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Land registers and surveyors: Measuring lengths and areas

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***Text and practices: Land measure in South India, with special reference to Karnataka***

Karnataka is one of the federal states in the Indian government. One interesting observations made by the colonial surveyors about the practice of local measurement system, in this area in particular and colonial India in general, is that there were bewildering varieties in the measurement units. I Francis Buchanan in his published work entitled, *A Journey from Madras through the Countries of Mysore, Canara and Malabar* towards the beginning of the 19th century, recorded various systems prevailing in coastal and hilly regions of Karnataka. He expresses his opinion that the local difference has introduced confusion among the colonial revenue officers. Dr Benjamin Hyne a officer in Mysore principality of Karantaka could not understand the volumetric measure, because he notices difference between stuck capacity and heaped capacity. He says that if stuck measure is supplied instead of heaped capacity then the supplier would be profited.

The experience of the British surveyors in Dharwad region was no different. This is recorded in the Bombay Gazetteer as ‘ In Dharwar, as in other parts of the country, the variety of land measures in every group of villages and often in every village caused serious inconvenience in making revenue settlements; . . . some sub divisions had no fewer than nine land measures. These again varied in almost every village; as none of them had reference to any fixed length, there was not one of them that would answer as a standard. . . in 58 villages in the Dharwar sub division the pole or patti was the usual measure. But there was one pole or patti for the black soil, a second for the mixed or masab, and a third for tari or rice land. Even for black soil the pole or patti varied from 22 to 48 kurgis. From its inherent uncertainty and from the roguery of the village officers the kurgi was found to vary from 2 to 8 acres, its average size was about 5 acres’. As Thackery’s report on revenue settlement records, ‘ . . . this operation was not easy due to various types of measurement which were in practice through out the district. . . . the only usefull result was of the codification of the various land measure to that of the English acre.

Of course, the colonial officials were not hallucinating about the Indian measurement system. They were recording the fact as it was experienced by them in India as the responsible administrative officials of the colonial government. Pre colonial indigenous sources also

confirm that variety was an object level reality of traditional Indian measurement system. However, the puzzling question is how traditional society in India managed such a system of measurement for thousands of years when it was experienced as chaotic, inconvenient and confusing by the Colonial administrators. If it was really so, why did Indians, who were so adept and advanced in applied mathematics not innovate universal standards? Present paper will try to make sense of this situation and try to explain what looks unusual and puzzling.

The practice through out the historical period was not otherwise in India. This fact can be substantiated in the context of Medieval Karnataka. There are more than 25000 inscriptions of different historical period, covering a span of more than 1000 years, in this state. It is estimated that about 30% of these inscriptions refer to agrarian land and related matter. Such references occur as a part of the gift deeds to temples, Brahmanical settlements and deceased heroes. Inscriptions refer to a variety of terms of land units and land taxation as practiced in those days. However understanding these inscriptions depends upon answering the following questions: What was the system of land measurement? What are the units of measurement? Was it uniform throughout. How was the taxation system? These are some of the points which are to be known before arriving at some conclusion on the system of taxation and administration.

During 3-5<sup>th</sup> century unit of land measure was *nivartana*. This was also called as *mattar* in Karantaka and Andhrapradesh states and as *madakku* in Tamilnadu state. The land measure became more specific with boundaries enumeration in later periods. Inscriptions of later period mention two units of land measure. They are *mattar* and *Kambha* in Karantaka and Andhrapradesh states and as *madakku* and *Kuli* in Tamilnadu state. A cursory glance at the recordings indicate that *mattar/madakku* was main unit and *kamma/kuli* was the sub unit. The relation between the main and the sub unit is not known. Also the conversion factor between these units is not known. A copper plate inscription mentions 100 *nivartana* land measured 40 on both sides. A commentary in kannada language mentions that a *mattar* is a land measuring 100 *maru* on both sides. Inscriptions suggest different values for conversion of *kamma* to *mattar*. *Mattar kama* equivalents for different regions are different. They are different even in the same region at different periods.

As noted earlier there is no conversion factor to covert sub unit into main units. There are many adjectives to the main unit. The adjective are based soil type, water facility, crop grow. There are different measuring poles for different region. In Karnataka there are as many as 100 measuring poles of different lengths. Most of these were introduced during 10-12<sup>th</sup> century. It is said that during Mughal period there was rigorous measurement of land and the Zabti system was introduced. The assessment was based on the average produce from the land. We see a similar system being in vogue in different kingdoms of the late Medieval Deccan and South India, probably due to the influence of the Mughal system.

This new development introduced few more terms of revenue and land units into the historical records and probably complicated our present knowledge about measurement standards and practices. When British administrators tried to understand the local administrative system they based their reasoning on present day knowledge and systems. Col. Mackenzie in his stay at Karnataka collected local data of land measure at Midigesi during September 1801. The record is locally called as Kaifiyat. He records that 'lands are divided into two kinds neeravaree or wet land, buddal or dry: formerly the village officers measured the lands under these heads and entered them in their books to be let out annually to the cultivators. The Indian system was not known to the westerners and their understanding was dependent on the explanation of the villages or the officers. They perceived things in their own context and the systems with which they were conversant.

Modern Indian scholars have tried to ascertain the mathematical value of these units and they too have not been able to come out with conclusive statements. Dipak Ranjan Das in his work 'Economic history of the Deccan' writes that in Ancient India there were number of land measures. These are indicated by epigraphs and literary works. He later remarks that it is not safe to understand the same geographical area by the same measure in all places and periods. Sheik Ali in his work entitled History of the Western Gangas while dealing with revenue administration raises certain questions as to whether all the available land measured according to one uniform measurement? Whether the soil was divided into different categories on the basis of fertility? Whether the assessment of tax was based on any principle or was it just arbitrary? He further states that concrete answer cannot be found to these questions on account of paucity of relevant historical material.

The study by Indian scholars are incomplete because they too did not consult other branches of knowledge in this regard. Though all branches have grown in their own pace and it has its own adaptation in a community. How was the diversity tackled? Were there any universal standards at least in the texts? If yes, why this discrepancy between ideals and practice did not cause any problem? If no, did the practice base upon any regional standards? Present paper tries to co relate the mathematical texts and the inscriptional data to solve this problem.

The above discussions indicate that if land measure and taxation need to be understood properly, one has to focus on a specific historical space and time and reason it out on the basis of comparative analysis of the contemporary sources of that region. The present paper tries to analyse the measurement practices of medieval Karnataka, particularly those of 10th to 14th century A.D. with the help of a comparative analysis of Epigraphic and literary texts.

Three mathematical works are noticed in Karnataka. The works are *Ganita Sarasangrah*(Extracts of mathematics) (814-878) *Vyavahara Ganita* (mathematics of

commercial transaction) (1190) and *Kshetra Ganita* (Area measurement)(1600). All these texts deal with day to day affairs of life and offer solutions by means of formulae. Usually the *Sutra*(formula) is stated, this is followed by *tiku*(explanation) and followed *udaharane*(examples). Most of the terms archaic and it requires some effort to understand the subject. Apart from this there are other literary works which also offer a clue to the system that prevailed then.

Two encyclopaedic works namely *Manasollasa*(1126-1138) and *Shivattvaratnakara*(1696-1714) give some data on measurement units. Also dictionary named *Abhidana vastu kosha* (1150-1190) has a chapter on measuring units. A work on different materials named '*Padartha sara*' also give different types of measures and conversion factors.

Measurement is a multiple of a given unit. The measurement depends on method and procedure adopted. Area measure is the product of length and breadth. The author Timmarasa of *Kshetra Ganita* quotes that there are different measuring poles in different regions. This statement ascertains the fact that there are practically more than 100 different measuring poles of different lengths. The author mentions a formula for sub unit of land measurement. The sub unit of area measure *kamma* was one measuring pole on either side (Length X Breadth). The fractions of measuring poles are named differently.  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$ ,  $\frac{1}{64}$ ,  $\frac{1}{256}$ ,  $\frac{1}{1024}$  of a measuring pole are called as *haga*, *bele*, *visa*, *kani*, *gidda kani*, *giri pal gidda kani* respectively. Further the author gives thirty sub units with different names for area measurement.

Though linear measure and area measure have same nomenclature, the context in which it is used is to be understood. For example, *haga* pole X *haga* pole = *visa kambha* ie.,  $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$ . The nomenclature are *haga* and *visa* which is same in linear measure and area measure. Some times the adjective or superlative is omitted. But, the context of usage is to be considered.

The sub units that would comprise to make a unit is not defined. An inscription of 1232AD in Arasikre of Karanataka offers a clue in this regard. It states that the wet land was measured by a pole of 5 unit length and the dry land was measured by a pole of 7 unit length. The area is  $5 \times 5$  and  $7 \times 7$  ie., 25 and 49 square units of wet and dry lands. The ratio of wet and dry land area is 1:2. In European system (FPS System) or the SI system there is a fixed system of conversion factors. But, in the above example we find that the sub units that make up an unit can vary.

The same type of calculation is found in inscriptional data of Kudithini, Bellary dist inscriptions of 1119 AD where unit area and real area is in the ratio of 1:1/2:1:5:1, and Hirehadagali, Bellary dist inscription of 1107 AD where unit area and real area is in the ratio of 9:1:1

The variation is in terms of the adjective or superlative attached to the name of the unit. This system found in Karnataka based on inscriptional data and co relation with mathematical formulae was unique because it is dependent on local factors, once this is taken care of and entered and the unit value is entered in records, further calculation is simple and clear. The sub units that constitute to make an unit is dependent on soil type, water facility offered to land, crop grow and many more local factors which are decided upon by the local officer and agreed by the higher officer. There are some instances when the higher officer has interfered in the system, which resulted in the local habitants deserting the village, who were later assured that the old system would continue and they were brought back. Thus an understanding between text and practice helps in understanding the taxation and in turn the administration system.