Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

Lintangsari Susanto Putri[1], Bhimo Rizky Samudro[2], Evi Gravitiani[3]

[1,2,3] Faculty of Economic and Business, Sebelas Maret University, Surakarta Indonesia,

ABSTRACT: This research aims to analyze the efficiency level of eight traditional markets in Surakarta before, during and after the COVID-19 pandemic, using the Data Envelopment Analysis (DEA) method. Primary data that has obtained from the Surakarta Trade Office is the number of visitors based on parking fees and traditional market capacity in 2019, 2021 and 2023. The analysis result shows that in 2019 and 2023, Gede Market and Singosaren Market showed the same level of efficiency, while in 2021, Mojosongo Market, Singosaren Market and Kadipolo Market showed efficiency. However, the other six markets showed inefficiencies. There were differences between projected values and actual data on input and output variables, with an increase in all output variables and a decrease in all input variables in 2021 and 2023. Radial movement occurred in input variables in several markets in 2019, 2021 and 2023, while slack movement occured in income output and the number of visitors in several markets in the same year. This research provides a deeper understanding of the efficiency of traditional markets in Surakarta and the changes that have occurred along with the impact of the COVID-19 pandemic.

KEYWORDS: Traditional Market Efficiency, Data Envelopment Analysis (DEA), COVID-19 Pandemic, Surakarta

1. INTRODUCTION (2)

Covid-19 is a disease outbreak that began to enter Indonesia in 2020. Covid is the abbreviation of "co" which means corona, "vi" refers to viruses, "d" for diseases, and 19 is the year when the disease outbreak was first identified, specifically in December 31, 2019, in Wuhan, China. Sangadah, (2020) explains that the government has a focus on dealing with the pandemic by preparing facilities in a short time, especially in the health sector and budget allocation for handling the coronavirus outbreak in Indonesia.

The Covid pandemic forced the world to do things that had never been imagined, one of which was to maintain social distance to reduce the impact of Covid 19. Gogot Suharwoto, (2020) explains, every party or person was forced to 'stop' doing their usual routines. The whole aspect that Indonesia was focusing on is related to the policy of social distancing, or maintaining distance between one person to another. This policy is sought to slow the rate of spread of the Corona virus in society. The implementation of this policy forced each party to persist in meeting its own needs. One application was to fulfill primary needs in terms of food. Traditional markets and modern markets are people's destination every day to fulfill their needs. The impact was people tend to buy food supplies in large quantities, which has an impact on the scarcity of several food items. (Anna, 2020).

Indonesia has data on the distribution of traditional markets in 2020 of 16,235. Java Island is the largest island that has traditional markets with a distribution of 5,949 traditional markets in Indonesia. The distribution of traditional markets on the island of Java results in two main provinces with the largest number of traditional markets. These provinces are East Java Province and Central Java Province. Central Java Province is the province that has the second largest number of markets after East Java Province for three consecutive years. The following is the distribution of traditional markets in East Java and Central Java 2018-2020:

Table 1. Number of Traditional Market Distributions

Province	2018	2019	2020
East Java	1,823	2,249	2,359
Central Java	1,482	1,910	1,977

(BPS (2018); BPS (2019); Fu, (2021))

The amount of data distribution above is one of the real interactions in trading. This interaction gave rise to some of the

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

best markets in Indonesia. Two of the best markets are in Surakarta, namely Klewer Market and Gede Solo Market. Surakarta is divided into five sub-districts, these sub-districts include Kliwon District Market, Jebres District, Banjarsari District, Laweyan District, and Serengan District. Districts in Surakarta have traditional markets in each area. Several traditional markets are the best markets in Central Java.

2011 was the first year that the best traditional market competition in Central Java was held. Surakarta has consistently been the winner as the best traditional market in Central Java Province until 2018. The aim of this competition is that each region has standards in maintaining its traditional markets. These standards include traditional markets that are comfortable, clean and safe to be able to maintain the existence of traditional markets with their competitors, namely modern markets. (Central Java Province, 2018; Olson, 2019; Fu, 2021)

According to the Surakarta Mayor Regulation (2011) Law No. 4 year 2011, traditional markets are places where several sellers gather in buildings built by the Regional Government, BUMN and BUMD. The management of traditional markets is carried out by the regional government and has various types of traders, ranging from small, medium and non-governmental traders. The problem with traditional markets is that traditional markets are often known for being dirty, closed, smelly, and a crowded environment during buying and selling transactions. This weakness is quite common in traditional markets and has become the focus of solving common problems in traditional markets. The dynamics of problems in traditional markets make local governments take part in resolving the problems that occur, one of which is by revitalizing traditional markets. (Assa Aprillia, Sambiran Sarah, 2022)

The role of traditional markets in government has an influence in alleviating poverty in society. This is because traditional markets are the economic driver for society. Some people depend on traditional markets for their livelihood as traders. The existence of traditional markets can fight against their competitors, namely modern markets. The existence of traditional markets in Surakarta also increased when the Covid-19 pandemic hit. The government of Surakarta said that from 2020 to 2022, the economy in traditional markets in Surakarta has increased. Starting from December 2020, traders experienced a 40% increase in profits from food commodities in the traditional markets of Surakarta. (Ferricha and Fauzan (2020, p. 9), Radar Solo, 2020, 2022))

In contrast to information from the government of Surakarta, the Head of the Research and Development Section of the Indonesian Market Traders Association (Ikappi) in Susanto, (2021) believed that the spread of the Covid-19 pandemic has had an impact on the economic conditions of market traders. Market traders are in a condition where they cannot continue their business due to the PPKM. PPKM is an abbreviation for Implementation of Restrictions on Community Activities, PPKM is an action from the government to deal with the emergency situation due to the Covid pandemic on 03-20 July 2021. The impact of PPKM caused traditional market traders to experience the condition that 5 million traders out of a total of 12 million traders were forced to close their businesses. Traders' businesses were closed as a result of few buyers and desolated markets. This calculation is equivalent to 43% of the number of traders affected in traditional markets throughout Indonesia.

Differences in resource management in each region also have an impact on the development of traditional markets. Proper and optimal management of traditional markets has efficient value for the interests of regional governments in developing regional potential. Surakarta Trade Service (2018) said that Surakarta has a top priority on trade. This is because trade is the lifeblood of the economy in Surakarta. Surakarta does not have natural potential that can be superior. So that developments in traditional market management became a superior program continuing from the 2000s.

After the Covid pandemic, traditional markets in Surakarta are required to continue to increase. This increase has the aim of traditional markets in Surakarta being able to compete with their competitors. The differences in achievement targets for each traditional market create their own challenges before, during and after the pandemic. The differences in achievements of each market mean that the efficiency of traditional markets needs to be analyzed to determine the level of efficiency of market management in Surakarta before, during and after the Covid 19 pandemic. The efficiency of traditional markets in Surakarta needs to be taken into account in order to know the maximum effort that has been generated from the resources available. has been processed. Measuring the level of efficiency can be done using Data Envelopment Analysis (DEA). DEA analysis is a non-parametric calculation aimed at evaluating the performance of a number of Decision Making Units (DMU). DMU in DEA can be carried out in units such as banks, hospitals, units in factories, fields and other units that have the same type of operations.

The novelty of this research is that the research was conducted to analyze the efficiency level of 10 traditional markets in Surakarta. This is necessary because before the Covid-19 pandemic, the traditional market in Surakarta was nominated as the best traditional market consecutively from 2011. After the Covid-19 pandemic, the traditional market in Surakarta was still able to increase its existence by experiencing a 40% increase in profits for food commodities. This increase in profits can be achieved by traditional markets in Surakarta when the majority of other traditional markets experienced losses during the Covid 19 pandemic.

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

2. LITERATURE REVIEW

Major and Tannous (2020) explain that traditional markets are called Souq in Arabic and Socco in Spanish. The market is a publicly accessible pedestrian market with arcades, plazas, and many shops where people gather regularly to buy and sell goods, socialize, and walk. Traditional markets have buying and selling activities that continue to encourage human behavior in meeting their needs and creating trading instruments. Traditional markets are the wheels of a nation's economy because one of the areas that provides employment is trade. Traditional markets tend to be older and are still competing with competitors, namely modern markets. The government also supports traditional markets in maintaining their existence against competitors by implementing traditional market revitalization. (Putra and Rudito, 2015)

Młynarski and Kaliszewski (2018) explain that efficiency is an important aspect of the economy. Efficiency reflects the results of economic activity in the ratio of maximum output to production factor input. Another definition of efficiency is the maximum use of public resources in the process of meeting community needs and without wasting input factors.

Broekel, Rogge, and Brenner (2018) argue that the term efficiency is used to highlight that innovation output is compared with the maximum amount of output that can be achieved from the available input. Other variables outside input and output function as benchmarks in determining the maximum results that can be achieved.

Lampe and Hilgers (2015) argue that DEA analysis is an efficiency measurement method that uses a non-parametric model that does not require explicit a priori determination of the relationship between input and output, or setting rigid importance weights for various factors so that the function in research does not need to be defined. DEA analysis is an efficiency evaluation model based on mathematical programming theory. Dea offers an alternative to classical statistics in extracting information from sample observations. The difference between DEA and other parametric approaches is that DEA optimizes each individual observation with the aim of calculating separate wise limits determined by the set of appropriate decision management units or Decision Making Units (DMU). The focus point of DEA is on individual observations and not a single optimization statistical approach that focuses on the average of parameters. DEA refers to each port as a DMU, in the sense that each is responsible for converting input to output. DEA analysis can involve many inputs as well as several outputs in assessing its efficiency. (Abbott & Doucouliagos, 2004; Lampe & Hilgers, 2015).

Nandy and Singh (2020) argue that DEA is a linear programming method that aims to calculate efficiency levels. The efficiency level calculation involves inefficient DMUs versus efficient DMUs. The efficient DMU is a temporary value that lies in the middle of the other DMU values below the border. The results of the input and output DMU values in DEA are as follows:

a. DEA input has the value of reducing the input level while maintaining a constant output level.
b. DEA output has a value that changes while maintaining the input level constant.

Hermawan et al, (2022) explain that traditional markets are places where people gather to carry out trading processes. Markets as economic and trade centers certainly involve many people and crowds cannot be avoided. This crowd caused the spread of the Covid-19 pandemic to become faster. The Covid-19 pandemic is a new outbreak caused by the Sars-Cov2 virus. The Sars CoV2 virus is known as Severe Acute Respiratory Syndrome Coronavirus 2 which has become an epidemic that has spread across continents. The discovery of cases of this outbreak in Indonesia emerged in March 2020 (Wahidah et al., (2020).

Qurrata et al, (2022) explained that the Covid-19 pandemic had an impact on many sectors, one of which was the economic sector. The lockdown policy is one of the reasons why everyone reduces activities outside the home. This reduction in activity has an impact on buying and selling transactions, one of which is in traditional markets. Consumers prefer to fulfill their needs by buying at the nearest shop or through online shopping. Fulfilling these needs causes a decrease in consumer purchasing power in traditional markets. This decrease in purchasing power causes sellers' income in the market to decrease. This decline is characterized by market traders being unable to meet their daily needs. (Hermawan et al, 2022)

3. RESEARCH METHOD

The scope of the research is the calculation of the level of efficiency that will be carried out with DEA to conduct an analysis of traditional markets in Surakarta. The research objects are eight traditional markets in Surakarta. The types and sources of research data are secondary data and primary data. Primary data was obtained from the Surakarta Trade Service as the manager of traditional markets in Surakarta. Eight traditional markets based on the division of 4 market areas in Surakarta. Primary data obtained from the Trade Department is the number of visitors based on parking fees and the total capacity of Surakarta traditional markets as seen from the total stalls that can accommodate sellers in 2019, 2021 and 2023.

This research was carried out directly by collecting data and interviews with the Surakarta Trade Office. The managers interviewed were employees of the Surakarta Trade Department, market heads, as well as security guards or parking attendants at eight traditional markets in Surakarta.

The author uses 2 variables, namely input and output variables. Input variables consist of market traders and market capacity.

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

Meanwhile, the output variables are traditional market income and market visitors. These variables will be analyzed using quantitative methods, namely the Data Envelopment Analysis (DEA) analysis tool.

4. RESULTS AND DISCUSSION (2)

Score Analysis of Eight Traditional Markets in Surakarta

The score results explain eight traditional markets in 2019. Analysis before the pandemic showed that only two markets were efficient, namely Gede Market and Singosaren Market. Efficient traditional markets have a score of one. Meanwhile, the other 6 markets have inefficiency results, namely less than one (< 1). The score results on the six inefficient markets refer to the values of traditional efficient markets. Mojosongo Market has a score of 0.5384 and Kadipolo Market has a score of 0.4609. These two markets have a lambda value referring to an efficient market (Gede Market), namely 0.111. Klewer Market has a score of 0.2649, with a lambda value referring to two efficient markets, namely Gede Market 0.514 and Singosaren Market 0.857. Nusukan Market has a score of 0.1898, with a lambda value referring to two efficient markets, namely Gede Market 0.17 and Singosaren Market 0.044. Legi Market has a score of 0.1276, with a lambda value referring to two efficient markets, namely Gede Market 0.206 and Singosaren Market 0.091. Last, Harjodaksino Market has a score of 0.0825, with the lambda value referring to two efficient markets, namely Gede Market 0.091 and Singosaren Market 0.116.

The score results explain eight traditional markets in 2021. Which produces an analysis during the pandemic which shows that there were three markets that are efficient. The three efficient markets were Mojosongo Market, Kadipolo Market and Pasa Singosaren. 2021 is a year when the Covid pandemic is increasing. The impact of the pandemic occurred on the Kadipolo Market which was able to achieve efficiency during the pandemic. This achievement was a result of Kadipolo Market being chosen to be the New Normal market pilot market for traditional markets in Surakarta. Meanwhile, the other five markets have inefficiency results, namely less than one (<1). The score results on the five inefficient markets refer to the values of the efficient traditional markets. Gede Market has a score of 0.884, with a lambda value that refers to an efficient market, namely Singosaren Market 3.333. Nusukan Market has a score of 0.3696, has a lambda value referring to an efficient market, namely Singosaren Market 1.333. Legi Market has a score of 0.3542, with a lambda value referring to three efficient markets, namely Mojosongo Market 0.165, Singosaren Market 0.08, and Kadipolo Market 2.422. Klewer Market has a score of 0.138, with a lambda value referring to an efficient market, namely Singosaren Market, 1.457. Last, Harjodaksino Market has a score of 0.0589, with the lambda value referring to two efficient markets, namely Singosaren Market 0.311 and Kadipolo Market 0.022. In contrast to the Kadipolo market, the Harjodaksino Market can not achieve efficiency. Another reason was the closure of the Harjodaksino Market with an initial trial of four days during the pandemic. Harjodaksino Market was the only basic food market that was closed because it was the location of the first Covid case found in a traditional market in Surakarta.

The score results in table 4.6 explain eight traditional markets after the Covid pandemic in 2023. The table produces an analysis before the pandemic which shows that only two markets were efficient. Efficient markets are Gede Market and Singosaren Market. Meanwhile, the other 6 markets have inefficiency results, namely less than one (< 1). The score results on the six inefficient markets refer to the values of traditional efficient markets. Klewer Market has a score of 0.614, has a lambda value referring to an efficient market, namely Gede Market 0.565 and Singosaren Market 4.352. Mojosongo Market has a score of 0.4846, with the lambda value referring to an efficient market at Gede Market, namely 0.1. Kadipolo Market has a score of 0.3284, with the lambda value referring to two efficient markets, namely Gede Market 0.064 and Singosaren Market 0.056. Legi Market has a score of 0.1892, with a lambda value referring to an efficient market, namely Singosaren Market 0.1287. Nusukan Market has a score of 0.1267, with the lambda value referring to two efficient markets, namely Gede Market 0.023 and Singosaren Market 0.37. Last, Harjodaksino Market has a score of 0.1074, with the lambda value referring to two efficient markets, namely Gede Market 0.033 and Singosaren Market 0.47.

Projection Analysis of Eight Traditional Markets in Surakarta

Tables 2 to Table 7 below have the results of the analysis of projection data for 2019, 2021, and 2023. The projection results for an inefficient DMU are the projected input and output values that an inefficient market should be able to achieve in order to become an efficient market. The projection results are rounded up to facilitate discussion of the DEA analysis below.

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

Table 2. Projection of inputs for traditional markets in Surakarta in 2019

No.	DMU	Score	Market Capacity (Los/Kiosk)		Market Trader (Person)	
			Data	Projection	Data	Projection
1	Gede Market	1	1037	1037	1037	1037
2	Mojosongo Market	0.5384	1819	115	214	115
3	Legi Market	0.1276	3186	239	1871	239
4	Nusukan Market	0.1898	992	188	992	188
5	Singosaren Market	1	275	275	275	275
6	Kadipolo Market	0.4609	333	115	250	115
7	Klewer Market	0.2649	3015	769	2903	769
8	Harjodaksino Market	0.0825	1554	126	1523	126

Source: primary and secondary data processed in 2023

Table 3. Output projections for traditional markets in Surakarta in 2019

No.	DMU	Score	Income (Rp. Per Year)		Total Visitors (People Per day)	
			Data	Projection	Data	Projection
1	Gede Market	1	1152781799	1152781799	4500	4500
2	Mojosongo Market	0.5384	88210600	128086867	500	500
3	Legi Market	0.1276	617256310	617256310	1000	1000
4	Nusukan Market	0.1898	379842978	379842978	800	800
5	Singosaren Market	1	4194738113	4194738113	800	800
6	Kadipolo Market	0.4609	89157512	128086867	500	500
7	Klewer Market	0.2649	4187383849	4187383849	3000	3000
8	Harjodaksino Market	0.0825	589820818	589820818	500	500

Source: primary and secondary data processed in 2023

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

Table 4. Projection of inputs for traditional markets in Surakarta in 2021

No.	DMU	Score	Market Capacity (Los/Kiosk)		Market Trader (Person)	
			Data	Projection	Data	Projection
1	Gede Market	0.884	1037	917	1037	917
2	Mojosongo Market	1	1819	1819	214	214
3	Legi Market	0.3542	3186	1129	1871	663
4	Nusukan Market	0.3696	992	367	992	367
5	Singosaren Market	1	275	275	275	275
6	Kadipolo Market	1	333	333	250	250
7	Klewer Market	0.138	3015	401	2903	401
8	Harjodaksino Market	0.0598	1554	93	1523	91

Source: primary and secondary data processed in 2023

Table 5. Output projections for traditional markets in Surakarta in 2021

No.	DMU	Score	Income (Rp. Per Year)		Total Visitors (People Per day)	
			Data	Projection	Data	Projection
1	Gede Market	0.884	1489892286	11369907673	1000	1000
2	Mojosongo Market	1	86196265	86196265	300	300
3	Legi Market	0.3542	489726100	489726100	800	800
4	Nusukan Market	0.3696	453065094	4547963069	400	400
5	Singosaren Market	1	3410972302	3410972302	300	300
6	Kadipolo Market	1	84222570	84222570	300	300
7	Klewer Market	0.138	4969318260	4969318260	200	437
8	Harjodaksino Market	0.0598	674477970	1062661341	100	100

Source: primary and secondary data processed in 2023

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

Table 6. Projections of input to traditional markets in Surakarta in 2023

No.	DMU	Score	Market Capacity (Los/Kiosk)		Market Trader (Person)	
			Data	Projection	Data	Projection
1	Gede Market	1	1037	1037	1037	1037
2	Mojosongo Market	0.4846	1819	104	214	104
3	Legi Market	0.1892	3186	354	1871	354
4	Nusukan Market	0.1267	992	126	992	126
5	Singosaren Market	1	275	275	275	275
6	Kadipolo Market	0.3284	333	82	250	82
7	Klewer Market	0.614	3015	1783	2903	1782
8	Harjodaksino Market	0.1074	1554	164	1523	164

Source: primary and secondary data processed in 2023

Table 7. Output projections for traditional markets in Surakarta in 2023

No.	DMU	Score	Income (Rp. Per year)		Total Visitors (People Per Day)	
			Data	Projection	Data	Projection
1	Gede Market	1	503721140	503721140	5000	5000
2	Mojosongo Market	0.4846	22544090	50372114	500	500
3	Legi Market	0.1892	730114590	730114590	550	644
4	Nusukan Market	0.1267	221624703	221624703	300	300
5	Singosaren Market	1	567225073	567225073	500	500
6	Kadipolo Market	0.3284	63947160	63947160	350	350
7	Klewer Market	0.614	2752979443	2752979443	5000	5000
8	Harjodaksino Market	0.1074	283357710	283357710	400	400

Source: primary and secondary data processed in 2023

Radial movement analysis of eight traditional markets in Surakarta

Radial Movement *is* an input value that has an excessive value, thus, UKE must reduce the input by the projected value to

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

achieve efficiency. The following is a table of input and output that experiences radial movement.

Table 8 .Radial Movement Input in traditional markets in Surakarta in 2019

Economic Activity Unit	Input 1 Market Capacity (Los/kiosk)	Input 2 Market Trader (Person)
Mojosongo Market	1,704	99
Legi Market	2,947	1,632
Nusukan Market	804	804
Kadipolo Market	218	135
Klewer Market	2,246	2,134
Harjodaksino Market	1,428	1,397

Table 9. Radial Movement Input in traditional markets in Surakarta in 2021

Economic Activity Unit	Input 1 Market Capacity (Los/kiosk)	Input 2 Market Trader (Person)
Gede Market	120	120
Legi Market	2,057	1,208
Nusukan Market	625	625
Klewer Market	2,614	2,502
Harjodaksino Market	1,461	1,432

Table 10. Radial Movement Input in traditional markets in Surakarta in 2023

Economic Activity Unit	Input 1 Market Capacity (Los/kiosk)	Input 2 Market Trader (Person)
Mojosongo Market	1,715	110
Legi Market	2,832	1,517
Nusukan Market	866	866
Kadipolo Market	251	168
Klewer Market	1,232	1,121
Harjodaksino Market	1,390	1,359

Efficiency Analysis of the Traditional Market in Surakarta: Application of Data Envelopment Analysis Methods

Slack movement analysis of eight traditional markets in Surakarta

Slack Movement is the output target where the UKE data value experiences weaknesses compared to other UKE. The following is a table of inputs and outputs that experience slack movement.

Table 11. Slack Movement output in traditional markets in Surakarta in 2019

Economic Activity Unit	Output 1 Income (Rp. per year)	Output 2 Visitors (people per day)
Mojosongo Market	39,876,267	0
Legi Market	0	0
Nusukan Market	0	0
Kadipolo Market	38,929,355	0
Klewer Market	0	0
Harjodaksino Market	0	0

Table 12. Slack Movement output in traditional markets in Surakarta in 2021

Economic Activity Unit	Output 1 Income (Rp. per year)	Output 2 Visitors (people per day)
Gede Market	9,880,015,387	0
Legi Market	0	0
Nusukan Market	4,094,897,975	0
Klewer Market	0	237
Harjodaksino Market	388,183,371	0

Table 13. Slack Movement output in traditional markets in Surakarta in 2023

Economic Activity Unit	Output 1 Income (Rp. per year)	Output 2 Visitors (people per day)
Mojosongo Market	27,828,024	0
Legi Market	0	94
Nusukan Market	0	0
Kadipolo Market	0	0
Klewer Market	0	0
Harjodaksino Market	0	0

5. **CONCLUSION**

Conclusion

The conclusions from the analysis of envelopment data in eight traditional markets in Surakarta before the pandemic, during the pandemic, and after the pandemic, represented by 2019, 2021, and 2023, are as follows:

1. The efficiency of traditional markets in Surakarta in 2019 and 2023 is the same, namely Gede Market and Singosaren Market. Meanwhile, in 2021 there were three traditional markets, namely Mojosongo Market, Singosaren Market and Kadipolo

Market. The six traditional markets with inefficiency or (< 1) in 2019 and 2023 were Mojosongo Market, Legi Market, Nusukan Market, Kadipolo Market, Klewer Market, and Harjodaksino Market. Meanwhile, traditional markets with inefficiency or (< 1) in 2021 are Mojosongo Market, Legi Market, Klewer Market, and Harjodaksino Market.

2. Projection values occur in input variables and output variables. In 2019, the input variables for market capacity and market traders experienced projected values that were smaller than the data. The income output variable has a greater projected value than traditional market income data for one year. The years 2021 and 2023 have projected additions to all output variables and reductions to all input variables. Input variables include market capacity and market traders. Output variables include income and total visitors.

3. Radial Movement occurs in two inputs, namely market capacity input and total traders in six markets in 2019 and 2023. The six markets were Mojosongo Market, Legi Market, Nusukan Market, Kadipolo Market, Klewer Market, and Harjodaksino Market. In 2022, radial movement occured in two inputs in five traditional markets. The five markets were Gede Market, Legi Market, Nusukan Market, Klewer Market and Harjodaksino Market.

4. Slack movements occurred in 2019, 2021 and 2023. In 2019 slack movements occurred in income output in two markets, namely the Mojosongo Market and the Kadipolo Market. In 2022, slack movement occured in the income output of three markets, namely Gede Market, Nusukan Market, and Harjodaksino Market. Then were slack movement in visitor output at Klewer market. In 2023, there were a Slack movement in the income output at Mojosongo market and visitor output at Legi Market.

SUGGESTION

The suggestions for this research are input to the research object, namely the Surakarta Trade Service and the next researcher as follows:

1. Achieving inefficient traditional market efficiency can be achieved if the traditional market refers to the value of the efficient traditional market according to the value in the analysis table. Results Efficiency and inefficiency are greatly influenced by the variables of the DMU to be studied.

2. Reduction of capacity from traditional market inefficiencies. The reduction will have an impact on reducing the number of traders so that traditional markets with inefficiencies experience an increase in the income they receive so they can compete with other traditional markets and modern markets. Apart from that, the increase in total visitors also contributes to the efficiency of traditional markets.

3. Radial movement in traditional markets has an explanation if input in traditional markets is maximum. The value of the radial movement is considered to be able to be reduced to achieve efficiency in traditional markets

4. Slack movement can be reduced by regular evaluation in traditional markets. Evaluation can improve the performance of the Surakarta Trade Department in the field of traditional market management to avoid unexpected events such as fires due to electrical short circuits.

REFERENCES

1) Abbott, M., & Doucouliagos, H. (2004). Research output of Australian universities. Education Economics. https://doi.org/10.1080/0964529042000258608

2) Anna, L. K. (2020). Mengapa Orang Panik dan Borong Makanan Saat Wabah Covid-19 Artikel ini telah tayang di Kompas.com dengan judul "Mengapa Orang Panik dan Borong Makanan Saat Wabah Covid-19", Klik untuk baca: https://lifestyle.kompas.com/read/2020/03/23/140700020/mengapa-or.   Kompas.Com. https://lifestyle.kompas.com/read/2020/03/23/140700020/mengapa-orang-panik-dan-borong-makanan-saat-wabah-covid-19

3) Assa Aprillia, Sambiran Sarah, W. W. (2022). Peran Pemerintah Daerah Dalam Pengelolaan Pasar Tradisional di Kecamatan Langowan Timur Kabupaten Minahasa. Jurnal Governance, 1(1).

4) Badan Pusat Statistika (BPS) 2018. (2019). Pasar Tradisional Menurut Provinsi 2018. Databoks.Katadata.Co.Id. https://databoks.katadata.co.id/datapublish/2019/03/27/jumlah-pasar-tradisional-indonesia-mencapai-14-ribu-unit

5) Badan Pusat Statistika (BPS) 2019. (n.d.). Sebaran Pasar dan Pusat Perdagangan Menurut Klasifikasi 2019. Bps.Go.Id. Retrieved November 28, 2022, from https://www.bps.go.id/indicator/173/1875/1/sebaran-pasar-dan-pusat-perdagangan-menurut-klasifikasi.html

6) Boďa, M., Dlouhý, M., & Zimková, E. (2020). Modeling a shared hierarchical structure in data envelopment analysis: An application to bank branches. Expert Systems with Applications. https://doi.org/10.1016/j.eswa.2020.113700

7) Broekel, T., Rogge, N., & Brenner, T. (2018). The innovation efficiency of German regions – a shared-input DEA approach.

Review of Regional Research. https://doi.org/10.1007/s10037-017-0112-0

8) Creswell, J. W. (2003). Research design Qualitative quantitative and mixed methods approaches. Research Design Qualitative Quantitative and Mixed Methods Approaches. https://doi.org/10.3109/08941939.2012.723954

9) Despotis, D. K. (2005). Measuring human development via data envelopment analysis: The case of Asia and the Pacific. Omega. https://doi.org/10.1016/j.omega.2004.07.002

10) Dewita, Y., Burke, M., & Yen, B. T. H. (2020). The relationship between transport, housing and urban form: Affordability of transport and housing in Indonesia. Case Studies on Transport Policy. https://doi.org/10.1016/j.cstp.2019.01.004

11) Dinas Perdagangan Kota Surakarta. (2022). Daftar Nama Pasar di Kota Solo. Dinas Perdagangan Kota Surakarta. https://dinasperdagangan.surakarta.go.id/

12) Dr. Gogot Suharwoto. (2020, April 11). Pembelajaran Online di Tengah Pandemi Covid-19, Tantangan yang Mendewasakan.

13) Fare, R., Grosskopf, S., Whittaker, G., & Grosskopf, S. (2015). Department of Economics , Delhi School of Economics , University of Delhi On Value Efficency and Data Envelopment Analysis On Value Efficency and Data Envelopment Analysis. 39(1), 81–88.

14) Ferricha, D., & Fauzan, H. (2020). How the policy and empowerment of traditional markets in Indonesia? International Journal of Scientific and Technology Research.

15) Fu, H. (2021). 7 Provinsi dengan Jumlah Pasar Rakyat Terbanyak di Indonesia. Https://Www.Beritadaerah.Co.Id/. https://www.beritadaerah.co.id/2021/02/18/7-provinsi-dengan-jumlah-pasar-rakyat-terbanyak-di-indonesia/

16) Hermawan, A., Suhada, B., & Septiana, N. (2022). Dampak Covid-19 terhadap Pendapatan Pedagang Pasar Tradisional di Simpang Mataram Baru Lampung Timur. SNPPM (Seminar Nasional Penelitian Dan Pengabdian Kepada Masyarakat), 48, 7–13. https://prosiding.ummetro.ac.id/index.php/snppm/article/view/98/74

17) Jayani, D. H. (2021). Jumlah Pasar Rakyat Menurut Wilayah 2020. Databoks. https://databoks.katadata.co.id/datapublish/2021/02/04/lokasi-persebaran-pasar-rakyat-di-indonesia

18) Lampe, H. W., & Hilgers, D. (2015). Trajectories of efficiency measurement: A bibliometric analysis of DEA and SFA. In European Journal of Operational Research. https://doi.org/10.1016/j.ejor.2014.04.041

19) Major, M. D., & Tannous, H. O. (2020). Form and function in two traditional markets of the middle east: Souq Mutrah and Souq Waqif. Sustainability (Switzerland). https://doi.org/10.3390/su12177154

20) Mallach, A. (2018). Shrinking cities: Understanding urban decline in the United States Russell Weaver, Sharmistha Bagchi-Sen, Jason Knight, Amy E. Frazier London and New York: Routledge. 2017. 232 pages. ISBN 9781138796867. Papers in Regional Science. https://doi.org/10.1111/pirs.12397

21) Minuci, E., Ferreira Neto, A. B., & Hall, J. (2019). A data envelopment analysis of West Virginia school districts. Heliyon. https://doi.org/10.1016/j.heliyon.2019.e01990

22) Młynarski, W., & Kaliszewski, A. (2018). Efficiency evaluation in forest management – a literature review. Forest Research Papers, 79(3). https://doi.org/10.2478/frp-2018-0029

23) Mosbah, E., Zaibet, L., & Dharmapala, P. S. (2020). A new methodology to measure efficiencies of inputs (outputs) of decision making units in Data Envelopment Analysis with application to agriculture. Socio-Economic Planning Sciences. https://doi.org/10.1016/j.seps.2020.100857

24) Naeem, M. A., Appiah, M., Karim, S., & Yarovaya, L. (2023). What abates environmental efficiency in African economies? Exploring the influence of infrastructure, industrialization, and innovation. Technological Forecasting and Social Change, 186(PB), 122172. https://doi.org/10.1016/j.techfore.2022.122172

25) Nandy, A., & Singh, P. K. (2020). Farm efficiency estimation using a hybrid approach of machine-learning and data envelopment analysis: Evidence from rural eastern India. Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2020.122106

26) Niswati, Z. A. I. (2014). Analisis Efisiensi Kinerja Menggunakan Model Data Envelopment Analysis (Dea) Pada Pt Xyz. Universitas Indraprasta PGRI.

27) Olson, D. (2019). Pasar Terbaik Di Indonesia. Http://Www.Artechpower.Com/. http://www.artechpower.com/pasar-terbaik-di-indonesia/

28) Pambudi, G., & Nananukul, N. (2019). Wind turbine site selection in Indonesia, based on a hierarchical dual data envelopment analysis model. Energy Procedia. https://doi.org/10.1016/j.egypro.2019.01.980

29) Pemerintah Kota Surakarta. (2011). PERATURAN WALIKOTA SURAKARTA. file:///C:/Users/USER/Downloads/4986PERWALI_NO_4_TAHUN_2011.pdf

30) Primasasti, A. (2022). Makna Dibalik The Spirit of Java. Pemerintah Kota Surakarta. https://surakarta.go.id/?p=27951\

31) Provinsi Jawa Tengah. (2018). Pasar Rejosari Terbaik se-Jawa Tengah. Provinsi Jawa Tengah. https://jatengprov.go.id/beritadaerah/pasar-rejosari-terbaik-se-jawa-tengah/

32) Purnamasari, A. D. (2014). Analisis kinerja operasional pasar tradisional kota bekasi. In Fakultas Ekonomika Dan Bisnis Universitas Diponegoro Semarang. https://docplayer.info/43904380-Analisis-kinerja-operasional-pasar-tradisional-kota-bekasi.html

33) Putra, R. D. D., & Rudito, B. (2015). Planning Community Development Program of Limbangan Traditional Market Revitalization with Social Mapping. Procedia - Social and Behavioral Sciences. https://doi.org/10.1016/j.sbspro.2015.01.296

34) Qurrata, V. A., Supratman, R. G., & Khuzaimah, R. B. (2022). Strategi ketahanan pasar rakyat di masa pandemi covid-19. Inovasi, 18(1), 105–111. https://doi.org/10.30872/jinv.v18i1.10365

35) Radar Solo. (2020). Lewat Layanan Belanja Online, Transaksi Pasar Tumbuh 40% saat Pandemi. Radarsolo.Jawapos.Com. https://radarsolo.jawapos.com/daerah/solo/26/10/2020/lewat-layanan-belanja-online-transaksi-pasar-tumbuh-40-saat-pandemi/

36) Radar Solo. (2022). Pemkot Solo Terus Berupaya Percantik Pasar, Perluas Cashless. Radarsolo.Jawapos.Com. https://radarsolo.jawapos.com/daerah/solo/17/02/2022/pemkot-solo-terus-berupaya-percantik-pasar-perluas-cashless/

37) Ray, S. C., & Chen, L. (2015). Data envelopment analysis for performance evaluation: A child's guide. In Benchmarking for Performance Evaluation: A Production Frontier Approach. Springer India. https://doi.org/10.1007/978-81-322-2253-8_2

38) Sa'diyah, N. H. (2016). Analisis Efisiensi Menggunakan Metode Data Envelopment Analysis (Dea) (Kasus Pada PT. Indonesia Toray Sinthetic). Sains: Jurnal Manajemen Dan Bisnis. https://doi.org/10.35448/jmb.v9i1.5358

39) Sangadah, K. (2020). Partisipasi Masyarakat Dalam Penanganan Pencegahan Covid-19 Di Desa Tawangsari Kecamatan Taman Kabupaten Sidoarjo". Orphanet Journal of Rare Diseases, 21(1).

40) Setyaningrum, D. U. (2014). Analisis efisiensi dengan menggunakan metode Data Envelopment Analysis (Issue 2000) [Universitas Diponegoro Semarang]. http://eprints.undip.ac.id/45212/1/02_SETYANINGRUM.pdf

41) Shabani, A., Torabipour, S. M. R., Farzipoor Saen, R., & Khodakarami, M. (2015). Distinctive data envelopment analysis model for evaluating global environment performance. Applied Mathematical Modelling, 39(15), 4385–4404. https://doi.org/10.1016/j.apm.2014.12.053

42) Susanto, V. Y. (2021). Imbas pandemi Covid-19, 6,7 juta pedagang pasar alami penurunan pendapatan hingga 70%. National.Kontan.Co.Id. https://nasional.kontan.co.id/news/imbas-pandemi-covid-19-67-juta-pedagang-pasar-alami-penurunan-pendapatan-hingga-70

43) Taliani, E. C., Escobar, S. G., & Silva Da Rosa, F. (2017). Environmental disclosure and economic efficiency: A correlational evaluation of Spanish ports authorities. Intangible Capital. https://doi.org/10.3926/ic.937

44) Wahidah, I., Athallah, R., Hartono, N. F. S., Rafqie, M. C. A., & Septiadi, M. A. (2020). Pandemik COVID-19: Analisis Perencanaan Pemerintah dan Masyarakat dalam Berbagai Upaya Pencegahan. Jurnal Manajemen Dan Organisasi, 11(3). https://doi.org/10.29244/jmo.v11i3.31695

45) Wasiaturrahma, Sukmana, R., Ajija, S. R., Salama, S. C. U., & Hudaifah, A. (2020). Financial performance of rural banks in Indonesia: A two-stage DEA approach. Heliyon. https://doi.org/10.1016/j.heliyon.2020.e04390

46) Widiarto, I., Emrouznejad, A., & Anastasakis, L. (2017). Observing choice of loan methods in not-for-profit microfinance using data envelopment analysis. Expert Systems with Applications. https://doi.org/10.1016/j.eswa.2017.03.022

47) Widiyana, S. S., & Indiyanto, R. (2017). Analisa Pengukuran Efisiensi Dengan Metode Data Envelopment Analysis (Dea) Di Heaven Store Surabaya Barat. PROZIMA (Productivity, Optimization and Manufacturing System Engineering). https://doi.org/10.21070/prozima.v1i1.705

48) Yanti, P., & Kustiani, N. A. (2016). Analisis Efisiensi Belanja Daerah Urusan Pendidikan dan Kesehatan dengan Metode Data Envelopment analysis (DEA): Studi pada Pemerintah Kabupaten/Kota di Provinsi Banten. Jurnal Informasi Keuangan Dan Akuntansi, 4, 81–96. https://jurnal.pknstan.ac.id/index.php/JIA/article/view/49/37

49) Zeng, Y., Guo, W., Wang, H., & Zhang, F. (2020). A two-stage evaluation and optimization method for renewable energy development based on data envelopment analysis. Applied Energy. https://doi.org/10.1016/j.apenergy.2019.114363