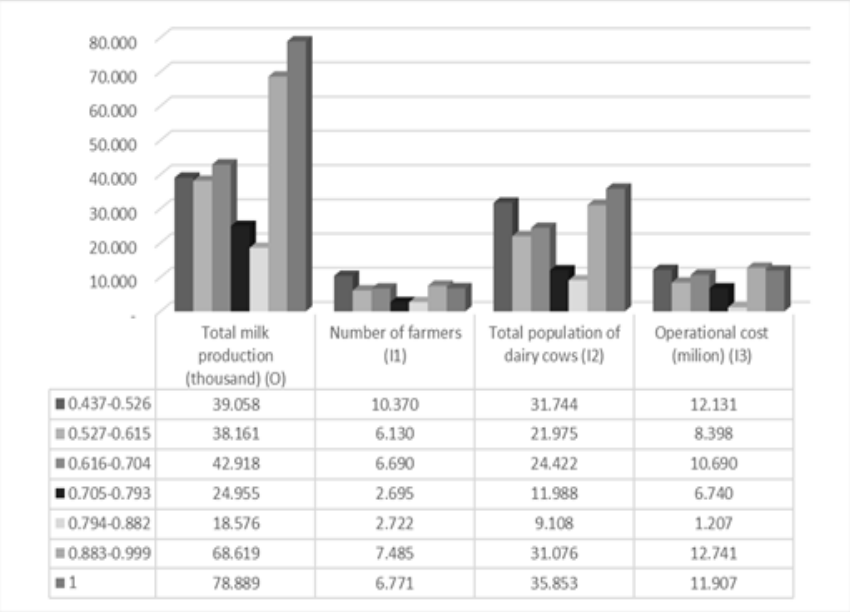


Figure 1: Distribution Technical Efficiency of members GKSI in East Java at 2019

In the distribution of technical efficiency members of GKSI in East Java, there are 9 cooperatives that have an efficiency level of 1, and the remaining 32 cooperatives are not yet technically efficient. There were 9 efficient GKSI members in 2019 consisting of The Milk Cooperative SAE Pujon, The Village Unit Cooperative (KUD) of Karang Ploso, The Livestock Farming Cooperative (KUTT) of Suka Makmur, The Joint Business Marketing Cooperative (KPUB) of Sapi Jaya, KUD Kertajaya, KUD Sidoluhur, KUD Suka Mulya, KUD Sumber Makmur, Farmers Cooperative (KOPTAN) of Jasa Tirta. Figure 1. Efficient cooperatives have a higher total milk production than inefficient cooperatives, namely (78.8 million) liters, with a cow population of (35 thousand) head. High cow milk production results are followed by high livestock operational costs (11.9 billion).

Members of GKSI in East Java who have achieved a perfect efficiency score show that in management, they have utilized the most optimal resources to provide maximum output. Based on the average input and output of members of GKSI in East Java in 2019, the total

cattle population has a greater value than the average of other inputs. This is because the total cow population is the main input in cow's milk production. Livestock operational costs also have a high value because they represent the amount of costs that must be incurred to meet the nutritional needs of livestock in the form of concentrates and other nutritious food besides grass feed, the cost of vitamins for livestock, and veterinary costs to keep livestock in healthy condition.



	Total milk production (thousand) (O)	Number of farmers (I1)	Total population of dairy cows (I2)	Operational cost (milion) (I3)
0.437-0.526	39.058	10.370	31.744	12.131
0.527-0.615	38.161	6.130	21.975	8.398
0.616-0.704	42.918	6.690	24.422	10.690
0.705-0.793	24.955	2.695	11.988	6.740
0.794-0.882	18.576	2.722	9.108	1.207
0.883-0.999	68.619	7.485	31.076	12.741
1	78.889	6.771	35.853	11.907

Figure 2: Average Input and Output DEA of mambers GKSI in East Java at 2019

This research is in line with Permatasari & Setyawan (2019); Yang & Shang (2020) stated that the DEA result was less than 1, indicating that resource utilization was still not optimal in production, so it could be further improved and existing input factors maintained. This research is in line with Permatasari & Setyawan (2019); Yang & Shang (2020) stated that DEA results were less than 1, indicating that resource utilization was still not optimal in production so that it could be further improved and the existing input factors were maintained.

In 2020, the level of technical efficiency of members of GKSI in East Java was 0.856 or 85.6%, as shown in Table 2. This reflects an increase of 10.8% from the previous year due to the increase in cow milk production, which aligns with the increasing demand for fresh cow milk supply from IPS (Milk Processing Industry). Even though the value of technical efficiency has increased, it is necessary to improve each input to improve the technical efficiency of members GKSI, which do not yet have an efficiency value of 1.

Table 2: Technical Efficiency of Members GKSI in East Java at 2020

	N	*Average*	*Min*	*Max*	*Standard Deviation*
TE-DEA VRS	41	0.856	0.594	1	0.135

*TE-DEA VRS = Techinical Efficiency-Variabel Return To Scale

In the distribution of technical efficiency of members of GKSI in East Java, there are 11 cooperatives that have an efficiency level of 1, and the remaining 30 cooperatives are not technically efficient. Based on the results above, it is known that there is an increase in the number of cooperatives that have a technical efficiency level of 1 in 2020. In contrast, in the

previous year, there were 9 cooperatives that had a technical efficiency value of 1. There were 11 efficient GKSI members in 2020 consisting of The Village Unit Cooperative (KUD) of Sumber Makmur, KUD Batu, KUD Gondanglegi, dairy farming cooperative (KPSP) of Setya Kawan, The Livestock Farming Cooperative (KUTT) of Suka Makmur, KUD Tani Jaya, KUD Suka Mulya, KUD Sri Among Tani, KUD Subur, KUD Tani Wilis, KUD Sumber Makmur.

Based on the number of technically efficient cooperatives spread across several regions, it shows that the majority are located in rural areas and highlands; this indicates that highland areas have a character and climate that is suitable for dairy farming. As many as 30 cooperatives in 2020, members of GKS in East Java, have not yet achieved perfect technical efficiency, indicating that the level of input utilization is still low. There were 27 cooperatives in 2020 that were below the average efficiency value. The number of cooperatives that have below-average technical efficiency decreases slightly in the following year. Members of GKSI in East Java that are still below average technically efficient need to make improvements to increase the efficiency value.

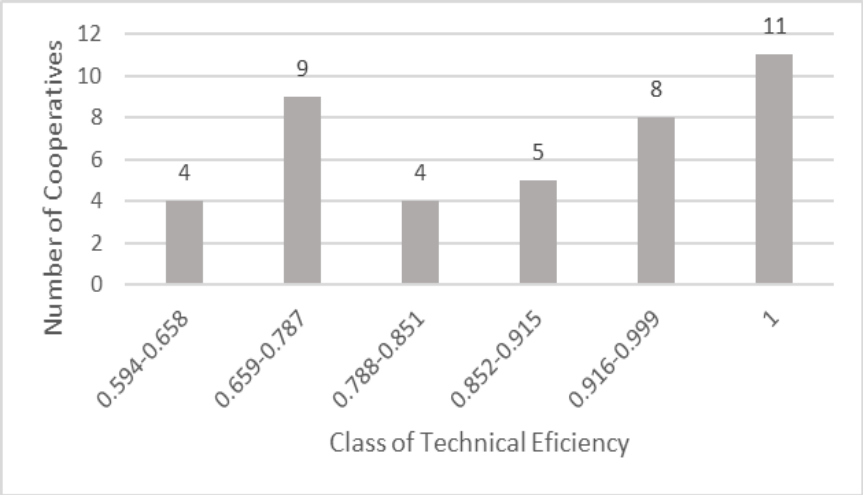
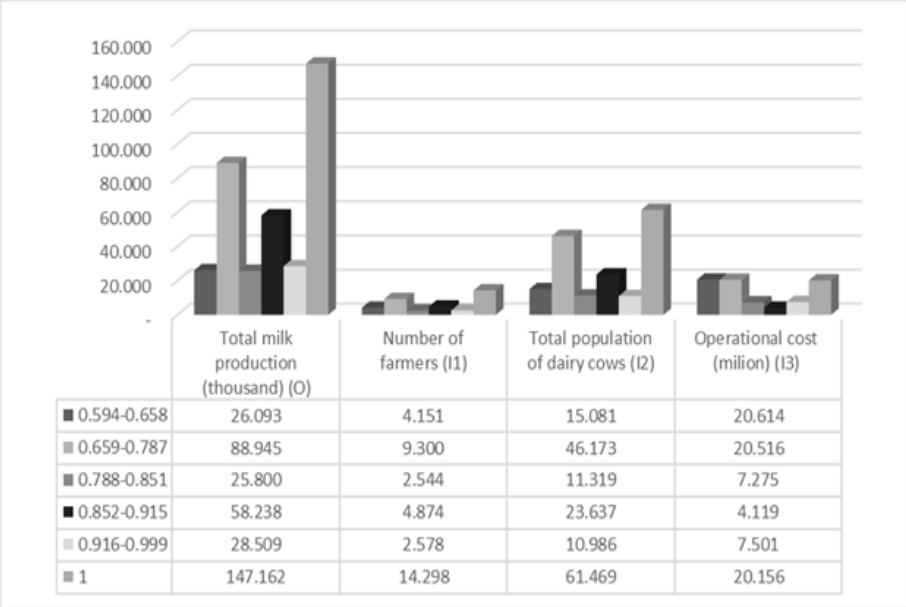


Figure 3: Distribution Technical Efficiency of members GKSI in East Java at 2020

Judging from the amount of cow's milk production in 2020, it has increased from 2019. The average amount of fresh cow's milk production is 7,589,789 liters per year, increasing to 9,140,243 liters per year. Milk production is relatively high due to the high demand for fresh milk by the milk processing industry (IPS), and the forage provided is based on the needs of dairy cows. The need for forage can be met because breeders do not have difficulty finding forage. After all, the members of GKSI in East Java, mostly in highland areas, still have forage land in the form of forests, mountains, and smallholder plantations. Concentrate feed also affects high milk production because dairy cows that are given concentrate feed and vitamins, in addition to forage, will have higher milk production than dairy cows that are only given forage. Adding concentrate to livestock rations is an effort to meet the need for food substances so that high production will be obtained. Concentrates can also increase the digestibility of dry matter in the ration, increase body weight, and be efficient in using the ration. It is hoped that by giving concentrates and vitamins to dairy cows, farmers can increase milk production. According to Hafiz (2016) only providing forage, lactating cows cannot obtain the nutritional requirements that meet the requirements to reach peak optimal and quality production.



	Total milk production (thousand) (O)	Number of farmers (I1)	Total population of dairy cows (I2)	Operational cost (milion) (I3)
0.594-0.658	26.093	4.151	15.081	20.614
0.659-0.787	88.945	9.300	46.173	20.516
0.788-0.851	25.800	2.544	11.319	7.275
0.852-0.915	58.238	4.874	23.637	4.119
0.916-0.999	28.509	2.578	10.986	7.501
1	147.162	14.298	61.469	20.156

Figure 4: Average Input and Output DEA of member GKSI in East Java at 2020

Based on the average milk production produced by farmer cooperatives, which are members of GKSI in East Java, which has increased by 1.5 million liters, the Covid-19 pandemic, which started at the beginning of March 2020, has not affected milk production and milk demand from the IPS. According to Merita (2020), the COVID-19 pandemic has influenced adults' fruit, vegetables, and milk consumption. Milk consumption in adults has shown an increase during the Covid-19 period. Apart from calcium and fat, milk also contains high protein. Milk protein is comparable to meat and is only surpassed by egg protein. Protein is needed to regenerate new cells and brain formation in the fetus, forming enzymes, hormones, and energy. Apart from that, protein also functions as a defense against bacteria and viruses. Regular consumption of milk will form a good body defense.

Conclusion

This research aims to determine the technical efficiency level of member GKSI in East Java before and during the COVID-19 pandemic. Based on the results of analysis using DEA, the average technical efficiency level was 74.8% in 2019, there were 9 cooperatives that had a technical efficiency value of 1 and 32 cooperatives that had a technical efficiency value of less than 1 in 2019. Meanwhile, in 2019 and 2020, the average technical efficiency level was 85.6%; 11 cooperatives had a technical efficiency value of 1, and 30 cooperatives with less than 1 in 2020. With the above research results, it is hoped that members of GKSI can improve their performance to reach technical efficiency. Meanwhile, the government, as a policy maker, is expected to be able to help farmers, especially dairy cattle, by providing policies to support increased performance, such as by providing financial capital assistance and increasing human resources.

References

Arifandy, F. P., Norsain, N., & Firmansyah, I. D. (2020). Peran Koperasi Dalam Meningkatkan Perekonomian Masyarakat Nelayan: Perspektif Modal Kerja. *Jurnal Akademi Akuntansi*, *3*(1), 118-132.

Coelli, T. (1998). A multi-stage methodology for the solution of orientated DEA

models. *Operations Research Letters*, *23*(3-5), 143-149.

Cooper, W. W., Seiford, L. M., & Tone, K. (2006). *Introduction to data envelopment analysis and its uses: with DEA-solver software and references*. Springer Science & Business Media.

Damayanti, T. (2021). *Usaha Peternakan Sapi Perah*. Bekasi: Elementa Media.

Elinur., & Vaulina, Sisca. (2019). The Efficiency of Broiler Chickens Production in Rumbai District Pekanbaru City Riau Province. *Journal of Dinamic Agriculture, 1*(3), 19-26.

Erpurini, W., & Alamsyah, N. (2021). Kajian Strategi Pemasaran dalam Menghadapi Era Disrupsi Teknologi di Masa Pandemi Covid-19 Pada Koperasi Susu KUD Sarwa Mukti. *Jurnal Pengabdian Masyarakat Nusantara*, *1*(2), 40-46.

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society: Series A (General)*, *120*(3), 253-281.

Fikri, Y. T. A., & Gopar, I. A. (2021). Analisis Peningkatan Angka Pengangguran akibat Dampak Pandemi Covid 19 di Indonesia. *Indonesian Journal of Business Analytics*, *1*(2), 107-116.

Haryanti, S. S., Susila, L. N., & Kesdu, P. (2020). Pendampingan Pembentuan Koperasi Sebagai Usaha Mewujudkan Kemandirian Ekonomi di Grogol Kabupaten Sukoharjo. *Wasana Nyata*, *4*(2), 108-114.

Ikhsan, M. T. K., & Septiandika, V. (2021). Peran KUD Argopuro Sebagai Stabilisator Perekonomian Masyarakat Krucil Pasca Covid-19. *Publicio: Jurnal Ilmiah Politik, Kebijakan dan Sosial*, *3*(2), 1-8.

Kasnelly, F. A. J. S. (2020). Meningkatnya Angka Pengangguran Ditengah Pandemi (Covid-19). *Al-Mizan: Jurnal Ekonomi Syariah*, *3*(1), 45-60.

Kusumastuti, D., & MP, S. M. S. (2022). *Peran koperasi dalam memajukan perekonomian di Indonesia*. Unisri Press.

Li, H., Liu, S. M., Yu, X. H., Tang, S. L., & Tang, C. K. (2020). Coronavirus disease 2019 (COVID-19): current status and future perspectives. *International journal of antimicrobial agents, 55(5)*, 105951.

Madau, F. A., Furesi, R., & Pulina, P. (2017). Technical Efficiency And Total Factor Productivity Changes In European Dairy Farm Sectors. *Agricultural and Food Economics*, *5*(1), 1-14.

Merita. (2020). Pandemi Covid-19 Terhadap Kebiasaan Konsumsi Buah, Susu Dan Multivitamin Pada Orang Dewasa Di Provinsi Jambi. *Jurnal Media Ilmu Kesehatan, 9*(2).

Nicholson, & Snyder. (2016). *Microeconomic Theory 12th Edition: Basic Principles and Extentions*. USA: Cengage Learning.

Novendra Alfianto, D., & Lambelanova, R. (2021). Pemberdayaan Usaha Mikro Kecil Menengah Susu Sapi Perah Di Kabupaten Boyolali Provinsi Jawa Tengah. *J-3P (Jurnal Pembangunan Pemberdayaan Pemerintahan)*, *6*(2), 91-114.

Permatasari, M. F., & Setyawan, A. A. (2019). *Pengukuran Efisiensi Kinerja Umkm Menggunakan Metode Data Envelopment Analysis (DEA).* Prosiding Seminar Bisnis Magister Manajemen (SAMBIS) 2019, 118-131.

Prastyaningtyas, efa wahyu. (2016). Analisis Peran KUD Tulu Bhakti dalam Menampung Hasil Produksi Susu Sapi di Kecamatan Pagu- Kabupaten Kediri.*Majalah Ekonomi*, *21*(2 Desember), 226–233.

Rasyidi, M. A. (2021). Mengembalikan Koperasi Kepada Jatidirinya Berdasarkan Ketentuan-Ketentuan Dan Peraturan-Peraturan Yang Berlaku Di Indonesia. *Jurnal Ilmiah M-Progress*, *8*(1).

Salvatore, D. (1992). *Theory and Problems of Microeconomic Theory, 3rd edition.* McGraw-Hill.

Sembiring, E. S. K., & Alfarizi, A. W. (2023). Strategi Efektif dalam Manajemen Kemiskinan (Pendekatan Terpadu untuk Mengurangi Ketimpangan Ekonomi). *WORLD MANAGEMENT*, *1*(02), 37-47.

Sofian, A., & Lestarini, N. (2021). Analisis framing pemberitaan tentang kebijakan pemerintah dalam menangani kasus Covid-19 (Analisis framing model Robert N. Entman pada media online Koran. tempo. co Edisi Maret 2020). *Commicast*, *2*(1), 58-70.

Sudarsono, (1995). *Pengantar Ekonomi Mikro*. Jakarta: LP3ES.

Sugiyono, D. (2013). *Metode penelitian pendidikan pendekatan kuantitatif, kualitatif dan R&D*. Alfabeta, Bandung

Timur, C. J., & Dwiputri, I. N. (2021). Eksistensi koperasi wanita dalam pencegahan feminisasi kemiskinan. *Jurnal Ekonomi, Bisnis dan Pendidikan*, *1*, 78-84.

Xaba, S. T., Marwa, N., & Mathur-Helm, B. (2020). Efficiency evaluation of agricultural cooperatives in Mpumalanga: An empirical study using the DEA approach. *African Journal of Economic and Management Studies*, *11*(1), 51-62.

Yang, X., & Shang, G. (2020). Smallholders' agricultural production efficiency of conservation tillage in Jianghan plain, China—Based on a three-stage DEA model. *International Journal of Environmental Research and Public Health*, *17*(20), 7470.