Journal on Mathematics Education Research

Journal homepage: https://ejournal-science.upi.edu/jmer

Ethnomathematics in Watermelon Farming: An Analysis of Traditional Calculation Techniques and Planting Patterns in Paseban Village, Jember

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A B S T RAK

Secara tidak sadar manusia telah hidup berdampingan dengan matematika dalam waktu yang cukup lama. Etnomatematika adalah aktivitas matematika yang terjadi secara turun temurun. Penelitian ini bertujuan untuk mengetahui konsep matematika yang digunakan dalam teknik hitung dan pola tanam tradisional pada pertanian semangka di desa Paseban, Kabupaten Jember. Dalam penelitian ini, peneliti menggunakan penelitian deskriptif kualitatif dengan pendekatan etnografi. Narasumber dalam penelitian ini adalah Bapak Nuralim selaku salah satu petani semangka di Desa Paseban, Kecamatan Kencong, Kabupaten Jember. Alasan peneliti memilih narasumber ini karena memiliki pengalaman yang cukup dalam budidaya semangka serta terlibat secara langsung dalam berbagai aktivitas pertanian, mulai dari penyemaian, penanaman, pemeliharaan, hingga panen dan masih menggunakan teknik hitung dan pola tanam tradisional. Instrumen penelitian yang digunakan diantaranya adalah pedoman observasi, pedoman wawancara semi-terstruktur, dan dokumentasi. Teknik pengumpulan data yang digunakan yakni observasi, wawancara, dan dokumentasi. Teknik analisis data dilakukan dengan proses penyajian data, reduksi data, dan penarikan kesimpulan. Hasil dari penelitian ditemukan banyak konsep matematika pada teknik hitung dan pola tanam pertanian semangka di desa Paseban Kabupaten Jember. Konsep tersebut meliputi konsep geometri bangun ruang, konsep geometri bangun datar, pola bilangan kelipatan 3, perbandingan senilai, luas bangun ruang dan bangun datar, persamaan garis lurus, konsep penjumlahan, perkalian, dan pembagian. Pada teknik hitung, proses penyemaian berkaitan dengan konsep matematika yaitu pola bilangan, konsep geometri bangun ruang dan bangun datar, dan perbandingan senilai. Penentuan jarak tanam berkaitan dengan konsep geometri bangun

A R T I C L E I N F O

Article History:
Received:2026-05-23
Revision: 2026-05-24
Accepted: 2026-05-31
Published: 2026-05-31

Kata Kunci:
Etnomatematika
Pertanian Semangka
Teknik Hitung
Pola Tanam

ruang dan bangun datar serta rotasi. Proses penjepitan berkaitan dengan konsep geometri bangun datar dan sudut. Pola tanam sejajar berkaitan dengan persamaan garis, pola bilangan, dan geometri bangun ruang. Penelitian ini diharapkan dapat membantu guru mengajarkan matematika kepada siswa dengan contoh kehidupan nyata. Penelitian ini juga akan menjadi referensi bagi peneliti masa depan untuk mempelajari lebih banyak konsep budaya tentang matematika.

A B S T R A C T

Unconsciously, humans have coexisted with mathematics for quite some time. Ethnomathematics refers to mathematical activities that have been passed down through generations. This study aims to identify the mathematical concepts used in traditional calculation techniques and planting patterns in watermelon farming in Paseban Village, Jember Regency. In this study, the researcher employed a qualitative descriptive research design using an ethnographic approach. The informant in this study is Mr. Nuralim, a watermelon farmer in Paseban Village, Kencong Subdistrict, Jember Regency. The researcher selected this informant because he possesses significant experience in watermelon cultivation and is directly involved in various agricultural activities—from sowing, planting, and maintenance to harvesting—while still employing traditional calculation techniques and planting patterns. The research instruments used included an observation guide, a semi-structured interview guide, and documentation. The data collection techniques employed were observation, interviews, and documentation. Data analysis was conducted through the processes of data presentation, data reduction, and drawing conclusions. The results of the study revealed numerous mathematical concepts in the calculation techniques and planting patterns used in watermelon farming in Paseban Village, Jember Regency. These concepts include solid geometry, plane geometry, number patterns involving multiples of 3, equivalent ratios, the areas of solids and plane figures, linear equations, and the concepts of addition, multiplication, and division. In planting techniques, the seeding process relates to mathematical concepts such as number patterns, the geometry of three-dimensional and two-dimensional shapes, and equivalent ratios. Determining planting distances relates to the geometry of three-dimensional and two-dimensional shapes as well as rotation. The staking process relates to the geometry of two-dimensional shapes and angles. Parallel planting patterns are related to linear equations, number patterns, and solid geometry. This study is expected to help teachers teach mathematics to students using real-life examples. This study will also serve as a reference for future researchers to explore more cultural concepts related to mathematics.

Keywords:
Ethnomathematics
Watermelon Farming
Calculation Techniques
Planting Patterns

1. INTRODUCTION

Mathematics is one of the most important subjects taught in school. This is because mathematics has the ability to enhance students' capacity to think rationally, logically, critically, carefully, effectively, and efficiently (Akbar et al., 2024). Therefore, mathematics is an essential part of modern human knowledge. Mathematics is not only found in textbooks but also in everyday human activities. Mathematics is used by everyone in daily life, particularly for calculating, reasoning, or solving problems using various mathematical concepts (Septia et al., 2024). Therefore, mathematics is a field of study that is always intertwined with human life.

Ethnomathematics connects culture and community activities with mathematical concepts, which naturally share mutually supportive characteristics (Akbar et al., 2024). Ethnomathematics is a mathematical discipline that studies cultural manifestations (ideas, activities, or cultural artifacts) that have become distinctive features of specific social groups. Ethnomathematics is also practiced by individuals with mathematical knowledge and expertise (Lutfiyah et al., 2023). One example of the application of ethnomathematics in everyday life is agricultural activities.

Agriculture is one of the main sectors of the Indonesian economy. As an agrarian country, farming is one of the primary sources of livelihood for the Indonesian people. Indonesia is currently known as an agrarian country where the majority of the population earns a living as farmers (Nita et al., 2023). One form of agriculture that is quite successful and commonly found is watermelon farming. In Paseban Village, Kencong Subdistrict, Jember Regency, the majority of the community manages sandy land along Paseban Beach to grow watermelons. Although Jember's watermelon-growing area is not the largest, it has become the largest watermelon producer in East Java, surpassing Jombang Regency (Sasongko & Soejono, 2021).

Most of the land in Paseban Village is utilized by the community for agriculture, with the dominant land area making agriculture a key regional potential. In recent years, agriculture in Paseban Village has evolved from rice paddy farming to farming on coastal sandy land. The development of agriculture on sandy land is driven by the expansion of watermelon production in neighboring villages, which has encouraged some villagers to cultivate watermelons on coastal sandy land. Farmers grow watermelons on idle coastal land owned by the state, specifically by the Indonesian Air Force (TNI AU) and the Ministry of Marine Affairs and Fisheries (KKP) (Sasongko & Soejono, 2021).

Watermelon farmers use their own methods for making raised beds, estimating the number of watermelon seeds used for planting, and measuring planting distances. This is very interesting; although some of them have a low level of education, they use mathematics in their own way. Everything we do every day is always related to mathematics, and we use it indirectly or unconsciously (Septia et al., 2024).

However, the practice of ethnomathematics in traditional calculation techniques and planting patterns in watermelon farming in Paseban Village has not yet been systematically analyzed. In fact, exploring these practices has the potential to enhance contextual and meaningful mathematics learning, particularly by connecting mathematical concepts to students' real-life experiences. Based on the above description, this study is necessary to analyze ethnomathematical activities in traditional calculation techniques and planting patterns in watermelon farming, which have long been neglected. Therefore, it is hoped that this study

DOI: http://doi.org/10.17509/j-mer.v7i1.907
e- ISSN 3047-1095

can provide new insights for farmers, showing that they unconsciously engage in many mathematical activities every day.

Several studies conducted on agriculture have found that various mathematical concepts are present within the field. This has prompted researchers to conduct further research. By applying mathematics within the context of local culture, this study is expected to provide new insights for developing more efficient and sustainable agricultural strategies. Furthermore, the findings of this study can be used to develop educational methods that incorporate ethnomathematics into the school curriculum, thereby enabling local wisdom and agricultural techniques to work together to create synergy.

2. METHOD

This study employs a descriptive qualitative approach to gain an understanding of ethnomathematical practices in traditional calculation techniques and planting patterns in watermelon farming using an ethnographic approach. Based on intensive field research, the ethnographic approach—an empirical-theoretical method—aims to provide a comprehensive description and analysis of a culture (Putri & Kusno, 2025). This approach is expected to yield comprehensive information regarding the concept of ethnomathematics in calculation techniques and planting patterns in watermelon farming in Paseban Village, Kencong Subdistrict, Jember Regency.

This study was conducted in Kencong Subdistrict, Jember Regency. (Ardiansyah, Risnita, 2023) Qualitative research uses data collection techniques such as interviews, observation, and document analysis. (Ardiansyah, Risnita, 2023) Qualitative research uses research instruments such as interview guides, observation checklists, and documentation study guidelines. The researcher used the Miles and Huberman model to analyze the data by conducting data presentation, data reduction, and drawing conclusions (Noris et al., 2022). The collected interview and observation transcripts were transcribed into written text without altering the content of the information obtained. This was done to maintain the integrity of the information and to facilitate the data processing and analysis. The researcher then identified the main themes related to ethnomathematics, after which the article was drafted based on the determined themes. Documentation was used to strengthen the research data and ensure greater accuracy. The study concluded by drawing conclusions regarding the calculation methods and planting patterns identified in watermelon farming. Data validity was assessed using triangulation, which involved comparing the results of interviews, observations, and documentation to ensure that the data were consistent and reliable.

3. RESULT AND DISCUSSION

Based on observations in Paseban Village, Kencong Subdistrict, Jember Regency, a significant number of farmers utilize sandy land along the Southern Cross Road (JLS) to grow watermelons. Watermelon farmers in Paseban Village still employ traditional calculation techniques and planting patterns that incorporate mathematical and cultural elements passed down through generations. Their planting techniques remain traditional. Most farmers apply mathematical concepts in their daily lives without having formally studied them. This study identified several instances of ethnomathematics. These include their calculation techniques and planting patterns; the calculation process is divided into three parts: seedling sowing, determining planting distances, and growth periods, while the planting pattern employs a parallel arrangement.

DOI: http://doi.org/10.17509/j-mer.v7i1.907
e- ISSN 3047-1095

Calculation Techniques

The Seedling Sowing Process

The watermelon sowing process begins with the preparation of "bedengan" in the "media". The arrangement of these "bedengan" can be seen in Figure 1

Figure 1. "Bedengan" layout

Based on interviews with informants, the community refers to the container used to store the seedlings as a "media," and the polybags containing the seedlings as "bedengan." The media used are rectangular containers with one open end at the top. When constructing the media, farmers use traditional units of measurement: the "jengkal" to determine length and width, and the "ruas jari" to determine height. These units have been used for generations and have standard conversions to centimeters: 1 jengkal equals 25 cm, and 1 finger joint equals 2.5 cm. The "growing medium" used by the farmer above measures 1 1/2 jengkal in length, 1 jengkal in width, and 3 finger joints in height. When converted to centimeters, this means the medium has a length of 40 cm, a width of 25 cm, and a height of 7.5 cm.

Figure 1 above shows the first step performed by the farmer: the seed sowing process. Seeds are planted into beds with a 3 cm diameter, arranged in an orderly pattern to form a numerical sequence. If calculated along the length of the growing medium: the length of the beds can form a pattern, for example, 1 bed is 3 cm; placing 2 beds makes 6 cm, and so on until the bed is fully filled with 13 beds, resulting in a total length of 39 cm. Similarly, when measured from the width, the beds can form a pattern from 3 cm until the bed is fully filled with 8 beds, totaling 24 cm. Note that this is calculated from each edge of the growing medium. Thus, the uniform and repeating dimensions of these beds form a pattern based on multiples of 3, which can be expressed in the general form 3n. In this arrangement, the lengths of the beds are 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, and 39 cm, and the widths are 3, 6, 9, 12, 15, 18, 21, and 24 cm.

Area of the *bedengan* field calculations :

$$A = l \times w$$

$$= 39 \times 24$$

DOI: http://doi.org/10.17509/j-mer.v7i1.907
e- ISSN 3047-1095

$$= 936\ cm^2$$

Area of the "bedengan" mathematical calculation:

$$A = l\ \times w$$

$$= 40 \times 25$$

$$= 1000\ cm^2$$

The difference between the mathematical calculation and the field measurement:
= Area of the "bedengan" field calculations – Area of the "bedengan" mathematical calculation

$= 1000\ cm^2$ - $936\ cm^2$

$= 64\ cm^2$

Thus, there is a difference of 61 cm² between the area of the growing medium and the area of the raised bed. This is because the arrangement of each "bedengan" irregular.

Watermelon seedlings are arranged in neatly organized containers to facilitate care and growth monitoring. Farmers usually refer to this as "media

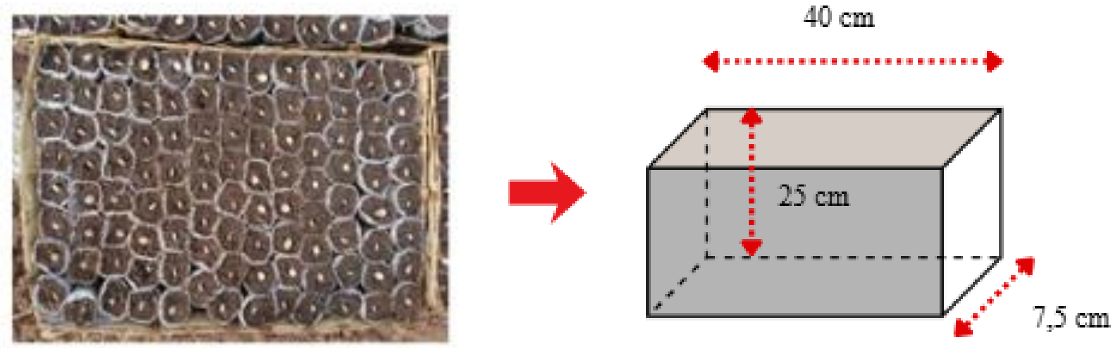

Figure 2. Media

"Media" it has a shape similar to that of a rectangular prism, as shown in Figure 2. The dimensions of length, width, and height define the area where the seedlings are arranged. Farmers can control the number of seedlings to be sown and make efficient use of space in this way.

Volume "media": $v = l \times w \times h$

$v = 40 \times 25 \times 7{,}5$

$= 7.500\ cm^3$

Surface area: $A = 2\ (lw + lh + wh)$

$= 2\ (40\times25 + 40\times (7{,}5) + 25\times (7{,}5))$

$= 2\ (1000 + 300 + 187{,}5)$

$= 2 \times 1.487{,}5$

$= 2.975\ cm^2$

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e- ISSN 3047-1095

Each medium contains 100 “bedengan”. Farmers calculate the number of seedlings needed using a simple method, which is to count the number of “media” that is used. Every plot of land measuring 5,000 m² requires 55 “media”. This means that every 5,000 m² plot requires 5,500 watermelon seedlings or 110 “media”. The relationship between the number of growing “media” and the number of seedlings forms a proportional relationship.
Here’s how to calculate the amount of “media” needed:

Comparative form:

$\frac{M1}{Mx} = \frac{B1}{Bx}$

$\frac{1}{X} = \frac{100}{5500}$

100 x = 550

$x = \frac{5500}{100}$

x= 55

Description:

M_1= the first “media”

M_2= the second “media”

B_1= the first of seedlings

B_2= the second of seedlings

So, the amount of “media” required for each plot of land measuring 5,000 m² is 55 units of “media”.

Calculating the number of poly bags used in production “bedengan” for land area 5000 m^2 :

It is known that : Total “bedengan” = 5.500 “bedengan”

Length “bedengan” = 4 cm

Length of one roll of poly bag = 100 m = 10.000 cm

Do you need poly bags… in rolls?

Total length of poly bags needed :

= 5.500 × 4 cm

= 22.000 cm

Requirements for polybag rolls :

= Length of poly bag : Length of one roll of poly bag

= 22.000 : 10.000

= 2,2

Therefore, farmers need ≤ 3 rolls of polybags for a plot of land measuring 5,000 m².

Watermelon seedlings are placed in small plastic bags, which serve as an initial growing medium before the seedlings are transplanted to the field. The shape of the raised bed can be seen in Figure 3.

DOI: http://doi.org/10.17509/j-mer.v7i1.907
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Figure 3. “Bedengan”

Figure 3 shows that the containers used in the seedling-raising process are small plastic bags shaped like cylinders. The circular base and lid, along with the curved vertical sides, reflect the cylindrical design. Farmers use this shape as a growing medium container to support the growth of watermelon seedlings during the early stages of development. To calculate the volume of the raised bed:

Volume “bedengan” : $v = \pi \times r^2 \times h$

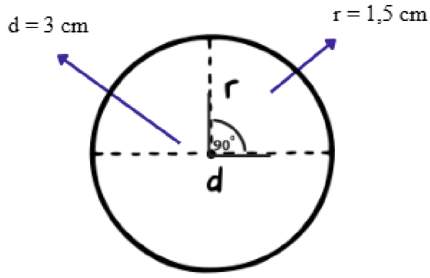
$v = \pi \times (1{,}5)^2 \times 4$

$= 28{,}26\ cm^3$

Area of a circle: $L = \pi r^2$

$L = \pi \times (1{,}5)^2$

$= 7{,}06\ cm^2$



In addition to exploring the concepts of three-dimensional and two-dimensional shapes, students are also introduced to angles, starting with 180° and moving on to 90°.

To facilitate the care and monitoring of seedling growth, farmers arrange the seedling trays in an orderly manner in the nursery area. The arrangement of the seedling trays is shown in Figure 2.

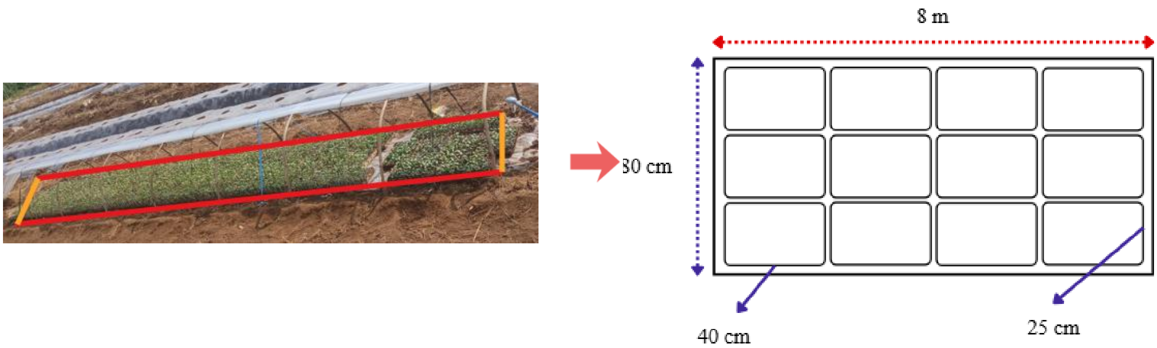


Figure 4. Preparation “Media”

The seedling trays are arranged in neat rows to form a rectangular layout, as shown in Figure 2. The arrangement of the seedling trays also has four sides, with pairs of sides that are equal in length and parallel to one another. The length is 19 units of the growing “media” and the width is 3 units of the growing “media”. According to interviews with the informants, this

DOI: http://doi.org/10.17509/j-mer.v7i1.907
e- ISSN 3047-1095

is done to facilitate the care process and to determine the number of seedlings required. The mathematical concepts involved in arranging the growing medium include the geometry of two-dimensional shapes and the sequence of multiples of 3: 3, 6, 9, 12, 15, …, and so on.

It is known that : l = 800 cm

w = 80 cm

Calculation via "media"*:*

$l = 19 \times 40$ $\quad\quad$ $w = 3 \times 25$

$= 760\ cm$ $\quad\quad$ $= 75\ cm$

$Area = 760 \times 75$

$= 57.000\ cm^2$

$\text{Mathematical area} = 800 \times 80$

$= 64.000\ cm^2$

Thus, there is a difference between the calculation of "media" composition using "media and using mathematical methods, namely:

$= 64.000\ cm^2 - 57.000\ cm^2$

$= 7.000\ cm^2$

This difference is used to account for the spacing between "media".

Farmers place covers over the prepared "media" made of bamboo and plastic to protect the seedlings from the weather and environmental disturbances, as shown in Figure 5.

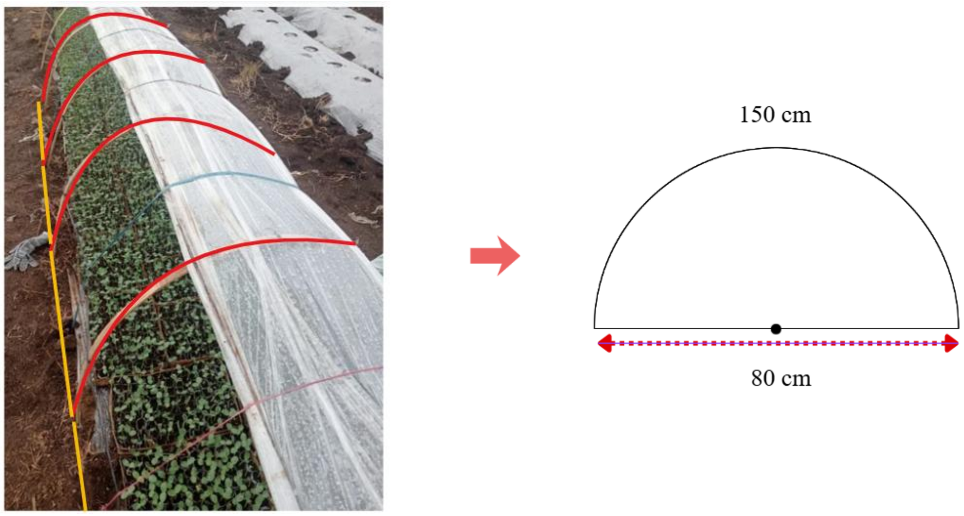


Figure 5. "Penutup bedengan"

The "bedengan" are made of bamboo that is planted and bent to form a semicircle, creating a half-cylinder shape when covered with plastic. In the process of making these "bedengan", farmers use the units of measurement known as "depa" and "langkah kaki." The "depa" unit is used to measure the bent bamboo, while the "jengkal" unit is used to measure the distance between the bent bamboo pieces. These units have been used for generations and have standard metric conversions: 1 depa equals 1.5 m, and one footstep equals 0.8 m. The length of the bamboo, which is 1 depa, is equivalent to 150 cm, so the bamboo length is half

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the circumference of the circle. "Bedengan" cover forms a semicircular tube with a radius of 1.5 foot-steps or ≤ 120 cm and a length of 7 foot-steps or ≤ 560 cm, adjusted to fit the growing medium arranged lengthwise. On top of the bamboo shaped into a semicircle, plastic mulch is then placed to encircle the entire bed cover, as shown in Figure 5.

It is known that :

Length of bamboo = $\frac{1}{2}$ circumference of a circle

The Mathematical Calculation : $k = \left(\frac{1}{2}\right) \pi \text{ d}$

$$k = \left(\frac{1}{2}\right) 3{,}14 \times 80$$

$$k = 125{,}6\ cm$$

The difference between the field measurements and the mathematical calculations :

= 150 cm – 125,6 cm

= 24,4 cm

It turns out that the bamboo is longer than half a circle. This difference is used to create space between the end of the bed cover and the area where the growing *media* is placed.

Determining planting distances

Determining the proper spacing between plants is one of the key steps in watermelon cultivation. To facilitate care and provide sufficient space for plant growth, the spacing is carefully planned. Figure 6 illustrates how to determine the proper spacing for planting watermelons.

Figure 6. Watermelon planting spacing

Figure 6 shows that the watermelon plants are spaced at relatively even intervals. This planting pattern indicates that the farmers used concepts of measurement and geometry to determine the position of each plant in the field. The regular spacing facilitates maintenance and provides the plants with ideal growing space. The mounds of soil to be planted are covered with plastic mulch, which farmers refer to as "gulutan." To determine the planting spacing, farmers make holes in the plastic mulch using a circular "cemplong" tool with a diameter of 3 inches or ≤ 8 cm. The traditional unit of measurement used in this process is "sak gulut," which is equivalent to 1 meter.

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e- ISSN 3047-1095

Farmers use a traditional tool called a cemplong to make planting holes in the plastic mulch and to determine the spacing between plants. Figure 7 shows how this tool is used.

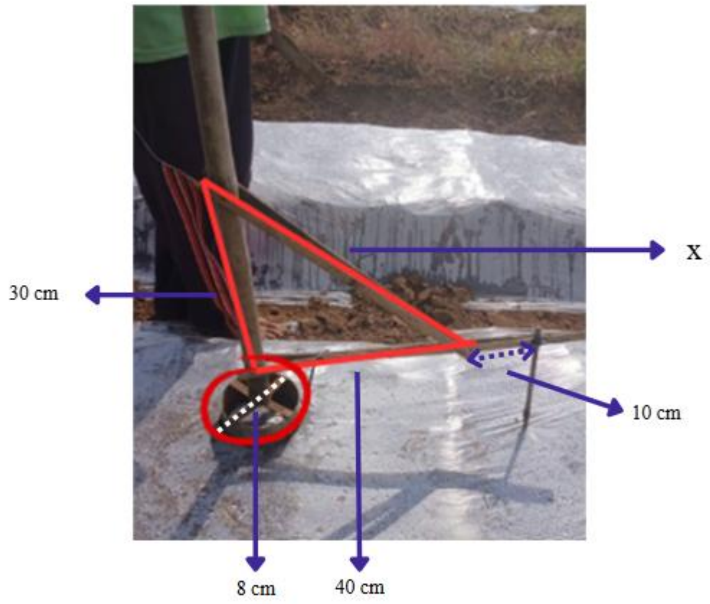

Figure 7. "Cemplong"

Farmers can use a "cemplong" to make planting holes in the plastic mulch at predetermined intervals, as shown in Figure 7. This tool helps farmers maintain uniform planting distances so that each plant is arranged in an orderly manner in the field. The tool shown above is used to help farmers determine planting distances; they call it a "cemplong." It is made of bamboo, with a circular bamboo ring attached to its lower end, forming a cylindrical shape with a diameter of 3 inches (≤ 8 cm) and a height of ≤ 3 cm. On the side, a 50 cm long bamboo rod is attached, with a pointed bamboo rod underneath, reinforced by a triangular bamboo piece with a 90° angle, as shown in Figure 7, to ensure that the distance between each hole produced is the same. Holes are made in the plastic "gulutan" by rotating the cemplong tool 180°.

Volume of a "cemplong" tube : $v = \pi \times r^2 \times h$

$$v = \pi \times (4)^2 \times 3$$

$$= 150{,}72\ cm^3$$

Growth Period

Farmers prune the vines (watermelon tendrils) during the growing season using specially shaped bamboo sticks to keep the plants in the desired position. This process is illustrated in Figure 8.

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Figure 8. The "penjepitan" process

The unit of measurement used in this process is still traditional: the "jengkal," which is equivalent to 20 cm. Seedlings that have been planted for 15 days usually begin to "sprout" by 45 days of age; each hole typically yields 3–4 "golor." Farmers perform "penjepitan" every 7 days between 15 and 45 days of age. The "pin" is a split bamboo stick resembling a skewer, 1 jengkal long (equivalent to 20 cm) and as thin as a fingernail (≤ 3 mm), which is then bent into two parts as shown in Figure 8. This process utilizes the concept of division and also applies the geometry of two-dimensional triangles with angles <90° (acute angles). The mathematical elements involved include arithmetic and solid geometry.

We can calculate the number of times farmers perform the "penjepitan" process using the concept of number patterns:

$U_n = a + (n - 1)\, b$

$45 = 15 + (n - 1)\, 7$

$30 = 7\,(n - 1)$

$n = 5{,}3 \approx 5$

Description :

U_n = the nth term

a = the first term (15)

b = the common difference (7)

n = the term number

This means that farmers perform the "penjepitan" process five times between 15 and 45 days after planting

Crop Rotation

Watermelon farmers use specific planting patterns to arrange the plants so that they can be grown and cared for optimally. The parallel planting pattern is one such method, as shown in Figure 9.

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e- ISSN 3047-1095

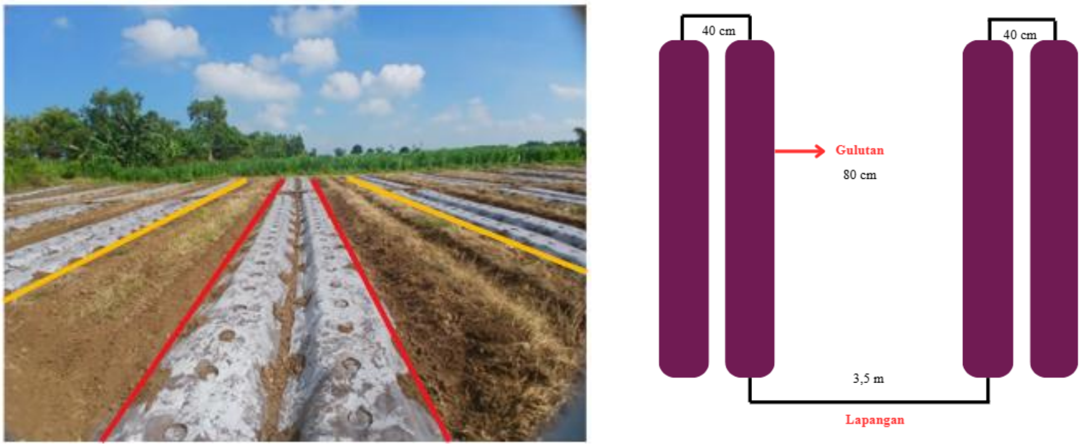

Figure 9. Parallel Planting Pattern

Watermelon farmers prepare the planting area using a plow they call a "brujul." The watermelon fields are rectangular in shape and vary in size; planting patterns are then established in parallel rows with consistent spacing and dimensions. According to information from our source, this is intended to facilitate planting and crop maintenance; the spacing is arranged regularly to form parallel lines, hence this planting pattern is called a parallel planting pattern. Farmers use the unit "sak gulut" or ≥ 80 cm to determine the distance between planting sites, which they call "gulutan"—these will become the spots where watermelon seedlings grow. The distance between gulutan is 3 gulut, or approximately ≤ 3.5 m. This spacing arrangement aims to enhance plant growth and increase crop yield and land productivity.

Note Figure 9, where the distance between gulutans and the field width are repeated. This demonstrates the concept of a numerical pattern. In the field, there are odd numbers: 350, 40, 350, 40… and so on. Meanwhile, in the gulutans, there are even numbers: 40, 350, 40, 350… and so on.

Additionally, the furrows demonstrate the concept of three-dimensional geometry, where the length of a furrow is 100 m, the width is 80 cm, and the height is 25 cm.

Volume "Gulutan" :

$$v = \mathrm{l} \times w \times h$$

$$= 100\, m \times 0{,}8\,\mathrm{m} \times 0{,}25\,\mathrm{m}$$

$$= 20\, m^3$$

To help readers understand the relationship between the field calculations performed by farmers and formal mathematical concepts, the researchers present a comparison of the two in Table 1.

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Table 1. Comparison of Field Calculations and Mathematical Calculations

Activities	**Calculation Field**	**Calculation Mathematical**	**Difference**	**Description**
Seed Sowing	$A = l \times w$ $= 39 \times 24$ $= 936\ cm^2$	$A = l \times w$ $= 40 \times 25$ $= 1000\ cm^2$	$64\ cm^2$	Due to the irregular arrangement of the “bedengan”.
The Creation of “Media”	$A = l \times w$ $= 760 \times 75$ $= 57.000\ cm^2$	$A = l \times w$ $= 800 \times 80$ $= 64.000\ cm^2$	$7.000\ cm^2$	This difference is used to represent the distance between “media”.
“Bedengan” Cover	150 cm	$C = \left(\frac{1}{2}\right) \pi\ d$ $= \left(\frac{1}{2}\right) 3{,}14 \times\ 80$ $= 125{,}6\ cm$	24, 4 cm	Leave a gap between the edge of the “bedengan” cover and the area where the “media” is placed.

Table 1 shows that the calculations farmers perform in various activities related to watermelon cultivation align with formal mathematical concepts, although there are still slight discrepancies for specific reasons.

DISCUSSION

Calculation techniques in watermelon farming are divided into three categories: the sowing process, measuring planting distances, and the growing period. In terms of calculation techniques and planting patterns, farmers use traditional units of measurement, including finger-joint spans, arm spans, foot lengths, fingernail tips, and the “sak gulut” unit. This aligns with research (Pakiding & Tulak, 2019) as these units are considered practical and widely applicable; most of these traditional units are based on body parts. As for the planting pattern, a parallel planting pattern is used.

The sowing process involves patterns of multiples of 3, geometric concepts of three-dimensional shapes such as cuboids and cylinders, two-dimensional shapes like circles and rectangles, and equivalent ratios. This aligns with research (Parimin, 2022), which states that a sequence is a list of numbers arranged in order from left to right and possessing a specific numerical pattern or feature. Equivalent ratios are statements about two equal ratios, while a ratio is a relationship between two specific quantities (Harfin, 2016).

The determination of planting distances is not only intended to optimize plant growth while increasing land productivity and crop yields (Arya Bagas Susanto et al., 2026). The determination of planting distances involves the geometry of cylindrical solids, triangular planes, and 180° rotations. Geometry is a branch of mathematics that studies points, lines, planes, three-dimensional shapes, their properties, measurements, and their relationships to one another (Syafiqah, 2020) . Simple, traditional, human-powered agricultural tools (Juliana et al., 2023).

DOI: http://doi.org/10.17509/j-mer.v7i1.907
e- ISSN 3047-1095

During the pinching process, a triangular plane figure is formed with an angle <90° (acute angle) and a number pattern of multiples of 3 from the 3rd term to the nth term. An acute angle is an angle measuring between 0° and 90° (Asih et al., 2024). Number sequences, object configurations, and pattern examples are discussed in number patterns (Syafiqah, 2020).

The parallel planting patterns used by farmers relate to line equations—specifically parallel lines, odd and even number patterns, and the geometry of cylindrical shapes. Suharto states that (Arafah, 2026) The planting and harvesting process can be used to learn number patterns and simple functions. According to line geometry theory, there are four possibilities when two straight lines are connected. They can be parallel, coincident, intersecting, or perpendicular (Busrah & Pathuddin, 2021).

4. CONCLUSION

Based on the results of research conducted by the researcher on traditional calculation techniques and planting patterns in watermelon farming in Paseban Village, Jember Regency, it can be concluded that many concepts of ethnomathematics were identified. These concepts include solid geometry, plane geometry, patterns of multiples of 3, proportionality, the area of solids and plane figures, linear equations, and the concepts of addition, multiplication, and division. In the calculation technique, the sowing process relates to mathematical concepts such as patterns of multiples of 3, the geometry of three-dimensional shapes (cubes and cylinders), two-dimensional shapes (circles and rectangles), and proportional relationships. Determining planting distances relates to the geometry of three-dimensional cylinders, two-dimensional triangles, and 180° rotations. The pinning process involves forming a two-dimensional triangle with angles. This study involved only one informant and was conducted at a single location; therefore, the results cannot represent the ethnomathematical practices used by farmers in watermelon farming across various regions. Additionally, this study focused solely on the calculation techniques and planting patterns used by watermelon farmers. To obtain a more comprehensive picture of ethnomathematics, future research is recommended to involve more participants and diverse research locations, as well as to examine broader aspects of agriculture.

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DOI: http://doi.org/10.17509/j-mer.v7i1.907
e- ISSN 3047-1095