ETHNOMATHEMATICS ON CABBAGE CULTIVATION PATTERN

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ABSTRACT

People in the South of Jember, especially in Wuluhan District, activities that cannot be separated from mathematics are buying and selling, farming, and building houses. One of the interesting activities that also use mathematics in the field of agriculture, namely the determination of cabbage planting patterns. Based on the results of interviews with cabbage farmers in Wuluhan District, the cabbage planting pattern is regulated by paying attention to sunlight, irrigation, and ease of maintenance. So that there is a size and distance that must be regulated on the land when planting cabbage. This type of research is qualitative. Data collection techniques used are observation, interviews, and documentation. This study was analyzed using the Nasution Circular model namely by reducing data, displaying data, and drawing conclusions. The results of this study are (1) the line spacing used is at least 60 cm; (2) the minimum distance between cabbage is 50 cm; (3) the cabbage planting hallway is at least 80 cm; and (4) the distance of the cabbage plant from the edge of the land at least 60 cm. The distance is determined and is used by the farmers as a condition for the cabbage plant can grow optimally. The size is determined by considering irrigation factors, ease of maintenance, and maximization of fertilizer absorption.

Keywords: ethnomathematics, cultivation pattern, cabbage.

INTRODUCTION

Mathematics is a subject that is taught in school. But mathematics is also an important science and is widely applied in people's lives. Without realizing it, people use mathematics in their daily habits and activities. For example, the concept of social arithmetic is used in buying and selling activities in the community. Buyers do not realize that in their daily life they use one of the concepts in mathematics. So mathematics is closely related to the way of life, habits, behavior, and activities of society.

As has been described previously, according to Koentjaraningrat, many ideals, values, and standards of behavior in social life, which cause individual actions to be understood by the group are culture (Sumantri & Yatimah, 2015). Culture is a unified whole and comprehensive of the various manifestations produced and applicable in a community. It is possible that there are mathematical concepts embedded in cultural practices and recognizes that all cultures and all people develop unique methods for understanding and changing their own reality, which is then called ethnomathematics (Rosa dan Orey, 2011). Based on this opinion, it can be understood that mathematics and culture are interrelated. Related to this, there is the term ethnomathematics in mathematics. Ethnomathematics is a term that emerges based on the similarities between culture and mathematics, which is a study to find special or unique patterns in mathematics that arise and develop in certain community groups (Suprayo, Nuryusri, & Noto, 2018). With the existence of ethnomathematics, mathematical activities carried out by the community will be explored even though these mathematical activities are not realized by the community.

Many ethnomathematical studies have been carried out, such as the ethnomathematical study among farmers in Kelir Kalipuro village conducted by Ikrimah et al (2017). This study

explores the mathematics that occurs in the process of seedling and agricultural treatment in the village of Kelir Kalipuro. In addition, Hariastutik (2017) has also carried out ethnomathematical research that revives the traditional guessing game of mangosteen fruit which is associated with the concepts of addition and multiplication for elementary school students. The game matches the many petals of the mangosteen rind with the contents of the mangosteen fruit. So the game can also be used as a medium for planting mathematical concepts in elementary school students.

People in the South of Jember, especially in the Wuluhan District, activities that cannot be separated from mathematics are buying and selling activities, farming, and building houses. In addition, an interesting activity that also uses mathematics is the distribution of cabbage from farmers to collectors. Cabbage is an agricultural product that is widely grown and used as a buying and selling business in Wuluhan District. Based on the results of an interview with one of the cabbage farmers in Wuluhan District, cabbage is grown using certain rules. There is a minimum size used to adjust the spacing between cabbage. These rules are determined by the factors of irrigation, ease of maintenance, and so that the fertilizer can be absorbed optimally.

The results of the exploration of the emergence of mathematical concepts in cabbage planting patterns are expected to be used as a source of learning mathematics in schools. Learning resources are all sources such as messages, people, materials, tools, techniques, and backgrounds that are used by students as sources for learning activities and can improve the quality of their learning (Abdullah, 2012). Learning resources in this study are activities that contain informal to formal mathematical activities, namely the process of abstracting experiences in everyday life into mathematical concepts. So based on this description, this study explores the cabbage cropping pattern in Wuluhan District.

METHODS

This study's aim is to describe the cabbage cropping pattern in South Jember. Therefore, this study uses a qualitative approach. The subjects in this study were cabbage farmers in Wuluhan District, Jember Regency. Data collection techniques in this study are through observation, interviews, and documentation. Observations were made to obtain data and descriptions related to the position and arrangement of cabbage plants in the field. Interviews were conducted to obtain data related to the systems and methods used by farmers in the pattern of growing cabbage. While the documentation is in the form of supporting research data such as photos related to this research.

This study uses Nasution's circular model data analysis technique (Satori & Komariah, 2017). The sequence of data analysis activities according to this circular model is data reduction, data display, and conclusion. At the data reduction stage, what is done is to check the completeness of the data obtained during the research. Furthermore, at the data display stage, what is done is the grouping and categorizing of research data based on their respective themes. In the final stage, concluding the results of data analysis and compiling in the form of a descriptive description.

RESULTS AND DISCUSSION

At the beginning of the study, the researcher asked subject 1 about how to measure a land area. The method used is to use a mine or bamboo that already has a certain size. After knowing the length and width of the land, subject 1 multiplied them and obtained the land area. The method was also carried out by subject 2. The mathematical concept that emerged in the activity of measuring the land was the concept of multiplication. In addition, mathematical concepts related to flat plane geometry also appear in this activity, namely the determination of the area of the plane.

Further data related to cropping patterns, it was explained that the minimum distance between cabbages to the east was 50 cm and the minimum distance between cabbages was 60 cm to the south. This rule is determined by paying attention to the direction of the sun's rays. Based on the established rules, it is expected that cabbage plants will get enough sunlight. The subject explained that before determining the spacing between cabbages, they must first provide a distance of 10 cm at each end of the upper and side borders. This is done so that the plants do not go outside the boundaries of the land. The measuring tools used by farmers are bamboo or mines that have a certain size. Farmers admit that they have never used a measuring instrument in the form of a meter directly when measuring land or determining the spacing between cabbages. The mathematical concept used in this activity is the concept of measurement. The illustration of the spacing of cabbage on the land is depicted in Figure 1.

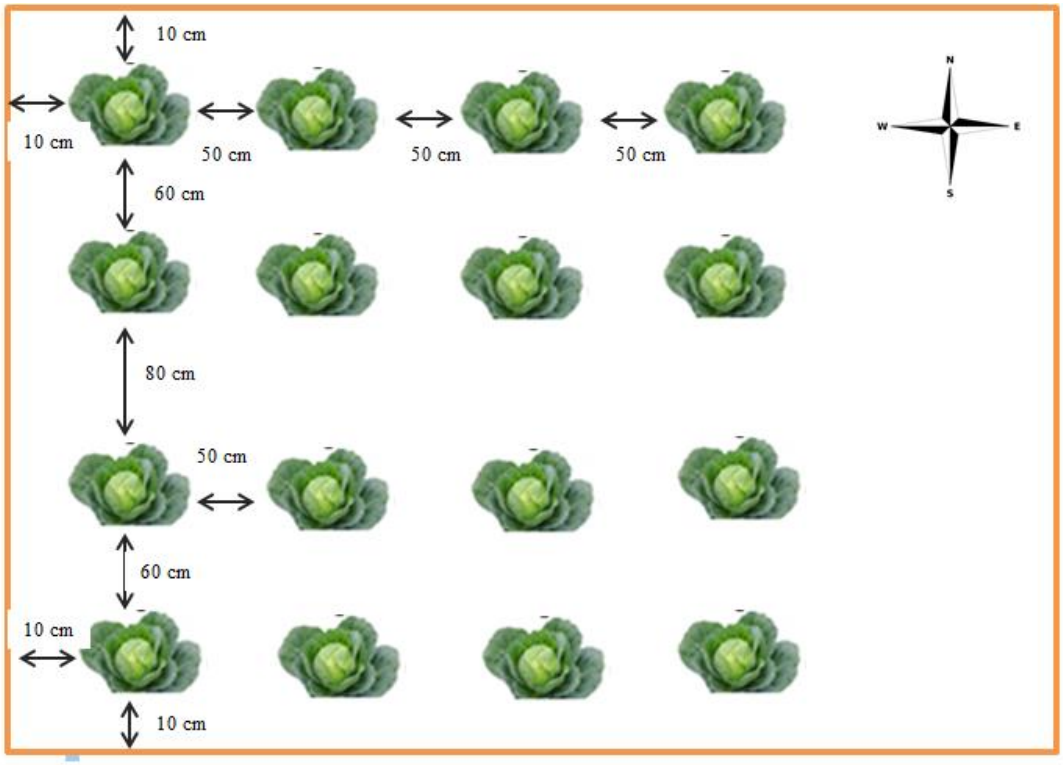

Figure 1. Cabbage Planting Distance Illustration

Figure 1 shows the position of the cabbage in the field along with the minimum distance between the cabbage and on each edge. Based on the results of the interview, if the length and width of the land are known, the farmer can also estimate the cabbage seeds needed on the land. According to the subject, the method used is by subtracting the length of the land with a border of 10 cm×2 and dividing it by a spacing of 50. Next, subtrsubtract land width by a border of 10 cm×2 and dividing it by a spacing of 60, then multiplied by the land width which has been reduced by the border of 10 cm×2 and divided by the spacing of 80. The result of multiplying the two is an estimate of the number of seeds needed on the land. Determination of the number of seeds on the land can be clarified by the following description.

$$Lots\ of\ cabbage\ from\ west\ to\ east = \frac{land\ length - border(10 \times 2)}{50} = x$$

$$Lots\ of\ cabbage\ from\ north\ to\ south = \frac{land\ width - border(10 \times 2)}{60} \times \frac{land\ width - border(10 \times 2)}{80} = y$$

$$Estimated\ number\ of\ seeds = x \times y$$

Based on the results of interviews on a land that has an area of about 180 ru or equivalent to 253.08 m2, there are about 7500 to 8000 cabbages. So from the description above, farmers can estimate the number of seeds needed based on the length and width of the land and the minimum distance between cabbages.

Based on the results of the study, the ethnomathematical aspects contained in the activities of regulating cabbage cropping patterns in the field are arithmetic operations, flat geometry, measurement, and estimation. In addition, the activity of determining cabbage cropping patterns also contains an ethnomathematical aspect of designing. This can be seen when farmers design cabbage planting patterns on the land by paying attention to aspects of lighting, water sources, and ease of care. The determination of the size of the aisle is determined by the farmer in order to facilitate maintenance and irrigation. The size of the aisle is determined with a minimum size of 50 cm for the middle. While the edge is 10 cm from the rice fields.

Furthermore, Sirate (2011) suggested several ethnomathematical activities, including counting, measuring, and determining locations. The activity of counting is related to determining the number of objects. The activity of measuring is related to determining the size by using a measuring instrument. While the activity of determining the location is related to determining a certain point and direction. The ethnomathematical activities contained in the activity of setting the cropping pattern are also in accordance with the activities of counting, measuring, and determining the location. The counting activity carried out is to determine the number of seeds needed on the land. The measuring activity carried out is to determine the spacing of cabbage seedlings according to the relevant minimum size. The activity of determining the location carried out is determining the direction of planting by considering sunlight, irrigation, and ease of care.These results are expected to be a source of learning mathematics, especially contextual mathematics, especially for students in the Wuluhan District, Jember Regency. Ethnomathematics will be a bridge for mathematics and culture (Abdulah, 2016). So that school mathematics learning is not monotonous. Students are able to use mathematics to solve real-life problems. This is because students are trained to associate mathematical concepts with problems in everyday life.

CONCLUSION

The results showed that mathematical concepts are widely used in everyday life. The fact that has been found is in farming activities, especially in determining cabbage planting patterns. Without realizing it, farmers have used mathematical concepts in their activities and it has been happening for years every time they will plant cabbage. The results of this study are expected to be a learning resource for school mathematics. Students can be given real examples of the use of school mathematical concepts in real life, especially in the concepts of arithmetic operations, plane geometry, measurement, and estimation. Students are expected to be able to solve everyday problems if they are trained to connect school mathematical concepts with real-life problems.

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