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Implementation of Demand and Supply Functions Related to The Application of Mathematical Science to MSME Products in Pelawi Utara Village, Babalan, Langkat Regency

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Abstract. *This study analyzes related to the application of mathematical concepts to the demand and supply function of MSME products in North Pelawi Village, Babalan District, Langkat Regency. The results show that there is an elasticity associated with mathematical concepts for the demand function and the supply function. Usually, because MSME products are hampered by supply chain disruptions and production. However, through recovery strategies and interventions to apply mathematical concepts in the demand and supply functions, a balance curve between the demand and supply functions is formed. Awareness to apply mathematical concepts for business actors has an important role in controlling the rate of supply of goods so that the number of goods demand can be fulfilled according to the number of desires and the prices offered can be adjusted to the prices requested by consumers. This research highlights the importance of awareness and understanding the role of business actors who are aware of the application of mathematical concepts so that regulating demand and supply can run systematically and not damage the market price offered to consumers.*

Keywords: *MSME, Demand, Supply, Mathematical Concepts*

1. INTRODUCTION

The number of MSMEs that are growing rapidly in rural areas has a positive impact and a negative impact. This condition is like two very opposite currencies where the rapid growth of MSMEs certainly slows down economic development and growth, but on the other hand, if MSMEs are not managed properly and optimally, it will lead to management that does not have competitiveness and innovation in implementing it. There for many newly established MSMEs are only able to last 1-2 years. This can happen if in its establishment the MSMEs are only established based on a participatory mindset without paying attention to the prospect of the ability to compete with other MSMEs is low and will eventually experience decline and bankruptcy.

To able compete, innovation and management are needed that are carried out systematically through recording and forecasting the condition of whether the product is still popular or not on the market. Systematic observation needs to be carried out by paying attention to the required time period time. One of the MSMEs that survive in North Pelawi Village is a homemade product of tempeh crackers. Based on the results of observations and interviews with actors and at the same time the owner of the Ayam Pedak business, the problem experienced during running a business for approximately 8 years is that when approaching the

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holidays, everyone wants to do culinary tourism, if supported by sufficient funds, the number of demand for products will increase, then the inventory, in this case, the stock of products must be conditioned so that there is no shortage.

If the production of tempeh crackers is not properly conditioned, there will be a situation where the demand number will exceed the capacity of the product offered with minimal management, often the number of requests cannot be met optimally. This disappointment can make customers switch to other similar businesses that are able to serve the customer's requests according to their wishes. Slowly but surely the number of customers will decrease one of the reasons why the management of demand for a product with a certain category must be considered because of the importance of prioritizing tastes or requests from customers which can be one of the excellent services of the number of product offerings offered.

Demand and supply management can be done by applying the concept of mathematical calculations by making simple business management reports. This is the basis for considering the number of calls and offers in the future so that there is no shortage or excess in products with a balanced amount of demand and supply.

2. LITERATURE REVIEW

Demand describes the nature of the relationship between the amount of demand and the price. In the principle of economics, the term demand means that a number of products requested by consumers are related to the price offered. The definition of demand is the quantity of goods to be purchased or able to be purchased so that the buyer is entitled to the goods always associated with the price tag attached to the product offered. According to (Nugraha, 2024) demand is the amount of an item that can be purchased at various possible prices over a certain period of time assuming that other things remain the same cateris paribus. (Nugraha, 2024) That the demand for a product in the form of goods and services is influenced by the relationship or willingness and need of consumers or buyers to own the products or services offered a clear relationship will be formed between demand and future price expectations that will affect the dynamics of declining demand, for example in predicting the sales level of a product will be able to increase the price of the products. Various factors can affect the purchase rate of a product. Furthermore, the above opinion is also emphasized based on the results of the research (Yusuf et al., 2023)If the number of requests can be conditioned in a condition that is balanced with the number of supply, then there will be a situation of cateris paribus so that there will be no excess or shortage of the number of products offered.

North Pelawi Village is one of the villages that has agricultural commodities, one of which is palm oil products, and agricultural products are overflowing in the village. Various businesses, both small and medium-scale, are also growing well in this region because the economy is maintained and the community has an adequate income level. With a wealth of natural resources in the form of agricultural products, North Pelawi Village is widely used as a research location related to MSMEs that grow and spread around North Pelawi Village, this is in line with the results of service (Napid et al., 2022) carried out in North Pelawi Village, where natural resources and human resources are very supportive for the sustainable development of MSMEs and support economic growth in the North Pelawi Village area.

Furthermore, according to(Sofyan et al., 2023), with the support of natural resources and human resources, both must also be given, it is necessary to be given expertise and abilities for MSME management so that it can run well and generate maximum profits. For this reason, it is necessary Mathematical concepts related to demand and supply are usually presented in the form of graphs and functions that contain variations x and y defined as the sum of prices, the sum of demands and the quantity of supply. (Fuadi, 2021) explaining the meaning of the Gagne concept in the concept research method is an abstract idea that allows in grouping objects into examples and non-examples for demand and supply management, it is important to carry out mining and calculation with the aim that there is no excess either in terms of production or the amount of demand that occurs in the condition of other factors considered fixed or caters paribus.

This is in line with the results of the research (Fadilah et al., 2020) The embodiment of one of the tri dharma activities of higher education is always carried out to provide solutions to problems in the field related to the community. For this reason, the author and the service team feel encouraged to study and trace the application of mathematical concepts for the demand and supply function of MSMEs spread across North Pelawi Village, Babalan District, Langkat Regency. The author and his team also expressed their gratitude for providing the opportunity to carry out research at the location of Pelawi Village and was well received by the local community so that it could be carried out very well and smoothly. To the community, especially MSME owners and actors who have been the subject of research and with awareness want to provide information in the form of data related to the list of requests and offers of the goods presented. The author hopes that business actors will not underestimate the application of mathematical concepts because with the use of mathematical concepts

For this reason, the approach of mathematical concepts in regulating or managing management activities related to the number of requests and the number of offers needs to be

given special attention so that it will directly affect the smooth financial management of MSMEs that can synergize with similar businesses, although the various obstacles faced in the process of business continuity are carried out, this is emphasized by the opinion of (Nst et al., n.d.) who stated that the lack of knowledge in managing finances will have an impact on various things, one of which is a decrease in the performance of the business being run.

3. METHODS

The type of research conducted is qualitative research. This research uses key instruments. This research is used to research on the condition of natural objects where the subject is determined based on related phenomena. Qualitative research is used to understand the phenomena that have occurred in the research subject. The type of research conducted based on the data source is field research.

This research was carried out by directly entering to obtain data The researcher researched the object directly so that the data did come directly from the research location. The qualitative research approach used by the researcher is the ethnographic approach where the researcher also participates during the research process. Ethnography itself is a unique research with ethnographers participating as observers, either openly or covertly to observe what is happening in the field related to the application of basic mathematical concepts of relation to the relationship between the function, demand supply of MSME products in North Pelawi Village.In qualitative research, triangulation is one of the most important parts. This type of qualitative research is very easily affected by a subjective assessment if in-depth checks are not carried out. In the research on the application of basic mathematical concepts relation of the relationship between the function of demand and supply of MSME products in North Pelawi Village (Case study of North Pelawi, Langkat) will use the interview method to collect various existing data. The first party to be interviewed is the head of the North Pelawi village and the staff of employees who pursue MSMEs, in the case who handle the activities of PKK mothers to deepen the quality of the necessary data, they will also be asked for existing data from business owners and MSME actors spread across several neighborhoods in North Pelawi Village, Babalan District, Langkat Regency.

4. RESULTS

North Pelawi Village consists of agricultural and urban land. The boundaries of the area around the North Pelawi village are, the northern part of the North Pelawi village is the village

of South Palawi, the southern part of the North Pelawi village is Telaga Said village and Lama village, the western part of the North Pelawi village is the village of Berandan Timur Baru and the eastern part of the North Pelawi village is bordered by the Lepan River. The area covered by North Pelawi sub-district is 4.33 km².

North Pelawi Village, one of the areas that is rich in social and cultural values, where every culture of the community still upholds the cultural values of customs that are very prominent in this area is the Langkat Malay cultural tradition which has a high level of solidarity with cultures and communities outside the Malays such as Javanese, Aceh, Padang and other tribes. Various multicultural cultures blend in this region and salih shows high tolerance attitude. Some of the social activities that are recorded in the field are in the form of the following activities Social Potential: the handover of KIS assistance at Pringadi Hospital. Cultural Potential: In North Palawi Village there are also dance studios and theaters that can preserve traditional dance dances in this area, the activities of this dance studio and theater have a positive value in the North Palawi area, where there are many enthusiastic teenagers who participate in every existing activity, making this activity a reduction in the risk of crime and drug use.

Based on the results of the research with the process of applying the basic concepts of mathematics to the demand and supply function of goods and services. Some of the interview results that can be summarized are from several MSME owners spread across North Pelawi Village, Babalan District, Langkat Regency. Relation between Mathematics and Demand The demand function shows the relationship between the number of products requested by consumers and other variables that affect in a certain period. Other variables when explored in the economy numerous. However, economists generally assume that the number of products that consume during a certain time periode depends on 5 main variables, namely the price of goods, income, the of other goods that are interconnected, the price of goods expected in the future period, consumer appetite for shopping for promotions. At the time of the condition of the cateris paribus.

$$Q_x = f(P_x)$$

When transformed into the form of a linear equation then the general form becomes

$$Q_x = a + b(P_x)$$

Remarks:

Qx = Number of Items requested

Px = Product Price X

a and b = Parameters

Based on this equation, there are two important things about the demand function Parameter b has a negative value because the demand function is guided by the law of demand, namely: "If the price of a product rises or falls, the number of products requested by consumers will decrease or increase assuming other variables are constant. The independent variable Px is the power of 1, so this demand function when depicted, the curve will have a negative slope, which is descending from the top left to the bottom right and is in the form of a straight line. An example of the application of mathematical consem related to the demand function and supply of MSMEs (geprek chicken). The products produced are several types that will be applied special mathematical concepts for the geprek chicken menu

Table 1. Data on the Number of Geprek Chicken Requests

No.	Request Amount	Prise
1	10 servings	Rp. 10.000,00
2	16 servings	Rp. 8.000,00

A mathematical concept related to the relationship of the demand function will be created. The form of application is as follows:

Created a reasoning for

Q1 = number of requests 1

Q2 = number of requests 2

P1 = Price for product 1

P2 = Price for product 2

From the table above, what is known is as follows:

Q1 = 10 servings

Q2 = 16 servings

P1 = 10,000

P2 = 8.000

Settlement :

$$(Q - Q1) / (Q2 - Q1) = (P - P1) / (P2 - P1)$$

To determine the formula for the demand function can be abused by using the formula of the two-variable linear equation system

$$\frac{(Q-Q1)}{(Q2-Q1)} = \frac{(P-P1)}{(P2-P1)}$$

$$\frac{(Q-10)}{(16-10)} = \frac{(P-10.000)}{(8000-10.000)}$$

$$\frac{(Q-10)}{6} = \frac{(P-10.000)}{-2000}$$

-2000(Q-10) = 6(P-10.000)

20000Q + 20.000 = 6P – 60.000

2000Q = 6P -80.000

Q = 0,003P – 40

The demand function is obtained if other factors are considered fixed or cateris paribus, then Q = 0.003 P – 40 is formulated. In the future, if the price increases by 12,000, the amount of demand will be:

Q = 0,003(12.000) -40

= 0,036 – 40

= -39,964

The relationship between mathematics and supply The supply function shows the relationship between the number of products offered by the manufacturer for sale and other variables that affect in a certain period. The main variables are: the price of the product, the level of technology available, the price of the production factors (inputs) used, the price of other products related to production, the expectations of producers for the price of the product in the future. Systematically the Offer Function is written if the only thing that affects is the price and other factors considered fixed are:

$$Q_x = f(P_x)$$

When transformed into the form of a linear equation then the general form becomes

$$Q_x = a + b(P_x)$$

Remarks:

Qx = Number of Items requested

Px = Product Price X

a and b = Parameters

In the application of mathematical concepts for MSMEs Moci cake located in North Pelawi Village, the following list of offers was obtained:

Table 2. List of Quantities of Quotations and Prices of Moci Cakes

No	Amount Of Goods	Price Goods
1	30 kue	Rp 7. 000
2	60 kue	Rp. 10.000

Based on the results of interviews with MSME owners to moci located in North Pelawi Village, when the price of cakes was Rp 7,000, business owners were able to sell 30 cakes when the price rose to 10,000, sellers were able to sell as many as 60 cakes. The mathematical concept will be applied to the supply function relationship as follows:

$$= P - P1 / P2 - P1 = Q - Q1 / Q2 - Q1$$

The form of application is as follows:

Created a reasoning for

Q1 = number of offers 1

Q2 = number of offers 2

P1 = Price for product 1

P2 = Price for product 2

From the table above, what is known is as follows:

P1 = Rp. 7,000

P2 = Rp. 10,000

Q1 = 30

Q2 = 60

To determine the formula for the demand function can be abused by using the formula of the two-variable linear equation system

$$\frac{(P-P1)}{(P2-P1)} = \frac{(Q-Q1)}{(Q2-Q1)}$$

$$\frac{(P-7000)}{(10.000-7000)} = \frac{(Q-30)}{(60-30)}$$

$$\frac{(P-7000)}{3000} = \frac{(Q-30)}{30}$$

30 (P - 7000) = 3000 (Q - 30)

30 P – 210.000 = 3000Q – 90.000

3000Q = 30P – 210.000 + 90.000

3000Q = 30P – 120.000

Q = 0,001P – 40

0,001P = Q + 40

P = 1000Q + 40

The demand function is obtained if other factors are considered fixed or cateris paribus, then P = 1000Q + 40 In the future, if the moci cake offer is 100, then the price offered is:

P = 1000 (100) + 40

= 100,000 + 40

= 100,040 rounded up to Rp. 100,000

5. DISCUSSION

Based on the results of interviews at the research site with a minimum of 32 business actors, data related to things or factors that affect the demand and supply of products produced by various MSMEs in North Pelawi are as follows. Factors that affect the Demand for Prices of Goods and ServicesIf prices rise, the number of goods/services requested by consumers will decrease, on the other hand, if prices fall, the number of goods and services requested increases. Buyers will try to postpone the purchase of a good or service if the price is high and vice versa. People's appetite The factor that affects the demand is the comfort of the community. When a good is very popular, the higher the demand in the market, the number of people related to the number of goods also affects the demand for goods. The higher the number of people in a given area, the higher the demand for these goods. Income LevelThe higher the income. . Factors that affect the number of offers The number of producers in a region increases, the higher the supply of goods will be. As an example of an area that has a majority of the population whose livelihood is a mabel craftsman, there will be more sellers and the number of mabel products offered will be more in terms of quantity or quantity. Price of Goods The price of goods also has the same principle as the number of producers. The higher the price of goods, the higher the offer made by the manufacturer. Production CostWhen production costs are high, the bang offered will be less. Some examples of production costs are employee salaries, raw materials

and production process costs. Technological Advancements Technological advances affect the level of supply With technological advancements, manufacturers can increase production quantities in a shorter time.

6. CONCLUSION

Based on the results of interviews at the research site with a minimum of 32 business actors, data related to things or factors that affect the demand and supply of products produced by various MSMEs in North Pelawi are as follows: Demand will increase in certain conditions where the production of the products of interest cannot be controlled, resulting in not all demand can be met with a shortage of stock and make potential consumers or buyers experience disappointment. For this reason, debriefing or training related to the expertise of business actors is needed that can contribute more value to the management of the number of demand for goods offered so that in other circumstances or factors that affect the number of demand and supply can be achieved a balanced condition or a stable amount. The application of mathematical concepts to the management of the number of demand and supply will be very rewarding.

7. LIMITATION

The embodiment of one of the tri dharma activities of higher education is always carried out to provide solutions to problems in the field related to the community. For this reason, the author and the service team feel encouraged to study and trace the application of mathematical concepts for the demand and supply function of MSMEs spread across North Pelawi Village, Babalan District, Langkat Regency. The author and his team also expressed their gratitude for providing the opportunity to carry out research at the location of Pelawi Village and was well received by the local community so that it could be carried out very well and smoothly. To the community, especially MSME owners and actors who have been the subject of research and with awareness want to provide information in the form of data related to the list of requests and offers of the goods presented. The author hopes that business actors will not underestimate the application of mathematical concepts because of the use of mathematical concepts.

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