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Ethnomathematics on the Rice Cultivation Practices in Sablan, Benguet

Jessica A. Yeban

School Division Office - Department of Education Baguio City
Author email address: jessica.yeban@deped.gov.ph

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Abstract

This descriptive-interpretive design documented Ethnomathematics pertaining to rice cultivation practices in Sablan, Benguet. Interviews were conducted among the identified key informants of the indigenous people of Sablan, Benguet, identified through purposive sampling. Results showed that accounting for rice harvest involved simple counting while ciphering included posting *purong* in rice fields. Estimation in measuring their rice harvest was documented as a common practice. Sequential steps in cultivation include seedling preparation, land preparation, transplanting, pest control, harvesting, and drying. Harvests were categorized by variety and harvest time. Additionally, beliefs related to rice cultivation were also observed by the people of Sablan. They predict the weather based on the arrival of specific birds and the color of rice grains. Further, their planting method exhibited mathematical patterns and the sidewalls of their *alang* or rice granary displayed modeling patterns. Their rice cultivation practices showed the rich culture of the people which is worth documenting. Other indigenous practices may be documented to preserve the local practices. The identified ethnomathematics on rice cultivation practices may be incorporated into teaching math concepts. The community was also encouraged to participate in teaching the practices to the younger generations for cultural preservation and promotion.

Introduction

Culture and mathematics are related. The development of mathematics traces its origins in human civilization, as shown by its history. The comprehensive history of mathematics that focuses on anthropological, sociological, political, and religious aspects investigates the different ways of observing, comparing, classifying, evaluating, quantifying, measuring, counting, representing, and inferring.

D' Ambrosio (2001) first introduced the term Ethnomathematics during an annual meeting at the American Association for the Advance of Science, (Mania & Alam, 2021; Tutak et al., 2010). He used the word to express the connection between culture and mathematics, (Mania & Alam, 2021). The term ethno describes "all of the ingredients that make up the cultural identity physical traits" while mathematics expresses "a broad view of mathematics which includes counting, measuring, arithmetic, classifying, ordering, inferring, and modeling.

Similar indicators of ethnomathematics are also mentioned in the studies of Lodias (2018) and Rubio (2016) which account for practices classified undercounting, ciphering, measuring, classifying, ordering, inferring, and modeling patterns. Moreover, D'Ambrosio (2001) states:

> "The prefix 'ethno' is accepted as a very broad term that refers to the social and cultural context and therefore includes language, jargon, and codes of behavior, myths, and symbols. The derivation of 'mathema' is difficult but tends to mean to explain, to know, to understand, and to do activities such as ciphering, measuring, classifying, and modeling. The suffix 'tics' is derived from 'techne' and has the same root as technique."

Different cultural knowledge systems emerged from the coping activities of indigenous people because of environmental influences. They were motivated by the drive for survival and transcendence which are also compatible with their myths, religions, and language. Thus, ethnomathematics should be used to describe the many knowledge systems that emerged because of attempts to adapt to different environments (Rosa et al., 2016).

Each locality has its ethnomathematics. Indigenous Knowledge Systems and Practices (IKSP) is defined by the Indigenous People's Rights Act (IPRA) as "systems, institutions, mechanisms, technologies comprising a unique body of knowledge evolved through time embodying patterns of relationships between and among peoples, their lands and resource environment, including such spheres of relationships which may include social, political, cultural, economic, religious, and which are the direct outcome of the indigenous peoples' responses to certain needs consisting of adaptive mechanisms which have allowed indigenous peoples to survive and thrive within their given socio-cultural and biophysical conditions", (Tebtebba Foundation, 2020).

The Indigenous people bond with their land, the source of their lives. This has affected their belief systems and way of life. Early land tillers had already put into practice techniques they had learned through years of actual farming, including land preparation, planting, controlling insects and plant diseases, and other cultural management activities, until crop harvest and post-harvest process.

Indigenous Knowledge System (IKS) is equally crucial to agriculture in other nations. Siambombe et al. (2018) claim that animal behaviors including frog croaking, strange bird cries, and termite absence may be used to anticipate the coming of rain in African nations. The early wilting or falling of flowers, on the other hand, suggests the beginning of the dry season while the moon's broad encirclement promises heavy rainfall. IKS is also used to decide when to sow and when to prepare for bad weather (Narvaez, 2020).

In the field of agriculture, rice is 90% of the world's production and consumption in Asia. The majority of rice-dependent people live in Asia. More than half of the world's population consumes it as the main source of sustenance. In 2021, the volume of rice or palay produced in the Philippines amounted to approximately 19.96 million metric tons. This is not surprising since palay, popularly known as paddy, is a staple food in the Philippines (Statista Research Department, 2022).

Moreover, in the Philippines alone, the Philippine Statistics Authority (2020) reported that, on average, a Filipino consumes a total of 118.81 kilograms (kg) annually, equivalent to 325.5 grams of milled rice daily. With a current population of 108.66 million Filipinos, the country's total annual consumption would amount to 12.9 MMT. In the Cordillera Administrative Region (CAR), the yearly average per capita rice consumption was projected to be 125.53 kilograms. Among the provinces of CAR, Kalinga and Apayao registered the most significant consumption of rice per person per year at 166.61 kilograms and 154.88 kilograms, respectively. Benguet had the least rice consumption at 106.44 kilograms (PSA, 2017).

To fulfill the demands of future generations, rice production must be expanded by 70% by international standards (Hossain & Fischer, 1995). By sustaining traditional agricultural practices, such as sustainable resource management for food production and consumption, this can be achieved.

It is often recognized that the CAR has a rich cultural history, ethnic variety, and rice-growing customs. Upland rice is usually farmed in small regions and the highlands where the majority of indigenous people (IP) live, and the varieties grown there are usually associated with a tribe's identity.

For more than two millennia, traditional highland rice types have been farmed in the Cordillera, signifying a rich agricultural legacy that has continued for thousands of years. Slash-and-burn techniques are frequently used as the initial stage of land preparation. Dibbling (*asad*), which is the most common planting technique, is used because upland rice fields are situated on steep terrain. Pesticides are rarely utilized; instead, natural species of bullfrogs and crabs (*agatol*) are used to catch rice pests. Bush or pole sitao are also planted next to one other to avoid rat infestation. Bird scare tactics still include the deployment of a scarecrow (*bambanti*), a slingshot (*palsiit*), and vintage VHS or cassette tape movies. '*Pekkit*,' or the sap of any sticky plant or fruit, such as jackfruit, is used to attract insects and birds. The '*Ani*' technique, also known as panicle harvesting, is used for harvesting (Portilla & Mirandilla, 2013).

Several studies on ethnomathematics have been done around the world; however, culture varies from one place to another. Since diverse natural and cultural surroundings may have comparable reactions, each context has its unique ethnomathematics. Moreover, though few works of literature on the Cordillera culture were found, the researcher argues that there is a paucity of literature specifically for the municipality of Sablan on farming practices. This compelled the researcher to investigate and document the Sablan culture with an emphasis on identifying their ethnomathematics practices related to rice farming. The researcher believes that researching the tribe may greatly benefit residents, who are primarily farmers, in the preservation of the practices. Furthermore, the researcher would like to produce a narrative account of the rice cultivation practices in the locality and identify the ethnomathematics of each practice.

Methodology

The study employed a qualitative research approach, specifically the basic interpretive design since the researcher would like to document the indigenous practices of rice farmers and uncover mathematical concepts embedded in the practices. Basic descriptive-interpretive research design includes social theories and perspectives that support the idea that reality is socially produced or given meaning by how actors interpret occurrences. It focuses on distinctive features, meanings, and interpretations (Banghart & Putnam, 2017) and tells a coherent story that weaves in historical context and theory (Elliott & Timulak, 2021).

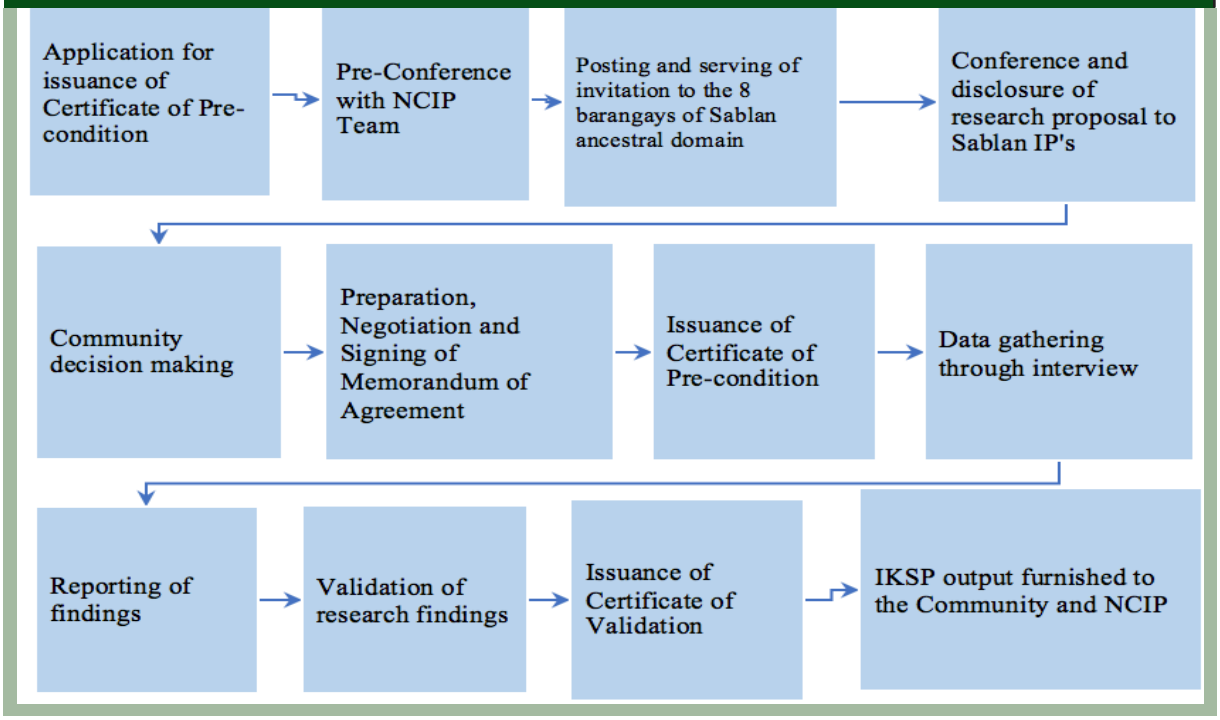
Purposeful sampling was utilized in selecting 16 elders with ages ranging from 65 to 78 from the eight barangays of Sablan who are practicing rice farming and are knowledgeable of the practices in the locality. Also, most of the respondents are the Indigenous Peoples Mandatory Representative (IPMR). Documents and records from the municipality of Sablan served as secondary sources of data and information for the study.

The study was conducted in Sablan, Benguet, a predominantly agricultural community. Vegetables, fruits like pineapple, and root crops such as ube, cassava, and rice are the major crops produced in the locality. Also, a large proportion of the locality is settled by Indigenous Peoples; thus, ethnomathematics on rice cultivation are worth documenting.

A structured type of interview questionnaire adapted from the study of Suayan (2012), which was translated into the Ibaloy dialect by the elders in Sablan, was used to determine the ethnomathematics practiced in the locality. The questions asked sought to identify the ethnomathematics of the rice cultivation practices in the locality. The study aimed to document the ethnomathematics of the rice cultivation practices of the Indigenous Peoples of Sablan. Thus, in compliance with Republic Act No. 8371, otherwise known as the Indigenous Peoples Rights Act (IPRA) of 1997 and National Commission on Indigenous People Administrative Order No.01, s.2012, otherwise known as Indigenous Knowledge Systems and Practices (IKSPs) and Customary Laws Research Documentation Guidelines of 2012, the researcher strictly followed the Free, Prior and Informed Consent (FPIC) process (Figure 1). The process aims to protect the rights and interests of the Indigenous Cultural Communities/Indigenous Peoples concerned. Moreover, written documents about the practices found at the Benguet Provincial Library were also considered secondary references.

Figure 1

The Free, Prior, and Informed Consent Procedure



The researcher employed deductive thematic analysis to analyze the collected data. This approach involves exploring data using preconceived theoretical ideas to challenge, expand, or replicate existing studies (Joffe & Yardley, 2004). The researcher closely examined the data to identify common themes – topics, ideas, and patterns of meaning that come up repeatedly. After transcribing the responses gathered through interviews, the data were then coded. Predetermined themes such as simple counting, ciphering, measuring, classifying, ordering, inferring, and modeling patterns were taken into consideration. D'Ambrocio (1978) had earlier recognized these themes as indicators of ethnomathematics.

Results and Discussion

Ethnomathematics on the Rice Cultivation Practices in Sablan, Benguet

The ethnomathematics on rice cultivation along simple counting, ciphering, measuring, ordering, classifying, inferring, and modeling patterns on the rice cultivation practices in Sablan, Benguet ranges from the preparation of the land to be planted to the drying of the harvested rice.

Ethnomathematics Along with Counting

Simple counting is observed when the farmers count the number of rice seedlings to be planted in a particular land area. The farmer's experiment; will prepare additional seedlings for the following crop season if they notice that there are not enough seedlings.

The same activity is documented in the study of Marleny et al. (2020), where it is mentioned that the counting activity of the locals occurs in calculating the number of seedlings to be planted in the area once the spacing pattern is identified.

Furthermore, the indigenous people consider *pansisinuwasi* (crisscrossing) (Figure 2) in the piling of harvested rice. *Pansisinuwasi* helps the one in charge of bundling remember that one pile is one *tan-ay*. One *tan-ay* (bundle of rice) of rice is usually ten to twelve *daob* or *dakjob* (a combined fistful of rice stalks of two farmers).

Ethnomathematics Along with Ciphering

The ethnomathematics on the practices of the indigenous people in Sablan, along with ciphering include posting of signs that are used to communicate with the other farmers. *Sapsap* (grass sticks), with their tips tied into a knot (*purong*) (Figure 3), are placed around and on the pathways toward the infested field after the ritual called *ëlaw* is performed. *Ëlaw* is a ritual performed when the rice field is infested. They will butcher a chicken and ask the manbunong to do the *madmad*. The *purong* warns the other locals not to enter or pass through the infested farm until *ngilin* or banning is lifted by the leaders.

Performing *ëlaw* represents the community's cultural response to challenges in their rice fields in which they aim to address and mitigate the negative impact of infestations, integrating cultural practices and beliefs with agricultural problem-solving. Additionally, the placement of *sapsap* along pathways and the tying of *purong* knots require spatial reasoning and geometric considerations. Farmers determine distances between *sapsap* sticks, interpret directional cues, and arrange them in a pattern that effectively communicates the warning message.

The *pansisinuwasi* (crisscrossing) of harvested rice during the harvest season is also considered along ciphering as the position of each pile indicates that it is one *tan-ay*.

Figure 2

Pansisinuwasi

Figure 3

Purong

Ethnomathematics Along with Measuring

The indigenous people devised their measuring techniques using what was available in the community and their body parts to ascertain the area of the land and the amount of harvest. The ethnomathematics on the practices of measuring are as follows:

Pasal/Pinasal

During the old times, the indigenous farmers of Sablan did not use instruments to measure land area and the number of seedlings planted in a specific area. Instead, they do the estimation. They call this measuring technique, *pinasal* or the practice of giving a measurement or value of something based on experience. For instance, when a farmer plants a bundle of rice in a specific land area for upland farming, they will conclude that an equal amount of rice will be enough to be planted in a field as wide as the land area for upland farming.

Kinemkem/Kemkem/Iniken

Kinemkem/Kemkem/Iniken is a unit of measurement that is a fistful of rice stalks. Whereas *daob* or *dakjob* is a measurement formed when two farmers combine *kemkem* of rice stalks.

Tan-ay/Tinan-ay is usually ten to twelve *daob* which makes one *tan-ay*. The *tan-ay* of rice is tied using bamboo strips, locals call it *banban*. Furthermore, the helpers are given a certain amount of *tan-ay* of rice. A specific quantity of *tan-ay* is determined based on the number of days they worked.

Figure 4

Kinemkem

Farmers often need to convert between different units of measurement in their practices. This requires them to utilize conversion factors to establish relationships between the units. In their practice, they used conversions such as 1 *daob* being equal to 2 *kemkem*, or 1 *tan-ay* being equal to 10-12 *daob*. For instance, if there were 3000 *kemkem*, the farmer can determine the corresponding quantity in *tan-ay*. Assuming 1 *tan-ay* is equal to 10 *daob*, we can establish the following relationship:

$$3000\ kemkem = \left(\frac{1\ daob}{2\ kemkem}\right)\left(\frac{1\ tan{-}ay}{10\ daob}\right)$$

Simplifying this expression, we will have 3000 *kemkem* equal to 150 *tan-ay*. Similarly, if we use 1 *tan-ay* is equal to 12 *daob*, we will have 3000 *kemkem* is equal to 125 *tan-ay*. Thus, a specific value of the conversion will depend on the conversion factor used.

Ethnomathematics Along with Classifying

Classifying is also eminent in the Indigenous rice cultivation practices of the people in Sablan. They sort the rice harvested according to the time of gathering. These classifications are as follows: *baak*, left-over from the first crop harvested, and *bado*, the new crop harvested.

Also, they classify the rice according to the variety of rice they cultivate and where it is grown. These varieties are *Mavudo, Maltika, Mayok, Saikolot,* and *Shihet*. *Mavudo* is a red, shiny rice with a long tail. It was named *mavudo* because of the tiny hairs in the plant referred to by the locals as *vudo*. This rice is cultivated in the *payew* (field) and takes six months to cultivate. *Maltika*, on the other hand, is a variety of rice that is white. It is grown in the field and takes 4 to 5 months to cultivate. *Mayok* is another variety of rice that is white. It is cultivated in the field and takes 6 months to produce. *Saikolot* is the only rice type that is cultivated in the *bangkag* (upland farming). This type of rice is color red and has black hair. This type of rice is usually used in making tapey. They also cultivate sticky rice called *Shihët*. It is cultivated in the field. It has two types. First is the *Balatinaw*, which is violet in color, and *Bongkitan* which is white.

Barangay Pappa, Bagong, and Bayabas used to cultivate rice in the upland farming; however, caused by the need to change to agricultural products, they shifted to planting vegetables such as Baguio beans, tomatoes, bell pepper, pechay, and the like. Currently, only Barangay Bayabas is still practicing upland rice farming.

Rice varieties can be seen as elements within a set; thus, can utilize the principles of set theory to categorize them. Set theory enables us to establish criteria for classifying rice varieties into distinct subsets or classes based on their characteristics such as their color, length of cultivation, and geographic origin. This approach allows us to define the qualities that differentiate one rice variety from another and enables a systematic approach to organizing and understanding the various types of rice.

Ethnomathematics Along with Ordering

The systematic procedure in rice cultivation practices in Sablan, Benguet exhibits ethnomathematics along with ordering. The following were noted as ordered in rice cultivation: seedling preparation, land preparation, transplanting, pest control, harvesting, and drying and sorting. Along with each step in rice cultivation, there are also procedures identified in performing them. For rice cultivation in the rice field, the procedures are as follows:

Seedling Preparation

When growing rice in the field, farmers first prepare the seedbed by plowing. After preparing the seedbed, the rice seeds are soaked in the water for 18 hours. Once everything is ready, they *bunubun* the seeds on the seedbed and cover them with *sapsap*. The method is known as *memunubon*.

Land Preparation

If roots have emerged from the seeds, the farmer will begin to prepare the land by plowing it with an *arasho* (plow) pulled by a carabao. The farmer will then drive the carabao back and forth over the field to the soil. Locals refer to it as *mengarasho*. Softening the ground is a necessary step in getting it ready for planting. The farmers then fill the rice paddy with water and utilize a *saloysoy* (harrow), a carabao-drawn plow to soften the soil. Once the rice paddy is ready, the seedlings are now planted.

Transplanting

Manda-ëp is the name of the planting procedure. Certain parts of Sablan use the word *mantunëd*. The *bunubon* is uprooted from the seedbed and planted in the rice paddies. The farmer ensures that the rice paddies are clean and weed-free before planting the *bunubon*. A farmer may plant two or three seedlings together, depending on the size and height of the individual seedling.

Pest Control

After two months of sowing, farmers clear the weeds that have sprouted in the rice paddies (*kamas*) and then clean the slopes of the fields (*dang-dang*) to prevent pests from eating the rice. Also, the weeds removed are buried in the mud which turns into fertilizer when they decay.

Harvesting

As the palay is ready to be harvested, a little sickle called a *shahëm* is used. The locals refer to this technique as *pan-ëni*. The farmer holds the *shahëm's* (Figure 5) handle, while the blade is placed between the middle finger and the index finger. The farmer separates the flag leaves from the rice before cutting the rice panicle one at a time.

Drying and Storing

After harvesting and bundling the rice, the locals put it on a *daktang*, a bamboo platform shaped like a table that was constructed next to the rice fields. It is lighter to carry as it has been dried. A *sakwil*, a bamboo bar with slightly pointed ends, is used to transport the dried rice to the *alang* (granary).

Figure 5

Shahëm

Cultivating rice in upland farming follows a different procedure in the preparation of land and seedlings, planting, and pest control. These procedures are as follows:

Land Preparation

The land preparation starts with clearing the forest for kaingin. This process is called *më'nguma*. Before burning the grass, the surroundings are being cleared to prevent the fire from spreading. Such activity is called *kinihinan*. Other parts of Sablan call it *shaikan*. To completely clear the area, the farmer then burns the total area. Locals call it *më'muol*. After burning, the farmers then do the *ngëp-ol* which is removing unburnt wood.

Planting

Unlike the palay cultivated in the field, the *palay* planted in upland farming is directly planted. They use pointed wood to plant the seeds. It is called *ësad*. They remove the weeds that have sprouted after two months of sowing to prevent pests from eating the rice. Locals term this process as *mandëmon*.

Harvesting

A little sickle called a *shahëm* is used when harvesting the *palay*. This method is referred to as *pan-ëni* by the natives. Before cutting the rice panicle one at a time, the farmer removes the flag leaves from the rice to prevent the grains from falling.

Drying and storing

To dry the harvested palay, the bundled rice is placed in the *daktang*. When it is completely dry,

it is stored in the granary.

The success of rice cultivation greatly depends on how the process of cultivation is done. Performing certain tasks in a specific order is necessary to get the maximum yield. This idea of order and sequencing is not just relevant to rice farming; it is also found in mathematics. Arithmetic and geometric sequences, as well as the order of mathematical operations, are examples of situations in mathematics. Similar to how mathematics highlights the need to carry out computations in a particular order, rice farming requires that the sequence be followed appropriately to ensure efficient cultivation and an abundant harvest.

Ethnomathematics Along with Inferring

The activities of the indigenous farmers of Sablan in cultivating rice also exhibit inferring along with inferring. When events occur because of inference for indigenous people in Sablan, they become true for them and eventually become a part of their culture and beliefs.

Certain periods were used as guidelines for planting, harvesting, and other agricultural activities. Natural signs observed in the environment play a significant role in determining timing. Farmers observe and interpret signals from nature. The blooming of certain plants, or the arrival of migratory birds, can be used as indicators of season.

As for the indigenous people in Sablan, the appearance of a particular *manmanok* or bird such as *uwak* or *kiling* implies that *panag-ooran* (rainy season) is coming. The appearance of the *kiling* is associated with June which is the start of the rainy season. This signals the local farmers to prepare the seedlings and land for planting. The appearance of *këdang* (earthworms) implies that they are expecting *puwëk*. (typhoon). Also, the appearance of *dul-duli* suggests that there will be no rain, which is associated with March, the start of summer.

Another activity in conclusion is observed by the Sablan farmers in harvesting rice. When the rice grains turn yellow, it is *ëduwem*, a term used by locals for ripe products that are ready for harvest.

Aside from these practices, the indigenous people of Sablan also have beliefs related to planting rice where inferring is also applied. These observations are proven to be true and eventually became part of their beliefs.

Dëbën/Pi'jëw

The locals practice *ngilin* on the day of burial and the day after. Farmers are prohibited from working in the field during those days as it would result in no harvest. The community's decision to limit danger is by not working in the field during the burial period. They presume that laboring in the fields during those times would bring bad energy or upset the natural order, which could result in a bad crop or other unfavorable events. The community exhibits an awareness of risk mitigation, a notion that can be associated with mathematical decision-making, by avoiding the perceived risks connected to working during the burial.

Mëngisuwek

Before the helpers plant the seedlings, the owner should plant the first few seedlings. The indigenous people believe that in doing this practice, they will not run out of seedlings (*maëshëk e semilja*), finish the work immediately, and the crop will yield an abundant harvest. In this practice, the concept of optimization can be associated. It involves finding the best solution for a function while considering constraints. In this case, the goal of the farmers is to have an abundant harvest. The limited availability of seedlings and the need to complete the work promptly are the constraints. Having the owner plant the first few seedlings optimize their use strategically allocating the resources to ensure that the seedlings are used efficiently.

Shuwëm

Another interesting activity of the indigenous farmers in Sablan is the *shuwëm*. They gather a portion of the rice field and put it above the fire (*ibanag*) believing that the rice in the field will ripen at the same time. Their belief that heating a portion of the rice field will cause the remaining rice plants to ripen at the same time can be associated with the concept in statistics, where the behavior of a sample reflects the behavior of the whole data set.

While these practices may not be explicitly grounded in mathematical concepts, they can still incorporate mathematical elements indirectly, as they may involve empirical observations, data gathering, and the application of practical knowledge.

Ethnomathematics Along with Modelling Patterns

Patterns are observed in the techniques of how they plant the seedlings. The indigenous people of Sablan do the transplanting of rice in two methods: random and straight method (*pinaltengan*). In the random method (Figure 6), the seedlings are planted without a definite spacing between the seedlings. This type of method is usually done by the younger ones who are not used to planting.

Pinaltengan, on the other hand, is usually done by those who are already experts. The indigenous people say that it is easier to do *kamas* (weeding) if the rice is planted in a straight method. Plant spacing is an important factor in transplanting rice. Given the variety of rice varieties available to the farmer, the distance between rice seedlings should be considered, (Talango, 2010; Banao, 2005).

In the straight method of planting patterns, geometric concepts are observed. The mathematics concept observed in this pattern is the undefined terms – points, lines, and planes. The planted rice represents points, and it forms a line. The rectangular figure formed by the planted rice spacing also applies the plane concept. The lines created by the planted rice also form parallel lines.

Figure 6

Random Transplanting Pattern

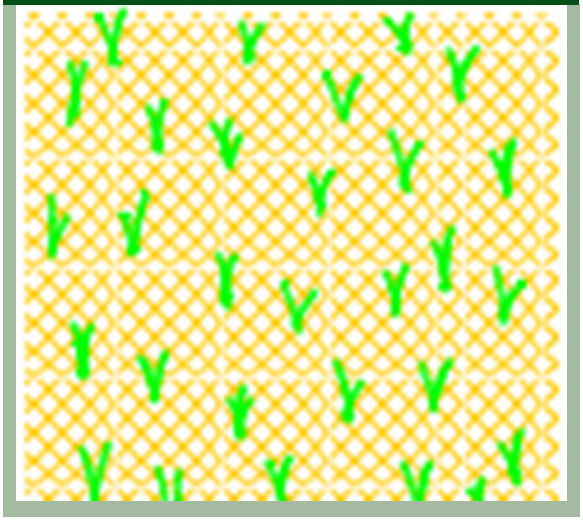
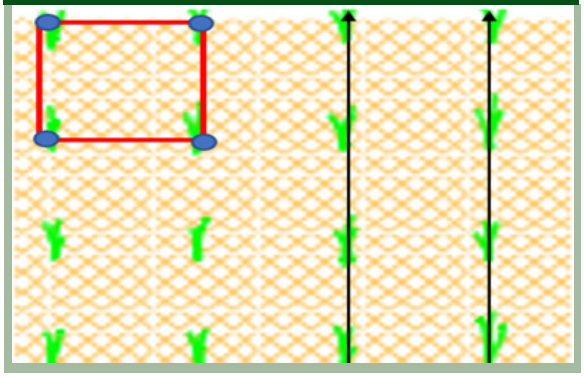


Figure 7

Points, Lines, and Planes Illustrated in the Inaltengan Pattern



Aside from the patterns observed in how they plant the seedlings, geometric concepts are also evident in the designs of the *alang* (granary) walls where they store the rice. The sidewalls are made of woven *bolo* (bamboo). They call this tidied. These walls are not only used in the granary but also in the old houses of the indigenous people.

There are several versions of the weaving patterns for *tidtid* (Figure 8). The weaving pattern is done by alternating one slice of dried bamboo lifted and two slices are inserted. These patterns were chosen because they were considered neat and tight and bar pests from entering.

The woven bamboo follows a pattern in such a way that it will look neat and will not be easily deformed. With mathematics, the pattern formed in the weaving of *tidtid* illustrates geometric concepts such as congruency and geometric transformations: translation, reflection (Figure 10 & 11), and rotation.

In the illustration, the pre-image A has moved four units to the right, producing now the image A' (Figure 9).

Figure 8

The Concept of Congruence Illustrated in the Titid

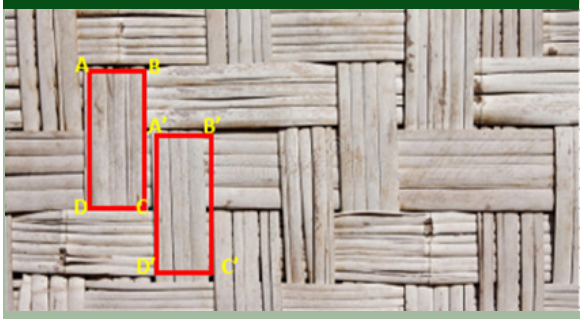


Figure 9

The Concept of Horizontal Translation Illustrated in Tidtid

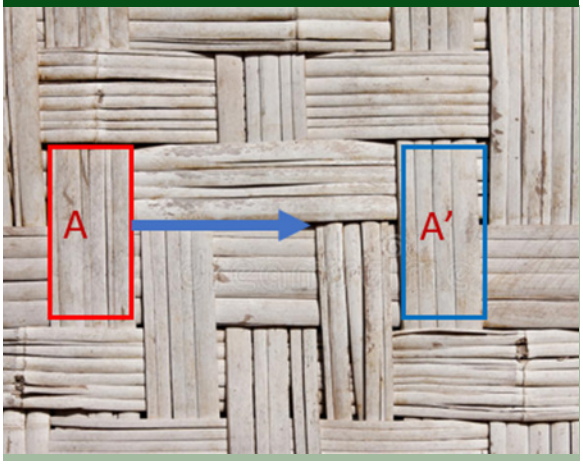
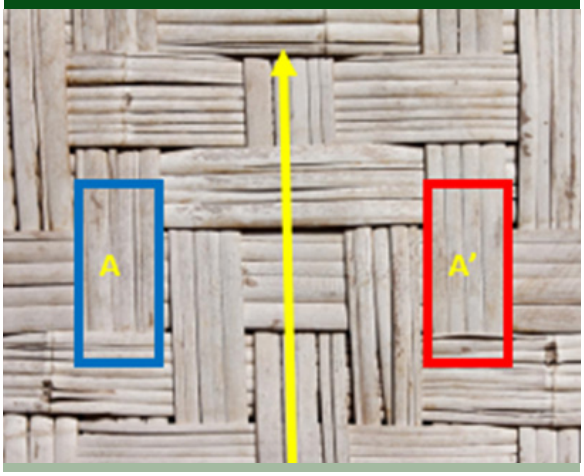


Figure 10

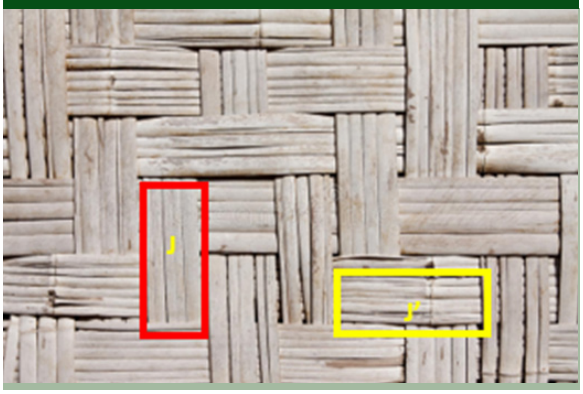
The Concept of Reflection Illustrated in Tidtid



Another modeling pattern observed in the weaving of *tidtid* is reflection. Reflection is the process of reflecting each point of building the geometry against a predetermined line. The line is called the mirror axis or symmetry axis.

Figure 11

The Concept of Reflection Illustrated in Tidtid



Conclusions

The rich culture of rice cultivation of the people of Sablan, Benguet manifested ethnomathematics concepts along with counting, measuring, ciphering, inferring, classifying, ordering, and modeling. These concepts were present from the cultivation of the land to the harvesting of rice crops and even in storing their harvest.

Recommendations

Considering the findings of the study, it is recommended that documentation of other indigenous practices may be done as a way of preserving the culture and the early practices. The identified ethnomathematics on the rice cultivation practices may be incorporated in teaching math concepts and educators may incorporate culture and practices in designing learning materials, lesson planning, and teaching and learning activities of learners.

Additionally, the researcher recommends the continued preservation of the Sablan Indigenous Knowledge Systems and Practices (IKSPs) through further research and proper documentation.

Likewise, the community is encouraged to participate in school activities and programs related to IKSPs such as culminating activities of Indigenous Month in which elders such as Indigenous Person Mandatory Representative (IPMR) can be invited as speakers.

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