

MEASURES OF NORTH INDIA WITH A SPECIAL REFERENCE TO SANSKRIT LITERATURE

T.Santhi

Assistant Professor,

Department of Mathematics,

J.K.K.Nataraja College of Arts and Science,

Komarapalayam, Coimbatore, Tamil Nadu, India.

Abstract

A detailed study on the prescriptions given in the agamic text puranas, temple inscriptions etc will throw light on the importance given for the measurements in the ancient days. It is necessary to know the interest bestowed upon the prescriptions of the mana followed in the ancient historical period both for the construction of the temples. Thus the Sanskrit literature helps us to understand the different types of linear and grain measures that were used. Though the terms used are different, the measures are common throughout the country. A detailed examination of the land measures and grain measurements used will further enable us to assess the economic condition of that period.

Keywords: Angula, Kanishta Angula, Madhyama Angula, Uttama Angula Paramanu, Śulbasūtra, Arthaśāstra, Silpa Sastra, Manasollasa, Sivatattvarantnakara and Vyvahara Ganitam, etc.,

Introduction

A Tamil Proverb says, “ஆற்றிலே போட்டாலும் அளந்து போட வேண்டும்” means that the even if you throw it in the river, measure it. The above-mentioned Tamil proverb implies the importance of measurement. The objectives are to explain the variations in the use of spatial measurements and grain measurements and to analyze the pattern of standardization of spatial linear measurements. To collect and scrutinized empirical data from the temples, epigraphy, inscriptions and Sanskrit literatures that found mentioned during the medieval period.

Measures constitute an interesting aspect of Mathematics. Enough source materials are available to study the various measures. This part of mathematics should be studied not in isolation but as interdisciplinary. History is not only replete with information on the rule of kings and their chronology but also with information pertaining to measures. The diversity of units

of measures makes it interesting to find a connecting link form the basis for discussion.

Measurement is a multiple of a basic unit. The unit is arbitrary or standard in nature. It has to be appropriate to the size of the quantity that is being measured. There are innumerable references to the terms of measurements. They are found mentioned in inscriptions of our country in general. There are a few archaeological designs measuring poles/ rods depicted on the medieval monuments.

The ancient measurement systems are often found to be based on natural and human body-parts. In India, evidence for the use of a measurement system is found from the time of the Indus civilization, from 3000 BC (Danino, 2005, 2008; Balasubramanian and Joshi, 2008). Ancient texts such as the Śulbasūtra (Sen and Bag, 1983), Arthaśāstra (Kangle 1968), and architectural treatises mention about the measurement units that were used in ancient India and many of these measurement units have the names of human body-parts.

Sanskrit Measures

Angula was considered as the smallest and most common practical linear measurement unit in that was used in India. It was considered as the distance between the two lines forming the middle part of the middle finger.

The Brahmanda Purana gives a curious origin of the angula measure. "It is stated that, people at first used to live in caves, mountains, river banks etc. They began to build houses in order to protect themselves from cold and heat. Then they built towns, houses, villages and cities. To measure their length, breadth and the intermediate distance between two settlements the people instinctively employed their own finger. Thence forward angulas have been used as standards of measurement".

The period from Baudhayana Sulba sutra (800 BC) to that of Katyayna sulba sutra (400 AD), is very large. The angula measure during Sulba sutra period was derived from the height of the site. This site was calculated to be an area of $7\frac{1}{2}$ purusha. One purusha is the height of the sacrificer with his hands raised above the head, and this was taken as to be equal to 120 angulas. Rajaditya in Vyvahara ganitam gives the same method for deriving the height of purusha. It was later found that the height of each individual varied and there was no standard measure. Manava Sulba sutra mentions that if the sacrificer is rather short due to some illness or he is born pigmy, then the standard angula are measured by placing six barley grains along their width. The other forms for obtaining the angula measure was to place 34 grains of gingili or 14 grains of anu one against the other.

According to ancient texts angula measure is derived in two ways. In the first method six pollen stalks of lotus are placed so as to form a circular section, this diameter is equal to cross section of the hair in the tail of a three years old cow. Six such hairs formed the diameter of mustard seed, six mustard seeds placed one against the other would give a grain of barley. Each measure is six times greater than the smaller one.

In the second method angula was derived in different form beginning with paramanu. This is the smallest measure mentioned in Silpa sastra, Manasollasa, Sivattvarantnakara and Vyvahara Ganitam.

The form of deriving angula in Sivattvaratnakara is as follows:

Jalasuryamarichistah sukshmo yah paridrsyate //6//
trasarenuriti khyatah sarvasastreshu sammatah
rajovalagralikshascha yukaschaivayavodaram //7//
angulam tadvijaniyadastadha vrdihbhagbhavet
cahaturvimsyatangulani hastastu parikirtitah //8//
chaturhasta tu chapah syat
krosoastadvisahasrakam yojanam tachchatuskam
chetyeva manabhedatah //9//
etasya shatalidstu brahmande manamuchyate
kechichchapadvyamdanah krosastadvisahasrakam //10//

The translation is as follows: the size of dust particle moving around in sun rays that enters the room through a perforation in the wall/ roof is called as paramanu. Eight paramanus make one liksa (a nit, an egg of louse); eight liksas make one yuka (a louse). Eight yukas make one mustard seed; eight mustard seeds make one barley grain. Each measure is eight times greater than the smaller one. Twenty four chapa make one krosa, four krosas make one yojana.

There are three sub types in angula, length of six barley grains placed width wise will be kanishta angula (small), seven grains will be madhyama angula (medium) and eight grains will be uttama angula (standard).

A similar approach has been followed by people of Tamil nadu in the case of linear measures. Here the angula of the northern India may be compared with the term viral. It is 1-3/8" in length. It is the distance between the tip of the thumb and the first fold in the finger. As men vary in their height, the Tamil text Adiyaarukku nallar mentions about the length of the uttaman may be taken as the viral measurement and a man is said to be uttaman if he is neither too short nor too tall. Hence, a man of height 5' 6" is considered as a man of standard height. It also reveals that 8 nel (paddy) is equivalent to uttaman viral (standard), 7 nel is equivalent to madhyamam

viral (medium) and 6 nel is considered as adhamam viral (small).

It is to be noted here that the materials chosen are small units of things used daily. The size of these units remains same irrespective of the change in weather/ season. These are absolute units. This raises the question whether they had any instrument to measure such minute dimensions. If not, then why have they used such materials to show these relations? It is probable that this suggests the intellectual imagination in ascertaining or fixing the dimensions to smaller units. The derivation of angula from barley grains as well as from the paddy may be considered as the first practical stage in standardization of measure.

Since, it was easy to use the body parts for measuring; it was in vogue, though the measures have been standardized. While standardization the length of the body parts of the king or the donors were used in order to please them.

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Ved Vidya Prathisthan, Pradhikaran bhawan, Bharat puri, Ujjain.

- 3) Manava Sulvasutra 4.5, Vimsangulatah purasah svaih svairanguliparvabhiih.
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Sutra 42-
purusha pramanamenthene
Purusham thanneradu keyya melakettal
Prusha pramana menusunu
Paramartham thappadenda Rajadityam
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- 6) STR, Taranga I, II Kallola, sloka 6-10, MSA, Vimsati III, sloka 194-197.