

Understanding Traditional Concept of Weights and Measures by the Nagas

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Abstract: *Measurements have been an essential part of human lifeways since the dawn of civilization. Before the introduction of the standard metric system, there were various measurement units used by different communities for various purposes. Likewise, tribal people also use their own convenient units for measurements. Traditional Naga communities resort to available resources like fingers, stretched palms, hands, bamboo, reeds and baskets of various sizes as units of measurement used for their everyday activities. Many aspects of such traditional concepts also have social and cultural values which reflect a lot on the past ways of life of the Nagas. This paper is an attempt to highlight the traditional knowledge and methods of measurements practised by the Nagas.*

Keywords: traditional, measurements, length, weight, volume.

Measurement has been essential in human life since the dawn of civilization. Before introducing and developing the standard metric system, different communities practised various units of measurement. Tribal societies are well known for their traditional knowledge system. Traditional Naga society also employed a wide variety of measurement concepts. Nagas, like the rest of the tribal communities around the world, have preserved distinctive understandings rooted in cultural experiences that guide relations among human, non-human, and other-than-human beings in specific ecosystems. Even in the simplest form, measurements have always been part of Naga culture.

Nagas' culture, measurement system, and mathematics relate to each other. All these have manifested into the broader frame of the traditional knowledge system of the Nagas. Sumardiyono¹ states that the objects of mathematics are social-cultural-historical, meaning, mathematics and learning are common property of all the people. Therefore, mathematics has always been part of human culture, even in the simplest form, which means that culture and mathematics relate to each other. This can also be explained through the arguments set by William D Barton² where he argues and brings the term 'ethnomathematics' as a field of study that examines the way people from other cultures understand, articulate, and use concepts and practices, which are from their culture. All these can be described as

mathematical usage by the tribal communities. Thus, mathematics can have different shapes and be suitable for each culture. The result of this study is a form of units of length, area, and volume in Naga society and its mathematical implications. Traditional Naga society uses typical units obtained traditionally. All these can be used as a reference to develop learning materials of contextual mathematics based on local culture.

Based on preliminary studies, one cultural activity the Naga society does is the measurement concept. In measuring activities, Nagas use a unique length, area, and volume unit. Therefore, this study aims to uncover units of length, size, and volume used by Nagas. This paper attempts to study the traditional knowledge and method of different weights and measures practised by the Nagas. The main objectives of this paper are 1) To find out traditional knowledge and method of weights and measures and 2) To understand the socio-cultural value of these aspects and knowledge centres in early Naga society and the change.

Study area

The State of Nagaland lies on the easternmost side of North East India. It has an area of 16,579 square kilometres⁷. The state lies between 93°21' to 95°15' E longitude and 25°6' to 27°6' N latitude, and it is bounded by Assam in the west and north, in the north-east by the district of Arunachal Pradesh. The southern boundary is shared with the state of Manipur, and on its eastern side, it shares the international border with Myanmar. Nagaland is divided into eleven districts: Dimapur, Kohima, Kiphire, Longleng, Mokokchung, Mon, Phek, Peren, Tuensang, Wokha, and Zunhebhot. More than 14 significant tribes inhabit the state, namely Angami, Ao, Chekassang, Chang, Khiamnuingan, Kongyak, Lohar, Phom, Pochury, Rengma, Sumi, Sangtam, Yimchunger and Zeliang.

Till the British occupation of the Naga Hills in 1866, as the district of Naga Hills, under Assam, Nagas were leading an independent life. All activities were based on traditional methods, which were simple yet logical and precise. Measurements played an essential role in conventional Naga society. Many Naga activities required accurate measurements, which were well-accepted in the community. However, in the absence of prevailing standard units, Nagas resort to available resources like fingers, stretched palms, hands, feet, the length of a traditional bamboo or reed, bamboo baskets, etc. as units of measurement. These measurements became the codified units of size in society.

Each Naga village is unique and has a beauty of its own. One must pass through rivers, streams, forests, and hillylocks to reach these Naga villages. When walking down the mountainous villages, one can also see the *Jhum* fields, forests, and rivers. Almost all Naga villages are surrounded by the natural environment. The life principle of Naga society is to live with nature and make use of such resources in its everyday activities. This is evident from Naga society's efforts to preserve character. Nagas are versatile artisans, leaving an impression of ethnicity on most of their objects of

everyday usage. The traditional Naga house comprises wood, bamboo, mud, and thatches. Walls are made of bamboo splits, wooden poles plastered with mud and roofed with thatches. The Nagas are the most expert and resourceful in beautifying almost every single article they use daily. Crafts items like *dao* handles, walking sticks, baskets or mats, attractive patterns etc, took a lot of time to make such with delicate enterprises¹. Crafts like woodwork, basketry, pottery, and weaving not only had a sense of beauty, but it was a way of life of self-dependence which was made with accuracy in its measurements as well. For all these, measurements were well laid out and carried out with accuracy using the available resources.

Methodology

Modern education for the Nagas came only during the 19th century when the region was annexed and brought into colonial rule. From then, the local languages began to be transcribed using the Roman script² (Aier, 2012:227). What was before is just word of mouth, passed on from generation to generation. Since written records are not available on this matter, primary data were collected from three Naga tribes- the Ao Naga, Angami Naga, and Phom Naga, by interacting closely with people from these tribal communities and recording the various traditional practices related to weights and measures. There was no structured interview schedule, and questions were posed depending on the situation and nature of the interaction. Also, wherever measuring objects were available, photographic documentation was done.

Different measurement units of the Nagas

The study presented in this paper was undertaken to get insight into the units of weights and measures practised by traditional tribal communities of Nagaland. It is noticed that they used different units of measurement for different purposes, which can be roughly divided into three categories:

1. Measurement of length
2. Measurement of liquid
3. Measurement of solids
4. Measurement of length

Nagas used different units for length measurement depending on the length of an entity they wanted to measure. The units can be very short, short med, mum, or very long units of measurement. For most of the measurements, parts of the human body were used. Nagas use their fingers, palms, or figures to refer to very short lengths like the height of a step, the thickness of a wooden strip, the breadth of a pit, etc. For the construction of houses or any other measurements requiring tiny measurements, they use their fingers to denote lengths or breadths of objects they handle. Conventionally, the index and middle finger length is taken as a unit. If the distances are smaller, a finger size or if it is much smaller, the side of the fingers or a thumb press are used as units. For even smaller distances, the

side measurement of the index finger is used as a unit. This unit is often used to tell the width of a wooden strip, bamboo strip, etc. However, if it is even smaller, the dark line inside the nail (accumulated dirt after work on the pin) is also taken as a unit of measurement.

Some very short and short distance measurements using the fingers by the Nagas are as follows (Fig.1):

Udzietse keteide (U-our, *dzietse*- nail, *ketei*- black, *de*-equal) (Angami) Measurement equal to the black line of the nail.

Meyonglen (Ao) Measurement of one finger from side-ways.

Meyongnem (Ao) *Lakjangthet hük* (Phom) Measurement of one finger from its base.

Dziekriine (Angami) Measurement of the size of a thumb press.

Yongna (Ao) *Lakjangthet nyi* (Phom) Measurement of two fingers.

Yongsem (Ao) Measurement of three fingers.

Kapu (Ao) *Dziezhüine* (Angami) *Lakfabap* (Phom) Measurement of palm size (Measurement of all the fingers together).

Küpza (Ao) *Pfödzü* (Angami) Measurement from thumb to forefinger.

Aka (Ao) *Khamha* (Phom) *Pfücha* (Angami) Measurement from thumb to middle finger.

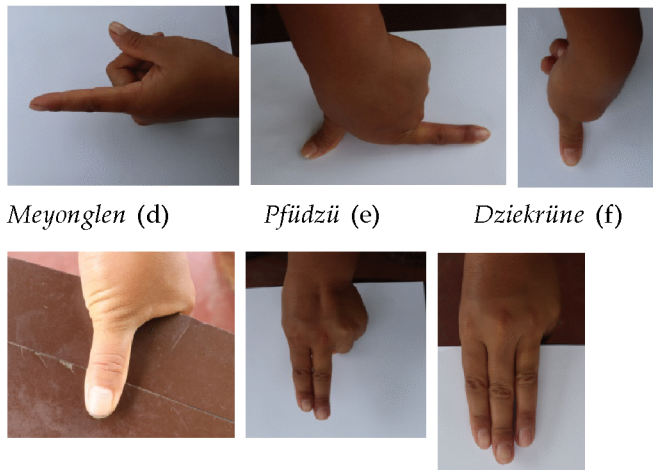
For the measurement of short and medium lengths, various body parts of the human body were used, which consisted of the cubit, i.e., the distance from the elbow to the tip of the middle finger, an averaged man footprint, the width from the mid-chest till the middle finger, the width of both arms stretch and the distance of both the legs stretched were some human body measurements customarily used and accepted. If the villagers have to refer to medium distances, they refer to units like 'stone's throw distance' or 'calling/hearing distance'. The team of calling distance is used if one is referring to a person or an animal from a distance. Also, calling distance is the distance covered by a loud voice produced by a person. Suppose a person is standing from where they can hear the audible voice; they are stated to be located at calling distance. The other unit of stone's throw is used if the distance of an animate object is to be mentioned. It is equivalent to the distance covered by a stone thrown by an ordinary man with a normal force. Some distances are too far, and cannot be measured beyond human measurement. However, tribal people do not need to estimate the distances between interstellar objects. For example, they never need to tell the distance between the sun and the earth. Whenever they refer to this distance, they say that the sun is located at a very long distance, immeasurable, from the planet.



Fig.1. *Lakfabap* (a)

Khamha (b)

Lakjangthet hük (c)



Meyonglen (d)

Pfüdzü (e)

Dziekrüne (f)

Udzietske keteide (g)

Yongna (h)

Yongsem (i)

Fig.1 (a-i): Very short and short distance measurements using the fingers by the Nagas

Some of the measurements using the body by the Nagas are as follows (Fig.2):

Phu (Angami) Measurement of both the thumb fingers stretched and the palms together.

Süklep (Ao) *thu* (Angami) *Veihang* (Phom) Measurement from elbow to the tip of the middle finger.

Phizho (Angami) Measurement of a footprint.

Phiyha puo (Angami) Measurement of one step by foot

Ubou chie (Angami) Measurement from arm's length (arm to the middle of finger)

Kuzükmamid (Ao) *Jaafi* (Phom) *Chierha* (Angami) Measurement from middle chest to middle finger tip.

Am (Ao) *Chiepuo/Chiete* (Angami) Measurement of the full length of both arms stretches from one hand to the other. Approximately 6 feet.

Rangdong (Ao) take picture measurements consisting of two arms. It can also be the measurement of the length of a normal reed or a bamboo stem also known as *Whuorie Chie* (Angami)- Length of a bamboo stem. Approximately 12 feet.

Ka puo (Angami) Measurement of a long step by foot.

Capuo (Angami) One stretch of both legs.

Lungzük (Ao) *Yongshük* (Phom) distance of a stone throw or measurement of a stone throw.

Cha pthi puo (Angami)- one reachable distance of footpath.

Kengu chie (Angami)- visible horizon.

Ongrang (Ao) *Mükyangneshom* (Phom) immeasurable. It is too far away. The distance cannot be measured or beyond eyesight which is too far away.

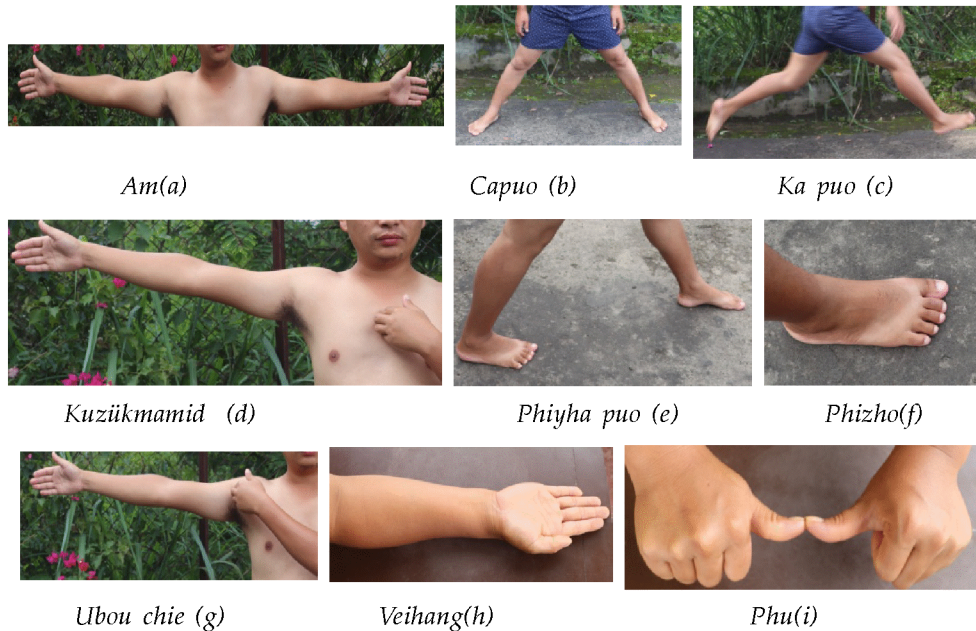


Fig.2 (a-i): Measurements using the body by the Nagas.

Measurement of liquid

The two most essential liquids used in traditional Naga society were water and rice beer. Thus, when it comes to liquid measurement, it was mainly for these two. Liquid measurements were not complex, and the smallest unit was a sip - *Meprie puo* (Angami Naga) or the amount of an empty eggshell- *entsürep ka* (Ao Naga). The most accepted units for the measurement of liquids were bamboo cut out into various sizes and baskets of different sizes. Sometimes, earthen pots known as *mori* (Ao Naga) were also used for more significant amounts. Dehydrated matured gourd, known as *koda* (Ao Naga), *vahie*, and *shü puo* (Angami Naga) was also used.

Some of the liquid measuring units are as follows (Fig.3):

Entsürep ka (Ao) An empty eggshell full.

Meprie puo (Angami) One sip.

Koda (Ao) *Vahie puo* (Angami) Gourd ladle full, one gourd for 1 person.

Shü puo (Angami) One large gourd, serving in group.

Marok (Ao) *Shongkuk* (Phom) *Hie puo* (Angami) is a mug made of bamboo used for an individual drinking purpose- a cup full, about a hand measure.

Shongküp (Phom) *Tzüpong* (Ao) *Zutse puo* (Angami) Bamboo jar, used for drinking wine- individual. However, the Ao Naga *Tzüpong* is also used for washing hands before eating.

Maroklang (Ao) *Yungshong* (Phom) Bamboo jar for water, A jar full. This Jar is used to fetch water from the pond and will have a handle.

Shipa (Ao) *Leitei puo* / *teiphinuo* (Angami) These are rice beer container baskets made out of the fibre of bamboo. Banana leaves and others are used to hold the leakage of the liquid. This basket is used for making beer and bamboo shoot water by the Ao Nagas.

Mori (Ao) Hamdüik (Phom) An earthen pot full for storage- usually wine (around 3 ltrs).

*Entsürep ka(a)**Hamdüik(b)**Koda (c)**Shü puo(d)**Maroklang (e)**Shongkuk (f)**Tzüpong(g)**Fig.3 (a-g): Liquid measuring units by the Nagas*

Measurement of solids

Since early Naga society was rice-based, measurements of solids were mainly for rice and other dry commodities. Bamboo baskets of various sizes were used for the measurements of solids. Each basket had a specific size with a standard height, which was unanimously accepted and used. Unlike the bulk of lengths, the human body was not used to measure solids. The only usage of the human body is the *Dzielhi* ($\frac{1}{2}$ palm full) by the Angami Naga, one of the minor units of solids measurements. Thus, the human body provides no such easy approximations as for length. Also, the solids measurements were more varied and detailed than the liquids' height. This can be because of rice's importance and widespread usage in society. However, it was also used for the size of cereals and pulses.

Some of the solids measuring units are as follows (Fig. 4):

Dzielhi (Angami) $\frac{1}{2}$ palm full.

Jangrih (Ao) Jangkloh (Phom) is one of the smallest measuring baskets used for measuring rice while cooking. It is woven in the size of an average man's toe which is equivalent to a normal tea cup or 250 ml.

Jangkhu or *akhu (Ao)*: A measurement basket to take out rice from the rice container.

Süra molok (Ao) Small basket. This basket is around 8 inches on all sides and 3-4 inches deep, this basket is used for everyday purposes. It is used even during weaving by women to pass on the thread as well as Zharha

(Angami) a small measuring basket.

Yoktsa Molok (Ao) A basket bigger than *süra molok* or *Rhajü* (Angami) a measuring basket (equivalent to two *zharha*)

Purama (Ao) *Mühdow* (Phom) Medium size basket. (*purama* is half of a *pua*)

(*Rama-* divided, *pura-* measure of a mat fill to dry, spread. It is a basket woven to carry 5 to 6 kgs of rice)

Pua (Ao) A basket full, capable of spreading over a medium mat for dry rice, two *purama* equals a *pua*.

Yimchi (Ao) *Goo* (Phom) Con-shaped basket used for carrying paddy.

Tsüngken molok (Ao): Big basket.

Musem (Ao) *Anshok* (Phom) the small four-corner container woven of bamboo 4 feet tall and 8 feet wide used for storage of separate paddy. Big basket used to store rice.

Ao's have a bigger basket which is a very big container called an *Aning* which is a big bamboo basket. It is not woven like other baskets. The four sides are woven separately as thatched walls. These are very big paddy storage.

Chüdi (Angami) is similar to Ao *Aning*- a big storing basket

For the Phom's who are well known for their basketry work not only one but three varieties were used. Such as:

Kukhashok (Phom) the medium-sized corner container of woven bamboo of 2 feet tall and 12 feet wide further height is extended by 3 ft size mat for more storage kept in the Granary house

Hapüanshok (Phom) the big corner containers woven of bamboo 2 feet tall and 15 feet wide, further height is extended by 3 ft mat for more storage of paddy kept in the granary house.

Pünyipüan shok (Phom) is Comparatively much bigger than that of the above 3 containers height 3 feet and 20 feet wide, further, its height is extended by a 3 ft mat, these are mostly used only by a rich family.



Hapüanshok(a)

Jangkhoh(b)

Jangkhu(c)

Kukhashok(d)



Mühdow(e)

pua(f)

Pünyipüan shok(g)

*Tsüingken molok(h)**Goo(i)**Yoktsa molok(j)**Süra molok(k)**Fig.4: Solids measuring units of the Nagas*

An investigation of the traditional measurement concepts of the past is of no minor importance because of its close relationship to the economy and culture, and, in particular, to methods of trade, systems of land tenure, and patterns of social life, as well as modes of thought in general.⁶ Many aspects of Naga traditional society concern the weights and measures knowledge system. Traditional Naga society was a rice rice-based society. Almost all the activities centred on rice and its cultivation. It was the essence of life for the Nagas, interwoven in its tradition, folklore, ritual, and everyday practices. Measurements were thus influenced by rice, where the sizes of solids and liquids were mainly for rice and rice beer, even though other grains and essential commodities were also used. Besides rice, bamboo, and wood also shaped the economy because of their accessibility and availability. Right from the construction of a house to the smallest object used in a household, it was made of these two materials. Thus, bamboo played an essential role as a unit of measurement for the Nagas as well. Baskets and cups of various sizes and shapes made of cane and bamboo were the accepted units of measurement. The multiple baskets made of cane and bamboo also reflect the art of basketry by the Nagas.

Though the physical difficulty of measuring commodities without actual standard weights or measures could have led to an atmosphere of imprecision in which there might have been improvisation, there was an accuracy that the society adhered to. Without an advanced measurement system, what the traditional culture practised offered practical, accessible, standard (generally agreed upon) conversions between units of length, weight, and capacity based on some assumed average density of a particular item. Interestingly, certain measurements were similarly associated with specific commodities for the Nagas, one measure being used, for example, for grain and another for liquid. The size of measures depended on their contents, the volume of a given unit of rice beer being, for instance, different from the same rice team.

Measurements based on the human body practised by the Nagas can also be compared with the modern metric units and mathematics. The measurements practised by traditional Naga society had accuracy, were not randomly made and met the essential needs of the traditional society. Measurement practices by the Nagas, for example, the *süklep* (Ao Naga)

which is the measurement from the elbow to the tip of the middle finger as equivalent to foot and the *kuziikunniid* (Ao Naga) the measurement from the middle chest to the pointing finger to a meter. Even the *Udzicise ketide* measurement of the Angami Nagas when we compare it with modern metric scale is equivalent to a millimetre. Thus, traditional Naga society though not an advanced society with simple ways of life, adhered to some certain degree of mathematical precision.

The centre of learning traditional knowledge

Traditional Naga society had its system of education, which garnered the needs of the people. It was based on the values of traditional customs and cultural norms. The conventional education system socialized young adults to build strong tribal and clan identities.⁷ Such traditional institutions taught without a syllabus or any aided text, through word of mouth, passed on from generation to generation through actions and practices. These learning institutions of Nagas are signs of maturity of the people and their culture. Hence, it would be incorrect to say that Nagas had no idea about the ways of life and received no education before the British occupation and contact with the missionaries or before the introduction of modern education. One of the most significant features of the traditional social organization of the Nagas is the institution of learning and teaching institutions or dormitories. It was a requirement that every Naga village should have a well-organized *Morung* for the males and several female dormitories, which served as vital social institutions of growth and survival of Nagas' religion and culture. Most of the social activities and teachings revolved around these dormitories. It was a place of holistic development where proper habits, manners, and discipline were taught, adequate moulding of the young's personality, and all-around education in social, traditional knowledge, religious, educational, and cultural activities took place. Until the advent of the British administration and the Christian missionaries during the 19th century, which transformed Naga society, the *Morung* and female dormitories remained a place for political, social, and cultural education.

By the end of the 19th century, the traditional practices- folk music, folklore, folk dance, festivals, and many other social activities- were considered part of the animistic society and purposely undermined.⁸ Thus, the traditional methods or practices of measurements changed with time due to the introduction of the modern metric system through modern education and outside exposure. Instead of using traditional units, people in Naga society prefer to use standard weights. Scales and tapes are used instead of the palm standard weights instead of baskets, etc. Thus, the traditional knowledge of weights and measures is a fading tradition, especially for the younger generations, who must be made aware of such practices in society. However, an understanding of traditional knowledge of weights and measures is vital. It reflects a lot not just on the culture and economy but also on the thoughts and lifestyles of the early Naga society.

These knowledge systems are part of the socio-cultural heritage of the Nagas, and such an understanding will enlighten us with better knowledge of the past economy and lifeways. The results of this study can be used as a reference to develop learning materials of contextual mathematics based on local culture. What we need is to realize the traditional ways of life and move forward without forgetting one's unique identity and preserving it with the change in time.

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