



Ethnomathematics and Cultural Values in Madurese Agricultural Activities: An Ethnographic Study for Contextual Mathematics Learning

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ABSTRACT

*This study aims to explore and describe the manifestation of ethnomathematics concepts and cultural values contained in the rice farming activities of the Madurese community in Bangkalan and Pamekasan Regencies. This study uses a qualitative approach with an ethnographic design. Data were collected through observation and in-depth interviews with farmers and farm laborers. Data analysis was conducted interactively using the Miles and Huberman model, which includes the stages of data condensation, data presentation, and conclusion drawing, with triangulation techniques as a guarantee of data validity. The research findings indicate the presence of significant mathematical concepts, including counting and calculating activities. Furthermore, the application of the concept of comparison and the system of linear equations and inequalities was found. Culturally, this agricultural activity is based on the tradition of mutual cooperation and a strong philosophy of selfless work, which is reflected in the terms *dherebbhan* and *urunan*. These values are rooted in the principles of equal-average-equal-feeling and equal-high-equal-low, which strengthen social cohesion. This study concludes that integrating ethnomathematics into mathematics instruction in schools can serve as a contextual and cooperative learning tool. This strategy not only helps students understand abstract concepts through agrarian realities but also internalizes the dimensions of the Pancasila Student Profile based on Madurese local wisdom.*

Keywords: Culture, Ethnomathematics, Madurese Farmers, Mathematics Learning

ABSTRAK

Penelitian ini bertujuan untuk mengeksplorasi dan mendeskripsikan manifestasi konsep etnomatematika serta nilai-nilai budaya yang terkandung dalam aktivitas pertanian padi masyarakat Madura di Kabupaten Bangkalan dan Pamekasan. Penelitian ini menggunakan pendekatan kualitatif dengan desain etnografi. Data dikumpulkan melalui observasi dan wawancara mendalam terhadap petani dan buruh tani. Analisis data dilakukan secara interaktif menggunakan model Miles dan Huberman yang meliputi tahapan kondensasi data, penyajian data, dan penarikan kesimpulan, dengan teknik triangulasi sebagai penjamin keabsahan data. Temuan penelitian menunjukkan adanya konsep matematika yang signifikan, mencakup aktivitas membilang dan menghitung. Lebih lanjut, ditemukan penerapan konsep perbandingan dan sistem persamaan dan pertidaksamaan linear (SPPL). Secara kultural, aktivitas pertanian ini dilandasi oleh tradisi gotong royong dan filosofi bekerja tanpa pamrih yang kuat, yang tercermin melalui istilah *dherebbhan* dan *urunan*. Nilai-nilai ini berakar pada prinsip sama-rata-sama-rasa dan sama-tinggi-sama-rendah yang memperkuat kohesi sosial. Penelitian ini menyimpulkan bahwa integrasi etnomatematika ke dalam pembelajaran matematika di sekolah dapat berfungsi sebagai sarana pembelajaran kontekstual dan kooperatif. Strategi ini tidak hanya membantu siswa memahami konsep abstrak melalui realitas agraris, tetapi juga menginternalisasi dimensi Profil Pelajar Pancasila berbasis kearifan lokal Madura.

Kata Kunci: Budaya, Etnomatematika, Pembelajaran Matematika, Petani Madura

INTRODUCTION

Madura, comprising the regencies of Bangkalan, Sampang, Pamekasan, and Sumenep, is a key pillar of the agricultural sector in East Java. The majority of its population relies on farming, fishing, and trading, with agriculture being the most dominant sector (Laksono et al., 2014). The



sector's relevance is further strengthened by the 2024 government policy encouraging the optimization of land potential on Madura Island to restore national food self-sufficiency (Kementan, 2024). However, despite this economic urgency, agricultural activity in Madura is not merely a food production process, but a cultural manifestation closely linked to mathematical concepts. In line with Muhtadi's (2017) thinking, mathematics and culture are inseparable. Mathematical ideas are constructed by communities to solve problems in their environment, which then develop into systematic thinking tools for dealing with complex situations.

In a scientific context, the intersection between culture and mathematics is studied through ethnomathematics (Burkhardt, 2008). Risdiyanti and Prahmana (2020) define ethnomathematics as mathematical ideas, methods, and procedures produced by a particular cultural group. Furthermore, ethnomathematics combines cultural anthropology with institutional mathematical modeling to solve real-world problems (Firdiansyah et al., 2024; Firdiansyah & Fausi, 2023). The integration of ethnomathematics into formal education is crucial, considering that mathematics learning will be more meaningful and effective for students if it begins in the socio-cultural context they are familiar with on a daily basis (Rosa & Orey, 2011; Webb et al., 2011).

The ethnomathematics potential of Madurese farmers is evident in various philosophies and field practices. One prominent cultural value is the spirit of mutual cooperation in farming. Furthermore, there is a philosophical expression "*tembeng meleh beres, anyaman nenem padih*" representing food self-sufficiency, stating that growing rice is far more important than simply buying it because the yield can guarantee long-term needs. Implicitly, this principle demonstrates the application of the concept of comparison, which is part of mathematics. Previous research has confirmed that farmers' activities encompass various ethnomathematic categories, from counting and calculating (wages, seeds, and profit sharing), measuring land, to designing traditional tools (Fadlilah et al., 2015; Pratama & Lestari, 2017; Aulia & Rista, 2019; Kautsar et al., 2021; Banoet et al., 2022).

Although ethnomathematics studies on farmers have been extensively conducted, the majority of the literature remains limited to identifying basic mathematical concepts and physical activities. A significant research gap remains, as the cultural values underlying farmers' technical decisions have not been explored in depth. Furthermore, the identification of more specific and complex mathematical concepts, such as systems of linear equations and inequalities (LSEs), is largely absent from current ethnomathematics literature. The novelty of this research lies in its attempt to integrate the identification of LSE concepts with the philosophical values of the Madurese community in Bangkalan and Pamekasan Regencies.

Based on these problems, this study aims to describe the cycle of activities and time management of Madurese farmers, identify and describe mathematical concepts, especially the LSEs concept manifested in the practical activities of rice farmers in Madura, explore the cultural values inherent in these agricultural activities as a local identity, analyze the potential integration of the ethnomathematics findings into mathematics learning tools in schools to improve students' understanding through realistic contexts. Thus, practically, this study is expected to provide a framework for developing farming businesses, while theoretically, the results of this study will

contribute to innovations in mathematics learning based on local wisdom that are more contextual and integrative for students in schools.

METHOD

This research was conducted using a qualitative approach through an ethnographic design. Qualitative research is used to uncover and obtain comprehensive, broad, and in-depth information (Moleong, 1988). The researcher wanted to reveal the deep connection between mathematical concepts and cultural values in the activities of rice farmers in Madura. The use of an ethnographic design aims to holistically describe how farmer groups in Bangkalan and Pamekasan Regencies construct mathematical knowledge, especially on LSEs material, through their traditional agricultural practices. The researcher acted as the main instrument, present directly in the field to conduct participatory observations to observe interaction patterns, farming techniques, and economic mechanisms carried out by informants selected purposively.

Data were collected through a series of systematic field activities, including in-depth observations and structured interviews with farmers and laborers as informants. The criteria for selecting informants were farmers who cultivated their own land, while laborers only cultivated land owned by others. In this study, 11 Madurese rice farmers were selected as informants, consisting of 8 farmers in Bangkalan and 3 farmers in Pamekasan. Ten of the 11 informants worked as both farmers and laborers, while 1 informant worked only as a farmer. The validity of the data in this study was guaranteed through triangulation techniques, in which researchers cross-checked data by comparing information from various sources (source triangulation) and matching interview results with field observation findings (technical triangulation). This was done to ensure that the interpretation of the mathematical concepts and cultural values found were truly representative of the reality in society.

Researchers conducted interviews with informants and mathematics education lecturers. Interviews with informants were conducted to gain in-depth understanding of the farming process and economic mechanisms. Interviews with mathematics education lecturers were conducted to determine two points: 1) to verify the existence of mathematical concepts, particularly LSEs, in the activities of Madurese farmers and 2) to determine whether Madurese farmers' activities can be used as a context for mathematics learning. The interview instrument was tested using the Aiken's Value validity test (Mansur et al., 2023). This test was conducted by a lecturer from the Mathematics Education Study Program, State Islamic University of Madura. The content validity index obtained an average value of all instrument items which was classified as high enough for use in this study.

The data analysis technique followed the interactive model of Miles and Huberman, which consists of three simultaneous activity flows. The first stage is data condensation, in which researchers select, simplify, and transform raw field data into notes focused on identifying mathematical concepts and cultural values. The second stage is data presentation, in which the findings are organized in the form of descriptive text, tables, or matrices of the relationship between farmer activities and mathematical concepts to facilitate understanding. The final stage is conclusion drawing and verification, namely the process of interpreting data to find patterns and regularities,

which are then tested for accuracy through field reviews to produce credible final conclusions regarding the ethnomathematics of Madurese farmers.

The entire research was conducted with ethical practices in mind, including obtaining informed consent from informants, maintaining the confidentiality of informants' identities through anonymity procedures, and demonstrating cultural sensitivity and respect for local norms during field interactions. This descriptive-analytical approach is ultimately expected to transform Madurese farmers' local knowledge into meaningful and contextual mathematics learning materials for students in schools.

RESULT AND DISCUSSION

RESULTS

Activity Cycle and Time Management of Madurese Farmers

Rice farming in Madura is a structured process that lasts approximately three months and ten days. All stages of land preparation and plant care are based on the calculated age of the plants, starting from the first sowing of the seeds. Chronologically, this process begins with selecting quality seeds through sun-drying the grain, followed by a cleaning process using a winnowing basket to separate empty grains from full ones. The selected seeds are then sown in wet fields for 20 days until shoots ready for planting emerge. Concurrently with the sowing period, farmers perform primary land preparation by plowing to ensure optimal soil conditions for transplanting the seedlings.

After planting, plant care management focuses on a three-time periodic fertilization cycle. The first fertilization is applied when the plants are 10 days old, followed by a second fertilization at 25 days, and finally with a third fertilization at 40 days. This time interval demonstrates the farmers' meticulousness in calculating the vegetative growth phases of the plants. In addition to fertilization, a successful harvest is also supported by a flexible irrigation system, whether through rainwater harvesting, springs, or drilled wells, as well as regular pest control using pesticides to ensure healthy plant growth. All of these activities culminate in the harvest, when the grain is stored in a barn as a form of traditional Madurese food security.

Ethnomathematics in Madurese Farmers' Activities

Based on the research results, it was found that the rice farming activities carried out by the Madurese people consistently apply fundamental mathematical concepts, particularly the activities of counting and calculating.

Numerating activities are identified through the mention of weight and land area measurements, which use the prefix "se-" to denote a quantity of one. The Madurese people use traditional, communally agreed-upon units, such as *sak* and *bak* for weight, and *petak*, *hektar*, and *lokek* for area. In the context of land area, the terms *se-petak* and *se-hektar* refer to one plot or one hectare of land. Specifically, there is a *se-lokek* unit whose size varies because it is based on the physical boundaries of land between owners, not on formal metric standards. Meanwhile, for weight

measurements, farmers use the units *se-sak* and *se-bak*. The relationship between these units in field practice is often converted into a common standard, for example 1 *hectare* = 10.000 m^2 .

The act of counting arises intuitively in the process of estimating seed and wage requirements. Determining the number of seeds demonstrates the application of the concept of equivalent comparison, with land area as the primary reference. Although these estimates are often based on experience and habit, the mathematical pattern that emerges is clear: the larger the land area, the greater the number of seeds required.

For example, a 70 m^2 plot of land requires a tub or 5 kg of seeds, while a quarter-hectare plot requires a sack or 15 kg of seeds. In addition to seeds, a similar comparison is also found in the farm labor wage system. Field data shows that wages for 13 laborers are Rp. 550.000, while for 7 laborers it is Rp. 297.000, where the total cost is directly proportional to the number of workers deployed.

In addition to value comparisons, this study also identified the concept of inverse value comparisons in labor management. This is evident in the relationship between the number of farm laborers and the time required to complete seeding on the same area of land.

Based on interviews with 11 informants, on a 70 m^2 plot of land, using 13 farm laborers allows the work to be completed in just one day. However, if the number of laborers is reduced to seven, the completion time increases to two days. This demonstrates the farmers' practical understanding that increasing the number of workers will speed up the work duration, which is the essence of the concept of inverse proportions in formal mathematics.

Beyond the technical aspects of planting, agricultural activities in Madura are deeply embedded in social values, particularly in the form of mutual cooperation between relatives. Observations of 11 research subjects revealed two groups of farmers with close kinship ties who collaborated on rice field management. The findings focused on the first group, highlighting the application of the concept of a system of linear equations when calculating fertilizer prices and needs. The following is an excerpt from the interview transcript.

- Researcher* : "Sir, when you work in the rice fields, do you often get help from your own family?"
- Informant* : "Yes. Here, we work together, especially if we're related. We often buy fertilizer together or take turns helping out on each other's land to make things easier."
- Researcher* : "Regarding fertilization, how do you regulate the initial and follow-up fertilizer amounts?"
- Informant* : "Usually, it's a rough estimate. The follow-up fertilizer is one part, and the initial fertilizer is two parts. The main thing is that the initial fertilizer should be more so that the roots are strong first."
- Researcher* : "Can you please detail how much you spent last time?"
- Informant* : "Yesterday, I spent Rp 330,000. That's a mixture of 35 kg of initial fertilizer and 10 kg of follow-up fertilizer. If my brother bought more, he'd spend Rp 460,000 because his land is quite large, containing 40 kg of initial fertilizer and 20 kg of follow-up fertilizer."
- Researcher* : "Do you know the exact price per kilo for each type?"
- Informant* : "Well, I don't really remember the price per kilo because I usually buy it wholesale by the sack or in a mix. The important thing is that I have enough money and the right amount for the rice fields."

Farmers use two types of fertilizer, namely initial fertilizer and follow-up fertilizer. Generally, they apply a mixture ratio of approximately 1:2, where one part is allocated for follow-up fertilizer and two parts for initial fertilizer. The identification of the LSE concept emerged when analyzing the total expenditure and composition of fertilizers from two different farmers as follows: 1) The first farmer allocated funds of Rp. 330,000.00 to obtain a composition of 35 kg of initial fertilizer and 10 kg of follow-up fertilizer, and 2) the second farmer allocated funds of Rp. 460,000.00 for a composition of 40 kg of initial fertilizer and 20 kg of follow-up fertilizer. These differences in composition and total price indirectly form a system of equations that can be used to determine the unit price per kilogram of each type of fertilizer. Based on the data above, the following linear equation system is obtained.

$$\begin{aligned} 40A + 20B &= 460000, \\ 35A + 10B &= 330000, \end{aligned} \quad (1)$$

where A is the initial fertilizer and B is the follow-up fertilizer. Using the substitution method, the price of each fertilizer obtained from equation (1) is $A = 6666.7 \approx 6700$ and $B = 9700$. So, the price of each fertilizer is the initial fertilizer at Rp. 6.700.00 per kg and the follow-up fertilizer at Rp. 9.700.00 per kg. This shows that the economic activities of Madurese farmers can be transformed into formal mathematical problems in the classroom.

Research findings in the second group, consisting of two related farmers, revealed the application of the Linear Inequality System concept. Unlike the previous group, which focused on fixed prices, this group faced the challenge of optimizing labor within certain cost constraints. The following is an excerpt from an interview transcript with one of the informants.

- Researcher* : "Sir, for a plot of land this size, how many people usually help you work?"
Informant : "Right now I'm employing 50 men and 10 women. But to be honest, it's still slow. I want to add more people so we can finish it faster."
Researcher : "If you want to add people, are there any special considerations, sir?"
Informant : "Of course. The problem is money. The wages here are fixed, Rp. 60,000 for men and Rp. 50,000 for women. I need to calculate again. I want this job done quickly, so I need more workers, but the total payment can't exceed my savings. I have to be smart about keeping costs down."
Researcher : "So the number of workers doesn't have to be a certain number of people, the important thing is that there are enough and the money comes in?"
Informant : "Yes, the important thing is that there are more people than there are now, but the costs must not balloon. We're looking for the most economical way."

Field data shows differences in labor scale based on land area. The farmer manages a 1-hectare plot of land with a workforce of 50 male laborers and 10 female laborers. The farmer stated that the current number of laborers is still considered insufficient to meet the workforce requirement. However, this increase is limited by local wage regulations, namely RP 60.000.00 for male laborers and Rp 50.000.00 for female laborers. This is where the logic of inequality arises, where the farmer wants to add as few laborers as possible to complete the work quickly, but the total wage expenditure must not exceed the remaining available budget. Based on the interview results, it was found that the farmer's activities can be converted into a linear inequality system model.

$$\begin{aligned}
60000X_1 + 50000X_2 &\leq C \\
X_1 + X_2 &\geq n, \\
X_1, X_2 &\geq 0,
\end{aligned}
\tag{2}$$

where X_1 is the number of additional male workers, X_2 is the number of additional female workers, and C is the maximum limit of expenditure costs. The farmers' logic to reduce expenditure costs while still increasing labor shows that they are intuitively seeking an optimum solution area. This proves that the material on linear inequality systems is not just an abstract theory, but rather a survival and business strategy used by Madurese farmers in managing work efficiency.

Traditions and Cultural Terms in Madurese Agriculture

This sub-chapter presents findings related to Madurese traditions and terms that emerged during the observation and interview process. Broadly speaking, there are two main pillars of local wisdom that underpin Madurese farmers' activities: the tradition of mutual cooperation and the philosophy of selfless work. Furthermore, specific Madurese terms are found that represent the cooperative system of agrarian society, namely *dherrebbhan* and *urunan*.

Mutual cooperation is a system of collective labor mobilization involving family members and the wider community to address labor shortages during crucial periods of agricultural production, such as planting and harvesting. This activity is not only physical but also intellectual, like Madurese farmers regularly gather at home or on rice paddy embankments to exchange ideas and seek solutions to agricultural problems they face. Based on field findings, this tradition of mutual cooperation is classified into two main categories, namely 1) mutual cooperation between close relatives based on blood ties and moral familial obligations, and 2) mutual cooperation between neighbors based on the principles of residential proximity and social reciprocity.

Another interesting finding is the philosophy of selfless work held firmly by Madurese farmers. In managing their land, they tend not to use rigid commercial profit-and-loss calculations. Farmers realize that the effort expended is often not commensurate with the economic value of the grain when sold at the market. Therefore, they prefer to store their harvest in private barns to meet family food needs or share with relatives. This suggests that the primary goal of farming for Madurese is sustainability and strengthening social relations, rather than simply accumulating financial gain.

In the practice of cooperative work in the rice fields, Madurese farmers use two terms that convey the meaning of mutual cooperation but differ in their implementation. First, the term *dherrebbhan* refers to a work system in which farmers hire labor from neighbors or outsiders. In this system, farm laborers receive compensation in the form of a salary or wage in cash. Second, the term *urunan* is used when farmers involve close relatives to help with land cultivation. Unlike *dherrebbhan*, in the *urunan* system, relatives who help are not paid money but are instead given the harvest of grain or rice as a form of appreciation and gratitude. Although different in the methods of compensation, both *dherrebbhan* and *urunan* are manifestations of the Madurese community's spirit of togetherness, strengthening one another in facing challenges in the agricultural sector.

DISCUSSION

This study examines the relationship between Madurese agricultural activities and the concept of ethnomathematics and the cultural values contained therein. Based on the data obtained, rice farming activities in Madura follow a structured cycle consisting of seven main stages: 1) seed selection, 2) land preparation, 3) planting, 4) fertilization, 5) irrigation, 6) monitoring, and 7) harvesting.

The initial stage begins with seed selection to ensure quality plant growth. Madurese farmers select seeds by drying the grain before sowing it in wetlands. This seeding process aims to facilitate seed adaptation and ensure the soil is in optimal condition to support shoot growth. After the young shoots are 20 days old, farmers remove the seedlings and immediately transplant them to the main field. This practice aligns with the procedure proposed by Jamilah (2017), which states that ideal seedlings should be no more than 40 days old and less than 25 cm tall. Before replanting the seedlings, the land is plowed to loosen the soil and remove weeds (Jamilah, 2017).

The next crucial stage is fertilization, where Madurese farmers consistently fertilize three times per planting cycle. This fertilization schedule aligns with Ministry of Agriculture guidelines, which state that initial fertilization should be applied at 0-14 days, followed by follow-up fertilization at 21-28 days and 35-50 days (Abdulrachman et al., 2011).

During the growing season, plant survival is highly dependent on the intensity of irrigation and pest control. Madurese farmers utilize various water sources, from rainwater and springs to drilled wells. Regular irrigation is essential for rice growth, as this crop requires a stable water supply (Jamilah, 2017). Furthermore, regular monitoring is carried out to prevent pest attacks. Pesticides and insecticides are used in carefully calculated quantities to avoid disrupting plant growth (Wati, 2022).

This cycle culminates in the harvesting stage, which occurs when the rice plants are 100-110 days old. Accurate harvest timing is key to ensuring production results, both in terms of quantity and quality, which ultimately has a direct impact on increasing farm income (Abdulrachman et al., 2011). The integration of Madurese farmers' local wisdom with technical agrarian procedures demonstrates a highly disciplined logical-mathematical mindset in managing their agricultural ecosystem.

The second finding in this study revealed that Madurese farmers' activities contain rich ethnomathematic elements, which can be transformed into contextual mathematical problems. These activities, such as calculating seed requirements and managing production costs, can be integrated into school learning materials, particularly in the topic of Comparison and Systems of Equations and Linear Inequalities (LSEs). By presenting problems rooted in local culture, students can connect abstract concepts in the classroom with the real-world realities they encounter every day.

The application of ethnomathematics-based learning stimulates students' brains to develop cognitive patterns that connect academic content with practical contexts. This aligns with Lestari and Yudhanegara's (2015) opinion, which states that integrating academic content with everyday life will result in more meaningful learning. Furthermore, this strategy not only helps students understand the

material theoretically but also encourages them to apply that knowledge to solve real-world problems in their environment (Afni & Hartono, 2020).

Theoretically, contextual learning is based on the constructivist paradigm. This approach emphasizes students' thinking processes through independent observation from various sources (Cahyanto & Prabawati, 2019). In this context, students do not merely passively receive information but actively interpret and construct knowledge based on interactions with their socio-cultural environment (Romadhona et al., 2023).

Through ethnomathematics-based learning with Madurese farmers, students can understand the concepts of comparison and LSEs by directly observing existing agricultural practices. This knowledge is built through authentic experiences resulting from interactions with Madurese farmers' work patterns. This aligns with Jean Piaget's theory of cognitive adaptation, where knowledge is viewed as the result of adapting human thought structures to the realities of their environment (Saputro & Pakpahan, 2021). Thus, ethnomathematics serves not only as a teaching tool but also as a means for students to recognize their cultural identity while mastering formal mathematical competencies.

Further findings in this study reveal a dimension of cultural values deeply embedded in Madurese agricultural activities. These values are manifested through two main pillars: social traditions (mutual cooperation and selfless work) and the use of local linguistic terms (*dherrebbhan* and *urunan*).

In the agrarian society of Madura, mutual cooperation is not merely a physical activity, but rather a system of mobilizing collective energy to overcome limitations during peak production periods. This activity is classified into two social domains, namely mutual cooperation between neighbors and mutual cooperation between relatives. According to Koentjaraningrat's perspective (2004), this tradition is rooted in basic problems of human relations based on four main concepts, namely 1) communal awareness, individuals realize that they do not live alone, but are surrounded by community and nature, 2) interdependence, awareness of the dependence of life on others, 3) social harmony, efforts to maintain good relationships driven by a spirit of equality, 4) collectivity, the urge to act together based on a spirit of equality. In line with mutual cooperation, a tradition of spontaneous selfless work emerged. This value emerges naturally when a citizen experiences difficulties, driven by a sincere sense of brotherhood without considering material gain or loss.

Holistically, the agricultural tradition in Madura encapsulates four philosophical themes that align with Koentjaraningrat's (2004) theory. The first theme is the concept of shared fate. This theme refers to a life view that makes farmers more resilient in the face of suffering or crop failure. The second theme is social interdependence. This theme explains the rejection of individualism in order to create a sense of security within the community. The third theme is a culture of sharing. This theme is the foundation for all mutual assistance activities, both in the agricultural realm and domestic life, which are fueled by a spirit of equality (equal-average-equal-feeling). The fourth theme is equality. This theme is the concept of equal-high-equal-low, which emphasizes that every individual in the community has equal standing in social interactions.

The use of the terms *dherrebbhan* and *urunan* in the daily lives of Madurese farmers is not simply a choice of words, but rather a representation of long-established behavioral patterns and social systems. Although both share the same core meaning, namely mutual cooperation, the differences in their application reveal the structure of interpersonal relationships in Madura. This aligns with the characteristics of society proposed by Sihotang (2008), where a community possesses a uniform social system, collective behavioral patterns, and long-rooted traditions. Thus, language acts as both a guardian of identity and a regulator of social order in Madurese farming communities.

The value of mutual cooperation, which is at the root of Madurese farming culture, can be internalized in mathematics learning at school through a cooperative learning framework. In this approach, mathematics is no longer studied individually, but rather through structured social interactions. Through ethnomathematics-based contextual learning, students are guided to work in heterogeneous groups to identify and solve mathematical problems embedded in Madurese farming activities, such as the concept of comparison or the System of Linear Equations and Inequalities (LSEs).

This process directly implements the dimensions of the Pancasila Student Profile, particularly the aspect of mutual cooperation, which aligns with the vision and mission of the Ministry of Education and Culture (2024). Cooperative learning in mathematics enables these cultural values to be transformed into practical skills in the classroom. Students are not only required to achieve cognitive competence (understanding formulas) but also social competence. This aligns with the findings of Noppitasari et al. (2023) that cooperative learning encompasses three essential aspects: collaboration, caring, and sharing. In the collaborative aspect, students work together to solve complex math problems. In the caring aspect, a peer tutoring process occurs, where students who better understand a concept help their peers who are struggling. In the sharing aspect, students exchange thinking strategies and discuss various problem-solving methods to reach a shared solution. By implementing cooperative models such as Student Team Achievement Divisions (STAD) or Jigsaw, an atmosphere of camaraderie and solidarity among students can grow naturally. Ultimately, learning mathematics becomes more meaningful because students not only learn to count numbers, but also learn to revive the noble value of mutual cooperation in the context of modern education.

CONCLUSION

This study concludes that rice farming practices in Madura are carried out through a procedure based on plant age calculations that is highly adaptive to local geographic conditions, while simultaneously harboring rich ethnomathematics potential in the concepts of Comparison and Systems of Linear Equations and Inequalities (LSEs). These findings can be transformed into contextual mathematics learning materials that enable students to construct academic knowledge by connecting it to real-world realities in a more meaningful way. Socioculturally, the activities of Madurese farmers represent the deep value of mutual cooperation, both between neighbors and relatives, driven by the philosophy of equal-average-equal-feeling and equal-high-equal-low.

Therefore, the synergy between ethnomathematics and cultural values not only serves as a practical framework reference for farmers, but also becomes a strategic instrument for educators to integrate character building and students' mathematical literacy in schools.

DECLARATION OF THE USE OF AI

During the preparation of this work, the author did not use AI services, except for the use of basic tools such as Google Translate and Grammarly which were used to check grammar and spelling

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