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## **HISTORICAL MEASUREMENT UNITS OF THE MONGOL PERIOD (13th–15th cent.)**

### **Abstract**

The history of the Golden Horde and the Mongol period as a whole suffers from a scarcity of comprehensive and systematic sources on historical metrology. Existing evidence is fragmentary and derives mainly from individual yarliks, narrative chronicles, oral traditions, and numismatic materials. As a result, the study of metrological systems of the 13th–14th centuries relies heavily on written sources produced in neighboring regions that maintained political, economic, and cultural relations with the Mongol Empire.

This article examines metrological terminology and measurement practices used in Central Asia under Mongol rule, focusing on units of length, weight, volume, and area. The study demonstrates that the metrological system of the Golden Horde was hybrid in nature, combining Turkic, Persian, and Arabic traditions adapted to imperial administrative and economic needs. The absence of strict standardization was compensated by functional norms, including the widespread use of temporal (days, weeks, months of travel) and anthropometric measurements. Based on a comparative analysis of medieval written sources and modern historiography, the research identifies regional variations in measurement units, traces their etymology, and determines their geographical distribution. The findings reveal attempts at partial unification, particularly in fiscal and administrative contexts, while preserving local practices. The study contributes to historical metrology by systematizing underutilized data and situating measurement practices within the broader socio-economic and cultural framework of the Mongol Empire.

**Keywords:** historical metrology; measurement units; systems of measurement; anthropometric measurements; distance measurement.

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## **МОҢҒОЛ ДӘУІРІНДЕГІ ТАРИХИ ӨЛШЕМ БІРЛІКТЕРІ (XIII–XV ҒАСЫРЛАР)**

### **Аңдатпа**

Алтын Орда тарихы мен жалпы моңғол дәуірінің тарихын зерттеу тарихи метрологияға қатысты кешенді әрі жүйелі дереккөздердің тапшылығымен сипатталады. Қазіргі кезде сақталған мәліметтер үзік-үзік күйде жеткен және олар негізінен жекелеген ярлықтардан, баяндау сипатындағы жылнамалардан, ауызша тарихи дәстүрлерден, сондай-ақ нумизматикалық материалдардан құралады. Осы себепті XIII–XIV ғасырлардағы метрологиялық жүйелерді зерттеу көбіне Моңғол империясымен тығыз саяси, экономикалық және мәдени байланыста болған көршілес аймақтарда жазылған жазба деректерге сүйенеді.

Мақалада моңғол үстемдігі кезеңінде Орталық Азия аумағында қолданылған метрологиялық терминология мен өлшеу тәжірибесі жан-жақты талданады. Ұзындық, салмақ, көлем және жер өлшеу бірліктеріне айрықша назар аударылады. Алтын Ордадағы метрологиялық жүйенің түркі, парсы және араб дәстүрлерін ұштастырған гибридік сипатта болғаны көрсетіледі. Қатаң стандарттаудың болмауы уақытша және антропометриялық өлшемдерді кеңінен қолдану арқылы өтелген. Ортағасырлық жазба деректерге және қазіргі тарихнамаға сүйенген салыстырмалы талдау өлшем бірліктерінің аймақтық ерекшеліктерін, олардың этимологиясын және географиялық таралуын айқындауға мүмкіндік береді. Зерттеу тарихи метрология саласын жаңа деректермен толықтырып, өлшеу тәжірибесін Моңғол империясының әлеуметтік-экономикалық және мәдени кеңістігі аясында қарастырады және ғылыми интерпретация мүмкіндіктерін кеңейтеді қазіргі кезең үшін маңызды.

**Түйін сөздер:** тарихи метрология; өлшем бірліктері; өлшеу жүйелері; антропометриялық өлшемдер; қашықтықты өлшеу.

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## **ИСТОРИЧЕСКИЕ ЕДИНИЦЫ ИЗМЕРЕНИЙ МОНГОЛЬСКОГО ПЕРИОДА (XIII–XV вв.)**

### **Аннотация**

История Золотой Орды и монгольского периода в целом характеризуется недостатком комплексных и систематизированных источников по исторической метрологии. Сохранившиеся сведения носят фрагментарный характер и происходят преимущественно из отдельных ярлыков, повествовательных хроник, устных традиций и нумизматических материалов. В связи с этим изучение метрологических систем XIII–XIV вв. во многом опирается на письменные источники, созданные в сопредельных регионах, находившихся в политических, экономических и культурных связях с Монгольской империей.

В статье рассматриваются метрологическая терминология и практика измерений, применявшиеся в Центральной Азии в период монгольского владычества, с акцентом на единицы длины, веса, объёма и площади. Показано, что метрологическая система Золотой Орды носила гибридный характер, сочетая тюркские, персидские и арабские традиции, адаптированные к имперским административным и хозяйственным потребностям. Отсутствие строгой стандартизации компенсировалось функциональными нормами, включая широкое использование временных и антропометрических измерений. Проведённый сравнительный анализ средневековых источников позволяет выявить региональные различия, их этимологию и географическое распространение. Исследование вносит вклад в историческую метрологию, расширяя источниковую базу и интерпретацию данных.

**Ключевые слова:** историческая метрология; единицы измерения; системы измерений; антропометрические измерения; измерение расстояний.

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## **MOĞOL DÖNEMİNDEKİ TARİHİ ÖLÇÜ BİRİMLERİ (XIII–XV. YÜZYILLAR)**

## Özet

Altın Orda tarihi ve genel olarak Moğol dönemi tarihinin araştırılması, tarihî metrologiye ilişkin kapsamlı ve sistematik kaynakların eksikliği ile karakterize edilmektedir. Günümüzde mevcut veriler parçalı bir şekilde ulaşılmış olup, bunlar ağırlıklı olarak tekil yarlıklardan, anlatı niteliğindeki kroniklerden, sözlü tarihî geleneklerden ve ayrıca numizmatik materyallerden oluşmaktadır. Bu nedenle, XIII–XIV. yüzyıllardaki metrik sistemlerin incelenmesi çoğunlukla Moğol İmparatorluğu ile sıkı siyasi, ekonomik ve kültürel ilişkiler içinde olan komşu bölgelerde yazılmış belgelerden yararlanılarak yapılmaktadır.

Makale, Moğol egemenliği döneminde Orta Asya topraklarında kullanılan metrik terminoloji ve ölçüm uygulamalarını kapsamlı bir şekilde analiz etmektedir. Uzunluk, ağırlık, hacim ve arazi ölçüm birimlerine özel dikkat gösterilmiştir. Altın Orda'daki metrik sistemin, Türk, Fars ve Arap geleneklerini birleştiren hibrit bir karaktere sahip olduğu ortaya konmaktadır. Katı standartlamanın yokluğu, geçici ve antropometrik ölçümlerin yaygın kullanımına başvurulması telafi edilmiştir. Ortaçağ yazılı kaynakları ve günümüz tarih yazını temel alınarak yapılan karşılaştırmalı analiz, ölçü birimlerinin bölgesel özelliklerini, etimolojilerini ve coğrafi dağılımını belirlemeye imkân tanımaktadır.

Araştırma, tarihî metrologi alanını yeni verilerle zenginleştirerek, ölçüm uygulamalarını Moğol İmparatorluğu'nun sosyal-ekonomik ve kültürel alanı bağlamında ele almakta ve günümüz için bilimsel yorumlama olanaklarını genişletmektedir.

**Anahtar kelimeler:** Tarihî Metrologi; Ölçü Birimleri; Ölçüm Sistemleri; Antropometrik Ölçüler; Mesafe Ölçümü.

**Introduction.** In the history of the Golden Horde, as well as of the Mongol period as a whole, there is a lack of comprehensive and systematic sources providing complete information on the metrological systems of the time. The available evidence is fragmentary and limited, consisting primarily of individual yarliks composed in the Mongolian language, examples of oral folk tradition, and numismatic materials bearing the names of khans. Owing to the scarcity and discontinuity of such sources, the study of metrology in the Mongol era necessarily relies on written accounts produced in neighboring states that maintained diplomatic, economic, and cultural contacts with the Mongol Empire. The relevance of this topic is further enhanced by the significant similarities between the metrological systems of Central Asian societies. Both adopted units of measurement, primarily of arabic and persian origin, and indigenous local units were employed and adapted within the administrative and economic practices of the period. The present study focuses on the analysis of metrological terminology used in Central Asia during the 13th–14th centuries under Mongol rule.

Historical metrology, which examines the formation and functioning of systems of measurement across different historical periods, remains one of the least developed fields in historiography. This is particularly true for the Mongol period, characterized by complex interactions between diverse ethnocultural and administrative traditions of measurement. During the era of the Mongol Empire, metrological practice acquired a distinctive character: new units of measurement were introduced, some borrowed from Persian, Turkic, and Chinese traditions, while others were adapted or transformed in accordance with the administrative needs of the empire. As a result, the metrological system of this period represents a synthesis of traditional and innovative elements, making it a valuable subject for comprehensive historical, linguistic, and cultural analysis.

Historiography demonstrates the existence of a considerable body of works devoted to the identification, systematization, and scholarly introduction of medieval written sources. However, specialized studies offering a comprehensive analysis of metrological systems of the 13th–15th centuries remain limited within the field of historical research. Despite the interdisciplinary character of historical metrology—encompassing economic, legal, and cultural dimensions—this area has not yet received sufficient scholarly attention. The importance of the present article is

determined by the need for a more systematic investigation of historical metrology and the formulation of an integrated analytical perspective on measurement practices of the period under study. The research is based on the examination of written sources from the medieval era, as well as on modern scholarly works that have been introduced into academic discourse and are directly related to the historical context analyzed.

**Novelty of the study.** This article offers a systematic analysis of historical units of measurement documented in written sources dating from the 13th to the 15th centuries (Table №1). Particular attention is devoted to the scholarly contributions of both domestic and foreign researchers, whose works shed light on various aspects of this historical period. The study also addresses key methodological and historiographical issues related to the formation and development of historical metrology as a field of research. The scientific novelty of the article consists in the targeted compilation of metrological data from written sources, their contextual interpretation within a broader historical-metrological framework, and the identification of the geographical distribution of the recorded measurement units. By introducing and analyzing materials that have previously received limited scholarly attention, this research creates a foundation for further investigations of traditional measurement systems and promotes the integration of underutilized sources into active academic circulation within a comprehensive historical and cultural perspective.

The source base of this study is primarily composed of written historical monuments of the 13th–14th centuries that reflect the socio-political and cultural conditions of Central Asia and adjacent regions during the period of Mongol rule. Among the most significant sources are the following works. One of the key Mongolian-language sources is *The Secret History of the Mongols*, a unique historical text compiled in 1240. This work contains direct references to administrative practices and the social organization of early Mongol society and is therefore of particular importance for the study of institutional and terminological aspects of the period. An equally important source is *Jāmi‘ al-Tawārīkh* (Compendium of Chronicles) by Rashid al-Din Fazlallah, one of the most authoritative historiographical works of the early 14th century, produced in the Ilkhanid state. This text provides extensive information on Mongol norms and administrative practices, including references relevant to systems of measurement. The study also draws on *Tārīkh-i Jahāngushāy* (The History of the World Conqueror) by ‘Aṭā Malik Juwaynī, written around 1260 by a high-ranking official of the Mongol administration. This work reflects key features of governance and administrative terminology in the region. Another important source is *Sīrat al-Sulṭān Jalāl al-Dīn Mangburnī* by Shihāb al-Dīn al-Nasawī, a biographical account of the last Khwarazmshah, composed shortly after 1231 y., which provides valuable insights into the socio-economic realities of the early Mongol period. Additional information is drawn from *al-Kāmil fī al-Tārīkh* by Ibn al-Athīr, a comprehensive historical chronicle containing important data on the conditions in Central Asia and Khurasan on the eve of and during the initial phase of the Mongol invasions. The work of Ibn Wāṣil (*Mufīd al-Umam fī Sīrat al-Ayyūbiyyīn*), written by a prominent qāḍī of Hama, is also of significance, as it sheds light on the relations between the Mongol khanates and the Muslim world [1, 49]. Although references to the Golden Horde in this text are episodic, they contribute to a broader understanding of international interactions and the contextual use of specific terms. Among the supplementary sources relevant to the study of the Golden Horde’s external relations, particularly with Mamluk Egypt, is *al-Rawḍ al-Zāhir fī Sīrat al-Malik al-Zāhir* by Muḥyī al-Dīn Ibn ‘Abd al-Zāhir. As a secretary to the Mamluk sultan al-Malik al-Zāhir Baybars, the author had direct access to state affairs, including diplomatic relations with the Golden Horde. His work is therefore of considerable value for understanding the political and cultural context in which certain administrative and metrological terms were employed.

The sources examined in this study differ in their origin, language, and degree of proximity to political centers of power. Nevertheless, when considered collectively, they constitute a reliable foundation for reconstructing metrological concepts of the Mongol period. It should be taken into account that discrepancies between individual accounts are not uncommon, particularly with regard

to chronology and terminology, which necessitates careful critical comparison and contextual analysis.

Issues related to the historical metrological system of the Mongol period have attracted scholarly attention for several decades. Research in this field is based on factual evidence derived from written sources. A number of scholars, including V.G. Tiesenhausen, B. Shpuler, and M. Kramarovskiy, in their studies of Mongol history—especially the period of the Golden Horde—have provided valuable data relevant to systems of measurement, even though metrology was not always the primary focus of their research.

Methodologically, the study is grounded in a historical-philological approach that incorporates lexical and comparative analysis of terms, as well as their interpretation within a broader cultural and historical context. The application of an interdisciplinary framework, combining history, historical metrology, and source studies, enables a comprehensive examination of the formation and functioning of units of measurement during the period under investigation.

**Results of the study.** The analysis of written sources from the 13th–14th centuries, together with a comparison of metrological terminology used in different regions of Central Asia under Mongol rule, led to the following main findings:

1. **Identification of key units of measurement** widely employed during the Mongol period: **length** gaz, arshin, mile, farsakh; **weight/mass** miskal, qintar, man; **volume and area** man, jarib, and others.

2. **Origin and etymology** of certain terms indicate significant influence from Turkic, Persian, and Arabic metrological traditions. In several cases, direct borrowings were adapted to Mongol administrative practices.

3. **Comparative analysis of sources**, such as Jāmi‘ al-Tawārīkh, The Secret History of the Mongols, and Tārīkh-i Jahāngushāy, demonstrates that the values and measures of the same units could vary depending on region and context. For instance, the term jarib may refer to a fiscal unit of land in some texts and to a measurement used in land management in others.

4. **The absence of full standardization** in the metrological systems of the Golden Horde resulted from both political fragmentation and the multiethnic composition of the population. Nevertheless, certain sources reveal attempts at unification, particularly in the context of tax accounting.

5. **Yarliks and diplomatic correspondence** indicate the existence of stable terms and practices employed in international relations, including trade and tribute agreements with Egypt and the Ilkhanate.

6. **Linguistic analysis** shows that some metrological terms persisted in administrative vocabulary into the post-Mongol period, undergoing transformation but not disappearing entirely.

The results suggest that the metrological system of the Mongol period constituted a hybrid structure, combining local traditions with imperial elements. This system reflected the characteristics of a multi-layered imperial administration and contributed to the formation of a coherent economic and governance framework. In many written sources, the measurement of distances was expressed using temporal units, such as a day, week, or month of travel. These temporal markers were employed in descriptions of roads, state boundaries, and caravan routes, providing an intuitive sense of scale within the complex geography of Central Asia [2, 560].

A distinctive feature of the descriptive style in one of the key narrative sources, the work of Ibn Battuta, is the careful preservation of proper names and technical terms. The author consistently recorded specific designations, aiming to maintain their original pronunciation and orthography. Additionally, the text frequently refers to the unit of distance mile, indicating its widespread use in spatial descriptions of territories [3, 415].

The following examples are drawn from medieval written sources:

Rukn-ad-Din Baybars' Chronicles: "The Tatars crowded in flight and the snow beneath them gave way. This snowy area extended for three days" [1, 50]

Shafi' b. 'Ali's Chronicles: Distance covered in one day [1, 62]

Sheikh al-Birzali: “The renowned Sheikh Alaeddin Ennuman al-Khwarazmi-Hanafi during his stay in Damascus reported that the length of this state the realm of Berke extends over eight months and its width over six months of travel” [1, 88]

Al-Muddal: “The borders of the kingdom of King Tokhta extend in length from the Sea of Istanbul to the Irtysh River approximately six months and in width from Bulgar to the Iron Gates about four months of travel” [1, 95]

Ibn Fadallah al-‘Umari: “Between the mouth of the Jayhun and the Shash River approximately ten days’ journey” [1, 106]

Ibn Fadallah al-‘Umari: “The distance between Bulgar and Akikul is twenty days of ordinary walking” [1, 107]

Ibn Hajar al-‘Asqalani: “Caravans used to depart from Khwarezm and travel leisurely in carts to Crimea a journey taking about three months in width the area was a sea of sand stretching seven seas through which neither the guide nor the bravest of men could find a way” [1, 208]

Ibn Shuhbi al-Asadi: “His kingdom is vast it is said to extend in length for a year and in width for eight months of travel” [1, 203]

Such approaches to measuring distances were determined by practical needs for describing routes and administrative boundaries rather than by precise metrological standards. Measurements expressed in temporal units such as days weeks or months of travel were approximate depending on the mode of transport on foot horseback or by cart making this system highly variable

It should also be noted that anthropometric units of measurement are frequently mentioned in sources of the period. Their use was dictated by practical necessity in the absence of standardized measures the length width depth or height of objects was often determined in proportion to human body parts such as the span cubit or finger These units were intuitive easily reproducible and adapted to everyday practice including construction land surveying and the description of household items The examples above illustrate such practices in the context of medieval Central Asia.

Hamdallah Kazwini reports that Chagatai and Ugetai, having arrived at Karakul to hunt swans, spent the winter engaged in hunting and each week, as proof of their catch, sent fifty camel loads of swans to Genghis Khan until the game was exhausted and winter ended [4, 54-55].

Economic integration among different regions of the Golden Horde contributed to relative price stability across its territories. Several sources, including the chronicles of al-‘Umari, indicate that in the first half of the fifteenth century, around 1430, commodity prices and trade volumes in cities such as Sarai and Urgench were nearly identical. This suggests the existence of stable economic links and an internal market under conditions of imperial unity [3, 415]. Urban market infrastructure was characteristic of many settlements within the Golden Horde. In some cities, such as Khwarezm, markets operated according to clearly regulated schedules, remaining closed on Fridays. Bronze weights of various sizes were used for weighing goods, although detailed information regarding their forms, types, or names is largely absent from surviving written sources [3, 415].

The sources also frequently note the use of Persian and Arabic units of measurement, reflecting the significant influence of these cultural and metrological traditions on Central Asian practices during this period. Commonly used units included the farsakh (one farsakh equals three Arabic miles, approximately six kilometers), mile (Persian, column, or tower), misqal, dinar, tagar (Turkic, a measure of bulk goods equal to 100 mann, also used for per capita and livestock tributes [3, 341]), sabu, qintar, and man-i shar‘i (“legal mann”, approximately 800 grams) [1, 446].

In the regions of Khwarezm and Sarai, pricing was relatively uniform. The unit of weight, the ritl (pound), corresponded to 330 dirhams in Khwarezm. Staple foodstuffs included wheat, barley, millet (dohn, locally called erzhen), lentils, and javerse, a variety of millet similar to trefoil seeds. Grain sales were conducted by ritl. Traditional records indicate that the weight of a donkey load was approximately 100 ritls. The average price of mutton was one dirham per three ritls [1, 109]. Historical analysis indicates that the weight of the ritl varied between 400 and 450 grams. This

variability reflects the lack of strict standardization during the period and highlights regional and chronological differences in its use.

Postal services primarily functioned in the interests of the state, facilitating the transmission of orders from the khans and various messages. They were also used to serve foreign diplomats. The establishment of postal stations (*yam*), particularly enabled by the vast steppe expanses, represented a major achievement of the Horde, which constructed these stations along various routes throughout its territory [3, 357]. According to Spuler B., a dedicated department oversaw the postal service in the Golden Horde, including postmasters (*yamchi*), bridge and road workers (*korbukchi* and *yol arachi*), road supervisors (*tutkauly*), boatmen (*gemichi*), coastal guards, and station attendants (*yurtchi*) [3, 358]. Mirza Ulughbek also mentions that the efficient operation of these postal stations required regulated provisions of livestock, personnel, food, and other resources. The stations were distributed across administrative districts and maintained regularly, enabling the rapid transmission of messages, particularly important for diplomatic and state communication [5, 191].

Some units mentioned in the sources have indeterminate values, such as *tuk*, cartload, or bundle [1, 47]. Military tools were sometimes used as reference measures, particularly in the absence of standardized metrological units. Comparative methods relied on familiar physical objects, such as weapons, body parts, or household items. For instance, a spear (Mong. *chzhebe*) or javelin served as a convenient reference for height measurements due to its relatively stable and reproducible length [1, 446].

Analysis of metrological terminology recorded in 13th–14th century written sources demonstrates a complex, multi-layered system of measurements used across the Golden Horde and adjacent Central Asian regions. This system was hybrid in nature, combining elements from Turkic, Persian, and Arabic traditions, adapted to the administrative needs of the Mongol Empire. The lack of strict standardization was compensated by consistent practices for describing distances using temporal and anthropometric units, as well as reference objects such as pack-animal loads or the volume of bundles. Sources emphasize an extensive communication network (postal stations and *yam*), which facilitated effective information exchange throughout the empire. Thus, the metrological culture of the period functioned not only as an administrative tool but also reflected the imperial structure, where local and supra-regional practices interacted to form a stable economic and governance environment. Many of these practices persisted into the post-Mongol period.

Units related to length (*gaz*, *arshin*, *mile*, *farsakh*), weight (*misqal*, *dirham*, **mann**, *ritl*), and volume (*jarib*, *tagar*) varied by region and context. Distance measurements often relied on temporal indicators—days, weeks, or months of travel—highlighting the mobile and steppe-oriented nature of society. Terms such as “month of travel” or “day of journey” illustrate the difficulty of precise conversion without accounting for the mode of transport (on foot, horse, cart).

Anthropometric and object-oriented standards were widely used, including the cubit, span, finger, and even spear height. These measures were practical, connected to daily activities such as land surveying, military operations, and construction. Documents also contain natural equivalents for loads, e.g., camel or donkey packs, linking weight to the physical capacity of animals.

Fixed connections between trade-tax units and stable weight equivalents are evident, for example: 1 *ritl* (400–450 g), 1 *misqal* (4.8 g), 1 *dirham* (~3.36 g) [6, 332]. This illustrates the adaptation of Arab-Persian measurement systems to the needs of the Horde and gradual institutionalization of these units in state and commercial practices [7, 197].

The study demonstrates that the metrological system of the Golden Horde emerged at the intersection of ethnocultural diversity, imperial administration, and practical economic needs [8, 322]. Despite the lack of strict standardization, functional norms were established through administrative edicts, trade practices, and diplomatic correspondence. This supports the notion of functional unification of measurement practices within a politically fragmented but economically interconnected empire.

Authors of written sources described spatial and economic realities primarily according to the interests of their own states and the scope of their diplomatic and trade networks. This explains differences in emphasis: some sources prioritize military infrastructure and strategic routes, while others focus on trade, taxation, or economic characteristics. Therefore, the content priorities of the sources reflect not only the geographical and political specificity of regions but also the ideological or pragmatic perspectives of the authors shaping the texts within the framework of a specific state context.

**Table 1. Units of Measurement Used in the Mongol Period (13th–14th Centuries)**

Unit of Measurement	Type	Quantity / Description	Notes
Ritl (pound)	Mass	400–450 g	Basic unit of weight
Mani shar‘i	Mass	Approx. 800 g	Legal mann
Kharvār	Mass	Approx. 80–100 kg	Donkey pack load
Jav (barley grain)	Mass	Approx. 0.04 g	Single grain weight
Dāniq (dang)	Mass	One-sixth of a unit	Fractional unit
Dirham	Mass	3.36 g	Seven-tenths of a misqal
Arab mile (mīl)	Distance	Approx. 1.8 km	Geographical descriptions
Farsakh	Distance	Approx. 6 km	1 farsakh = 3 miles
Day’s journey	Distance/Time	Approx. 50 km	Transport-dependent
Month’s journey	Distance/Time	Approx. 750–1000 km	Territorial extent
Ziro‘ (cubit)	Length	Approx. 45–60 cm	Egyptian/Cairene cubit
Span	Length	Approx. 18–20 cm	Anthropometric unit
Asba’ (finger)	Length	Approx. 2–2.5 cm	Anthropometric unit
Qulaj	Length	Approx. 2.13 m	Anthropometric unit
Javelin / spear	Length	Approx. 1.5–2 m	Comparative measurement
Postal station (yam)	Distance	Approx. 30–40 km	Courier network

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