GPrEEc
Glocal Praxis in Elementary Education
Volume 2 Issue 1 (2026)
DOI: 10.26740/gpreec.v2.i2.56636
e-ISSN 3164-1490

Exploration of Mathematical Concepts in Shallot Farming as an Ethnomathematics Context in Elementary School

Qonik Nafaqiyatul Jannah[1*], Neni Mariana[1]
[1]Elementary Teacher of Education, Surabaya State University, East Java,Indonesia
*Correspondence: qonik.22264@mhs.unesa.ac.id

ARTICLE INFO

Received: 7 July 2026
Revised: 23 October 2026
Accepted: 25 October 2026
Published: 1 November 2026

Keywords:

Ethnomathematics, shallot farming, elementary mathematics, local culture, contextual learning

This is an open access article under the CC BY license.

ABSTRACT

Mathematics in elementary education is often perceived as challenging due to abstract teaching methods that lack connection to students' daily environments. This study explores the mathematical concepts embedded within shallot farming activities in Rejoso Village, Nganjuk Regency, utilizing an ethnomathematics framework. A qualitative ethnographic approach was employed, with data collected through observations, semi-structured interviews, documentation, and literature reviews. The findings reveal that traditional shallot farming incorporates fundamental mathematical domains—including numbers, geometry, measurement, pattern recognition, and data analysis—demonstrated in practices such as land allocation, bed organization, planting distance measurement, seed calculation, crop maintenance, and yield estimation. Furthermore, the study illustrates how these culturally grounded practices can be integrated into elementary mathematics instruction under the Merdeka Curriculum framework. By bridging local agricultural traditions with formal school curricula, this research contributes to the ethnomathematics literature and offers practical insights for designing meaningful, contextualized mathematics learning experiences for elementary school students.

How to Cite: Jannah, Q. N., & Mariana, N. (2026). Exploration of mathematical concepts in shallot farming as an ethnomathematics context in elementary school. *Glocal Praxis in Elementary Education, 2*(2), 94-102. http://doi.org/10.26740/gpreec.v2.i2.56636

© The Author(s) 2026

Mathematics is one of the important subjects in education because it plays a role in training students' logical, systematic, critical, and creative thinking skills (Siagian, 2016). However, in reality, learning mathematics in elementary school is still often considered difficult and boring by students (Solihin & Rahmawati, 2024). This condition occurs because mathematics learning tends to focus on numbers, formulas, and practice problems without being associated with students' real

experiences in daily life. As a result, students have difficulty understanding math concepts in depth and perceive math as an abstract subject (Simamora et al., 2023).

Mathematics learning will be more meaningful when it is linked to a real context that is close to students' lives (Asyiah et al., 2022). Contextual learning helps students understand the relationship between mathematical concepts and the everyday activities they see and experience firsthand (Indriastuti & Ratnaningsih, 2019). Through contextual learning, students not only learn to memorize formulas, but also understand how mathematics is used in people's lives (Yasin, 2023).

One approach that supports contextual learning is the ethnomathematical approach (Rosa et al., 2016). Ethnomathematics views that mathematics is not only found in schools, but also develops in the culture and activities of everyday society (Ambrosio, 1985). The cultural activities of the community actually contain many mathematical concepts, such as calculating, measuring, comparing, determining patterns, and regulating space (Maulida, 2020). Thus, ethnomathematics can be a bridge between formal mathematics in schools and students' cultural experiences in their surroundings (Maula et al., 2023).

In the context of the daily life of the Indonesian people, agricultural activities are one of the local cultures that are very close to people's lives and contain many mathematical concepts (Rofiq & Nuryami, 2024). Farmers use mathematics in various activities, such as dividing land, determining bed size, measuring planting distance, counting the number of seedlings, estimating fertilizer needs, and calculating crop yields (Putri & Kusno, 2025a). The activity shows that mathematics actually grows and develops in people's lives naturally (Djara et al., 2021).

One of the agricultural activities that is rich in mathematical concepts is shallot farming (Rofiq & Nuryami, 2024). In Nganjuk Regency, especially Rejoso Village, shallot farming is an important part of people's lives (Khoiroh et al., 2023). The layout of shallot farming land has an orderly pattern, ranging from the division of land plots, bed shapes, plant arrangement patterns, to irrigation systems (Ate & Hakim, 2023). The activity contains mathematical concepts such as numbers, geometry, measurement, patterns, and data analysis that can be used as a context for learning mathematics in elementary schools (Mandala et al., 2024).



Figure 1. Shallot farmland in Rejoso village

As seen in the **Figure 1**, the condition of the onion farmland shows bed patterns, crop arrangements, and irrigation systems that contain mathematical concepts such as numbers, geometry, measurements and patterns.

Various previous studies have discussed ethnomathematics in agricultural activities Akbar et al., (2021), Juliana et al., (2023), Padang & Lubis, (2023). However, most research still focuses

on identifying mathematical concepts in people's cultures without directly linking them to mathematics learning in elementary school (Putri & Kusno, 2025). In addition, research on the exploration of mathematical concepts in shallot farming as a context of mathematics learning is still limited (Rofiq & Nuryami, 2024).

Therefore, this study aims to explore the mathematical concepts contained in shallot farming activities as an ethnomathematical context in elementary schools. This research is expected to contribute to the development of mathematics learning that is more contextual, meaningful, and close to students' local culture so that students can understand mathematics through real experiences in daily life (Rosa et al., 2016).

METHODS

This research uses a qualitative approach with the type of ethnographic research. The ethnographic approach was chosen because this research focuses on the exploration of community culture in shallot farming activities as well as identifying mathematical concepts that arise in agricultural practices as an ethnomathematical context (Spradley, 2016). The research was carried out in Rejoso Village, Rejoso District, Nganjuk Regency, East Java, which is one of the shallot production centers. The research informants consisted of shallot farmers who were selected using purposive sampling techniques, namely farmers who had experience and knowledge about the shallot cultivation process. The selection of informants is carried out so that the data obtained is able to describe mathematical practices that develop in agricultural activities.

The participants in this study consisted of three shallot farmers from Rejoso Village, Rejoso District, Nganjuk Regency, who were selected purposively. The participants were chosen because they had more than ten years of experience in shallot cultivation and were actively involved in all farming stages, including land preparation, planting, maintenance, harvesting, and post-harvest activities. Their extensive experience enabled them to explain not only the farming techniques but also the local knowledge and cultural practices that have been passed down through generations.

Data were collected over a two-month period through direct field observations, semi-structured interviews, documentation, and field notes. Observations focused on identifying mathematical practices embedded in each farming activity, while interviews explored the reasons behind farmers' decisions, local terminology, and traditional knowledge related to shallot cultivation. Documentation included photographs of farming activities, field layouts, planting arrangements, harvesting processes, and supporting documents. The credibility of the findings was ensured through source triangulation and technique triangulation by comparing information obtained from different participants and different data collection methods.

Data collection was carried out through observation, semi-structured interviews, documentation, and literature studies. Observations are carried out at each stage of onion cultivation, including land cultivation, making beds, measuring planting distances, fertilizing, and harvesting. Interviews were conducted to obtain information about the mathematical practices used by farmers in agricultural activities, while documentation was used to reinforce the results of observations and interviews. Data were analyzed using an ethnographic analysis model Spradley, (2016) which includes domain analysis, taxonomic analysis, component analysis, and cultural theme analysis. The results of the analysis were then identified to find the mathematical concepts

that emerged in shallot farming activities, which were then mapped into elementary school mathematics materials in accordance with the Independent Curriculum Learning Outcomes. The validity of the data is obtained through triangulation of techniques and triangulation of sources by comparing the results of observations, interviews, and documentation so that credible data are obtained (Roosinda et al., 2021).

RESULTS AND DISCUSSION

The results of the study show that shallot cultivation in Rejoso Village consists of several stages, namely land cultivation, determination of planting distance, watering and caring for plants, as well as harvesting and post-harvest which are carried out systematically based on the experience of farmers inherited from generation to generation (Rofiq & Nuryami, 2024). Based on the results of observations, interviews, and documentation, each stage of cultivation contains various mathematical concepts, such as numbers, geometry, measurements, patterns, and data analysis that arise naturally in agricultural activities (Djara et al., 2021). These findings show that shallot farming activities have potential as an ethnomathematical context that can connect mathematical concepts with students' real experiences (Rosa et al., 2016). The results of the research at each stage of shallot cultivation are presented to explain the relationship between shallot farming activities and mathematical concepts that can be used as a source of contextual mathematics learning in elementary schools (Putri & Kusno, 2025).

Shallot Agricultural Land Processing Activities

The results of observations show that shallot cultivation in Rejoso Village begins with land cultivation. At this stage, farmers clean the land from weeds and plant residues, then do hoeing (*cocrok*) to loosen the soil. After the soil is ready, farmers make beds of a certain size that are adjusted to the conditions of the land. Between the beds, a water channel (ditch) is made that functions as an irrigation channel as well as controlling waterlogging during the cultivation process. All of these activities are carried out based on the experience of farmers who have been passed down from generation to generation so as to produce an orderly and efficient land layout.



Figure 2. Onion tub

The land cultivation activity contains various mathematical concepts. The creation of the bed (**Figure 2**) shows the concept of geometry because the bed is rectangular in shape with a certain length and width size. The determination of the bed size, bed height, and trench depth shows the measurement concept, while the parallel arrangement of the beds shows the pattern concept. In

addition, when farmers determine the number of beds made on each plot of land, the concept of numbers appears. These findings are in line with research Rofiq & Nuryami, (2024) which states that shallot agricultural land management activities contain various mathematical concepts, especially measurement, geometry, and spatial planning.

Planting Spacing Activities

After the beds are finished, farmers begin to plant shallot seedlings by paying attention to the planting distance between the bulbs. Planting spacing is determined regularly so that each plant gets enough growing space, facilitates the maintenance process, and increases plant productivity. The neat arrangement of plants shows that there is regularity in the planting process (see **Figure 3**).



Figure 3. Shallot planting distance

In this activity, several mathematical concepts were found. The measurement of the distance between plants shows the concept of measurement, while the arrangement of plants that form rows and columns shows the concept of geometry and pattern. When farmers count the number of plants in each row or the total number of plants in one bed, the concept of numbers appears, especially the multiplication operation as a repeated addition. These findings support research (Putri & Kusno, 2025) which states that land planning activities and planting spacing are mathematical practices that develop in the culture of onion farming.

Watering and Plant Care Activities

During the growing period, farmers water regularly and provide fertilizer according to plant conditions. Watering is carried out periodically to maintain soil moisture, while the amount of fertilizer is adjusted to the area of land and plant needs. In addition, farmers also weed weeds and observation of plant conditions as part of the treatment process.



Figure 4. Watering shallots

These activities, as shown in **Figure 4**, demonstrate the existence of the concept of measurement, especially when farmers determine fertilizer needs and water volume based on land area. The concept of numbers arises when farmers calculate the amount of fertilizer, the length of the maintenance period, and the number of plants cared for. Meanwhile, regular watering shows the concept of a pattern in the plant care time interval. These findings support the Mandala et al., (2024) that agricultural activities can be used as a context for mathematics learning because they contain various concepts of measurement, numbers, and patterns that are close to the lives of students.

Harvest and Post-Harvest Activities

The final stage of shallot cultivation is harvest and post-harvest. After the shallots are harvested, farmers sort them based on the size and quality of the bulbs. Next, the shallots are dried in the sun to reduce moisture content before being stored in a place that has good air circulation (see **Figure 5**). The yield is then weighed and recorded as the basis for evaluation in the next planting season.



Figure 5. Storage of shallots

In harvest and post-harvest activities, several mathematical concepts were found. The activity of calculating crop yields shows the concept of numbers, while the weighing process using kilograms shows the concept of measurement. Sorting by tuber size shows the concept of classification and comparison, while recording the harvest each season shows the concept of data analysis as farmers compare the productivity of each planting period as a basis for decision-making in the next season. The results of this study are in line with Padang & Lubis, (2023) which explains that agricultural activities involve not only measurement, but also the process of grouping and processing data in daily practice.

DISCUSSION

The results of the study show that each stage of shallot cultivation contains mathematical concepts that can be used as a learning context in elementary schools. Land cultivation activities contain the concepts of geometry, measurement, pattern, and numbers; the determination of planting distances contains the concepts of measurement, geometry, patterns, and numbers; watering and plant care contains the concepts of numbers, measurements, and patterns; Meanwhile, harvest and post-harvest activities contain the concept of numbers, measurement, classification, and data analysis. Thus, shallot farming activities can become a contextual, meaningful, and close mathematics learning context for students. These findings reinforce the view Rosa et al., (2016) Ethnomathematics is able to bridge students' cultural experiences with formal mathematics concepts so that learning becomes more relevant and meaningful.

Beyond demonstrating mathematical concepts, the findings reveal that shallot farming reflects the local wisdom of the farming community in Rejoso Village. The arrangement of planting beds, the determination of planting distances, and the scheduling of irrigation are not merely technical procedures but represent knowledge developed through long-term experience and inherited across generations. These practices illustrate that mathematics is embedded within cultural activities and functions as a practical tool for solving everyday agricultural problems. This finding supports the perspective of ethnomathematics proposed by Rosa et al., (2016), which emphasizes that mathematical knowledge develops naturally within cultural practices.

This study also contributes to the growing body of ethnomathematics research by extending previous studies that mainly focused on identifying mathematical concepts in cultural artifacts or agricultural activities. Instead of merely documenting mathematical elements, this research demonstrates how these concepts can be connected to elementary mathematics learning. Consequently, the study provides empirical evidence that local agricultural practices can serve as authentic learning contexts that promote meaningful mathematical understanding while simultaneously preserving local cultural values.

CONCLUSION

This study successfully explored the mathematical concepts contained in shallot farming activities in Rejoso Village, Nganjuk Regency, as an ethnomathematical context for mathematics learning in elementary schools. The results of the study show that each stage of shallot cultivation, starting from land tillage, making beds, making waterways, determining planting distances, watering, to harvest and post-harvest activities, contains various mathematical concepts that develop naturally in the cultural practices of the community. These concepts include numbers, geometry, measurements, patterns, and data analysis used by farmers in managing their daily agricultural activities.

The findings of the study show that shallot farming activities have a strong potential to be used as a contextual and meaningful mathematics learning context. The relationship between agricultural activities and mathematical concepts provides opportunities for students to learn mathematics through experiences close to their lives. Thus, learning is not only oriented towards mastering abstract concepts, but also helps students understand the application of mathematics in real life as well as get to know the cultural values that develop in the surrounding environment.

This research contributes to the development of ethnomathematics-based mathematics learning by presenting shallot farming activities as a learning resource that is relevant to the characteristics of elementary school students. The results of this exploration can be the basis for teachers to develop teaching materials, learning media, and learning activities that integrate local culture into mathematics learning. In addition, further research can develop the results of this exploration into learning designs, teaching modules, or test the effectiveness of its implementation in improving students' understanding of mathematical concepts.

From an educational perspective, the identified ethnomathematical concepts can be integrated into elementary mathematics learning across several topics in the Merdeka Curriculum. For example, the arrangement of planting beds can be used to introduce geometric shapes and area measurement, planting distances can support learning about measurement and multiplication, while harvesting activities can be applied to data collection, comparison, and simple statistics. Teachers can transform these authentic farming activities into contextual learning tasks, worksheets, project-based learning activities, or outdoor mathematics lessons. Such integration enables students to understand mathematical concepts through familiar real-life situations while fostering appreciation for their local culture and environment.

REFERENCES

Akbar, A., Haidar, I., & Hidayati, U. (2021). Eksplorasi konsep etnomatematika pada alat pertanian tradisional suku Bugis di Kabupaten Pinrang. *Jurnal Pendidikan Matematika*, *5*(2), 1399–1409.

Ambrosio, U. D. (1985). Ethnomathematics and its place in the history and pedagogy of mathematics. *For the Learning of Mathematics*, *5*(1), 44–48.

Asyiah, P. N., Sugilar, H., & Suratman, A. (2022). Pembelajaran matematika kontekstual pada pemahaman konsep matematika siswa. *Gunung Djati Conference Series*, *17*, 13–22.

Ate, R. R., & Hakim, T. (2023). Strategi manajemen tata kelola lahan pekarangan dalam penanaman tanaman bawang merah (*Allium ascalonicum*). *Agrisains*, *5*(2), 92–98. https://doi.org/10.31289/agrisains.v5i2.1316

Djara, E., Peni, N., & Wondo, M. T. S. (2021). Eksplorasi etnomatematika Ngadhu dan Bhaga dalam kaitannya dengan pembelajaran matematika pada masyarakat Desa Ubedolumolo Kabupaten Ngada. *Jupika: Jurnal Pendidikan Matematika*, *4*(1), 92–107. https://doi.org/10.37478/jupika.v4i1.846

Indriastuti, H., & Ratnaningsih, N. (2019). Penerapan model pembelajaran kontekstual untuk meningkatkan pemahaman konsep matematika. *Prosiding Seminar Nasional & Call for Papers Program Studi Magister Pendidikan Matematika Universitas Siliwangi Tasikmalaya*, *1*, 164–173.

Juliana, I., Herlinda, N., & Febriani, S. (2023). Eksplorasi etnomatematika pada alat pertanian tradisional Kabupaten Kampar. *Journal of Education Research*, *4*(1), 10–18.

Khoiroh, M., Umma, S., Amalia, F. K., & Zulfa, E. I. (2023). Pemberdayaan inovasi pupuk organik cair Jakaba Super untuk mengoptimalkan hasil panen bawang merah di Desa Puhkerep, Rejoso, Nganjuk. *Jurnal Pengabdian Kepada Masyarakat*, *14*(3), 457–465.

Mandala, A. S., Hidayah, I. R., & Rahmawaty, D. (2024). The effectiveness of ethnomathematical approaches on students' mathematical creative thinking skills in Indonesia: A meta-analysis study. *Journal of Mathematics Education*, *13*(2), 2759–2770.

Maula, L. H., Yulianasari, N., Salsabila, L., & Maulidina, N. (2023). Implementasi etnomatematika

sebagai cara untuk menghubungkan matematika dengan kehidupan sehari-hari. Santika: Seminar Nasional Tadris Matematika, *1*(2), 241–254.

Maulida, S. H. (2020). Pembelajaran matematika berbasis etnomatematika melalui permainan tradisional engklek. *Jurnal Pendidikan Matematika*, *7*(1), 35–44.

Padang, D. S., & Lubis, M. S. (2023). Ethnomathematical exploration of traditional agricultural tools in Hutamanik Village, Sumbul Regency. *Indonesian Journal of Science and Mathematics Education*, *6*(2), 137–151. https://doi.org/10.24042/ijsme.v6i2.17003

Putri, I. S., & Kusno. (2025). Eksplorasi pengolahan lahan pertanian bawang merah: Studi etnomatematika di Kabupaten Brebes. *Jurnal Ilmiah Profesi Pendidikan*, *10*(1), 102–111. https://doi.org/10.29303/jipp.v10i1.2891

Rofiq, A., & Nuryami. (2024). Eksplorasi etnomatematika pada aktivitas petani bawang merah di Desa Banyuanyar Kabupaten Probolinggo. *AL JABAR: Jurnal Pendidikan dan Pembelajaran Matematika*, *3*(1), 1–8. https://doi.org/10.46773/aljabar.v3i1.899

Roosinda, F. W., Lestari, N. S., Utama, I. G. S., & Anisah, H. U. (2021). *Metode penelitian kualitatif*. Penerbit Media Nusa Creative.

Rosa, M., D'Ambrosio, U., Clark, D., & Lawrence, O. (2016). *Current and future perspectives of ethnomathematics as a program*. Springer Nature.

Siagian, M. D. (2016). Kemampuan koneksi matematik dalam pembelajaran matematika. *Journal of Mathematics Education and Science*, *2*(1), 306–312.

Simamora, L., Hernaeny, U. F., & Hasanah, U. (2023). Pengaruh kemandirian belajar terhadap kemampuan berpikir kreatif matematika siswa. *Innovative: Journal of Social Science Research*, *3*(3), 5082–5092.

Solihin, A., & Rahmawati, I. (2024). KOMET-QR: Kartu eksplorasi etnomatematika-QR pada materi bangun datar kelas IV sekolah dasar. Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian, *10*(1), 64-79.

Spradley, J. P. (2016). *The ethnographic interview*. Waveland Press.

Yasin, F. N. (2023). Model pembelajaran kontekstual berbasis budaya lokal terhadap keterampilan sosial siswa Sekolah Dasar. Modeling: Jurnal Program Studi PGMI, *10*(1), 366-380.