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Historical Note

Metric Estimate of the Volume Measure used in the Madras Region at the Dawn of the Colonial Era

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Abstract

In order to estimate agricultural productivity in medieval and early modern India, it is important to get close estimates in modern metric units, of the measures which were used for agricultural produce including grains. This study collates information scattered through archival records as well as ethnographic field observations in order to estimate the metric equivalent of the standard grain measures used around Madras at the dawn of the colonial period.

Key words: Agricultural productivity, Chingleput, Great Divergence, Pre-colonial South India, Volumetric grain measures.

1. Introduction

By the middle of the eighteenth century the decline of the Mughal empire in India was apparent enough to stoke the ambition of every other emergent power in the sub-continent. The trading rivalry between the English and French broke out in to open warfare. As this contest played out along the Coromandel coast in peninsular India, the central issue became the control over the Nawab of Carnatic, and through him surrogate political power over parts of modern day Tamil Nadu.

The hostilities were finally settled in favour of the English as a part of the larger world-wide compact embodied in the treaty of Paris in 1763. This settlement also led to the confirmation of Muhammed Ali, the English nominee, as the Nawab of Carnatic. He was however in debt to them and in 1763 was forced to hand over to the English East India Company the area surrounding their base at the Fort St. George (the modern Madras/Chennai), yielding an annual revenue of four and a half lakh *pagodas*. This grant was subsequently confirmed by Mughal emperor in 1765 (Aitchison 1930, pp. 33–42). This was called the *Jaghire* of Chingleput by the British.

2. The Barnard Survey

To assess this strategically important area, the British commissioned a survey under the engineer Thomas Barnard. Barnard was instructed to survey and record data about the general topography and additional land usage, households, occupations, agricultural productivity, revenue, local shares and allotments and other such minutiae so that the British could get a correct picture of the region as well as the potential improvements that could be made. The instructions issued by Col. Call, the Chief Engineer for the *Jaghire,* were detailed and were accompanied by a letter to the inhabitants to co-operate with Barnard.[1]

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Thomas Barnard's survey of the newly-assumed English territory of Chingleput was conducted between 1767 and 1774 and he filed his report on 10th November 1774. Barnard, like many other English surveyors of the period, was accompanied by an Indian surveyor. They used the detailed records of locality wise information from close to 2000 villages spread across the region for their survey. In Barnard's own words

> To accomplish what was required of me in reporting the state of the country and the improvements which might be made, I had recourse to the records kept in every village of the transactions, which relate to revenue, cultivation and trade. The existence of any such material was I believe unknown, when Col. Call sent me out. The insight I obtained on this matter was furnished to me by the interpretor….[2]

In a country where archival records of any nature of the times past, except the few stone inscriptions, are at best rare, these village records could provide an unprecedented glimpse of how everyday life and the local economy in parts of India were at the dawn of the colonial period. The key economic activity was agriculture and therefore getting a close estimate of agricultural production in modern metric units is the key for understanding the state of affairs as they were in mid-eighteenth century in the *Jaghire*. However, estimating agricultural productivity of the past in India becomes difficult, due to the multiplicity of weights and measures which prevailed in the preceding centuries.

In a recent article on Paddy yields in Pre-industrial India, Pingle has highlighted this issue tellingly. He has noted a wide variation in the weight of the volumetric measure called *maraghghā* (*maraghghāl* is the literary form) which was widely used in Tamil Nadu. Since twelve *maraghghā* translate into the standard measure called the *ghalam* (*kalam*), there is considerable variation in the estimate of the weight of a *ghalam* (*kalam*) of grain. Pingle cites many estimates which range from 21.5 to 170.5 Kgs (Pingle, 2017, p. 39). Such a wide variation in the weight of a standard measure, make an estimation of agricultural productivity a difficult exercise.This note attempts to investigate and estimate a range of weight for grain measures used in the *Jaghire* at the dawn of the British rule.

3. English Records from the Eighteenth-century

Even before the East India Company assumed the rights to the *Jaghire*, their station at Fort St. George or Madras, was an important port and this importance was reflected in its mention in many shipping guides, registers and almanacs that were then extant. A survey of some of these sources is instructive in understanding what was called the Madras Measure.[3] In the second volume of his book *Oriental Commerce* William Milburn of the East India Company, gives us system of measures prevalent in Madras (Milburn, 1813, Vol II, p. 10).

1 *olluck* is equal to 11.79 [4]
8 *ollucks* make 1 measure or *puddy* or 93.752
8 measures make 1 *marcal* or 750
5 *marcal* make 1 *parah* or 3750
400 *marcal* make 1 *garce* or 300,000

A few years later P Kelly details the weights and measures prevalent in important trading posts across the world which were important to British trade interests. His notings on grain measures used in Madras are identical to those given by Milburn. He further adds that a garce (*karisai*) of grain was equivalent to 9256.5 pounds (Kelly, 1826,

[2] India office Records range 274/17, 20th Dec 1774 *Dharampal Archives CPS-EE-01,* Centre for Policy Studies, Chennai. In addition to all the other information, Barnard recorded the revenue accounts of the villages for a period of five years beginning 1761.

[3] The term Madras Measure or simply measure was used generally to describe the puddy (Padi/ *paḍhi*). See for example *Universal Commerce* (1818, p. 160) or Milburn (1813: Vol II: 10).

[4] Olluck is a corruption of *āzhāghghu* and is still called that by some. The measures are in cubic inches. For the Tamil ழ sound, "zh" has been used when transliterating into IAST.

vol 1, p. 93). If this is the case a *marcal* (*maraghghā*) of grain would be equivalent to 10.50 Kgs. Kelly also mentions that a *maraghghā* of fresh spring water would be equivalent to 27.2 pounds.

James Prinsep repeats Milburn's classification and specifies the internal volumetric capacity of the measure. The *maraghghā* is said to have a volume of 750 cubic inches and a weight of 27 pounds 2 oz of water in his notes (Prinsep, 1834, p. 79).

Raju and Mainkar tell us that capacity measures could also be described in terms of the area that could be sowed with that measure. In north Arcot 15.75 Madras Measures were said to be required for sowing a *kani* of un-irrigated land and 63 Madras Measures were needed to sow the same area of irrigated land (Raju and Mainkar, 1964, p. 9).

By this time, it seems that the British were perplexed by the multiplicity of weights and measures prevalent and circa 1850 W H Bayley of the Madras Civil Service proposed a uniform system for the country. His note, carried in the *Madras Journal* of July–Sep 1857, mentions the weights which have been traditionally prevalent (Bayley, 1857, p. 195). He mentions that an *olluck (āzhāghghu)* was 12.125 cubic inches, a *puddee* measure (*paḍhi*) was 100 cubic inches and a *marcal* (*maraghghā*) was 800 cubic inches.

Sharada Srinivasan in her magisterial survey of the topic, has given a detailed exposition of the various units of grain measure prevalent in Tamil Nadu through the ages. A list of units and conversions mentioned in the book is reproduced in Table 1 (Srinivasan, 1979, p. 79).

Tsukasa Mizushima in his study of the Nattars in 18th century concludes after a detailed examination that a *Garce* was equivalent to 9200 pounds and that it contained 400 *marcals*/ *maraghghā* (Mizushima Tsukasa, 1986, p. 326, footnote 80). This would make a *ghalam* (*kalam*) equal to 125 Kgs. He adds that this estimate should be verified.

The above information is summarized in Table 2.

Most of the historical sources surveyed seem to be in agreement that a *maraghghā* was between 750 and 800 cubic inches and a *ghalam* (*kalam*) was equal to twelve *maraghghā*. There is more than one reference in literature that a *karisai* (*grace*) is equal to 9256.5 pounds when used for grain.[6] Since a *karisai* is equal to 400 *maraghghā* and a *ghalam* (*kalam*) equal to 12 *maraghghā* we are left with a weight estimate of a *ghalam* (*kalam*) measure of grain at 277.7 pounds or 126 Kgs.

Table 1. A List of Units and Conversions (Srinivasan, 1979).

5 *seviḍhu*	=	1 *āzhāghghu*
2 *āzhāghghu*	=	1 *uzhghghu*
2 *uzhghghu*	=	1 *uri*
2 *uri*	=	1 *nāzhi* (*paḍhi*)
8 *nāzhi (paḍhi)*	=	1 *ghuruṇi* (*maraghghā*)
2 *ghuruṇi (maraghghā)*	=	1 *bhadhaghghu*
2 *bhadhaghghu*	=	1 *dhūṇi* (*ghāhi*)
3 *dhūṇi*	=	1 *ghalam* (*kalam*)

Table 2. Summary of the measures.

No of Units convert to	Unit	Cubic Inches
	olluck /āzhāghghu	11.79 to 12.125
8 *ollucks*/ *aazhakku*	1 Madrasmeasure/*puddy*/*puddee*/*paḍi*/*nāzhi* (*paḍhi*)[5]	Approx. 100
8 Madras measures/*nāzhi puddy*/*puddee*/*paḍhi*	1 *murcal*/*marakka*/*maraghghā*	750 to 800
5 *murcal*/*marcal*/*maraghghā*	1 *parah* (*parai*)	3750
12 *murcal*/*maraghghā*	1 *kalam*/*cullum*/ *ghalam*(*kalam*)	9000 to 9600
400 *murcal*/*maraghghā*	1 *garce*/ *karisai*	300000

[5] *Nāzhi* and *Paḍhi* are the same. See Srinivasan, 1979, p.79.

[6] See for example Universal Commerce , 1818, p. 160 or Kelly, 1826, p. 93.

4. Currently available Field Survey of Measures

Fortunately, some of the above-mentioned measures are still preserved and used occasionally in the localities of the erstwhile *Jaghire*. It was therefore possible to access and examine some of these physically. These are currently the property of householders in South Mada Street, behind Vardaraja Perumal temple, Kanchipuram.

A grain measure was intended for use when it was heaped.[7] The heaped measure was the maximum capacity that the measure could carry. The struck measure would be the amount that the measure could carry when it was filled only up to the brim. Fig. 1 shows the difference.

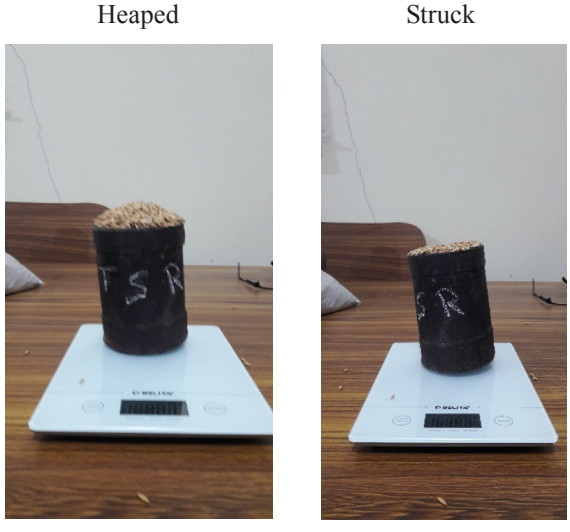

Fig. 1 a & b. Difference between Heaped and Struck measures for grain.

Out of the measures examined the details of those which were in the best usable conditions viz – no holes, cracks or other wear and tear are presented.

4.1 *Olluck* Measure (*āzhāghghu*) dated circa 1935

The dimensions of this measure were internal diameter two and a half inches and depth three and one eighth of an inch. With these dimensions this vessel has a cubic measure of 15.34 cubic inches.

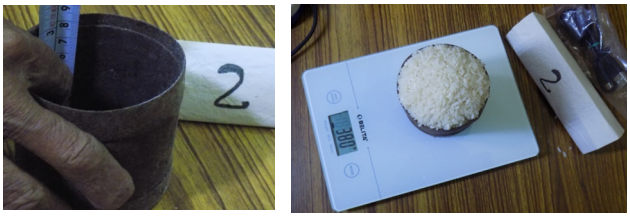

Fig. 2 a & b. Empty and filled *Olluck* measure.

Empty weight of measure = 126 grams

Weight of measure with rice (struck) = 350 gm or only rice (struck) weight = 224 grams

Weight of measure with rice (heaped) = 380 grams or only rice (heaped) weight = 254 gm

4.2 *Ghālpaḍhi* (one quarter *paḍhi*)

This was in use in the Vardaraja Perumal temple in Kanchipuram earlier and hence adhered religiously to the tradition on the dimensions of such a measure. This would be equal to two *āzhāghghu* and may have been called *uzhaghghu*. It will be referred to as Fig 3. The internal dimensions of this are diameter, two and three quarters of an inch and height, four and three eighths of an inch.

Fig. 3 a & b. Empty and filled *Ghālpaḍhi* measure.

Empty weight of measure = 144 grams

Weight of measure with rice (struck) = 500 gm or only rice (struck) weight = 356 grams

Weight of measure with rice (heaped) = 528 grams or only rice (heaped) weight =384 gm

[7] See for example Bayley (July-Sep 1857, p. 196) or Srinivasan (1979, p. 82).

Equivalent measure of paddy (unhusked and unpolished) were also weighed in the same measure (Fig 4).

Fig. 4. Measure of paddy (unhusked and unpolished).

Empty weight of measure = 144 grams

Weight of measure with paddy (struck) = 391 gm or only paddy (struck) weight = 247 gm

Weight of measure with paddy (heaped) = 407 gm or only paddy (heaped) weight = 263 gm

The measure which was used in the Vardaraja Perumal temple (Fig. 3) is likely to be the closest to the measures of the past as the temples have been the custodians of traditional practices in many areas. Hence for the purpose of analysis, this measure and its attendant weight are used as a baseline to derive the weights of the measures prevalent in the period under study. Table 3 gives the desired weights for the various measures using above baseline.

It is instructive to note what Bayley says in his note of 1857 about the de facto capacity of a *paḍhi*

> even in the Town of Madras, the Government have authorised the stamping with the Government seal the 'customary"' Measure or '*Puddee'* of 104 1/4 cubic inches, which has been the **real** (emphasis by Bayley) standard since 1802 (Bayley 1857, p.195).

Given that the sample's capacity is almost the same as what Bayley states as the 'real standard' in 1802, the weight of 101 kgs for a *ghalam (kalam*) of old paddy is a close estimate.

4.3 At the author's request, the weight of a traditional *paḍhi* was taken for freshly harvested paddy (seven days post cutting) at Thiruvettipuram which is 31 Kms away from Kanchipuram. The weight of a *paḍhi* of a freshly harvested paddy is 1.25 kgs. This works out a *ghalam* (*kalam*) weight of 120 kgs.[9]

A summary of findings of the metric measure for a *ghalam (kalam)* measure from various sources is shown in table 4.

To summarise, the conservative estimate for the weight of a *ghalam* (*kalam*) measure of year-old paddy in pre-colonial Chingleput would be at least 100 kgs, though the realistic figure would have been closer to 120 Kgs as the paddy would have been measured very soon after it was harvested.

Table 3. Derived weights for the various measures.

	Unit	Derived Volume (cubic inches)	Weight of Paddy [8] (Kgs)	Weight of polished rice (kg)
1	*Āzhāghghu*	12.9	0.132	0.195 (half exhibit 3)
2	Madras Measure/*paḍhi*/*nāzhi*	103.96	1.052 (four times exhibit 3)	1.536 (four times exhibit 3)
3	Maraghghā (8 *paḍhi*)		8.416	12.29
4	Ghalam (*kalam* or 12 *maraghghā*)		101	147.46

[8] The paddy used in the above analysis was around a year old.

[9] This *paḍhi* was sourced by Mr. Thi. Tha. Narayanan of Thiruvettipuram.

Table 4. Metric measure for a *Ghalam* (*kalam*) measure from various sources.

Source	Type of Grain	Kgs per *ghalam* (*kalam*) measure
Archival survey	Not specified	126.00
Author's field observation of old measures	Polished rice	147.46
Author's field observation of old measures	Year-old paddy	101.00
Observation at Thiruvettipuram	Freshly harvested paddy	120.00

Agricultural productivity in the Chingleput region in the eighteenth century is not believed to be high even among those who argue that in general the Indian economy in the eighteenth century was more advanced than has been traditionally believed.[10] With the use of the above estimates of the weight of a *ghalam* (*kalam*) measure of paddy, historical agricultural productivity figures for the Chingleput region could undergo a revision. Such a revision in this key economic indicator should encourage a rethink of the general level of economic development in this strategically important part of South India at the dawn of the colonial era.

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[10] See P. Parthasarathi, Rethinking Wages and Competitiveness in the Eighteenth Century: Britain and South India, 1998, footnote 34.