

The continuity of Śulbasūtra tradition as evident in the Agnichayana ritual of Kerala-A critical study¹

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Abstract

The Śulbasūtras are the ancient mathematical treatises primarily deal with geometry. They forms a part of *kalpasūtras*; one of the six Vedangās. Proper understanding of these texts is essential to study *Vedas*. The geometrical expositions of Śulbasūtras are original in nature and of physical and metaphysical value. The Kerala Vedic tradition firmly follows these geometrical texts. The adherence to these texts and the continuity of the The Śulbasūtra tradition is examined in the background of the Agni's of 1956 and 1976[agnichayana of Nelliktil Mamannu Mana in 1956 and pāñjal in 1976]. The measuring instruments and units used are explained. It will be shown that, the Agni ritual of Kerala follows the Śulbasūtra tradition even though some local adaptations are noticed.

Keywords: Vedic geometry, Agni, Śulbasūtra, Kerala Vedic tradition

The Śulbasūtras

In Vedic India the religious ceremonies and sacrifices were performed on altars and not in temples². The altars are raised platforms made of bricks. There were two types of sacrifices namely perpetual and timely. The design of the altar for each one is different and of intricate in design. The design and construction of these altars gave rise to a new branch of knowledge known as Śulbasūtras. The origin of the word can be traced to the words Śulba (rope) and sūtra (aphorisms). In fact all the construction was done using ropes and pegs. The major and available Śulbasūtras are four in number³ and are *Baudhāyana Śulbasūtra* [BSS], *Mānava Śulbasūtra*, *Āpastamba Śulbasūtra* and *Kātyāyana Śulbasūtra*. *Baudhāyana Śulbasūtra* is the oldest, formulated around 8th C. BCE⁴. The other Śulbasūtra are composed around the next 400 years or so.

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² *Explaining the gods*, R.L. Kashyap, Sri Aurbindo Kapali Sastry Institute of Vedic Culture, Bangaluru

³ For a complete list, refer to *Vedic mathematics*, Dr.A.K.Bag.

⁴ *History of dharmasūtras*, Introduction P.V. Kane,.

The Vedic tradition of Kerala

The Vedic tradition of Kerala with its associated rituals are preserved by Nambudiries; the Kerala Brahmins. The tradition is relatively small but quite different from the rest of India, and entirely self contained⁵. The three Vedas *R̥gveda*, *Yajurveda* (*Kṛ̥ṣṇa* and *Śukla*) and *Sāmaveda*, are followed in Kerala. The Kerala *Jaiminiya Sāmaveda* school is the only surviving school of that particular branch of Veda. The Vedas are transmitted orally across the generations. In fact the Kerala Vedic chanting style is listed in the *Intangible Cultural Heritage of Humanity* of UNESCO. The value of this tradition lies not only in the rich content of its oral literature but also in the ingenious techniques employed by the instructors in preserving the texts intact over thousands of years. To ensure that the sound of each word remains unaltered, practitioners are taught from childhood complex recitation techniques that are based on tonal accents, a unique manner of pronouncing each letter and specific speech combinations⁶. The Kerala Nambudiries, in recent times perform only two types of vedic rituals. They are *Agnishtomam* (*Somayāgam*) and *Athirāthram* (*Agni* or *Agnichayana*)⁷.

The Agni of 1956 and 1975

Athirāthram or *Agnichayana* or Simply *Agni* is a Vedic sacrifice lasting for 12 days. In 1956, one was conducted in the Nellikkatil Mamannu Mana of Pāñjal (Thrissur district) by Nellikkatil Mamannu Nilakanthan as Yajamana. This was the last Agni conducted as a private function. These types of Agnis were mainly funded by the Yajamāna himself. In 1975 another Agni was conducted in Pāñjal itself, from April 12th to 25th. This Agni ritual is a turning point in the history of Vedic rituals in Kerala in the sense that, it was the first public⁸ Agni and was funded by an international committee chaired by Frits Staal.

The present study

In the first part of the study, the measuring instruments mentioned in *Śulbasūtras*⁹ are compared with that of Kerala Nambudiries. The units for measuring linear dimensions are also compared. In the second part, the dimensions of the altar space and bricks used for altar construction are studied. The study includes the design and construction of *pracināsala* including the four altar elements, and the *mahāvedi* along with *sadas*, *somasāla* (*havirdhānam*), and *uttaravedi*. The minor elements like *Agnidhra*, *Utkara*, *Chatvāla* and *Marjālia* are also included in this study.

⁵ *Agni*, Frits Staal, Asian Humanities Press, Berkeley, 1983

⁶ <http://www.unesco.org/culture/ich/?RL=00062&topic=desc>

⁷ In the Tamil Sangam literature, however, there is reference to Vaajapeyam Yāgam having been performed during the second century BCE in Perinchellur Graamam near Taliparamba in the present Kannur district. So, performances of other Yāgams by Nambudiries during the earlier periods cannot be ruled out.

⁸ It was attended by a large number of visitors and the full events were recorded.

⁹ For the present study, the *Baudhāyana Śulbasūtra* is consulted.

Brief description of altar space

The altar space in general consists of a *pracinasāla* and a *mahāvedi*. The *pracinasāla* as the name implies could have been the original altar space and this include four minor altar elements by name *garhapatyam*, *daksināgni*, *ahavaniyam* and *vedi*. The *mahāvedi* is an east facing trapezium to the east of *pracinasāla*.

The *mahāvedi* has spaces and elements called *sadas*, *somasāla* (*havirdhānam*), and *uttaravedi* in the west to east and the *Agnidhra* and *Marjālia* at the north and south sides touching the *mahāvedi* boundary lines. The *uttaravedi* can be in different shapes like falcon, tortoise and circular¹⁰.

Measuring instruments of Śulbasūtra

The Śulbasūtras define the following instruments for measuring and construction

1. Rajju: rope or cord with markings on it at specified lengths. This rope served for the purpose of a scale and compass also¹¹.
2. Sanku: wooden pegs used to mark different points. Also served as reference point to rope.
BSS 1.22 to 1.28 gives the construction of a square using rope and pegs.
3. Venu: Bamboo pole with length equivalent to the height of “Yajamāna”, at raised hands position.
This is usually taken as 1 *purusha* which is 120 *angulam*. [BSS 3.13, 3.14]
4. Shamyā: wooden yoke-pin of length 36 *angulam*. This also refers to the unit of 36 *angulam*. [BSS 1.99]

Measuring instruments of Kerala Vedic tradition

In addition to the above mentioned, we find some peculiar instruments in Kerala tradition. They include

1. Strips of coconut palm leaves of specific length like 1 *aratni* , used for practical measurement.
2. A bamboo scale with markings of
 - a. Padam - 15 *angulam*
 - b. Aratini - 24 *angulam*
 - c. Prakramam -30 *angulam*

¹⁰ Chapters 5 to 21 of *Baudhāyana Śulbasūtra* give the details of 14 types of *uttaravedies*. In Kerala the mainly used are falcon shaped. There are three types of falcon shapes. Square falcon, falcon with 5 set of nails, and the last one with 6 set of nails. In 1956 and 1975, the 6 set version was selected. The type of falcon depends on the *vaidika* family who performs the Agni for Yajamāna.

¹¹ In fact a set of pins and a long string can very well replace the modern geometry box.

Units for linear dimensions as per *Śulbasūtra* [BSS 1.3-1.21]

1. Angulam = width of 14 anu=34 tila arranged side by side, or the width of the middlemost joint of the middle finger of a man of medium size may be taken to be equal to an angulam
2. 1 ksudrapadam= 10 angulam
3. 1 pradesam = 12 angulam
4. 1 pritha= 13 angulam
5. 1 padam= 15 angulam
6. 1 eesham= 188 angulam
7. 1 aksham= 104 angulam
8. 1 yuga= 86 angulam
9. 1 janu= 32 angulam
10. 1 shamya= 36 angulam
11. 1 prakramam= 30 angulam
12. 1 aratini= 24 angulam
13. 1 purushan= 120 angulam (Vyamam)
14. 1 vyayamam= 96 angulam

The units like angula, pada, prakrama, pradesa, bahu and aratni had a long tradition and were used earlier in the Samhitas and the Brahmanic literature in the same sense as those in the *Śulbasūtras*. The terms reveal that these were coined from body measures being commonly used in daily life, and became quite popular in social life. Although they are derived from the basic unit “Purusha”, [size of the *Yajamāna*] standardization measures are also taken. This is evident when one angulam is equated to 34 tila size.

It is to be noted that sometimes these units are used represent the area also. In such cases the context will reveal whether it is a linear or area measure. For e.g. BSS 2.1 gives the area of falcon fire altar as 7.5 *purusha*. It is to be read as 7.5 square *purusha*.

Measuring units used by Kerala Vedic tradition are

The main units used in agnichayana ritual are

1. Aratini= 24 angulams
2. Prakrama= 30 angulams
3. 1 pradesam = 12 angulam
4. 1 padam= 15 angulam

In addition to this, two more units are found. They are

Madhyama prakrama and *Vrddha prakrama*. These are the extended forms of *prakrama*. The value of these new units for six nail falcon altar¹² is

1. *Madhyama prakrama* = $32 \frac{1}{4}$ angulams
2. *Vrddha prakrama* = $34 \frac{1}{3}$ angulams

In Kerala tradition, the ordinary Prakrama is known as *Bala-prakrama*

These extended units are introduced to contain the newly constructed *garhapatyam* and *uttaravedi* within *pracināsāla* and *mahāvedi* respectively.

Dimensions of the altar space and elements as per Baudhyana Śulbasūtra

The Sūtra number is given in bold, along with description

1. **1.66:** The distance between *garhapatyam* and *ahavaniyam* altars are 8, 11 and 12 prakrama depending on the varna of Yajamāna.
2. **1.67:** The position of *daksinagni* is given with respect to the other two agnis.
3. **1.68:** Another method to find the location of *daksinagni*
4. **1.69:** Still another method to find the location of *daksinagni*
5. **1.71:** Location of *darsapournamāsika* Vedi
6. **1.72:** Measures of four sides of *darsapournamāsika* Vedi
7. **1.73:** Technique of drawing the curves to the south side of *darsapournamāsika* Vedi
8. **1.74:** Technique of drawing the curves to the north side of *darsapournamāsika* Vedi
9. **1.75:** Technique of drawing the curves to the east side of *darsapournamāsika* Vedi
10. **1.88:** Measures of *pracināsāla*
11. **1.89:** The distance between *garhapatyam* and *ahavaniyam* altars is given as 12 prakrams
12. **1.90:** Measures of *mahāvedi*.
13. **1.91:** Distance between *ahavaniyam* and *mahāvedi*
14. **1.92:** Distance from the western boundary of *mahāvedi* to the *sadas* is 1 prakram
15. **1.93:** Width of *sadas* is 10 prakram
16. **1.94:** The North-South distance of *sadas* is 27 *aratini*.
17. **1.95:** The North-South distance of *sadas* can be 18 *aratini* also.
18. **1.96:** The *havirdhānam* is 4 prakram east of *sadas*. It is a square of 10 or 12 prakram sides.
19. **1.97:** The *uttaravedi* is $\frac{1}{2}$ prakrama west of *Yūpam*¹³.
20. **2.61:** The *garhapatyam* has a measure of 1 *Vyayamam*
21. **2.62:** The *garhapatyam* is rectangular in shape.

¹² These values will change for a five nail falcon altar. In this case, *Vrddha prakrama* is $35 \frac{2}{3}$ angulams

¹³ *Yūpam* is the sacrificial pole erected on the midpoint of eastern boundary of *mahāvedi*

22. **2.63:** It can also be circular.
23. **2.64:** Each layer of *garhapatyam* should have 21 bricks of size $96/3$ and $96/7$ angulam.
24. **2.65:** Next layer should also have 21 bricks.
25. **4.45:** The bricks are square in shape and 24 angulam in size. Area of the *uttaravedi* (falcon altar) is 2 aratini and 1 pradesa

These dimensions are compared with the drawings and plans of *pracinasāla* and *mahāvedī* kept in Pandal Mana, Rāpal, Thrissur district. The plans were prepared by Pandal Vaidikan Damodaran's father, who was a Baudhāyana Yajurvedin and an expert in Baudhāyana Śulbasūtras.

The variation noticed was in the outer dimension of *pracinasāla* and *mahāvedī*. This is because, instead of prakrama, extended prakras viz. madhyaprakrama and Vrdhhaprakrama are used for measuring *pracinasāla* and *mahāvedī* respectively. All other dimensions matched perfectly.

Another major variation is the introduction of patnisāla, a private enclosure for Yajamāna's wife. Experts attribute this, to the privacy¹⁴ enjoyed by Nambudiri women of Kerala.

The measure of bricks

1. **4.57:** Measure of *panchami* and *Adhyardha* bricks
2. **4.58:** Measure of *sapadya* and *chaturasra* bricks
3. **4.59:** Measure of *padhya* bricks
4. **4.60:** Measure of Dirgapadhya brick
5. **4.61:** Measure of Ubahya brick
6. **4.62:** Measure of Ashtami brck

pancami bricks and its subdivisions (10 types) [in angulam units]

1. pancami (sq. fifth of a purusa) = 24×24
2. adhyardha – pancami (rectangular brick, side longer by one-half) = 36×24
3. pancami-sapada (rectangular brick, side longer by one-quarter) = 30×24
4. pancami ardha(triangular half)= $24 \times 24 \times 24\sqrt{2}$
5. pancami padya (triangular quarter) = $24 \times 12\sqrt{2} \times 12\sqrt{2}$
6. adhyardha-ardha (triangular half of adhyardha)= $36 \times 24 \times 12\sqrt{13}$
7. dirgha-padya (triangular quarter bricks of adhyardha with larger base) = $36 \times 6\sqrt{13} \times \sqrt{13}$
8. sūla-padya (triangular quarter brick of adhyardha with shorter base) = $24 \times 6\sqrt{13} \times 6\sqrt{13}$
9. ubhayi [triangular brick when brick types (f) and (g) are joined = $30 \times 12\sqrt{2} \times 6\sqrt{13}$

¹⁴ Nambudiri women are called Antarjanam, literarily meaning “who stays inside”.

10. pancami-astami (one-eighth triangular brick of astami) = $12 \times 12 \times 12\sqrt{2}$

Dimensions of Nellikkatu bricks [in Centimeters]

1. pancami = 41×41
2. adhyardha – pancami = 61×41
3. pancami-sapada = 51×41
4. pancami ardha= $41 \times 41 \times 59$
5. pancami padya (triangular quarter) = $24 \times 29 \times 29$
6. adhyardha-ardha (triangular half of adhyardha)= $61 \times 41 \times 74$
7. dirgha-padya (triangular quarter bricks of adhyardha with larger base) = $61 \times 37 \times 37$
8. sūla-padya (triangular quarter brick of adhyardha with shorter base) = $41 \times 37 \times 37$
9. ubhayi = $51 \times 29 \times 37$
10. pancami-astami = $20 \times 20 \times 28$

In the Nellikkatu bricks, the square one is considered as the reference and hence the value of one Angulam is derived from it. It turns out to be 1.71 cm [2 decimal places]

From this reference angulum the other brick dimensions in angulum is calculated

Sl.No	Type of bricks	Dimensions as per Śulbasūtras (angulam)	Dimensions Nellikkatu bricks (angulam)
1	pancami	24×24	24×24
2	adhyardha – pancami	36×24	35.88×24
3	pancami-sapada	30×24	30×24
4	pancami ardha	$24 \times 24 \times 24\sqrt{2}$	$24 \times 24 \times 24.54\sqrt{2}$
5	pancami padya	$24 \times 12\sqrt{2} \times 12\sqrt{2}$	$24 \times 12.06\sqrt{2} \times 12.06\sqrt{2}$
6	adhyardha-ardha	$36 \times 24 \times 12\sqrt{13}$	$35.88 \times 24 \times 12.07\sqrt{13}$
7	dirgha-padya	$36 \times 6\sqrt{13} \times 6\sqrt{13}$	$35.88 \times 6.03\sqrt{13} \times 6.03\sqrt{13}$
8	sula-padya	$24 \times 6\sqrt{13} \times 6\sqrt{13}$	$24 \times 6.03\sqrt{13} \times 6.03\sqrt{13}$
9	ubhayi	$30 \times 12\sqrt{2} \times 6\sqrt{13}$	$30 \times 12.06 \times 6.03\sqrt{13}$
10	pancami-astami	$12 \times 12 \times 12\sqrt{2}$	$11.76 \times 11.76 \times 11.64\sqrt{2}$

Table 1

As tabulated in the table 1, the Nellikkatu bricks closely follow the dimensions prescribed by Śulbasūtras. It is important to note that, there may be some reduction in the size, after firing the clay¹⁵. Even then the bricks match with the theoretical bricks of Śulbasūtras.

Conclusion

From the analysis of measuring instruments and dimensions of altar space and bricks, it is shown that, Kerala tradition still follows the Śulbasūtra geometry while performing Vedic rituals, although some local adaptations like patnisāla are noted. This shows the continuity of Vedic tradition over a period of 3000 years.

Limitations of the study

The study includes the Agni of 1956 and 1975 only. At least 23 Agnis were conducted between 1752 CE to 2006 CE. Some of the altars are still kept intact but unreachable to the present study¹⁶. A detailed study will bring out more insights in to the subject.

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¹⁵ Bricks decrease (in length, breadth and thickness) by 1/32 while drying and burning (*Kātyāyana Śulbasūtra* 7.30).

¹⁶ For example, the falcon altar of *Moolamkodu*(2006 CE) Atirathram.