

***NUKEN*¹: HOW THINGS BEING MEASURED²?**

NUKEN: BAGAIMANA BENDA DIUKUR?

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Abstract

Orang Ulu settlements in upper river and its tributaries of Belaga were once so remote and hardly accessed by outsiders. Inaccessibility for traders to penetrated the area has caused absence of economic activities thus hindered the standard measurement system to be used in quantification, transaction, product valuation and labour exchange in the region during that time. Thus, this paper discusses how Orang Ulu measured things using objects they have made purposely and unpurposely as gauges in the past and how figures obtained from the measurement imply to productivity, value and exchange in their daily transactions and routines. The discussion also includes the traditional measuring methods used in some of their utilitarian objects production in quantifying raw materials to estimate resources and to determine size of finished objects. The main reason for doing so is to draw attention and share this knowledge with others on Orang Ulu's technology of arithmetic and scientific thinking applied in their traditional measuring system in objects production, trade and exchange among these Central Borneo natives.

Keywords: *Orang Ulu, material culture, measuring systems, traditional gauges, exchange*

¹ A Kayan term for measure.

² This paper discusses results based on my study of Orang Ulu material culture and highlights findings on related subject from other researchers done elsewhere previously.

Abstrak

Penempatan Orang Ulu di hulu sungai di kawasan pedalaman Belaga dahulunya amat sukar didatangi oleh orang luar. Ini telah menyukarkan para pedagang terutamanya menembusi kawasan tersebut untuk menjalankan aktiviti ekonomi sekaligus menghalang penggunaan sistem ukuran piawai untuk mengukur and menyukat kuantiti bagi tujuan transaksi, pertukaran barangan dan perkhidmatan pada ketika itu. Justeru, makalah ini membincangkan sistem pengukuran tradisional yang pernah digunakan dalam kalangan masyarakat Orang Ulu. Ini termasuklah peralatan yang mereka buat khas dan objek sediaada yang digunapakai untuk menyukat. Makalah ini juga turut membincangkan bagaimana Orang Ulu memanfaatkan hasil ukuran dan sukatan sebagai penanda aras dan indikasi kepada produktiviti, nilai dan pertukaran dalam urusan transaksi dan rutin harian hidup mereka. Selain itu, makalah ini juga menerangkan kaedah ukur dan sukut dalam pembuatan objek utilitarian mereka dalam membuat anggaran keperluan sumber bahan mentah dan saiz objek. Tujuan utama perbincangan ini adalah untuk memberi tumpuan dan berkongsi pengetahuan mengenai teknologi aritmetik dan pemikiran saintifik Orang Ulu dalam sistem ukur dan sukut tradisional yang digunapakai dalam proses pembuatan objek, urusan jualbeli dan pertukaran.

Kata kunci: *Orang Ulu, budaya benda, sistem ukur, tolok tradisional, pertukaran*

Introduction

Belaga is home to Orang Ulu such as Kayan, Kenyah, Bhukat, Penan and many other subgroups. The groups of people were once living upriver and deep in the jungle; so remote that they were not easily reachable by traders. Inaccessibility to traders has hindered economic activities which consequently also forbid universal measuring system being practiced among the communities. Despites all that, Orang Ulu in Central Borneo have had their own self-sufficient economy where most foods and other commodities produced themselves either by farming or collecting form the forest. This somehow prevented them from being too dependent to traders for live necessities. In spite of this, they have developed and exercised their own measuring principal that suit their culture, accepted by the whole communities among them; to quantify,

perform daily transactions, product valuation and exchange of goods and labour within the region.

In the past, Orang Ulu involved predominantly in swidden farming and hunter-gathering as their main subsistence activity, thus this paper focuses on measuring system used by Orang Ulu in relate to paddy or rice and jungle produce such as rattan as these were the most important commodities in their subsistence and economic activities. The paper discusses the traditional gauges and methods used by the Orang Ulu communities to measure and how they make use of the figures in determining value and exchange in daily transaction as well as a production indicator.

Orang Ulu Principal of Measurement

Orang Ulu used some principal measurements in developing standard form of reciprocity and quantification in their daily transaction and routines due to lack of access to standard universal measuring gauges and tools. Despite, they have made used body parts such as fingers and limbs as measuring tools and utilized readily made objects around them as gauges and tools. This unique traditional measurement system have been practiced and shared among all Orang Ulu communities in Belaga for centuries. Orang Ulu measure not only to quantify physical quantities such as length, width, mass and volume of things related to their daily economic and exchange activities but more than that they also rely on the figures as indicators and determinants of many things including raw material utilization, dimension of finished object, productivity and use of land, rate of exchange and value of object and commodity. Next description explains how this traditional measurement system practices among the Orang Ulu in Belaga.

Technology in Making Product and Material Utilization

This section will discuss the traditional measuring methods used in some of their utilitarian objects production in quantifying raw materials to estimate resources and to determine size of finished objects.

To measure length, they used two general standards namely *buka* and *buhak*. (Hose and McDougall, 1912). *Buka* is the length of

the span finger tip to tip of the outstretched arms, while *buhak* is the length of the span from tip of the thumb to the tip of the first finger of the same hand.

These two methods are frequently used to measure length of rattan, to value the price when rattan is to be sold raw or to estimate quantity of rattan needed to weave utilitarian objects like baskets and mats. This is crucial as guideline in resources management pertaining to natural resources utilization, waste and sustainability issues.

Rattan Basket Production

Orang Ulu have been used plant materials as main constructive material to produce utilitarian objects for everyday use as well as crafts and artefacts for ceremonial practices (Chin, 1986). Sarawak ecology boasts as one of the richest rattan floras in the world, making it the most common material used for various types of plaited items such as baskets, mats, baby carrier and headband among the Orang Ulu (Pearce, 1991, Dransfield, 1992).

Rattan is divided equally and number of division is depending on the diameter of rattan and type of object to be made. For a small basket like *ajat*, a finer rattan such as *sega* (*calamus optimus*) or *sega mas* (*calamus laevigatus*) is used while for *ingen* and *keba*, a bigger rattan like *letikan* (*calamus caesius*) or *seringan* (*daemonorops sabut*) is frequently used. The selection of the rattan is based on its property such as strength and aesthetic quality to serve best for the purpose.

Ingen

Ingen is a traditional basket made and comprehensively used by Orang Ulu in Central Borneo. It is carried at the back of the bearer while harvesting paddy in the farm. For a common size *ingen*; 40 cm in diameter and 45 cm of height, it requires 20 of one *buka* rattan sticks, which approximately about 2 metres in length to weave a complete basket. The type of rattan used usually measured as 10 mm in diameter which is dividable to five strips. By this method, the maker can estimate quantity of resources and prepare the material beforehand, thus try to minimize wastage during production. Since *ingen* was also used as traditional measuring tool to measure paddy, other *ingen* was

used as mould during the weaving process to ensure right size and capacity of the end product can be achieved perfectly.



Figure 1: *Ingen* weaving process with other *ingen* used as mould.

Ajat and Blanyat

Ajat and *blanyat* are flexible drawstring rattan baskets used as a personal backpack among Orang Ulu. *Ulat* is a separate woven loop attached around the opening is the basis of every drawstring basket type. String is passing through the *ulats* to form a drawstring mechanism for open/close at the top part of the basket. Apparently, number of *ulat* also plays an important role. It was used as a determinant of number of rattan strands required for the weaving and to estimate the dimension of the finished product and the selling price if the basket is meant to be traded or exchanged.

For each *ulat*, it will require two strands of rattan. If the basket has 30 *ulats*, it means 60 strands of rattan are needed to weave a complete basket. This is another method applied by Orang Ulu to estimate quantity of material prior to main construction process started. Apart from that, they also use number *ulat* to estimate the finished circumference of the basket.

Figure 1 : (a) *Blanyat* weaving process (b) *Blanyat* (c) String through *ulats* and (d) *Ulat* as weaving starting point.

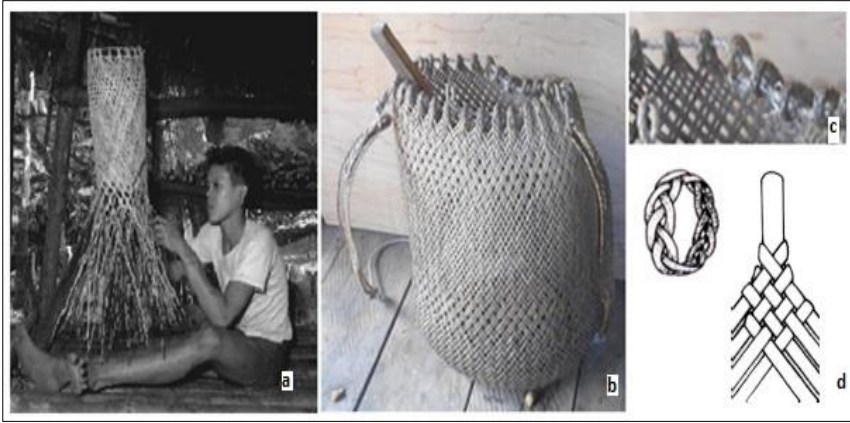
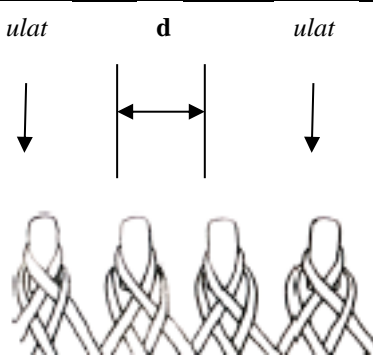


Table 1: *Ulat* as *Ajat*'s or *Blanyat* Size Determinant.

Measurement Unit	Conversion
1 <i>ulat</i>	requires 2 rattan strands
	In <i>buhak</i> (traditional)
Circumference	\approx distance of <i>ulats</i> interval(d) X (no. of <i>ulat</i>)
 <p>The diagram illustrates the measurement of the distance between ulats (d). It shows two vertical lines representing the ulats, with a double-headed arrow between them labeled 'd'. Below this, a series of four woven ulat units are shown, each consisting of two interlocking strands.</p>	<p>d is a distance of <i>ulats</i> interval. In normal practice, the distance is measured in point finger width, which is approximately 1/12 of a <i>buhak</i> length.</p>
For example:	
If number of <i>ulat</i> = 30	60 rattan strands are required to complete the basket
Circumference	$\approx 1/12(30) \approx 2.5$ <i>buhak</i>

Orang Ulu have a unique way to determine the value of the object they made. In case of the *ajat* and *blanyat* the basic value is dictated by the number of *ulats* and it was traded with number of rattan strands required to weave the basket (Ball, 2009). Later, when transaction was done in currency exchange, each number of *ulat* is traded equivalent to RM1, thus for a medium size *ajat*, it usually has 30 *ulats* which values RM30 (per. comm. Jane, 2011).

Table 2: *Ulat* as Exchange and Price Determinant.

Number of <i>Ulat</i>	Cost of <i>ajat/blanyat</i>
1 <i>ulat</i>	= 2 rattan strands (in rattan exchange)
1 <i>ulat</i>	= RM 1.00 (in monetary form)

Rattan Sleeping Mat

Sleeping mat is usually produced by women, from a good quality of rattan (Ball, 2009). Fine strands of rattan weave closely to make it soft and comfortable for sleeping. The mat is either woven plain or with motifs in two tones, natural colour of rattan and black.

Prior to weaving process, the rattan is cut and split in a specific length and quantity for the anticipated dimension of the finished mat. For this method, not only the quantity of raw material which in this case rattan can be properly prepared beforehand, but it also helps in minimizing rate of waste of natural substance and estimate the mat size.

Four main terminology for length and quantity were used by Orang Ulu in mat making; *buka*, *buhak*, *galung* and *asak* (Table 3).

Table 3: Traditional Length and Quantity Units of Rattan.

Measurement Unit	Conversion
1 buka	= 10 buhak
1 strand	= 1.5 buka
1 galung	= 25 rattan strands
1 asak	= 10 galung = 250 rattan strands

In normal practice, one *asak* is an adequate amount of rattan to produce a standard size of rattan mat which is measured as 9'x7' to 10'x7' a piece. Nonetheless, the variation in size may occur depending on the skill of an individual weaver.

Paddy and Rice Measuring Objects

Swidden farming is the most important subsistence activity and central focus of labour among the Orang Ulu. While, rice is not only the main staple food, but it was once perceived as valuable commodity for exchange purposes. From prestigious properties, labour to necessities such as materials and food can be rated by rice (Rousseau, 1990). Eversince they practiced swidden farming, they have developed a methodical measuring system to create a balanced reciprocity through paddy or rice exchange as part of their strategic adaptation to lifestyle and absence of standard universal measuring tools and gauges. This can be obviously seen through the use of *ingen* as one of a standard objects to measure paddy and rice in their daily transactions.

Ingen is not purposely made for measuring object, but this rattan receptacle rather made to be used to load and to transport paddy from the field to the barn during the harvesting season. For storage purpose, the basket will incorporated with lid to secure the content in case of accidental spillage and to protect paddy while kept in the barns. But because of the availability, familiarity and extensive use of this object, its utilitarian value added to other dimension of function – measuring tool.

Other than using readily available object like *ingen*, Orang Ulu also have made a specific basket such as *hubang barang* (Kayan) and

tutui baa' (Kenyah) to measure paddy and rice in smaller amount. Although the baskets are variant in shapes, the size and capacity of these two baskets are almost similar, which is about one tenth of an *ingen*.



Figure 2: (a) *ingen*, (b) *hubang barang* and (c) *tutui baa'*.

Productivity and Use of Land in Agriculture

Measured paddy was not solely for trade but also used to estimate the land to make farm as well as indicator to harvest productivity. The quantity of paddy seeds is measured in *ingen* determines the area for planting land relatively. If 2.5 acres land is planned to be cultivated for the incoming season, one *ingen* paddy seeds are needed. In this case,

proper strategy in terms of land clearing works and allocation of paddy seeds is planned ahead and prepared accordingly.

Table 4: Measure Use of Land for Swidden Farming³.

Measurement Unit	Conversion
1 ingen	= 2.5 acre of land

The production or harvesting yield also measured with the same unit, *ingen*. Number of *ingen* is used to mark the successful or failure of yield in that particular harvesting season. The general idea of this calculation is, for one *ingen* of seeds, how much paddy (also measured in *ingen*) is harvested? The figures use as basic parameter to decide if one farmer has poor, average or high yield.

Table 5: Yield Productivity Indication⁴.

Number of Ingen*	Indication (Production)
≤ 25	Poor
40 – 60	Average
≥ 80	High

* based on the ratio of 1 *ingen* of paddy seed planted

For the same method, they also used seed-yield ratios to measure soil quality. High yield indicates the better soil quality.

³ Tan, C. B. (1994). *Review of Socio-economic Studies on Bakun HEP with Preliminary Recommendations for Resettlement*. Sarawak: State Planning Unit, Sarawak Chief Minister Department.

⁴ Based on Armstrong, R. (1991). *People of The Same Heart The Social World of The Kenyah Badeng. Doctoral Thesis*. University of Sydney and Rousseau, J. (1977). *Kayan Agriculture. Sarawak Museum Journal*, 129-156.

Table 6: Soil Productivity Indication.

Seed-Yield Ratio ⁵	Soil Quality
1:25	Poor
1:60	Average
1:120	High

Sometimes, things are not always according to plan, where disasters happened such as flood and paddy disease where yield is affected badly. In this situation, this method might not work supposedly.

Rate of Exchange

Rice is not only the most important food of Orang Ulu but also an important commodity of exchange and trade (Rousseau, 1990). Variation measurement involving specified quantity of rice, husked or unhusked, has been applied among Orang Ulu community to determine the selling price of the commodity as well as in the exchange rate. Table 7 shows some common traded goods and services for value of paddy.

Table 7: Traditional Rate of Exchange⁶.

Quantity of Paddy	Commodity Selling Price / Rate of Exchange
1 <i>ingen</i>	= RM 38.00 (unhusked) = RM 45.00 (husked)
20 <i>ingen</i>	= 1 boat
½ <i>ingen</i>	= standard harvesting wage per day = pack of salt

⁵ Seed and yield ratio measured in unit of *ingen*

⁶ Rate of exchange is based on study done by Rita Armstrong in 1991.

Conclusion

Absence of standard measuring tools and units never hindered the Central Borneo groups to have self-sufficient economy. They developed their own standard tools, gauges and methods for trade and exchange among them in daily basis transactions. They also apply their own unique mental arithmetic in their traditional objects production particularly in raw material quantity estimation which suggesting that they have implemented good manufacturing practice where sustainability of resources are taken as main consideration in the making process. They use this methodical guideline as an effort to optimize the utilization of natural raw material and minimize waste rate.

In the absence of universal measuring tools and gauges, Orang Ulu has fully utilized their cultural materials for the purpose. Others like *hubang barang* and *tutui baa'* are made specifically to measure rice. *Ingen* is not only seen as utilitarian object but it plays a significant role as the most commonly used tool in the Orang Ulu measuring and trading system. Quantification in the unit of *ingen* has been used by them as an indicator and determinant of harvested paddy productivity and use of land as well as rate of exchange. Although in the situation where the proper gauge is absent, Orang Ulu has shown their capability in scientific and mathematical thinking by developing their own system and technology that seems to be practical and effective in their culture and environment.

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