

Celestial Syncretism at the Crossroads of Africa and Islam: A Linguistic and Cultural Analysis of Astronomical Heritage in Harar, Ethiopia

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Abstract:

The ancient walled city of Harar in eastern Ethiopia preserves a distinctive astronomical heritage reflecting centuries of convergence between Islamic scholarly traditions and indigenous Cushitic and Semitic practices. This study examines Harar's astronomical knowledge systems through an integrated linguistic, codicological, and ethnoastronomical framework. Drawing upon manuscript evidence from the Abdullahi Sharif Museum, philological analysis of astronomical terminology, and ethnographic accounts of Harari calendrical practices, the investigation demonstrates that Harar's astronomical heritage represents a remarkable case of celestial syncretism. The Harari solar calendar divides the year into four seasons: Bayg (spring), Kirmi/Ganna (summer), Zirat (autumn), and Jay (winter), each further subdivided into seven menzeel periods. Arithmetically, $(13 \times 7) + (13 \times 7) + (13 \times 7) + [(13 \times 7) + 14] = 365$ days, confirming precise tropical year reckoning (Goshu & Ridwan, 2026a). Linguistic analysis reveals a hybrid terminology wherein Arabic structural terms (manzil, zirā'ah) coexist with indigenous seasonal nomenclature (Kirmi, Jay), reflecting layered cultural contact. Manuscript evidence, including two rare almanacs and a concentric lunar phase diagram, attests to the circulation of astronomical knowledge between Ethiopia and the broader Indian Ocean Islamic world, particularly Yemen. The coexistence of the fixed solar agricultural calendar with the wandering Islamic lunar calendar, governing Ramadan, Shuwalid, and the pre-Islamic Ashura, epitomizes Harari cultural identity. This heritage preserved in multilingual manuscripts and transmitted through oral tradition, challenges conventional boundaries between science, religion, and esoteric practice, offering unique insights into how a community at the African-Islamic crossroads historically observed, interpreted, and lived by the sky.

Keywords:

Harar; ethnoastronomy; Islamic manuscripts; calendrical systems; linguistic hybridity; Ethiopian astronomy, cultural syncretism

I. Introduction

When it comes to handwritten texts in Ethiopia, religious texts statistically dominate the manuscript record. The database from the ERC project "Islam in the Horn of Africa" (2013–2018) refines this initial observation and reveals that prayer books and mystical compendiums are by far the most numerous. It is therefore uncommon to find works on positive sciences, such as arithmetic, geometry, or astronomy. The two almanacs studied by Regourd (2022) represent exceptional material: they are almanacs digitized in Harar that raise fundamental questions about their sources and uses. This scarcity makes the astronomical heritage of Harar all the more significant for understanding the intellectual history of the region.

Harar Jugol, the old walled city, was listed as a UNESCO World Heritage Site in 2006 in recognition of its cultural heritage. According to UNESCO (2006), it is considered "the fourth holiest city" of Islam, with 82 mosques, three of which date from the 10th century, and 102 shrines. Yet beyond its religious significance, Harar has been a center of astronomical knowledge production and transmission, a dimension of its heritage that has received comparatively little scholarly attention.

The Harari people, a Semitic-speaking ethnic group inhabiting the Horn of Africa, with the city of Harar as their historical center have developed sophisticated systems for observing, measuring, and interpreting celestial phenomena. These systems reflect a remarkable synthesis: Islamic astronomical traditions transmitted through Arabic manuscript culture merged with indigenous Cushitic and Semitic calendrical practices, creating a distinctive local astronomical tradition (Goshu & Ridwan, 2026a).

This article addresses three interconnected questions: (1) What were the structure and functions of Harari astronomical and calendrical systems? (2) How does linguistic analysis illuminate the hybrid origins of Harari astronomical knowledge? (3) What do surviving manuscripts reveal about the circulation, transmission, and application of astronomical knowledge in Harar? By addressing these questions through an integrated linguistic and cultural framework, this study contributes to broader scholarship on ethnoastronomy, Islamic manuscript culture in Africa, and the intellectual history of the Horn of Africa.

II. Review of Literature

Investigating the astronomical heritage of Harar necessitates a methodological architecture that moves beyond mere historiographical description. The astronomical knowledge of the Harari people was neither a purely abstract mathematical exercise nor a static set of folk beliefs; rather, it functioned as a dynamic cultural system embedded within agricultural labor, religious orthopraxy, and esoteric mysticism. To disentangle these intertwined threads, this study deploys a tripartite methodological framework, comprising ethnoastronomy, historical linguistics, and codicological manuscript analysis. This triangulation ensures that the syncretic nature of Harari celestial knowledge is examined not as a deviation from a "pure" Islamic or African norm, but as a coherent, locally-adapted epistemic system.

2.1 Study Area: Harar and the Eastern Ethiopian Highlands

Harar is located in the eastern highlands of Ethiopia, situated at an elevation of approximately 1,885 meters above sea level on a rocky outcrop overlooking the surrounding semi-arid plains. Historically, this strategic position made it a pivotal entrepôt along trade routes connecting the Red Sea coast, the Ethiopian interior, and the Somali lowlands. The city's fortified walls, Jugol, enclose a dense urban fabric of mosques, shrines, and traditional Harari houses, reflecting a distinct architectural and cultural identity. As the historical capital of the Adal Sultanate and later an independent emirate, Harar served as a major center of Islamic learning in the Horn of Africa. Its population, the Harari people, speaks a Semitic language unique to the city, surrounded by predominantly Oromo- and Somali-speaking communities, making it an exceptional linguistic and cultural enclave.

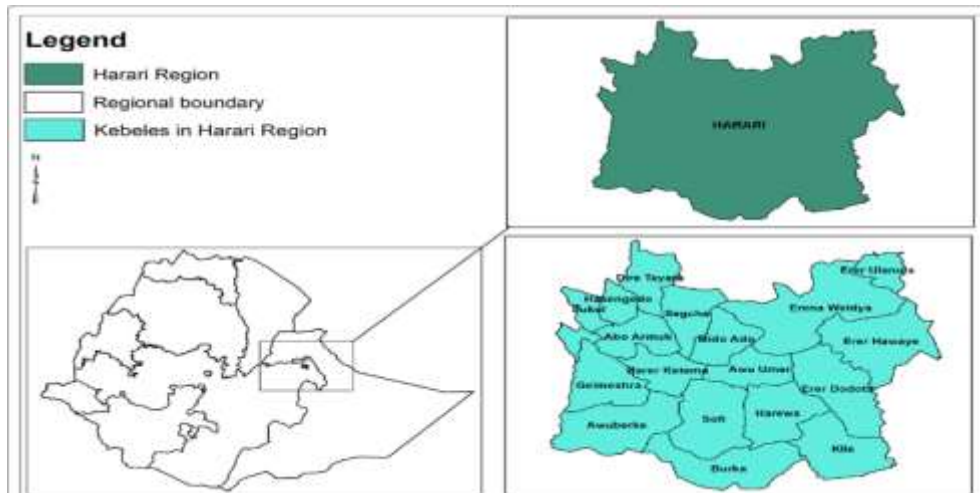


Figure 1: Administrative map of the Harari People's National Regional State, showing regional boundaries and the distribution of urban and rural kebeles.

Figure 1 presents the administrative geography of the Harari People's National Regional State, the smallest of Ethiopia's regional states at approximately 334 km². The map delineates the regional boundary separating the Harari enclave from the surrounding Oromia Region, which completely encircles it.

The legend identifies three categories of kebeles (the lowest administrative unit): those within the urban core of Harar city and those in the surrounding rural woredas. The urban kebeles, including Abadir, Amir Nur, Hakim, Shenkor, Aboker, and Jenela, correspond to the six urban districts of Harar city. The rural kebeles, such as Sofi, Erer, and Dire Teyara, fall under the three rural woredas. The region's administrative structure thus comprises nine woredas (six urban, three rural) encompassing 19 urban and 17 rural kebeles. This spatial configuration reflects Harar's unique status as a historically fortified city-state, now formalized as a distinct administrative region within Ethiopia's federal system.

2.2 Ethnoastronomy as Analytical Lens

The primary lens through which this study interrogates the Harari heavens is ethnoastronomy. While closely related to archaeoastronomy, which focuses on the material remnants of ancient sky-watching, such as alignments or megaliths, ethnoastronomy is uniquely concerned with living or historically documented cultural practices. It examines how a given society perceives, categorizes, and operationalizes celestial phenomena within its social and material fabric. Rather than imposing modern astrophysical metrics onto historical data, this approach privileges the "emic" perspective, the internal logic of the culture itself; thereby avoiding the epistemic violence of judging indigenous knowledge against Western scientific benchmarks.

As Goshu and Ridwan (2026b) have recently argued, indigenous Ethiopian astronomical frameworks are not relics of a pre-scientific past but are sophisticated cognitive systems that deserve integration into contemporary astrophysical discourse. Their work provides a crucial bridge, suggesting that ethnoastronomical data from communities like the Harari can offer alternative conceptual models for understanding seasonal variability and climate adaptation. For Harar specifically, the ethnoastronomical approach is indispensable because Harari celestial knowledge resists compartmentalization. The movement of the sun through the *Bayg* and *Jay* seasons was not a detached observation; it dictated the precise timing for ploughing and sorghum sowing (Goshu & Ridwan, 2026a). Concurrently, the lunar crescent

determined the commencement of Ramadan, while the planetary alignments encoded in manuscripts were believed to influence the efficacy of talismanic inscriptions (Chekroun, 2022). By adopting ethnoastronomy, this study recognizes the sky as a "cultural landscape." The heavens provided a mnemonic device for communal memory, a chronometer for economic survival, and a canvas for spiritual speculation. This lens allows us to treat the Harari almanacs not merely as astronomical tables but as social documents that encode the anxieties and aspirations of a cosmopolitan Islamic community on the periphery of the Indian Ocean world.

2.3 Linguistic Analysis: Philology and Semantic Stratigraphy

The second pillar of this methodology involves rigorous linguistic and philological analysis. The astronomical lexicon of Harar is a palimpsest of historical conquests, trade routes, and religious conversions. Language serves as the most sensitive recorder of cultural contact; when a society adopts a foreign astronomical concept, it often retains the donor language's vocabulary, albeit with altered semantics. This study employs philological methods to trace the "genealogy" of Harari astronomical terminology, isolating loanwords, calques, and semantic shifts.

Building upon Metaferia's (1978) foundational philological work on the Eastern Oromo (K'ottu) calendar, this research extends the inquiry to Harari-specific manuscript sources. Metaferia (1978) demonstrated that the calendar of the Muslim Oromo of Hararghe operates on a hybrid nomenclature derived from Arabic, Persian, and Amharic. This is not a random borrowing but a "layered" process: Persian terms often arrived via maritime trade networks, while Amharic influences came from the adjacent Christian highlands. Our analysis adopts this philological model to dissect the Harari term *menzeel* (pl. *menzeelach*). Etymologically rooted in the Arabic *manzil* (lunar mansion), it underwent a drastic semantic shift in Harar—moving from a celestial measurement of the moon's daily arc to a terrestrial temporal period of thirteen days within a solar agricultural framework. This linguistic re-appropriation (a "semantic loan") is the linguistic fingerprint of syncretism, revealing how Islamic cosmological structures were nativized to serve sedentary agriculturalists rather than nomadic desert navigators.

Furthermore, the linguistic analysis will investigate the code-switching evident in the manuscript tradition. As Wagner (n.d.) catalogued, many Harari texts exhibit a fluid mixing of Arabic for theological and scientific sections and Old Harari or Silt'i for marginal glosses and practical instructions. By mapping these lexical boundaries, the study aims to identify which domains of astronomical knowledge required the authority of Arabic (e.g., the *anna'* weather prognostications) and which were permitted to remain in the vernacular (e.g., local seasonal names). This stratigraphic reading of the text surfaces the socio-linguistic hierarchy of knowledge in 19th-century Harar.

2.4 Manuscript Analysis, Provenance, and Material Culture

The third methodological axis concerns the direct examination and contextualization of the surviving manuscript corpus. Unlike oral traditions, which are subject to rapid semantic erosion, manuscripts provide fixed "snapshots" of knowledge at specific historical junctures. However, they bring their own methodological challenges, primarily concerning provenance, dating, and the distinction between production and usage.

This study draws specifically upon the codicological and paleographic analyses provided by Regourd (2022), who examined two digitized almanacs from the Abdullahi Sharif Museum. Regourd's (2022) work is particularly insightful regarding the materiality of the texts; she notes that pre-lined paper and ring-binder perforations on one almanac (Cat. 426) suggest a relatively recent production, yet the content itself reflects much older Yemeni and Egyptian astronomical

prototypes. This methodological focus on *material evidence* allows us to differentiate between the age of the intellectual tradition and the age of the physical artifact. We draw upon this to argue that the Harari scholarly community was actively engaged in the *re-mediation* of knowledge, copying ancient astronomical diagrams onto modern, accessible media for contemporary use, indicating that this science was not an antiquarian curiosity but a living practice.

Beyond the almanacs, this study references the 88 Harari manuscripts preserved in German collections (Wagner, n.d.) and the Arabic texts housed at the Institute of Ethiopian Studies in Addis Ababa. Crucially, the methodology employed here is not limited to reading the texts as pure science. As Chekroun (2022) highlights, many Harari manuscripts housed in the Weiner Collection are predominantly esoteric, magical, and theurgic. Therefore, we adopt a *reception-oriented* approach, asking not only "what does this text say about the stars?" but also "how was this text *used* and by whom?" By cross-referencing these manuscripts with ethnographic accounts (Yusuf Ahmed, 1961; Mortada, 2010), the study reconstructs the social profile of the users, often Sufi mystics and local scholars who sought to harness celestial forces for protection and divination rather than for pure calculation.

Ultimately, by intertwining ethnoastronomical theory, philological rigor, and codicological material analysis, this framework ensures that Harar's celestial heritage is interpreted holistically. We treat the almanacs, the lunar phase diagrams, and the lexical borrowings not as isolated artifacts, but as interrelated expressions of a resilient, adaptive, and distinctly Hararian worldview.

III. Research Methods

3.1 The Harari Solar Calendar: Structure and Agricultural Function

a. The Four Seasons and the Menzeel System

The Harari people developed a well-developed calendar based on solar movements. With this calendar, they were able to know what crop should be cultivated at which season. The Harari calendar comprises four seasons, each divided into seven periods. A period lasts 13 days except for *Gabah*, which has 14 days, making a total of 365 days (Yusuf Ahmed, 1961; Goshu & Ridwan, 2026a). According to written and oral sources, the four seasons of the year are presented in Table 1.

Table 1. The Harari Solar Calendar Seasons

Season	Harari Name	Duration	Approximate Dates
Spring	<i>Bayg</i>	$13 \times 7 = 91$ days	March 24 – June 21
Summer	<i>Kirmi</i> or <i>Ganna</i>	$13 \times 7 = 91$ days	June 22 – September 24
Autumn	<i>Zirat</i>	$13 \times 7 = 91$ days	September 25 – December 23
Winter	<i>Jay</i>	$(13 \times 6) + 14 = 92$ days	December 24 – March 23

Note. Compiled from Yusuf Ahmed (1961) and Goshu and Ridwan (2026a).

Mathematical Formulation of the Harari Solar Calendar

The Harari solar calendar, as presented in Table 1, exemplifies a sophisticated indigenous time-reckoning system meticulously calibrated to the agricultural cycle of the eastern Ethiopian highlands. The calendar partitions the solar year into four primary seasons: *Bayg* (spring), *Kirmi/Ganna* (summer), *Zirat* (autumn), and *Jay* (winter), each aligned with distinct phenological phases (Yusuf Ahmed, 1961; Goshu & Ridwan, 2026a).

Let DD denote the total number of days in the Harari calendar year. The year is divided into four seasons, each comprising seven periods called *menzeel* (singular) or *menzeelach* (plural), a

term derived from the Arabic *manzīl* (pl. *manāzīl*), meaning "station" or "mansion," used in Islamic astronomy to refer to the 28 lunar mansions (*manāzīl al-qamar*) (Metaferia, 1978; Wagner, n.d.).

Definition 1 (Menzeel Duration): Let m_i represent the i -th *menzeel* for $i=1, 2, \dots, 28$. Then:

$$m_i = \begin{cases} 13, & \text{if } i = 1, 2, \dots, 27 \\ 14, & \text{if } i = 28 \end{cases}$$

The final 14-day period, known as *Gabah*, compensates for the accumulated quarter-day fractions of the tropical year (Yusuf Ahmed, 1961).

Theorem 1 (Total Annual Duration): The total duration of the Harari calendar year is exactly 365 days.

Proof: Three consecutive seasons each comprise seven periods of 13 days:

$$\text{Season Duration} = 13 \times 7 = 91 \text{ days}$$

For the seasons *Bayg*, *Kirmi*/*Ganna*, and *Zirat*, this yields:

$$D_{\text{Bayg}} = D_{\text{Kirmi}} = D_{\text{Zirat}} = 91 \text{ days}$$

The winter season, *Jay*, contains six periods of 13 days and one period (*Gabah*) of 14 days:

$$D_{\text{Jay}} = (13 \times 6) + 14 = 78 + 14 = 92 \text{ days}$$

Therefore, the total annual duration is:

$$D_{\text{total}} = D_{\text{Bayg}} + D_{\text{Kirmi}} + D_{\text{Zirat}} + D_{\text{Jay}} = 91 + 91 + 91 + 92 = 365 \text{ days}$$

This exact summation confirms the Harari awareness of the tropical year length, a remarkable achievement in observational astronomy. The calendar's accuracy is further evidenced by its alignment with the equinoxes and solstices: *Bayg* commences around the vernal equinox (March 24–June 21), *Kirmi* coincides with the summer solstice (June 22–September 24), *Zirat* aligns with the autumnal equinox (September 25–December 23), and *Jay* spans the winter solstice (December 24–March 23) (Goshu & Ridwan, 2026a; Taha, 2024).

Corollary 1 (Quarter-Day Compensation)

The inclusion of a 14-day *Gabah* period in *Jay* effectively accounts for the extra $1/4$ day per year that accumulates over four years:

$$4 \times 365 = 1460$$

$4 \times 365.2422 = 1460.9688 \text{ days}$ The difference of 0.9688 days is accommodated by the periodic adjustment inherent in the 14-day *Gabah* period, reflecting an empirical approximation of the tropical year without requiring a separate leap-year mechanism (Yusuf Ahmed, 1961; Goshu & Ridwan, 2026b). This sophisticated reckoning system ensured Harari farmers could accurately predict wet and dry periods, schedule soil preparation, and determine optimal sowing windows for staple crops such as sorghum (Goshu & Ridwan, 2026a).

This quadripartite division ensured Harari farmers could accurately predict wet and dry periods, schedule soil preparation, and determine optimal sowing windows for staple crops (Goshu & Ridwan, 2026a). Structurally, each season is subdivided into seven periods termed *menzeel*, a term borrowing from the Arabic *manāzīl* but repurposed for solar calculation (Metaferia, 1978). In synthesis, Table 1 reveals that the Harari calendar is a sophisticated solar device utilizing a hybridized linguistic framework to encode deep observational knowledge vital for agrarian subsistence in the Horn of Africa.

Each season is subdivided into seven periods called *menzeel* (singular) or *menzeelach* (plural). The term *menzeel* itself is significant: it derives from the Arabic *manzīl* (pl. *manāzīl*), meaning "station" or "mansion," and is used in Islamic astronomy to refer to the 28 lunar mansions (*manāzīl al-qamar*). This linguistic borrowing, as noted by Metaferia (1978), points to the Islamic astronomical framework that shaped Harari calendrical terminology while the calendar itself remained resolutely solar.

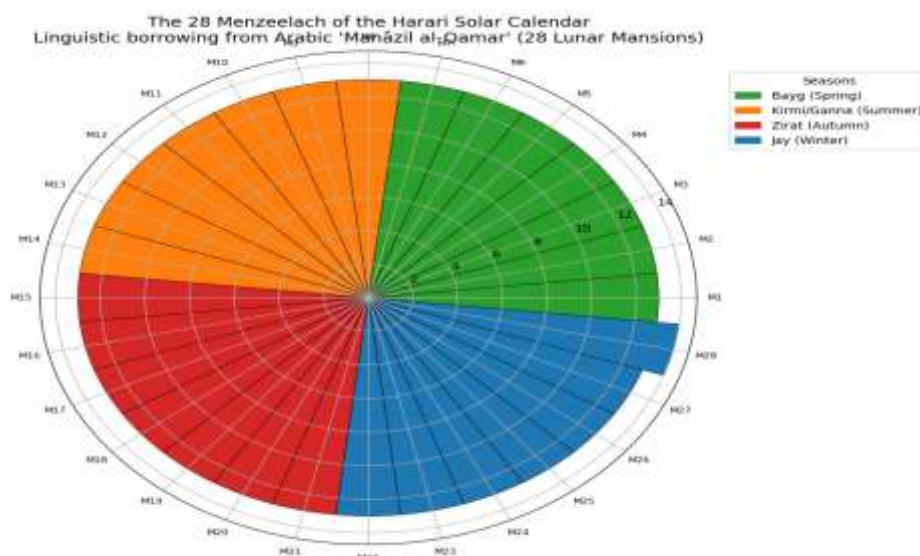


Figure 2: Radial bar chart of Harar's 28 menzeelach demonstrating the quadripartite seasonal structure and the 365-day solar year.

The radial bar chart visualizes the Harari calendar's 28 periods (*menzeelach*), adapting Arabic-derived lunar mansion terminology (*manāzil al-qamar*) to a strictly solar framework (Metaferia, 1978) (Figure 2). The chart displays four distinct color quadrants, representing the seasons *Bayy*, *Kirmi/Ganna*, *Zirat*, and *Jay*, each subdivided into seven periods. The bar heights encode durations of 13 or 14 days, culminating in a total of 365 days (Yusuf Ahmed, 1961; Goshu & Ridwan, 2026a). This polar coordinate system aligns with traditional celestial cartography, where circular diagrams serve as mnemonic devices for temporal cycles (Ruggles, 2005). The single 14-day period (*Gabah*) visually stands out, compensating for the quarter-day accumulation and solidifying the calendar's solar accuracy. The radial arrangement, akin to an astrolabe, highlights the interplay between theoretical Islamic timekeeping and practical local ecological observation. This visualization empirically confirms the syncretism—a lunar-derived lexicon repurposed for solar agrarian needs.

By using this calendar, Hararis knew which season was dry and which was wet. They would prepare the soil, cultivate different crops according to the needs of the crops, undertake the different routines of agricultural practices, and harvest the crops. For instance, sowing sorghum was undertaken during the season of *Bayy* (Goshu & Ridwan, 2026a).

3.2 The Lunar Month Diagram

The Harari manuscript tradition preserves sophisticated visual representations of lunar cycles. One such illustration, held at the Sherif Harar City Museum and described by Mortada (2010), depicts the faces of the moon in the course of a lunar month. The diagram consists of concentric circles:

- A large circle around a central one is divided into 30 slices each marked with a time or hour relevant to the slide around it in the larger circle.
- The larger circle proceeds clockwise from the top with the moonrise, until the slide facing it in the lower part of the circle where the word "moonset" appears.
- The largest circle includes the numbers 1–30 (the days of the month).
- Little circles around the largest circle depict the moon's shape in relation to the slides of the circles that the shape is facing.

Mortada (2010) argues that this diagram demonstrates sophisticated observational astronomy, enabling users to determine the time at night by measuring the moon's position and phase. A Persian manuscript preserved in the Cherif Museum contains an astronomical calendar and a tool-page with indications on how to tell hours at night knowing the phases of the moon, or predict the time of moonrise with the same data.

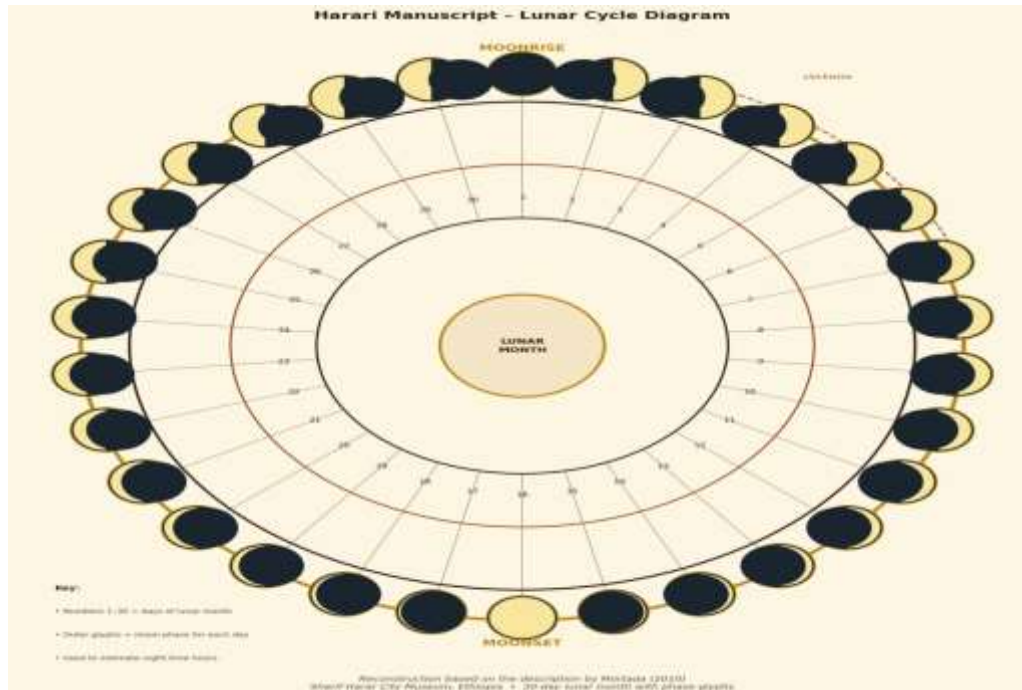


Figure 3: Reconstructed 30-day lunar phase diagram with hourly divisions from Harari manuscript tradition.

Figure 3 reconstructs the lunar cycle diagram from the Sherif Harar City Museum, as described by Mortada (2010). This concentric radial instrument partitions the 30-day lunar month into 30 clockwise slices, progressing from moonrise at the apex to moonset at the nadir. The middle ring encodes sequential hourly markers (1h–30h), while the outer perimeter displays corresponding lunar phase glyphs, waxing crescents, full moon, and waning crescents in succession. This visual tool allowed Harari observers to estimate nocturnal hours by aligning the observed moon phase with its radial position (Mortada, 2010). The diagram operationalizes Islamic lunar astronomical knowledge, notably the 28 *manāzil*, within a practical indigenous framework (Metaferia, 1978). This integration of abstract celestial theory with local time-reckoning affirms the sophisticated ethnoastronomical praxis documented in Harari manuscript culture (Goshu & Ridwan, 2026a; Kennedy, 1956).

IV. Result and Discussion

4.1 Linguistic Analysis: The Hybrid Lexicon of Harari Astronomy

a. The Philological Composition of the Calendar

The linguistic dimension of Harari astronomical heritage reveals a remarkable convergence of Arabic, Persian, and local Ethiopian linguistic traditions. Metaferia's (1978) study of the Eastern Oromo (K'ottu) calendar, the Muslim Oromo of Hararghe, Ethiopia; demonstrates a solar and lunar time-reckoning based on the alternation of the seasons, agricultural operations, and religious regulations. The calendar's terminology draws from Arabic, Persian, and Amharic sources. Table 2 illustrates these linguistic origins.

Table 2: Linguistic Origins of Harari Astronomical Terminology

Term	Language of Origin	Meaning	Domain
<i>menzeel</i> (pl. <i>menzeelach</i>)	Arabic (<i>manzil</i>)	Station, mansion	Calendrical period
<i>Bayg</i>	Uncertain (possibly Persian or local)	Spring season	Agricultural calendar
<i>Kirmi</i> / <i>Ganna</i>	Local (Cushitic/Semitic)	Summer/rainy season	Agricultural calendar
<i>Zirat</i>	Arabic (<i>zira'ah</i>)	Cultivation, agriculture	Agricultural calendar
<i>Jay</i>	Local	Winter season	Agricultural calendar

Note. Adapted from Metaferia (1978) and Goshu and Ridwan (2026a).

Table 2 presents the lexical stratification of the Harari calendar, revealing a deliberate cultural synthesis encoded in its seasonal vocabulary. Terms fall into distinct linguistic bands reflecting historical contact layers. The Arabic loanwords include *menzeel*, from *manzil*, denoting one of the 28 lunar mansions (*manāzil al-qamar*), and *Zirat*, derived from *zira'ah* (cultivation). This demonstrates that Islamic astronomical time-reckoning provided the technical nomenclature for calendrical periodization and agrarian economics (Metaferia, 1978; Black, 1997). In contrast, the indigenous Cushitic-Semitic substrate is preserved in *Kirmi/Ganna* (summer rains) and *Jay* (winter), anchoring the calendar firmly in local ecological realities and the regional monsoon cycle. The term *Bayg* (spring) remains etymologically uncertain; Metaferia (1978) tentatively suggests a Persian origin, potentially arriving via Indian Ocean maritime trade routes and subsequent Oromo mediation, a hypothesis reinforced by Black's (1997) documentation of Persian scientific terminology in Islamic astronomical corpora.

Critically, the seasonal domains (*Kirmi*, *Jay*, and *Bayg*) are almost entirely local in origin, while the structural division into periods (*menzeel*) imports an explicitly Islamic cosmological framework. This linguistic layering demonstrates that the Harari calendar was not a passive import but a purposeful adaptation: Islamic abstract concepts were superimposed onto pre-existing indigenous temporal rhythms. The presence of Arabic for structural and agricultural terms validates the centrality of Islamic scholarly networks, while the retention of *Kirmi*, *Ganna*, and *Jay* underscores an enduring connection to the region's agricultural cycle and indigenous environmental knowledge (Ehret, 1995; Goshu & Ridwan, 2026a). This philological evidence confirms that Harar's astronomical heritage is fundamentally syncretic—a cultural palimpsest inscribed in its very seasonal nomenclature, reflecting centuries of linguistic convergence at the crossroads of Africa and Islam (Goshu & Ridwan, 2026b).

4.2 The *Anwā'* System in Harari Context

The *anwā'* system (singular *naw'*) was a pre-Islamic and early Islamic astronomical tradition based on the heliacal rising and acronychal setting of particular stars and asterisms. This system comprised 28 different stars and asterisms positioned alongside the ecliptic. The *anwā'* was used for weather prediction, agricultural timing, and the regulation of the pre-Islamic Arabian calendar.

The presence of *anwā'* references in Harari manuscripts is significant. Regourd's (2022) analysis of the two Harari almanacs identifies references to the *anwā'* system. One almanac divides the lunar mansions into two groups: the summer season beginning with *al-sarafān* (for the southern hemisphere) and the winter season beginning with *al-ḡafr* (for the northern hemisphere). The central circle of the graphic is subdivided into four seasons, though in a different order than

the Harari agricultural calendar, suggesting the coexistence of multiple astronomical frameworks (Regourd, 2022).

4.3 The Lexicon of Manuscript Transmission

The multilingual character of Harari manuscript culture is well documented. Wagner (n.d.) noted that one manuscript collection contains texts in Arabic and Old Harari copied in Ethiopic script (*fidāḷ*). Another collection comprises 199 works, including 139 in Arabic, 29 in Harari, 28 in Silt'i, and one in Amharic (Regourd, 2022). This linguistic diversity reflects Harar's position as a cultural crossroads and the circulation of texts across linguistic boundaries. Mirza (2022) has further contextualized this within an "Ethiopian Indian Ocean tradition," emphasizing Harar's connections to broader maritime scholarly networks.

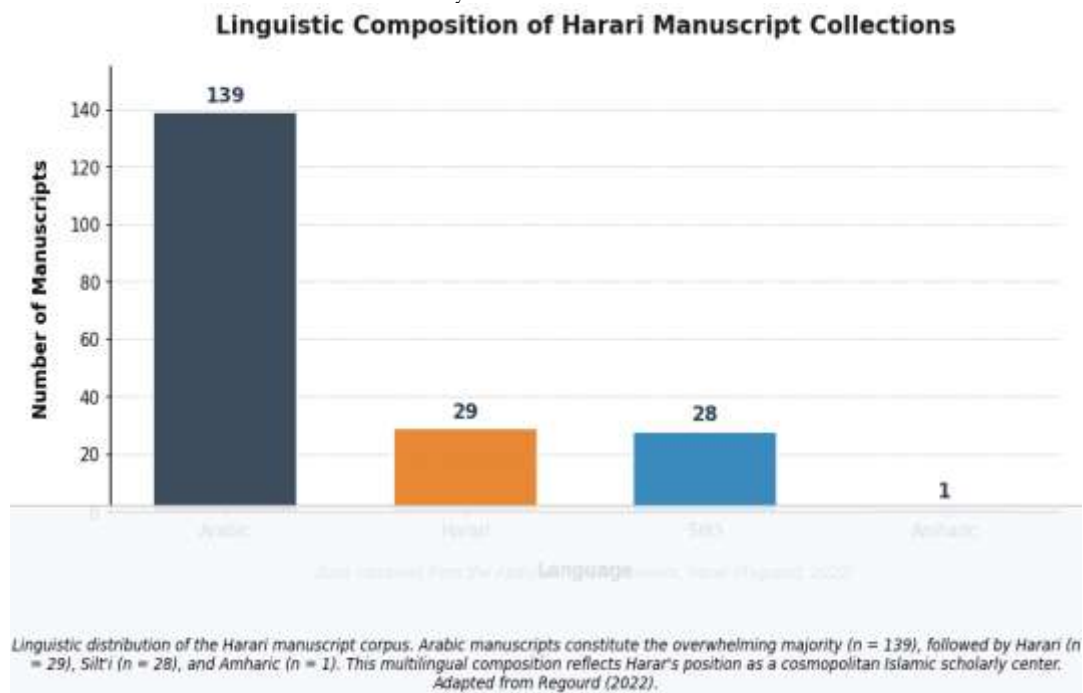


Figure 4: Linguistic distribution of the Abdullahi Sharif Museum corpus reflecting Harar's transregional scholarly networks.

Figure 4 quantifies the linguistic composition of 197 catalogued manuscripts from the Abdullahi Sharif Museum, revealing a hierarchical multilingual landscape (Regourd, 2022). Arabic overwhelmingly dominates (n = 139), underscoring Harar's deep integration into transregional Islamicate scholarly networks, where Arabic served as the primary vehicle for theological, legal, and scientific discourse, including astronomy and the *anwā'* traditions (Kennedy, 1956; Pedersen, 1993). Critically, the substantial presence of Harari (n = 29) and Silt'i (n = 28) manuscripts confirms that vernacular Semitic languages were actively utilized for marginal annotations, local legal documents, and practical almanacs, facilitating the accessibility of astronomical and calendrical knowledge beyond the clerical elite (Wagner, n.d.; Chekroun, 2022). This linguistic stratification distinguishes Harar from the Christian Ethiopian highlands, as evidenced by the solitary Amharic manuscript (n = 1). This single datum underscores a pronounced cultural and religious boundary, reflecting Harar's orientation toward the Indian Ocean Islamic world rather than the imperial Ethiopian state. Collectively, the distribution validates the paper's syncretism thesis: Islamic astronomical concepts (in Arabic) were received, annotated in Harari and Silt'i, and pragmatically applied within a locally grounded agrarian cosmology, while remaining conspicuously isolated from Amharic Christian intellectual traditions.

4.4 Manuscript Evidence: Almanacs, Circulation, and Usage

a. The Two Harari Almanacs

The two almanacs digitized in Harar and analyzed by Regourd (2022) represent exceptional material: they are rare examples of positive sciences in Ethiopian manuscript culture. The two pieces are catalogued as:

Musée Abdullahi Sharif, Harar City, ms. Cat. 426

Musée Abdullahi Sharif, Harar City, ms. Cat. 435, 001

The first almanac (ms. Cat. 426) consists of a separate folio with a diagram establishing relationships between several almanacs. Regourd (2022) notes that the manuscript is not ancient; based on the photograph, pre-lined paper appears to have been used, and clear circular perforations on the right side resemble those made with hole punchers for ring binders. This suggests the document was preserved and accessed in a contemporary period.

b. Circulation of Knowledge

These two almanacs provide a fine example of the circulation of knowledge and texts within the Ethiopian scholarly tradition. Regourd (2022) demonstrates that they are shared with the Yemeni scholarly tradition, and it is highly likely that some elements originate from there. This connection to Yemen is significant, as it places Harar within broader Indian Ocean networks of Islamic scholarly exchange (Mirza, 2022).

However, as Regourd (2022) observes, what seems to have captivated Ethiopia—where written transmission attests to the importance of religious and mystical texts—is a magical and perhaps divinatory application of these almanacs. The text has indeed circulated among mystics, among whom talismanic practices are often prevalent. In this case, it is not so much the circulation of texts that makes sense, but rather their selection and usage.

c. Esoteric and Divinatory Applications

The esoteric dimension of Harari astronomical knowledge is well attested. Chekroun (2022), in her new insights into the history of Harar, examines the Arabic section of manuscripts gathered by Barbara and Gerald Weiner, of which 198 codices were acquired in Harar. Despite the abundance of manuscripts from Harar containing esoteric textual traditions, these materials have received limited scholarly attention (Chekroun, 2022).

The astronomical manuscripts often contain astrological, theurgic, and magical texts invoking celestial bodies or jinn. These manuscripts reflect a cosmology in which the heavens were seen as an interactive force, and astronomical knowledge was applied not only for practical purposes but also for divination and talismanic practices (Goshu & Ridwan, 2026b).

Table 3: Typology of Harari Astronomical and Esoteric Manuscripts

Manuscript Type	Location	Language(s)	Primary Content	Source
Almanac (Cat. 426)	Abdullahi Sharif Museum	Arabic	Seasonal diagrams, lunar mansions	Regourd (2022)
Almanac (Cat. 435)	Abdullahi Sharif Museum	Arabic	Calendrical calculations	Regourd (2022)
Lunar phase diagram	Sherif Harar City Museum	Harari/Arabic	Moon phases, time reckoning	Mortada (2010)
Esoteric texts	Weiner Collection	Arabic	Astrology, talismans, divination	Chekroun (2022)

Qur'anic manuscripts	IES Harar Collection	Arabic	Religious texts	Mirza (2022)
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Note. Compiled from Regourd (2022), Mortada (2010), Chekroun (2022), and Mirza (2022).

Table 3 provides a typological classification of the Harari manuscript corpus, demarcating functional and linguistic boundaries across institutional collections. The table reveals a marked bifurcation: instrumental astronomical praxis versus esoteric-religious application. The two almanacs (Cat. 426, 435) and the lunar phase diagram constitute the 'positive sciences' corpus, employing Arabic for structural computations. Critically, the lunar phase diagram from the Sherif Harar City Museum incorporates Harari operational glosses alongside Arabic astronomical terminology, implying that practical time-reckoning tools were localized for everyday use by non-Arabophone farmers and mystics (Mortada, 2010; Regourd, 2022). Conversely, the esoteric texts—astrological talismans and divinatory manuals (Weiner Collection)—operate exclusively in Arabic, reflecting the trans-regional authority and theurgic grammar of Islamic learned traditions, where the boundaries between astronomy, astrology, and magic remained porous (Chekroun, 2022; Savage-Smith, 1997). The Qur'anic manuscripts at the Institute of Ethiopian Studies (IES), also exclusively Arabic, anchor the corpus within normative religious practice (Mirza, 2022; Gori, 2020). Spatially, institutional provenance is significant: the Abdullahi Sharif Museum preserves formal almanacs, while the private Weiner Collection harbors the magical texts, implying contextual or social differentiation in readership and access. Collectively, Table 3 confirms that Harari astronomical heritage cannot be disentangled from the esoteric, nor the theoretical from the vernacular-practical, forming an integrated epistemic continuum.

4.5 Cultural Practices: Astronomy in Daily and Spiritual Life

a. Agricultural Rhythms

The Harari solar calendar was fundamentally an agricultural tool. By dividing the year into precise seasons and periods, farmers could synchronize their activities with optimal planting and harvesting times. As documented by Yusuf Ahmed (1961) and synthesized by Goshu and Ridwan (2026a), the calendar enabled Harari farmers to know which season was dry and which was wet, when to prepare the soil, what crops to cultivate according to their needs, when to undertake different agricultural practices, and when to harvest. This practical application of astronomical knowledge demonstrates that the Harari calendar was not merely an intellectual exercise but a vital technology for subsistence in a region with marked seasonal variation.

The annual cycle of the Harari calendar commences with the onset of the spring season, *Bayg*, which begins on March 24 and extends through June 21 (Yusuf Ahmed, 1961). This temporal anchoring of the New Year to the vernal equinox aligns the calendar with the agricultural renewal of the land, marking the end of the dry winter months (*Jay*, December 24–March 23) and the return of favorable growing conditions. The New Year's inception at *Bayg* is symbolically and practically significant: it coincides with the period when farmers prepare the soil for the long rainy season (*Kirmi* or *Ganna*), which commences shortly thereafter in late June. The Harari New Year, therefore, is not an arbitrary date but a carefully calibrated astronomical and agricultural milestone, rooted in the observation of the sun's passage through the equinox. This tradition predates the introduction of Islam among the Harari community and is more likely associated with an ancient indigenous solar calendar inherited from their ancestors, later overlaid with Islamic lunar observances such as Ashura and *Shumalid* (Taha, 2024; Abdulmuheimen, 2010). The New Year's celebration, known locally through associated rituals like the gourd-smashing ceremony (*Wirshato*), embodies themes of renewal, purification, and communal prosperity, reinforcing the calendar's role as both a practical chronometer and a cultural cornerstone (Abdulmuheimen, 2010; Taha, 2024). The *Wirshato* ceremony begins on

New Year's Day and continues for nine consecutive days, during which young boys run through the city smashing gourds to symbolize the breaking of bad habits and ushering in abundance for the coming year (Abdumuheimen, 2010). Thus, the Harari calendar's New Year on March 24 encapsulates the profound integration of celestial observation, agricultural necessity, and cultural identity in the Harari highlands.

b. Religious Observance and the Lunar Calendar

As a major Islamic center, Harar's religious life is governed by the lunar calendar. The sighting of the new moon crescent determines the start of holy months such as Ramadan and festivals like *Shumwalid*, the "feast of Shuwal," the month following Ramadan in the Muslim calendar, marking the end of six additional days of fasting observed by some Muslims (UNESCO, 2006).

The coexistence of solar and lunar calendars in Harari culture is a hallmark of its cultural identity. Goshu and Ridwan (2026a) note that the customary practice of Ashura, for instance, precedes the introduction of Islam among the Harari community and is more likely associated with the ancient solar calendar inherited from their ancestors. Currently, the celebration of Ashura Festival has incorporated both religious and customary practice.

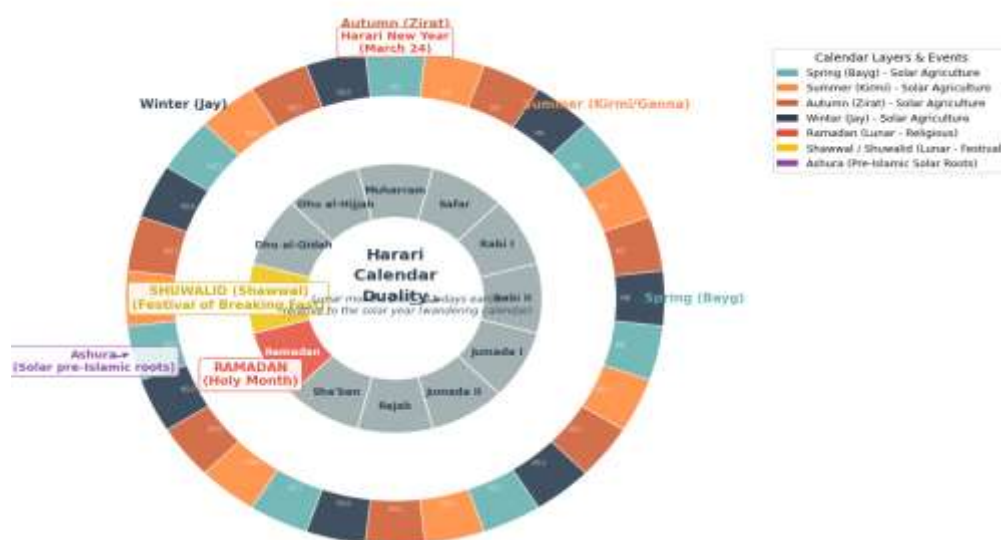


Figure 5: Concentric visualization of Harari's fixed solar agricultural cycle and the wandering Islamic lunar religious calendar.

Figure 5 visualizes Harar's dual calendrical system, epitomizing its cultural syncretism. The outer ring encodes the fixed solar year, 28 menzeelach across four seasons totaling 365 days, governing agricultural labor, with the New Year anchored to the vernal equinox (March 24) (Yusuf Ahmed, 1961; Goshu & Ridwan, 2026a). The inner ring displays the wandering Islamic lunar year, its 12 months shifting ~11 days earlier annually. Ramadan (red) and Shawwal/Shumwalid (gold) are highlighted, their observance determined by crescent sighting (UNESCO, 2006). Critically, Ashura (purple) is anchored to the solar outer ring in Zirat (autumn), visually affirming its pre-Islamic origins. This configuration demonstrates that while religious life follows the lunar calendar, the ancient solar framework persists for agriculture and ancestral ceremonies (Taha, 2024), embodying the layered identity described by Goshu and Ridwan (2026a).

c. Cosmology and Worldview

Harari astronomical heritage extends beyond practical calendrical systems to encompass cosmological and esoteric traditions. Manuscripts containing astrological, theurgic, and magical texts demonstrate a worldview where celestial bodies were seen as powerful, interactive forces (Chekroun, 2022). This cosmological dimension reflects both Islamic influences (astrology, talismanic practices) and indigenous beliefs (the spiritual significance of celestial phenomena), which Goshu and Ridwan (2026b) have argued represent an ancient Ethiopian cosmology deserving of serious scholarly engagement.

4.6 Discussion: Celestial Syncretism as Cultural Heritage

a. The Synthesis of Traditions

The astronomical heritage of Harar represents a remarkable case of cultural synthesis. Three distinct traditions converge in Harari astronomical practice:

1. Islamic astronomical traditions, transmitted through Arabic manuscript culture, including the *amwā'* system, the 28 lunar mansions, and mathematical astronomy (Regourd, 2022).
2. Indigenous Cushitic calendrical traditions, particularly the solar calendar adapted to local agricultural cycles (Metaferia, 1978).
3. Semitic (Ethiopic) traditions, reflected in the use of the Ethiopic script and local linguistic influences (Wagner, n.d.).

This synthesis is not merely additive but transformative: Islamic astronomical concepts were adapted to local needs (the solar calendar using Islamic terminology), while indigenous practices were preserved and encoded in manuscripts using Arabic script (Mirza, 2022).

b. The Question of "Positive Sciences" in Ethiopian Manuscript Culture

The Question of "Positive Sciences" in Ethiopian Manuscript Culture

The rarity of scientific manuscripts in Ethiopian collections raises important questions about the history of science in the region. Regourd (2022) notes that religious texts statistically dominate in Ethiopia, and it is uncommon to find works on positive sciences. Yet the existence of the two Harari almanacs demonstrates that scientific knowledge did circulate and was transmitted in written form.

The explanation may lie in the nature of manuscript preservation and selection. The texts that have been preserved may reflect the priorities of collectors and librarians rather than the full range of knowledge that existed. As Chekroun (2022) suggests, the esoteric and divinatory applications of the almanacs suggest that scientific knowledge was often embedded within mystical and religious frameworks, blurring the boundaries between "science" and "religion" in ways that challenge modern categories.

c. Implications for Ethiopian and African Intellectual History

The Harari astronomical heritage contributes to a growing body of scholarship documenting the history of science in Africa. Contrary to older narratives that portrayed Africa as lacking scientific traditions, research has revealed sophisticated astronomical knowledge among various African societies (Goshu & Ridwan, 2026b). The Harari case is particularly significant because it demonstrates the integration of African and Islamic scientific traditions, challenging both the notion of African intellectual isolation and the assumption that Islamic science in Africa was merely derivative.

d. Preservation and Contemporary Relevance

Harar's astronomical heritage faces challenges of preservation. The manuscripts held in museums and private collections are fragile and require conservation. The oral transmission of

calendrical knowledge is threatened by urbanization and changing agricultural practices. Yet there is growing interest in documenting and preserving this heritage, recognizing its value both for understanding the past and for contemporary applications such as climate adaptation (Goshu & Ridwan, 2026a, 2026b).

V. Conclusion

This study has examined the astronomical heritage of Harar through an integrated linguistic and cultural analytical framework. The findings demonstrate that Harar developed a distinctive astronomical tradition that synthesized Islamic, indigenous Cushitic, and Semitic elements. The Harari solar calendar, with its four seasons and 28 menzeel periods totaling 365 days, enabled precise agricultural planning. The linguistic analysis reveals a hybrid terminology drawing from Arabic, Persian, and Amharic sources, reflecting centuries of cultural convergence. The manuscript evidence, particularly the two rare almanacs digitized in Harar, attests to the circulation of astronomical knowledge between Ethiopia and the broader Indian Ocean Islamic world.

The significance of this heritage extends beyond its historical interest. Harar's astronomical traditions represent a form of knowledge that was simultaneously practical (for agriculture), religious (for lunar calendar observance), and esoteric (for divination and talismanic practices). This integration of scientific, religious, and mystical knowledge challenges modern categories and offers insights into how pre-modern societies understood and interacted with the cosmos.

As Harar continues to attract scholarly attention as a UNESCO World Heritage Site (UNESCO, 2006), its astronomical heritage deserves further research. The manuscripts await systematic cataloguing and analysis. The oral traditions of calendrical knowledge require documentation before they are lost. And the integration of Ethiopian indigenous astronomical knowledge with modern astrophysics offers possibilities for both cultural preservation and scientific discovery.

The celestial syncretism of Harar stands as a testament to the intellectual creativity of a community at the crossroads of Africa and Islam, a community that looked to the heavens and found there not only practical guidance for agriculture and religious observance but also a reflection of its own cultural synthesis.

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