CHAPTER II

CLASSIFICATION, SURVEY AND MEASUREMENT OF LAND

Land may be classified into different categories on the basis of its quality and socio-economic use. The various types of land mentioned in the Arthaśāstra include vāstu (land covered by houses), krṣṭa (cultivated land), ākrṣṭa (uncultivated land), sthāla (high land), kedāra (wet land), ārāma (grove), saṇḍa (vegetable gardens), mūla-vāpa (fields used for growing ginger, termeric, etc.), vāṭa (sugar plantation), vana (forests), vivītā (grazing grounds), etc.¹ Patañjali mentions four categories of land, i.e., kedāra (irrigated land),² gochara (pasture land),³ halyā or sityā (lands brought under cultivation),⁴ ahalyā or ūsara (barren land).⁵ In Manusmṛiti, we come across five categories of land, viz., tilled and untilled land (kshetra, kedāra, krita and akrita),⁶ barren land,⁷ pasture land,⁸ land having dry -

1. Aś., II, 35.
2. Mahābhāṣya, III, 1.87.
3. Ibid., III, 3.119.
4. Ibid., IV, 4. 91, 97.
5. Ibid., V, 2. 107.
6. Manu, IX, 33-40 ; IX, 137 ; IX, 114.
7. Ibid., III, 142.
8. Ibid., VIII, 237.
climate with little water (jāngala), and desert (dhanva). The Amarakosha, twelve types of land are mentioned, i.e., urvarā (fertile), ūshara (barren), maru (desert), aprahata (fallow), śādvala (grassy lands), pankila (muddy land), jalaprayāmanupam (watery or wet land), kachchha (moist low-lying land near a river), šarkara (land full of pebbles and pieces of limestone), šārkāvati (sandy), nadīmātrika, (land irrigated by river water), devamātrika (land watered by rain). From the economic point of view, S.K. Maity has classified land broadly into five categories, viz., habitable land, cultivable land, pasture land, waste land, garden and forest land.

The term vāstu or vatthu generally means habitable land where houses were built. But it also refers to the places of worship (chaitya, devagriha), irrigation works.

1. Ibid., VII, 69.
2. Ibid., VII, 70.
3. Amara., I, 5-6, pp. 70-71 ; I, 10-13, p. 72.
5. Monier Williams, A Sanskrit-English Dictionary, p. 948. Even today, in Bengal, Vāstu-pūja is performed within the house on the last day of the month of Pauṣa. It is a sort of declaration that the land in question belongs to the observer of the rite. See S.R. Das, 'Types of Land in North-Eastern India', Essays in Ancient Indian Economic History (ed.), Brajadulal Chattopadhyaya, New Delhi, 1987, p. 64.
(setubandhah),¹ alms-houses (sattra),² places for free supply of drinking water (prapā),³ charitable buildings (pūrvanuvṛtham dharmaḥ sattra),⁴ places for pilgrimage (puṇyasthāna),⁵ and cremation grounds (śmaśāna), etc.⁶

The term kshetra, khetta or khettiya frequently occurs in the literary and epigraphic sources. Epigraphic records explicitly mention the donation of fields (khetta) for the maintenance of Buddhist monks residing in the nearby monasteries.⁷ The term evidently denotes fertile land.⁸ It included vast plains, wet land, land on the banks of rivers with enough moisture, land in the vicinity of wells, land watered by rains, etc.⁹ Basak and Pargiter have interpreted the term kshetra as a cultivable field.¹⁰ In the Amarakosha, ¹¹

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1. AS., II, 10 ; II, 35.
2. Ibid., II, 35.
3. Ibid.
4. Ibid.
5. Ibid.
6. Ibid.
7. LL. Nos. 1000, 1024, 1047, 1125, 1126, 1130, 1137, 1162, 1164. Also see Ep.Ind., XV, p. 139 ; XVII, p. 347 ; XIX, p. 120.
8. Āpast., 1. 11. 30 & 39 ; Gaut., IX, 40 ; AS., II, 35 ; Manu, IV, 46 ; Vishnu, LX, 4.
9. AS., II, 6 ; II, 24 ; II, 35.
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tra is mentioned as a special type of land capable of producing all kinds of crops. The arable land was preferred to all other types of land as the very existence of the people depended on it.

The terms, like khila, ūshara, akriṣṭa, anurvara, etc., denoted uncultivated, fallow, barren, and salty lands. In the Amarakosha, khila is mentioned as an untilled land. The terms khila and khilya refer to the same type of land. According to Nārada, the land which has remained uncultivated for one year is called ardhakhila, that which has not been under cultivation for three years is called khila, and the land which has not been cultivated for five years is not better than a forest and may be called aranya. The khila, therefore, was a land which was not under cultivation for a certain period. It is, often, a common

1. Amara., I, 5, p. 70.
2. Baud., III, 2.2; AS., II, 1; II, 24; II, 35, III, 10; VI, 1; Mahābhāṣya, III, 3. 119; V, 2, 107; Mahāvastu, II, 295; Mbh. Śhānti Parva, 29. 21; 69, 85; Malinda Pañho, p. 136; Ep. Ind., XV, pp. 130, 136, 143; XXI, pp. 81-82; XX, p. 62.
3. Amara., I, 6, p. 71. Oldenberg, however, is of the view that the small patches of land lying between the cultivators fields were called khila and khilya. See Macdonell and Keith, Vedic Index, Vol. I, p. 216.
4. Ibid.
practice with the peasants to allow certain fields to remain
fallow for some time to increase the fertility of the soil.¹
In the Dāmodarpur Copper-plate Inscription of Kumaragupta,
another term aprahata is used along with khila.² According
to Monier Williams, aprahata means ununtilled waste land.³
R.G. Basak holds that both khila and aprahata are synonymous
terms meaning ununtilled land.⁴ But, as these terms occur
together in the inscriptions, evidently they denote two
different types of lands. In S.K. Maity’s view, khila means
the land which was previously cultivated whereas aprahata
was the land which had never been cultivated.⁵ Saletore
refers to another type of land called aprada which,
according to him, was ununtilled land.⁶ The term is used
along with three other types of land, viz., aprahata-khila,
kshetra, and khila.⁷ R.G. Basak explains it as land not

¹. In the Ain-i-Akbari, we find that the land which is
cultivated for one or two years is called parauti-bhūmi;
when such land is not cultivated for three or four
years, it is called chachar-bhūmi and that which is
left uncultivated for five years or more is called
banjar-bhūmi. These types of land mentioned by Abul
Fazl seem to be the same as the khila-bhūmi of the
earlier days.

². Ep.Ind., XV, pp. 130, 143.
⁵. S.K. Maity, Economic Life of Northern India, p. 35.
    338.
given to anyone before transaction was effected which means the unsettled land. In S.K. Maity’s view, the term aprada does not denote any type of land as it is often used along with the terms dharma (aprada dharma) and akshayanīvi, etc., which refer to land tenures. The Gunaighar Copper-plate Inscription of Vainyagupta mentions another type of land - hajjaka-khila-bhūmi, which has been interpreted by D. C. Sircar as a marshy land.

In the Arthaśāstra, the terms like sthāla and pārvata are used for uplands and high grounds. Houses were generally built on elevated spots to guard against floods. The Sattigumba Jātaka mentions a high land in the heart of the forest where silk trees were grown. Thus sthāla denoted both cultivable and habitable lands.

In the outskirts of the village there was a pasture land for the grazing of cattle. In the Khoh Copper-plate

7. *AŚ.*, III, 10 ; *Mahābhāṣya*, III, 3. 119 ; Manu VIII, 137.
Inscription of maharaja Jayanatha, we come across the term gōpatha-sarah. Fleet has interpreted it as a grassy land. Nārada clearly refers to pasture land where the cowherds used to tend their village cattle. In the Maliya Copper-plate of Dharasena II, the term śivaka-padraka is mentioned which has been translated by Fleet as common land.

Another type of land is called vana, vanapoara, aranya (forest or jungle land). In the Arthasastra, such uncultivated tracts are referred to under the title bhūmichhidravidhāman. These lands were used as grazing grounds, hermitages for the brāhmaṇas, game forests, timber and elephant forests, etc. There are numerous references in

1. CII, III, No. 27, p. 123.
2. Ibid., p. 125.
4. CII, III, No. 38, p. 170, fn. 3. D.C. Sircar, however, takes the term in the sense of a village or a part of it. The term padraka used in the Inscription seems to be a fuller form of padra which, according to Monier Williams, means 'a village, the entrance into a village, the earth, etc. See A Sanskrit-English Dictionary, p. 585. Buhler, however, explained it as 'the grazing place'. See Ind.Ant. vol. XV, p. 307. In H.H. Wilson's, Glossary of Indian Terms, the term padra is explained as the common land, the land adjacent to a village left uncultivated. See p. 285.
5. AŚ., II, 35; V, 2; Milinda Pañho, p. 219; Jāt., I Nos. 514, 538, 540, 543, 544, 546, 547.
6. Ibid., II, 2.
the sources to the reclamation of such lands for making them fit for cultivation and habitation. The term bhūmichhidra, though literally meaning land having holes, was not an entirely uncultivable waste.

The terms like vata,2 vādaka or vatika,3 uyana or udyana,4 ārāma,5 vana6 referred to gardens, pleasure parks and groves. In the Buddhist literature the term vana refers to a park or grove such as Jetavana at Sravasti, Ānjanavana at Sāket, etc.7 The term pushpaphala-vāța in the Arthaśāstra denotes flower and fruit gardens. Other types of land such as rocky,8 miry,9 uneven,10 desert,11

1. Milinda Paţho, p. 219 ; Jāt., II, 358 ; V, 167 ff. ; Strabo, XV. 1. 41.
2. AS', II, 6 ; Divyāvandāna, 286. 15 ; 288. 15.
4. Jāt., I, 120, 149 ; II, 104 ; IV, 213 ; V, 95 ; VI, 333 ; IHQ, XIV, pp. 472 ff.
5. AS', II, 1 ; LL. Nos. 82, 973, 974, 1336 ; Jāt., IV, 359, Nos. 541-543-47.
6 Mahāvastu, 1.4 ; III, 441 ff. LL. No. 731 ; Jāt., I, 92 ff.
8. AS', VI, 1.
9. Ibid.
10. Ibid.
11. Ibid.

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full of pebbles\textsuperscript{1}, etc., were not fit for cultivation. Kautilya states that a good country should be free from all such types of land.\textsuperscript{2}

II

The importance of cadastral survey in land revenue administration cannot be underestimated. It is essential to maintain proper records of boundaries of separate holdings to safeguard the interests of both the State as well as the peasants. In the Rigveda, reference is made to separate fields, i.e., urvarā, urvarā sā, urvarā jīt, kṣētra sā.\textsuperscript{3} We also come across the expression urvarā-pati ‘lord of fields’.\textsuperscript{4} The rights of the individual peasants over their fields could only be protected if the land was properly surveyed and demarcated. Our sources refer to the state functionaries who were actually connected with the work of land survey and measurement. Kurudhamma Jātaka refers to an officer called rajjugahāka-amacca, who was entrusted with the work of land measurement.\textsuperscript{5} The rajjukas mentioned in --

1. Ibid.
2. Ibid.
3. Rigveda, I, 110.5
the edicts of Ashoka were probably the settlement officers. ¹
Strabo had perhaps *rajjukas* in mind when he referred to the
gazetted officers superintending the rivers and measuring the
land.² Pāṇini refers to an officer called *kṣetrákara*.³
The term has been interpreted to mean an officer who
demarcated cultivable land into separate fields by actual
survey and measurement.⁴ These references to the state
officials suggest that land survey was carried out by the
State for the purpose of assessing the land revenue.⁵

1. Rock Edicts, III; Also see Romila Thapar, *Asoka and
the Decline of the Mauryas*, p. 107; M.H. Gopal,
Revenue System*, p. 231.

2. Strabo, XV, 1.50; J.W. McCrindle, *Ancient India as
Described by Megasthenes and Arrian*, p. 86. According
in Strabo, the Mauryan officers measured the land as
was done in Egypt. In Egypt, an exact and minute survey
was necessitated by the constant disturbance of
boundaries caused by floods in the river Nile. As a
consequence, the land had to be remeasured repeatedly.
Probably, the same conditions prevailed in the lower
Ganga plain. It seems that the state officials under
the Mauryas were conscious of the resurvey of lands for
revenue purposes as the boundaries were frequently
disturbed by the alluvial deposits.


4. V.S. Agrawala, *India as Known to Pāṇini*, Lucknow, 1953,
p. 197.

5. See Richard Fick, *Social Organisation in North-East
India in Buddha’s Time (tr.),* S. Maitra, Calcutta,
1920, pp. 119, 149; U.N. Ghoshal, *The Agrarian System
in Ancient India*, Calcutta, 1973, pp. 33, 41. Also see
*Hindu Revenue System*, p. 67. In the *Jātakas*, an
officer is described as measuring the field by holding one
end of the rope tied to a stick, while the other end is
held by the peasant. Seeing a crab-hole at the spot
where he wanted to pitch the stick, he reflected that
Although measurement of arable land was known at an early period, yet the detailed survey and measurement of all types of land such as cultivated, uncultivated, wet, fruit gardens, forests, pasture lands, etc., was probably made for the first time under the Mauryas.

In the Maurya period, the records of the boundaries of village lands were maintained by the state officers, i.e., the gopas and the sthānikas. Under instructions of the samāharta, the gopa ascertained the total area of the villages within his circle by means of the inspection of village boundaries, the total area of fields by numbering cultivated and uncultivated plots, the upland and lowland plots, the gardens, forests, the homestead land, the sacred sites, the shrines, the embanked reservoirs, the cremation grounds, the pasture lands, roads, etc. On the basis of the data collected, he prepared some registers (nibandhas) to keep the record of boundaries of village fields, of uncultivable lands, and of the transfer of land by gifts and sale. He also kept the record of loans advanced (anugraha)

if he placed the stick in front of the hole it would cause loss to the king's revenue, and if he placed it behind the hole it would harm the cultivator. See Jāt., II, No. 276, p. 257. In Richard Fick's view, the above reference indicates frequent cheating on the part of the royal surveyors. See Social Organisation in North-East India, p. 151.

1. AS., II, 35.
and revenue remissions (*parihāra*). In the same manner, the *sthānika* who was incharge of a larger area prepared similar registers on the basis of the records compiled by various *gopas*. To make sure that the records entered in the registers were correct, spies disguised as householders were sent to the villages by the *samāharta*.¹

As far as the compilation of registers is concerned, a striking parallel may be traced between the Indian and Egyptian practices. During the Maurya period, the village register was prepared, first of all, by the *gopa* after making an elaborate survey of the village lands. It was checked by the *sthānika* and the reports were ultimately sent to the *samāharta* for the preparation of the Grand Register of the villages under specified heads.² The Ptolemics inherited from their predecessors the practice of preparing annual registers based on the survey and measurement of land. The land registers were compiled by the village chiefs under the supervision of the high officials 'the royal scribes'. The village surveys were tabulated by the *toparchs* (officers of the sub-division of the *nome*) and were sent to the *nomarchs* (officers responsible for the cultivation of the crown land). The reports of the whole

nome were finally sent by the nomarchs to Alexandria for the preparation of the general revenue roll.1 As compared with the Egyptian village registers, those of the gopas were more thorough since they recorded detailed particulars of village lands and the amount of the government dues and their remissions and also were supplemented by the census of houses and families in the villages. Kautilya does not suggest the preparation of such registers annually, perhaps because the boundaries unlike those in Egypt did not tend to change from year to year. Such conditions, however, existed in the lower Ganga plain due to the frequent alluvium and diluvium caused by the river and its tributaries.2

The practice of land survey and measurement continued in the post-Maurya period as well. Under the Gupta rulers, all lands -cultivated and uncultivated - were surveyed and measured by officers referred to in the inscriptions as sīmākaras.3 They were also called sīmāpradātā.4 In some inscriptions, an officer who surveyed and measured lands is called as pramāṭr5 and settler of boundary disputes as

1. Ibid., p. 278.
4. Ep.Ind., XII, 75.
5. Ibid., XVII, p. 325.
nyāyakaraṇika. Another officer who performed the same functions is referred to as pustāpāla in many inscriptions. These officers carefully marked, measured and recorded the boundaries of different villages and of individual plots and kept the records of all land transactions.

To avoid land disputes arising out of desire for more land in a settled agricultural economy, boundaries of separate fields and of different villages were clearly demarcated. The law-givers divided the boundary marks into two categories, viz., visible and invisible. Manu states that boundaries can be marked by nyagrodhas, asvatthas, kimśukas śālas, palmyra palms and trees with milky juice. Moreover, shrubs, bamboos of different kinds, sami-trees, creepers, reeds, the thickets of kubgaka were also considered for boundary demarcation. Temples, tanks, wells, cisterns, fountains, sthalam (mounds), setu (embankments), chaitya (heaps of stones) were also preferred as boundary marks. A similar list of visible boundary marks is given by Bṛhaspati and Nārada. Referring to invisible marks, Manu states that stones, bones, cow's hair, chaff, ashes.

1. Ibid., XII, p. 79.
5. Nārada, XI, 4-5.
potsherds, dry cow-dung, bricks, cinders, pebbles and other things of similar nature which are not corroded by the earth for a long time should be buried beneath the soil where the boundaries meet.\(^1\) To safeguard such invisible marks from being corroded, Brihaspati recommends that these objects should be placed in a vessel before their being buried underneath the soil. He further lays down that the elders should inform their children about these boundary marks who, when they grow old, should inform their own children about them. By the information thus passed from generation to generation, the doubts regarding boundaries may be obviated.\(^2\) Manu says, "By these signs, by long continued possession, and by constantly flowing channels of water, the king shall ascertain the boundary (of the land) of two disputing parties".\(^3\) Land grants which were an important feature of land system implied that all such lands should have been clearly demarcated.

In some inscriptions, the boundary marks are given in minute details.\(^4\) The boundaries of individual plots were always carefully marked out and measured by the record keepers in the presence of the important men of the

1. Manu, VIII, 249-51.
2. Brih., XIX, 6-7.
locality. But, in the case of villages, such details were not always required, as their boundaries were more or less fixed by natural and artificial barriers. The Khoh Copper-plate Inscription of mahārāja Hastin mentions the gift of the village Vasuntarasandika which was demarcated by trenches (samantād garttā) on all sides.

The boundaries were held very sacred and any violation of them was severely dealt with. The Mahābhārata prescribes suitable punishment for any act of transgressing and removal of boundary marks. Kauṭilya also enjoins a fine of twenty-four pānas for similar offences. The law-givers suggest severe punishments in such matters. According to Manu, the person who destroys boundary marks should be punished by mutilation. We further learn from the Vishnu-smṛiti that anyone destroying the land marks should be compelled to pay a heavy fine and asked to mark the boundary again with similar land marks. Yājñavalkya also lays down severe penalty for the removal of the boundary marks.

1. Ep. Ind., XX, p. 59; XXI, p. 82.
2. CII., III, No. 21, p. 96.
4. AŚ., III, 9.
7. Yāj., II, 158.
In spite of boundary marks and penalties prescribed for violation of them, boundary disputes among villagers were quite common. Manu and other law-givers refer to such disputes as simāvivada. The land disputes were resolved by the neighbours, the village elders, the members of the same community and the outsiders having full acquaintance with the place.\(^1\) Yājñavalkya says that in disputes relating to boundaries of land under cultivation, persons residing in surrounding villages, aged men and other competent persons, cowherds, persons cultivating adjoining lands and persons living on forest produce, should solve the disputes on the basis of boundary-marks such as the elevated lands, charcoal, chaff, huge trees, bridges, ant-hills, ditches, bones, and piles of stones, etc.\(^2\) Similarly, Nārada says, "In all quarrels regarding landed property or boundaries, the decision rests with the neighbours, the inhabitants of the same town or village, the (other) members of the same community, and the senior inhabitants of the area and also with those living on the outskirts of the village and who live by the tillage of fields situated in those parts and with herdsmen, bird-catchers, hunters, etc. These men shall determine the boundary in accordance with the (old) landmarks, (such as) chaff of grain, coal, potshreds,

The witnesses were to determine the boundaries truthfully and those who gave false evidence were punished.\(^1\) Nārada lays down that the boundaries should not be fixed by one man single-handed, though he may be a reliable person. The task should be entrusted to several persons, because it is an affair of great importance.\(^3\) But Bṛhaspati is more liberal in his views regarding the fixing of boundaries. He states that even a single man agreeable to both parties, wearing a red cloak and garland of flowers, putting earth on his forehead, adhering to truth and having kept a fast, might fix the boundaries.\(^4\) In case the disputes regarding the boundaries could not be settled on the basis of land marks, they were settled by the king himself.\(^5\)

Kauṭilya lays down that before any transaction of land, the accurate boundaries of fields, gardens, lakes and tanks had to be declared in the presence of the elders of the neighbourhood.\(^6\) It could have been possible only if proper

2. Āpast., II, 11. 29; Gaut., XIII, 16; Baud., 1, 10, 19; Manu, VIII, 99, 257; Also see Yāj., 11. 153 ff.
5. AŚraj., III, 9; Manu, VIII, 245, 258, 265; Yāj., II, 156.
measurement of a piece of land in question had been made. He specifically mentions a number of linear measures for the purpose.¹ These include kamsa, aṅgula, pāda, danda, rajju, aratni, dhanus, gōruta and also bāhu vitasti, paridēśā, chhāyāpausuṣa, yōjana, etc. Some land measures like kulyavāpa and nāla that we come across in the inscriptions belonging to subsequent period may also be traced to Kauṭilya.²

III

During the Maurya period, perhaps some standard measures were used by the royal officers as well as by the peasants. Such measures were manufactured in the state manufactory and were duly stamped with the royal seal.³ According to Strabo, the fourth group of city magistrates regularly checked the measures of all kinds.⁴ Manu enjoins that the measures should be duly marked and re-examined at least twice a year.⁵ The other law-givers prescribe

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1. Ibid., II, 20. The Atharvaveda mentions two units of measurements, the abhisu (lit.rein), evidently a short measure and vyama, the space between the tips of the fingers when the arms are extended - VI, 137.2. In the Jātakas, reference is made to kārīsa measure. In the Suvannakakketa Jātaka, reference is made to a farm near Magadha measuring a thousand kārisas. See Jāt., III, No. 389, p. 184 ; IV, No. 484, p. 175.


3. Ibid., II, 19.

4. Strabo, XV, 1. 51.

5. Manu, VIII, 403.
punishment for counterfeiting or forging the standard measures. But the possibility of the local land measures used by the peasants cannot be ruled out. Even when the Mughal emperor Akbar tried to introduce a standard land measure, the local customary measures continued to be used by the peasants.

In the inscriptions of the Gupta period, we come across various land measures, but their precise length is not very clear. The area covered by the same measure differed from place to place. In lower Ganga plain, land was measured according to the length of the hand of the ruling prince or some state functionary. In such cases, the land measures were bound to vary from time to time, giving rise to disputes between the peasants and the beneficiaries. There was also a tendency on the part of the peasants to use larger measures to keep more land under their possession and that of using smaller ones on the part of the donees in order to deprive the former of a part of their land. W.C. Neale rightly points out that a beginner in the study of Indian agrarian matters is confused by the wide variations

1. Vas., XIX, 13; Vishṇu, V. 122; Yaj., II, 243.
4. Ibid., p. 83.
among the measures of land. A critical study of commonly used land measures, however, gives some idea of the area covered by them.

An important and basic unit of linear measurement was aṅgula. Its length, as given in the Arthatṣāstra, was equal to the middle joint of the middle finger of an adult man of at least six feet in height. Nārada also mentions the same length of aṅgula which is approximately 3/4 of an inch. The length of dhanurgraha and dhanurmushti units was equal to four or eight aṅgulas, respectively.

Another commonly used land measure was rajju. According to Kautilya, it is equal to ten dāṇḍas, each dāṇḍa having a length of ninety-six aṅgulas. It means, the length of the rope used for cadastral survey was equal to twenty yards. The length of two rajjus was equal to one paridēśā (square measure) or twenty dāṇḍas. According to

1. W.C. Neale, 'Land is to Rule', Land Control and Social Structure in Indian History (ed.), R.E. Frykenberg, New Delhi, 1979, p. 5.
6. One aṅgula being equal to 3/4 inches, the length of one rajju is equal to 96 x 10 x 3/4 x 1/12 x 1/3 = 20 Yards.
Shamasastry, the length of one rajju was equal to one hundred and twenty feet or forty yards.¹

The goruta or krosa measure, according to Kauṭilya, was equal to one thousand dhanus or one-fourth of the length of a yojana.² Bhattachvāmin, the commentator, takes goruta and krośā (goratum-krośām) as equal to two thousand dhanus or one-fourth of a yojana.³ In the Arthaśāstra, the length of a yojana is given as four thousand dhanus, one dhanus being equal to ninety-six aṅgulas.⁴ It means, one yojana was

1. See Shamasastry (tr.), AS‘., p. 118 :
   1 aṅgula = 3/4 inches
   1 daṇḍa = 192 aṅgulas
   1 rajju = 10 daṇḍa

   or = 192 x 3/4 x 10 x 1/12 = 120 feet or 40 yards.

The same length is given by M.H. Gopal :
   1 daṇḍa = 192 aṅgulas
   10 daṇḍa = 1 rajju
   2 rajju = 1 pardoṣa (square measure)
   3 rajju = 1 nivartana (square measure).

See Mauryan Public Finance, p. 47.

But R. K. Mookerjee calculated its length to 135 feet :

   1 rajju = 10 daṇḍas = 40 hands
   1 hand = 54 aṅgulas.

Therefore, 1 rajju = 54 x 40 x 3/4 x 1/12 = 135 feet.

See Chandragupta Maurya and His Times, Madras, 1943, p. 124.

2. AS‘., II, 20.


From equal to approximately four-and-a-half miles. From Bhattasvāmin’s interpretation it will be double the distance, i.e., approximately nine miles. According to Barnett, two types of yojana were used, viz., the long yojana being equal to nine miles and the short one of exactly its half length. P.J. Fleet refers to these measures as General yojana and Magadha yojana, respectively. On the basis of Yuan Chwang’s observations, Fleet points out a third type of yojana having a length of about twelve miles. But normally, the length of a yojana varied four-and-a-half miles to nine miles. Yojana as land measure was perhaps used for measuring long distances rather than for calculating the area of landholdings. As the yojana was equal to four krosas of either 1,000 or 2,000 dhanus, it means krosa or goruta was also of two types.

1. An āṅgula being equal to 3/4 inch, the equation will be: $96 \times \frac{3}{4} \times 4000 \times \frac{1}{12} \times \frac{1}{3} \times \frac{1}{1760} = 4.55$ miles approximately.

2. Rhys Davids takes the distance of yojana as equal to about 7 miles. See Pali-English Dictionary, p. 191; whereas to Childers, it is twelve miles. See Dictionary of Pali Language, p. 604.


6. Sel.Inscr., p. 68 fn. 1. According to D.C. Sircar, one yojana was considered a day’s march of an army in ancient India. Also see D.D. Kosambi, An Introduction to the Study of History, p. 191.
i.e., 1.14 and 2.28 miles, respectively.\(^1\) In the Lalitavistara, the Magadha krośa is given as equal to 4,000 hastas or 1,000 dhanus, i.e., 1.14 miles.\(^2\) Strabo states that 'they (agronomoi) construct roads and set up pillars at every ten stadia'.\(^3\) It seems that these pillars were erected at a distance of one smaller krośa from each other.\(^4\)

In the Satapatha Brāhmaṇa, the term bhūmi is referred to but its precise nature as land measure is not clear.\(^5\) It is not mentioned by Kautilya in the list of land measures given by him. Probably, it corresponded to the pāda, śala or śama of the Arthaśāstra which is equal to fourteen aṅgulas.\(^6\) The term also occurs in some of the Gupta inscriptions. In the Chammak Copper-plate Inscription of the Vākāṭaka ruler Pravarasena II, it has been mentioned how the village Charmāṅka measured eight-thousand bhūmis according to the royal measure.\(^7\) But the precise dimensions

\(^1\) 1000 x 96 x 3/4 x 1/12 x 1/3 x 1/1760 = 1.14 miles.
\(^2\) See Lalitavistara (tr.), R.L. Mitra (Memoirs of the Early Life of Śākya Buddha), Calcutta, 1877.
\(^3\) Strabo, XV, 1.50.
\(^4\) According to Rhys Davids, 10 stadia is equal to 2022 1/2 yards. See Buddhist India, Calcutta, 1959, p. 265.
\(^6\) AŚ., II, 20.
\(^7\) CII, III, No. 55, p. 241.
of the royal measure are not stated. In the same inscription, it is referred to as rāja-māṇika-bhūmi\(^1\) which indicates either a plot of land or the standard land measure. Fleet, however, is of the opinion that it was certainly a land measure the length of which is not known.\(^2\)

From the inscriptions of the Gupta period, it seems that hasta as land measure was widely used in the lower Ganga plain. Three Copper-plate inscriptions of Dharmaditya and Gopachandra mention that the land was measured by 'hasta' of virtuous Śivachandra.\(^3\) Similar reference is made in the Pāharpur Copper-plate Inscription to the 'hasta' of Darvikarma.\(^4\) But the precise area covered by this land measure is not clear. It does not seem practicable that the forearm of a particular person was used as standard land measure. Śivachandra and Darvikarma seem to be the keepers of the standard land measures and responsible for all official land measurement in the area.\(^5\) In the Nandapur Copper-plate Inscription (488 A.D.), the term 'Darvikarma-hastena' is used.\(^6\) It might have been the technical

\(^1\) Ibid., pp. 236 ff.; \textit{Ind.Ant.}, vol. XII, pp. 239 ff.
\(^2\) Ibid., p. 241, fn. 9.
\(^4\) \textit{Ep.Ind.}, XXI, p. 82; \textit{Sel.Inscr.}, pp. 356 ff.
\(^5\) S.K. Maity, \textit{Economic Life of Northern India}, p. 36.
\(^6\) \textit{Ep.Ind.}, XXIII, pp. 52 ff.; \textit{Sel.Inscr.}, pp. 382-83.
In the designation of a person who measured the land.\(^1\) In the *Arthaśāstra*, we come across the term *hasta* - a land measure of three different types.\(^2\) The first was the *prajāpatya hasta*, equal to one *aratni*\(^3\) or two *vitasti* or twenty-four *aṅgulas*, i.e., eighteen inches, and was probably used for measuring cultivable land.\(^4\) The second type of *hasta* was equal to twenty-four *aṅgulas* plus one *dhanurgraha*. One *dhanurgraha* is equal to four *aṅgulas*. That means, the length of the second type of *hasta* was equal to twenty-eight *aṅgulas* or twenty-one inches, and was used for measuring pasture lands. The length of the third type of *hasta* was equal to fifty-four *aṅgulas*, i.e., forty-and-a-half inches and was used for measuring forest lands. Thus, we have three types of *hastas* having the length of twenty-four, twenty-eight and fifty-four *aṅgulas*, respectively. The *Ilahi Gaz* of the Mughal times was also of three types and was used for different measurements.\(^5\)

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3. *Aratni* seems to be the same as 'råtha' of the Buddhist literature. However, its length was equal to 12 *aṅgulas*. See Rhys Davids, *Pali-English Dictionary*, p. 21.
5. Abul Fazl, *Ain-i-Akbari*, (tr.), Blochman and Jarrett, Vol. II, pp. 58-59. The long *gaz* was used for measuring cultivated lands, the second was employed to measure buildings, etc. and the third short *gaz* was used for measuring cloth, chairs, carts and so forth.
possibility that the hasta as land measure in its literal sense may have been used by the peasants for local measurements.¹

The dhanus or daṇḍa was equal to 4 hasta or 96 aṅgulas, i.e., approximately six feet.² Bühler also suggests the same length.³ In the Buddhist sources,⁴ we come across a term yaṭṭhi or yāsti in the sense of rod, the length of which was equal to seven hastas.⁵ The daṇḍa used for measuring the lands granted to the brāhmaṇas was of 192 aṅgulas, i.e., double the usual length of the daṇḍa.⁶ Thus, there were three measures of daṇḍa, equal to the length of four, seven and eight hastas, respectively. The smaller daṇḍa measure was probably used in survey and measurement of land for revenue purposes whereas the other two daṇḍas were used in measuring lands which were granted to brāhmaṇas and other beneficiaries. According to Nārada, the length of dhanus varied from 105 to 107 aṅgulas.⁷ In S.K. Maity’s opinion, the daṇḍa and dhanus were the same as

2. ASI, II, 20.
6. ASI, II, 30.

42
the naḍa of the Gupta inscriptions, though this is by no means certain.¹

In the Buddhist and Brāhmanical literature, we come across the term vitasti or vidaṭṭhi.² Kauṭilya gives its length as equal to 12 aṅgulas or one chhāyāpaaurusha.³ R.C. Childers⁴ and Rhys Davids⁵ also take it as of the same length. Vatasti covered the length between the thumb and the little finger of a stretched hand or the distance between the wrist and the tip of the middle finger, which is about 12 angulas or 9 inches. Patañjali mentions a linear measure called prādesa having the same length as vitasti.⁶ Baudhāyana, the law-giver, gives its length as equal to 12 aṅgulas.⁷ Prādesa is not referred to in the Arthaśāstra. Probably, prādesa, vitasti and chhāyāpaaurusha were measures of equal length, i.e., of 12 aṅgulas each. Another unit of linear measure was kishku or kamsa. Its length was equal to two vitastis plus one dhanurmushti, which means 32 aṅgulas.⁸

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1. S.K. Maity, Economic Life of Northern India, p. 36.
2. Jāt., I, 337 ; III, 318 ; VI, 341 ; Milinda Pañho, 85 ; Dhammapada Commentary, III, 172 ; IV, 220 ; Vinaya, III, 149 ; IV, 279 ; Mahābhāṣya, V, 2.37, p. 378.
5. See Pali-English Dictionary, p. 79.
Patanjali refers to a measure called aks’a. According to B.N. Puri, it was equal to 104 aṅgulas and, as such, it covered the area a little more than the dhanus or daṇḍa.

Another land measure bāhu was equal to 3 rajjus plus 2 daṇḍas. In the Arthaśāstra are also mentioned pāda, śama, śala, pariraya as units of measurements having length of 14 aṅgulas each, i.e., approximately 10 inches. Etymologically, pāda means a foot and as such the area covered by the unit is the distance from the outer side of the heel to the tip of the first digit of the toe. But as this distance can vary from person to person, the length of pāda may be between 9 to 12 inches. It seems that the length of 12 aṅgulas for pāda was considered the standard length for measurement.

In the inscriptions belonging to the western provinces of the Gupta empire, we come across a unit of land measurement called pādāvarta. Its origin may be traced to the pāda mentioned by Kauṭilya. Fleet suggests that 100 pādāvarta and 10 pādāvarta of land mentioned in the inscriptions implied an area measuring an equal number of

3. Though apparently, bahu means an arm, but as given by Kauṭilya, its length was: 32 x 96 x 3/4 x 1/12 x 1/3 = 64 yards, where 1 rajju is equal to 10 daṇḍas and one daṇḍa being equal to 96 aṅgulas. See AS., II, 20.
4. Ibid.
It would mean 10 padavarta were equal to eight feet and four inches, an area hardly worth granting to a worthy recipient. It shows that the padavarta was certainly larger than a foot. If we interpret it etymologically 'as a turning of foot', it would be equal to approximately nine square feet.

In the inscriptions, we often come across a unit of measurement called nāla, the standard rod of 8 x 9 reeds (aṣṭaka-navaka-nalābhyām-apaviñchchhyā, i.e., having been measured by reed of eight and nine). In the list of linear measures given by Kauṭilya, we find the term nālika which is equal to four aratnis. As one artani was equal to two vitastis or 24 aṅgulas, one nālika was equal to 96 aṅgulas or 72 inches. The meaning of 8 x 9 reeds is not clear, but if we suppose that the area covered by such reeds was in inches, then the length of nālika mentioned by Kauṭilya and the nāla of the inscriptions would be identical. There is every probability that nāla was an abbreviated form of the nālika because a number of linear measures mentioned by Kauṭilya like hasta, pāda, nivartana,

1. CIL, III, No. 38, p. 170.
2. S.K. Maity, Economic Life of Northern India, p. 42.
etc., continued to be in use in later periods. The naḷa as land measure referred to in the Dāmodarpur Copper-plate Inscription indicates an area measuring 8 x 9 reeds.¹ A similar reference is found in the Nandapur Copper-plate Inscription dated 488-89 A.D.² The term naḷa is also referred to in the Pañchataṅtra as a reed.³

The precise meaning of the expression 'aṣṭaka-navaka-nalabhyaṁ-apaviṇchchhya' is not very clear. Dikshit, on the basis of the practice in Bengal of measuring land by naḷas or reeds of a particular length of cubits, suggests that the terms aṣṭaka and navaka compounded with the term naḷa imply rods of eight and nine cubits, respectively.⁴ A similar view is expressed by D.C. Sircar.⁵ Pargiter, on the other hand, suggests that the length of naḷa varied from five cubits to sixteen cubits, and the expression 'aṣṭaka-navaka-nalabhyaṁ' denotes the land measured by eight reeds in breadth and nine reeds in length.⁶ R.G. Basak states that the expression means a rectangular plot of land, eight naḷas

². Ibid., XXIII, No. 8, p. 55.
⁵. Sel. Inscr., p. 334, fn. 2.
in breadth and nine nalas in length, measured by the same rod.\textsuperscript{1} According to B.C. Sen, "two nalas were used for the measurement of length and breadth, respectively, one measuring nine cubits and the other eight. The element 'aṣṭaka' as well as 'navaka' in the compound can well be taken as representing the size of the nala employed in each case, and the custom of measuring by hasta standard having been shown in some inscriptions to have been current, it is evident that, whether the compound is preceded by hasta or not, the same practice must have been followed throughout. Taking the average measurement of the hasta to be 19 inches, the unit represented by the aṣṭaka-navaka-nalas will correspond to oblong area of $19 \times 8 \times 19 \times 9 = 25,992$ square inches or $180 \ 1/2$ square feet".\textsuperscript{2} It is not a satisfactory interpretation of the expression. To employ two rods, one for measuring breadth and the other for length, is quite a confusing procedure. The practice of measuring land by rods is still prevalent in many villages but normally, only one rod is used for measurement. Moreover, measuring land by rectangular units is most inconvenient, especially when a large area is to be measured.

\footnotesize
\textsuperscript{1} See Asutosh Mukherjee Silver Jubilee Volume, III, pt. 2, p. 494.
\textsuperscript{2} Sel.Inscr., p. 325.
In the literary and epigraphic sources, *nivartana*, as a land measure, is frequently mentioned. But the area covered by it is a matter of controversy among the scholars. Kautilya gives the following relationship of *nivartana* with other linear measures:

\[
\begin{align*}
192 \text{ aṅgulas} & = 1 \text{ daṅga} \\
10 \text{ daṅga} & = 1 \text{ rajju} \\
3 \text{ rajju} & = 1 \text{ nivartana}
\end{align*}
\]

Taking roughly an aṅgula as equal to 3/4 inch, one *nivartana* comes to be equal to 2.975 acres, i.e., about 3 acres. But P.V. Kane suggests that *nivartana* was probably so called because it was used to denote a plot of land that could be ploughed in a day by eight or six oxen. Another scholar, assuming one rajju as equal to 20 yards has calculated the area covered by one *nivartana* as 3600 yards which is less than one acre. Brihaspati holds that one daṅga is equal to 10 cubits and so *nivartana* is roughly equal to about 5 acres. Vijñāneshvara while commenting on Yājñavalkya quotes Brihaspati, ‘sapta-hastena daṅgena-trimsādandam nivartanam’, to show that one *nivartana* is equal to 210 x

1. Baud., III, 2.2 ; LL. Nos. 1125, 1126, 1200, 1327.
5. Brih., V. 8.
210 cubits, i.e., about 2 1/4 acres.¹ Buhler takes it to be a measure of 4000 square hastas, which is equivalent to a modern bighā.² In Pran Nath’s opinion, the brahmadeya nivartana was an area of land granted to a brāhmaṇa and it was equal to an English acre. It appears probable, he says, that the nivartana was used in the sense of vṛtti or ‘allowance’ or ‘livelihood’; so an area of land sufficient to support one man from its produce was called nivartana.³ It seems that the area of one nivartana varied from one acre to five acres. As it was not a standard land measure, the difference may be due to local variations. Another such measure vaṭika or vali was equal to five vartanakas each vartanaka being of 128 dhanus or dandas.⁴

² Ep.Ind., XIV, ill fn.
³ Pran Nath, A Study in the Economic Condition of Ancient India, p. 83. A.S. Altekar holds that one nivartana covered the area of land equal to five acres. See Indian Culture, vol. II, p. 429. In R.S. Sharma’s opinion it was equal to one-and-a-half acre. See JBRS, vol. 44, 1958, p. 227; Perspectives in Social and Economic History of Early India, p. 139-40. According to Monier Williams, one nivartana was equal to 20 rods or 200 cubits. See Sanskrit–English Dictionary, p. 560. That one nivartana was equal to 20 rods is traced to a commentary on the Mahābhārata. See Ep.Ind., XI, p. 280. It is sometimes assumed that the nivartana was the same as nētana land measure used in Bihar as late as the 19th century. The nētana was equal to nine bighās and one bighā was equal to 2670 yards. Thus, nētana was equal to 24,030 square yards or 4.964 acres. See Ep.Ind., X, pp. 102-106; XI, p. 280 fn. Also see XXVIII, pp. 235 ff. for further discussion on the nivartana measure.
⁴ Ep.Ind., XV, p. 55.
In the land charters belonging to the lower Ganga plain, we come across land measures like āḍhavāpa, droṇavāpa, and kulyavāpa. In D.C. Sircar’s view, they indicate the area of land that was required to sow seed-grains weighing one āḍhaka, droṇa and kulya, respectively. He gives the mutual relationship of these measures of weight as follows:

\[
\begin{align*}
1 \text{ āḍhaka} & = 256 \text{ handfuls or mustīs of grain.} \\
1 \text{ droṇa} & = 4 \text{ āḍhaka} \\
1 \text{ kulya} & = 8 \text{ droṇas}\end{align*}
\]

On the basis of Kālidāsa’s Raghuvāṃsa which refers to the practice of transplanting the seedlings, D.C. Sircar assumes that the area covered by kulyavāpa was equal to the land required to transplant the seedlings produced from one kulya of seed which, according to his calculation, comes to 128 to 160 bighās of land.

1. Ibid., XV, p. 113 ; XX, pp. 59 ff ; XXI, p. 78.
2. S.K. Maity, Economic Life of Northern India, p. 56. Kautilya mentions the word kulyavāpa with reference to the areas where water channels were used for irrigation (ḥaimanyānām ca kulyavāpanām ca kālataḥ). See AS., II, 24.
3. Kullūka, the commentator, uses the same equation while explaining the term ‘dhānyadroṇa’ in Manusmriti - On Manu, VII, 126. Monier Williams also holds that one kulya of seed contained 8 droṇas or bucketfuls.
4. Kālidāsa, Raghuvāṃsa, IV, 36-37. Kālidāsa, while describing Raghu’s conquest of the Vaṅgas, used the simile that Raghu uprooted and replanted them (utkhata pratirūpita) like rice plants.
If we take into consideration the literal meaning of its root vap 'to sow', it would also suggest that one kulyavāpa was equal to the land required to sow seeds weighing one kulya.\textsuperscript{1} According to Pāṇini, the area of a field was determined by the quantity of seeds required for its sowing, viz., tasya-vāpah.\textsuperscript{2} If one prāstha measure of seed was sown in a field it was called prāsthika, and likewise, if one droṇa or one khaṛi measure of seed were sown in a field it was called droṇika or khaṛika, respectively.\textsuperscript{3} Similarly, if a field required one kulya of seed, it could well have been called a kulyavāpaḥ. R.G. Basak, on the basis of the reference in Pāṇini - upyate 'smin iti vāpah kṛṣṭram',\textsuperscript{4} suggests that vāpa may mean the place where seeds are grown, viz., a field, and kulyavāpa the area of land on which one kulya of seed can be grown.\textsuperscript{5} S.K. Maity has also expressed the same view that during the Gupta period, land measurement was based on the area of seed sown

\textsuperscript{1} D.C. Sircar, \textit{Indian Epigraphy}, p. 414. The land required to sow one kulya of seeds is approximately equal to 38 to 48 bighās. According to U.N. Ghoshal, kulyavāpa is related to the seed capacities of fields. See \textit{Agrarian System in Ancient India}, p. 52.

\textsuperscript{2} Pāṇini, V, 1. 45.

\textsuperscript{3} \textit{Ibid.}, II, 3. 87 ; V, 2.73.

\textsuperscript{4} \textit{Ibid.}, V, 1. 44.

\textsuperscript{5} \textit{Ep.Ind.}, XV, p. 132 fn. 2.
As both the practices, i.e., of sowing seeds directly and transplanting of seedlings were prevalent, nothing could be said with certainty. While explaining the terms aṣṭaka-navaka-nalābhyam mentioned in the Fāridpur Copper-plate, Pargiter states that one kulyavāpa of land covered the area nine rods in length and eight rods in breadth, and, on the basis of his own surmise that nala is equal to sixteen cubits or nineteen inches, he concludes that one kulyavāpa was equal to slightly more than an acre and a kulya of seed was sufficient for that much area. Pargiter’s conclusion is based on several conjectures and cannot be accepted as such. If we follow the explanation given by him, then the expression śatka-nalai-r-apaviṁchchhyā used in connection with the measurement of a kulyavāpa of land in the Pāharpar Copper-plate Inscription would mean an area only of six by six rods, i.e., equal to slightly more than half of an acre.

1. S.K. Maity, Economic Life of Northern India, p. 40. In an Inscription belonging to the Gupta period, it is mentioned that cultivable lands were sold in Bengal at the rate of four dināras for an acre that could be sown with a kulya of seed. See Ind.Ant., vol. XXXIX, pp. 197, 202, 205.

2. Ind.Ant., vol. XXXIX, pp. 215-216 ; Ep.Ind., XV, pp. 130-143. In the land charters of Gurjara rulers of Gujarat, the area of the gifted fields is mentioned according to their seed capacity. See Ind.Ant., vol. XIII, p. 28. A.S. Altekar, probably following Pargiter, also states that one kulyavāpa was slightly larger than one acre. See The Vakāṭaka - Gupta Age, Benaras, 1954, p. 332.
Moreover, the expression \textit{aśṭaka-navaka-nalābhyaṃ} \textit{apaviṇchchhya} occurs along with other land measures like \textit{pravarttavāpa}, \textit{dronavāpa} and \textit{āḍhavāpa}, and as such \textit{kulyavāpa} alone cannot be explained as equal to $9 \times 8$ \textit{nālas}.$^1$ Again, the Dāmodarpur Copper-plate records that one \textit{kulyavāpas} of land was purchased to the north of Pañchakulyavāpaka which was apparently a settlement comprising five \textit{kulyavāpa} of land.$^2$ If we take into consideration Pargiter's calculations that one \textit{kulyavāpa} was a little more than an acre, it would mean that the area of above-mentioned settlement, including its arable lands, was equal to about five acres which seems highly improbable.

According to Kullūka Bhaṭṭa, \textit{kulya} or \textit{kula} is as much of land as can be cultivated by two ploughs.$^3$ In Pran Nath’s opinion, \textit{kulyavāpa} was perhaps equal to ‘one plough’ of land, i.e., an area of about five or six acres which was thought sufficient for one \textit{kula}.$^4$ As each family kept their seeds separately, it seems that, gradually, \textit{kulya} came to mean the seed sufficient for one ‘plough’ of land. The introduction of the land measure called \textit{bighā} together with

\begin{itemize}
  \item \textit{Ep.Ind.}, XX, p. 62.
  \item \textit{Ibid.}, XV, p. 143.
  \item On Manu, VII, 119.
  \item Pran Nath, \textit{A Study in the Economic Condition of Ancient India}, pp. 84-85. According to R.S. Sharma, one \textit{kula} of land was equal to one hundred acres. See \textit{Aspects of Political Ideas and Institutions in Ancient India}, p. 231.
\end{itemize}
its sub-divisions during the medieval times gradually replaced the land measures earlier used in the lower Ganga plain.¹ But in many parts of Bengal, the kulavay, don and āriha land measures remained in use till recent times.² As the area covered by these measures differed from locality to locality, their precise relationship with kulyavāpa, drōṇavāpa and āḍhavāpa cannot be established with certainty. The drōṇavāpa was another unit of measurement mentioned in the inscriptions. In the Pāharpur Copper-plate Inscription dated 479-80 A.D., it is stated that the kṣetra measuring four and two-and-a-half drōṇavāpas of land and vastu (homestead land) measuring one and a half drōṇavāpas were gifted.³ In the same inscription, reference is made to āḍhavāpa land measure.⁴

During the Gupta period, a land measure called pāṭaka was also used in Bengal region. In the Gunaigarah Inscription of Vainyagupta dated 507-08 A.D., five plots of

3. Ep.Ind., XX, p. 63. If one kulya was equal to eight dronas and if, according to Pargiter’s calculation, the area required for one kulya of seed to be sown was a little larger than an acre, it would mean that one droma contained seeds adequate to cultivate area of land equal to one-eighth of an acre, i.e., 605 sq. yards. (one acre being equal to 4840 yards). As such the plots mentioned in the Pāharpur Inscription measured 2420, 1512.5 and 907.5 yards, respectively.
4. Ibid., XX, p. 62. (drōṇavāpa - dvayam - āḍhavāpa - dvayam - āḍhikam)
land measuring 11 pāṭakas are referred to as having been donated in the same village.¹ The separate area of land of each plot is mentioned in five copper-plates as under:

<table>
<thead>
<tr>
<th>Plate</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 pāṭakas and 9 drōṇavāpas</td>
<td>28 drōṇavāpas</td>
<td>23 drōṇavāpas</td>
<td>30 drōṇavāpas</td>
<td>1 3/4 pāṭaka</td>
</tr>
</tbody>
</table>

The total area, therefore, is equal to 8 3/4 pāṭakas and 90 drōṇavāpas. But in the grant, the total area donated is referred to as 11 pāṭakas of land. It means, 90 drōṇavāpas of land covered the area equal to 2 1/4 pāṭaka. Thus, 1 pāṭaka was equal to 90 x 4/9 = 40 drōṇavāpas or 5 kulyavāpas. If we take into consideration D.C. Sircar's estimate of the area covered by one kulyavāpa on the basis of the plantation of seedlings, the area covered by one pāṭaka would be equal to 640 to 800 bighās. It would mean that the land donated in a single village, as referred to in the Gunaigarh Inscription, was between 7040 and 8800 bighās, which is highly inconceivable. On the other hand, if we take Sircar's second view that the area covered by kulyavāpa was equal to the area in which one kulya of seed is sown, then pāṭaka would be equal to 190 to 240 bighās and as such

¹ IHQ., vol. VI, 1930, pp. 45-60.
land donated would come to 2090 to 2640 bighās, which again is a very large area of land. Thus, if the area of kulyavāpa is considered on the basis of the seed sown, then we arrive at the following equation:

1. pāṭaka = 192 to 240 bighās
2. kulyavāpa = 38.4 - 48 bighās
3. drōṇavāpa = 4.8 - 6 bighās
4. āḍhavāpa = 1.2 - 1.5 bighās

In the Pāridpur Inscription of Dharmāditya dated 567 A.D., we come across another land measure, the pravarttavāpa. The inscription refers to the purchase of waste land measured by kulyavāpa and pravarttavāpa, for which only two dināras were paid. Pargiter suggests that as the normal price of land in Bengal was four dināras a kulyavāpa, the area covered by one pravarttavāpa must have been less than half of a kulyavāpa. However, while making this calculation, Pargiter seems to have ignored the fact that the land referred to was waste land which ought to be cheaper in comparison with cultivable land.

In the literary and epigraphic sources, the term hala is used in the sense of a land measure. Manu refers to

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1. Ind. Ant., vol. XXXIX, 1910, p. 201.
2. Ibid., p. 202 fn. 17.

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various types of ploughs.1 Kulluka, while commenting on Manu, alludes to the expression ‘sādgavam madhyamam halam’, etc.2 From Kulluka’s explanations, we learn that the plough drawn by eight bullocks was called the lawful plough, the dharma-hala. Similarly, the ploughs drawn by six, four, and three bullocks were called the madhyama-hala, grhasta-hala, brahma-hala, respectively.3 Pāṇini also refers to the halya measure.4 He explained this type of land measure as halasya karsaḥ, i.e., an area of land cultivated by one plough, and the multiples of the one halya land were denoted as dvi-halya and tri-halya. If halya measure was used in the actual measurement of land, it must have been a large yardstick known as the parama-halya to which he also refers.5 The exact area that could be cultivated with one plough is difficult to ascertain.6 In Pran Nath’s opinion, one ‘plough’ of land was thought sufficient to provide food and provisions for one kula (family), and one hala covered an

1. Manu, VII, 119.
3. Ibid.
5. Ibid., I ; l. 72, 186.
6. It has been observed that one plough cultivates five acres in Dinajpur and six acres in Orissa. See B.P. Majumdar, ‘Measurement of Land in Northern India’, Proc.IHC., Aligarh, 1960, p. 9.

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area about five or six acres. 1 Brihaspati lays down that a hala should be eight aṅgulas long and four aṅgulas broad. 2 But according to these dimensions, it would mean a very small land measure being approximately six inches in length and three inches in breadth. From the Prākrit inscriptions found at Nāgārjunakonda belonging to the 3rd and 4th centuries A.D., we learn that 'hundreds of thousands of ploughs of land' were granted. 3 This apparently shows that a small type of plough measure was used to denote the area covered by such grants. In some other inscriptions, we come across another term bhikku-hala or bhiksuhala, but its meaning is not clear. 4 In an inscription belonging to Harsha reference is made to vṛiddhahala, which probably denoted a larger area than an ordinary hala. 5 During Harshavardhana's time, hala seems to be a popular land measure. Bāna has recorded that Harsha 'bestowed upon the

1. Pran Nath, A Study in the Economic Condition of Ancient India, p. 83. According to Pran Nath, even in the recent past, that much of land was considered sufficient for a single family in the middle Ganga plain. He cites C.J. Stevenson - Moore who, while referring to Gaya district writes, "Taking the cost of living of a family in this tract at Rs. 95, six acres, apart from any supplementary sources of income, can support a family in complete comfort".


4. Ibid., VII, p. 64 ; VII, 65 ; Sel.Inscr., p. 208 fn. 4.

5. Ibid., II, p. 125.

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brāhmaṇas a hundred villages delimited by a thousand ploughs.¹ According to D. Devahuti, hala covered the area that could be turned over with a plough pulled by a given number of oxen, and the land tax was fixed on each plough measure.² Bāna refers to another land unit called sira.³ In Devahuti's view, sira of Harsha's time was equal to the kulya-vāpa of Gupta days.⁴ The custom of measuring land by means of hala measure continued even after Harshavardhana, for, in an inscription dated 970 A.D., it is mentioned how various types of land were measured by 'a big plough of land'.⁵

The foregoing discussion leads us to the conclusion that the State was alive to the importance of measurement and classification of land for the purpose of revenue assessment. Land records were properly maintained by the royal officials. While different land measures were in

2. D. Devahuti, Harsha, A Political Study, Oxford, 1970, p. 203. According to Y.B. Singh, as a kind of vishtī the peasants were required to bring their plough teams to till the crown land for certain days, and they were allotted a fixed area of land for such tillage. The term hali may have gradually come to signify a fixed measure of land from this practice. See 'Hālika-kara: Crystallization of a Practice into a Tax', Essays in Ancient Indian Economic History (ed.), Brajadulal Chattopadhyaya, New Delhi, 1987, p. 90.
3. Bāna, Harshacharita (tr.), p. 199.
vogue during the period under review, preference for their use differed from area to area. It seems that the peasants in different parts of the Ganga plains mostly used locally popular land measures. The state functionaries probably relied on some standard land measures for survey and measurement of land.