

Implementation of Cattle Grazing Positions for Determining Cardinal Directions and the Qibla Direction

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ABSTRACT

Cows grazing facing north or south is a unique fact that not everyone knows. Therefore, this needs to be studied as an addition to the scientific treasures of science, especially in the field of falak science, this can be related to one of the fields in falak science, namely Qibla direction. This research aims to reveal the truth that the cow's body faces North South so that later it can be used to determine the Qibla direction. The results showed that the method of determining the Qibla direction with the position of grazing cows is done by observation repeatedly in order to produce accurate results. After doing the research, it is true that the position of the cow when grazing exposes its body to the North or South so that this method can be used to determine the Qibla direction. However, there are still many shortcomings when using this method so there is still a need for in-depth research on cows. There is another unique thing, it turns out that it is not only cows that do the behavior of directing their bodies to North and South when grazing, there are other animals such as buffaloes, sheep, deer.

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ABSTRAK

Sapi merumput menghadap ke Utara atau Selatan merupakan sebuah fakta unik yang tidak semua orang mengetahui. Oleh karena itu hal ini perlu dikaji sebagai tambahan khazanah keilmuan ilmu pengetahuan khususnya di bidang ilmu falak, hal ini dapat dikaitkan dengan salah satu bidang dalam ilmu falak yaitu arah kiblat. Penelitian ini bertujuan untuk mengungkap kebenaran bahwa tubuh sapi menghadap ke arah Utara Selatan sehingga nantinya dapat digunakan untuk menentukan arah kiblat. Hasil penelitian menunjukkan bahwa metode penentuan arah kiblat dengan posisi sapi merumput dilakukan dengan cara observasi secara berulang-ulang agar menghasilkan hasil yang akurat. Setelah melakukan penelitian benar adanya bahwa posisi sapi saat merumput menghadapkan tubuhnya ke Utara atau Selatan sehingga metode ini dapat digunakan untuk menentukan arah kiblat. Namun masih banyak kekurangan ketika menggunakan metode ini sehingga masih perlu penelitian yang mendalam tentang sapi. Ada hal unik lain, ternyata tidak hanya sapi yang melakukan perilaku mengarahkan tubuhnya ke Utara Selatan saat merumput, ada hewan-hewan lain seperti kerbau, domba, rusa.

INTRODUCTION

Cardinal directions constitute fundamental navigational indicators that provide orientation within a given location, thereby playing a crucial role in human life. Commonly referred to as cardinal points—East, South, West, and North—the ability to recognize these directions is essential to prevent disorientation and avoid becoming lost. For instance, when traveling in unfamiliar areas, understanding cardinal directions enables individuals to determine their orientation and return to their starting point even through alternative routes. Thus, incorporating knowledge of cardinal directions into daily life significantly enhances navigational accuracy. Although many people rely only on relative instructions such as “right,” “left,” or “straight,” a comprehension of cardinal directions offers a more systematic and reliable spatial understanding.¹

Cardinal directions may be determined using a variety of instruments, both optical and non-optical. Optical tools include devices such as the theodolite and telescope, whereas non-optical tools include the compass, celestial constellations, needles, and other similar instruments. Additionally, cardinal directions can be identified through a number of simple observational techniques, such as utilizing a magnetic compass, observing the Sun’s apparent motion—rising in the East and setting in the West—examining shadow orientation, employing needles or razor blades, observing the alignment of mosques and Islamic graves, assessing heat exposure on tree bark, observing leaf density and moss growth on forest trees, and referencing star constellations.²

In contemporary society, rapid advancements in science and information technology have led to the development of sophisticated tools that greatly assist human activities, including work, travel, and time management. Despite this

¹Cut Nazar Mutia Hanum and Ismail Ismail, “Pandangan Tokoh Agama Jungka Gajah Terhadap Arah Kiblat Bagi Orang Yang Jauh Dari Ka’bah,” *Astroislamica: Journal of Islamic Astronomy* 1, no. 2 (December 28, 2022): 169–86, <https://doi.org/10.47766/ASTROISLAMICA.V1I2.934>.

²Ahmad Izzuddin, “Typology Jihatul Ka’bah on Qibla Direction of Mosques in Semarang,” *Ulul Albab: Jurnal Studi Dan Penelitian Hukum Islam* 4, no. 1 (November 1, 2020): 1–15, <https://doi.org/10.30659/JUA.V4I1.12186>.

progress, many individuals still struggle to accurately determine cardinal directions, particularly when attempting to establish the Qibla direction in unfamiliar environments. Nevertheless, natural signs that can be interpreted through simple observation continue to hold considerable practical value. On August 27, 2008, “Koran Tempo” published an article titled “Sapi Punya Kompas Built-In” (“Cows Have a Built-In Compass”), reporting that cattle tend to align their bodies along the North-South axis when grazing or resting, purportedly due to the presence of an internal magnetic compass mechanism.³

This phenomenon stimulates significant academic interest regarding whether cattle indeed consistently orient themselves toward the North or South while grazing and whether such behavior may be utilized by humans as a natural indicator for navigation when disoriented. Moreover, it raises the question of whether this orientation could contribute to determining the Qibla direction, thereby offering an alternative natural approach to Qibla identification. If cattle grazing alignment reliably corresponds to the North-South axis, it may serve as a natural reference for determining the Qibla direction. Therefore, the present study seeks to explore the potential use of cattle grazing orientation as an alternative method for determining cardinal directions and, consequently, the Qibla direction. It is expected that the findings of this study will contribute valuable insights to readers and expand practical understanding of natural indicators in orientation and Qibla determination.

METHOD

This study employed a field-based observational research method, in which primary data were collected directly from natural conditions associated with the research problem. The observations were conducted in an open outdoor area free from obstructions such as trees or buildings. The purpose of the field observation was to examine the grazing orientation of cattle as a natural indicator for

³Iyan Hasjun, Andi Jusran Kasim, and Nur Astaman Putra, “Uji Akurasi Hasil Pengukuran Arah Kiblat Pegawai Kemasjidan Kua Menggunakan Aplikasi Google Earth,” *Astroislamica: Journal of Islamic Astronomy* 3, no. 1 (June 30, 2024): 114–35, <https://doi.org/10.47766/astroislamica.v3i1.2796>.

determining the Qibla direction. Through systematic observation of the alignment of cattle while grazing, data were obtained to analyze their positional tendency relative to cardinal directions, particularly the North–South axis.

RESULT AND DISCUSSION

Definition of Cardinal Directions and the Qibla Direction

The term *cardinal directions* is composed of three elements: direction, point, and wind. According to the Oxford Dictionary, *direction* is defined as “a general position toward which a person or thing moves or points”⁴, referring to the movement or orientation of an object or individual that indicates the intended destination. Directions may be expressed in two ways: relatively or absolutely. In a relative context, direction is based on a reference point that is not fixed – such as the referee’s position on a football field, which indicates orientation but does not remain constant. In an absolute context, direction relies on universally accepted reference points, such as stating that a mosque is located to the west of a university campus. In daily interactions, directions are often indicated simply by pointing with the index finger or using arrows. When direction is defined based on spatial position, *cardinal directions* serve as guiding references used to determine orientation.

Wind moves from areas of high pressure to areas of low pressure, and the direction of the wind indicates the source point. It may be described using cardinal directions such as North, East, South, and West, or expressed in degrees. According to the *Kamus Besar Bahasa Indonesia* (KBBI), cardinal directions refer to compass needle orientation or the direction from which the wind originates.⁵ Cardinal directions function as a reference method for locating a specific position or orientation.

In general, cardinal directions are extensively used in navigation, mapping, compasses, diagrams, and related applications. Typically, eight cardinal directions

⁴Oxford Dictionary, *Oxford Advances Learner’s Dictionary*, (New York: Oxford University Press, 2001), cet. VII, 353.

⁵KBBI VI Daring, Badan Pengembangan dan Pembinaan Bahasa, Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia, 2016, <https://kbbi.kemdikbud.go.id/>

are recognized following a clockwise sequence: North, Northeast, East, Southeast, South, Southwest, West, and Northwest. North serves as the basis for determining all other directions. Once North is identified, the remaining directions can easily be established. North, East, South, and West are classified as *primary cardinal directions*, while Northeast, Southeast, Southwest, and Northwest are classified as *intercardinal directions*. North and South represent the Earth's poles, while East and West correspond to the direction of Earth's rotation.⁶ The angular separation between cardinal directions is expressed in degrees. Thus, *cardinal directions* convey essential positional information based on recognized geographical orientation.



Figure 1.1 Cardinal Directions⁷

Cardinal directions enable accurate position identification, navigation of ships or aircraft, and analysis of weather patterns. Several simple methods may be used to determine direction, including using a compass, observing sunrise and sunset, analyzing object shadows, utilizing magnetic needles or razor blades, observing mosque orientations or Islamic graves, assessing temperature contrast on tree bark, evaluating leaf density and moss growth in forests, and observing star constellations.

⁶Agus Solikin et al., "Hifz Al Aql Dan Penerapan Open-Ended Question Dalam Materi Konsep Arah Kiblat Pada Mata Kuliah Matematika Astronomi," *Edukasi Islami: Jurnal Pendidikan Islam* 12, no. 02 (May 21, 2023), <https://doi.org/10.30868/EI.V12I02.3243>.

⁷<https://www.pinterest.jp/pin/695032154964487349/> (Diakses pada tanggal 4 September 2024 Pukul 22.24 WIB).

These practical methods help individuals determine direction efficiently using natural signs.⁸

In Islamic jurisprudence, scholars agree that facing the Qibla correctly is a fundamental requirement for the validity of prayer; therefore, determining the Qibla direction is essential for Muslims.⁹ The term *Qibla* refers to the Ka'bah (Baitullah) located in the Holy City of Makkah. The word *Qibla* derives from the Arabic term *قِبْلَة*, a verbal noun of *قَبِلَ - يَقْبِلُ - قَبْلًا*, meaning *to face*.^{10 11} According to the *Kamus Ilmu Falak*, *Qibla* refers to the direction toward which a person faces during prayer in all postures—standing, bowing, and prostrating—aligned with the direction of the Ka'bah.¹² The KBBI defines *Qibla* as the direction pointing toward the Ka'bah in Makkah during prayer.¹³

Several scholars in the field of astronomy (*falak*) have provided definitions related to the *Qibla* direction. Slamet Hambali defines the *Qibla* direction as the closest direction to the Ka'bah along a great circle of the Earth.¹⁴ Ahmad Izzuddin explains that the *Qibla* direction is the nearest route to the Ka'bah, which every Muslim must face during prayer.¹⁵ Muhyiddin Khazin adds that the *Qibla* direction is the shortest arc of the great circle that connects a specific location to the city of Makkah.¹⁶

⁸Arum Rifda, 8 Arah Mata Angin dan Gambar Arah Mata Angin, 2022 <https://www.gramedia.com/best-seller/arah-mata-angin/>

⁹ "Kamus Besar Bahasa Indonesia (KBBI) Daring," n.d., Diakses pada tanggal 26 Februari 2022 pukul 22.27 WIB. <https://kbbi.web.id/>.

¹⁰Susiknan Azhari, "Ensiklopedi Hisab Rukyat," 2005, 277, https://books.google.com/books/about/Ensiklopedi_hisab_rukyat.html?id=qT9mAAAAMAAJ.

¹¹Munawwir Ahmad Warson, *Al-Munawwir Kamus Arab-Indonesia* (Surabaya: Pustaka Progresif, 1997), 1087-88.

¹²Muhyiddin Khazin, *Kamus Ilmu Falak* (Yogyakarta: Buana Pustaka, 2005).

¹³"Kamus Besar Bahasa Indonesia (KBBI) Daring."

¹⁴Slamet Hambali, *Ilmu Falak Arah Kiblat Setiap Saat*, Cetakan I (Yogyakarta: Pustaka Ilmu, 2013), 14.

¹⁵Ahmad Izzudin, *Ilmu Falak Praktis* (Pustaka Rizki Putra, 2020).

¹⁶Muhyiddin. Khazin, *Ilmu Falak Dalam Teori Dan Praktik: Perhitungan Arah Kiblat, Waktu Shalat, Awal Bulan Dan Gerhana*. (Buana Pustaka, 2004), https://books.google.com/books/about/Ilmu_falak_dalam_teor_i_dan_praktik.html?id=Kx2-tgAACAAJ.

Based on these definitions, the Qibla direction refers to facing the Ka'bah, the sacred structure within Al-Masjid al-Haram. Determining and facing the correct Qibla is an obligatory requirement for Muslims; otherwise, the prayer is invalid. Therefore, the Qibla direction is understood as the nearest great-circle route connecting any given location to the Ka'bah.

In Indonesia, issues related to Qibla determination are still commonly found in mosques and prayer rooms. Many people incorrectly assume that the Qibla direction is simply West. However, a more precise geographical analysis shows that a direct westward orientation leads toward Africa rather than Makkah. Therefore, public education is essential to clarify that the Qibla direction in Indonesia deviates slightly northward from the true West.¹⁷

There are three jurisprudential classifications regarding facing the Qibla:

1. *Ainul Ka'bah* – directly facing the Ka'bah, applicable to individuals inside the Grand Mosque who can see the Ka'bah.
2. *Jihatul Ka'bah* – facing the direction of the Ka'bah from within the vicinity of Makkah without a direct view, by orienting toward the Grand Mosque.
3. *Jihatul Qibla* – facing the closest directional alignment toward the Ka'bah for those located outside Makkah or outside Saudi Arabia. For Muslims living outside the region, determining the correct Qibla requires proper calculation and methodological effort (*ijtihad*).¹⁸

Calculation of the Qibla Direction

The determination of the Qibla direction involves identifying the orientation from a specific location on Earth toward the Ka'bah. Various methods may be used to calculate the Qibla direction, one of the most widely applied being the calculation of the Qibla azimuth, which refers to the directional bearing or great-circle path

¹⁷Ismail Ismail, "Standar Operasional Prosedur (SOP) Kalibrasi Arah Kiblat Masjid Di Era Digital," *Al-Marshad: Jurnal Astronomi Islam Dan Ilmu-Ilmu Berkaitan* 5, no. 1 (June 20, 2019): 90-110, <https://doi.org/10.30596/jam.v5i1.3126>.

¹⁸Izzudin, *Ilmu Falak Praktis*.

leading directly to the Ka'bah.¹⁹ The following are the steps required to determine the azimuth value of the Qibla direction:

1. Preparation of Required Data:

- a) Latitude of the location
- b) Longitude of the location
- c) Latitude and longitude of Makkah

According to Ahmad Izzuddin,²⁰ the Ka'bah is located at 21° 25' 21.17" North latitude and 39° 49' 34.56" East longitude. Several methods can be used to determine latitude and longitude, including consulting published coordinate tables, using physical maps, traditional tools such as the *istiwa' stick*, GPS devices, theodolite measurements, Google Earth applications, or online geographic databases.²¹

- d) Regional (local) longitude

A longitude line measures the angular distance of a location from the Prime Meridian in Greenwich, expressed in degrees, with each 15° corresponding to one-hour time zones. Longitudes range from 0° to 180° in both hemispheres. Negative values represent locations west of Greenwich, whereas positive values represent locations east of Greenwich.²²

2. Determination of the Qibla azimuth value using the following formula:

$$\text{Cotan B} = \tan \phi^m \times \cos \phi^x : \sin C - \sin \phi^x : \tan C$$

Description of Variables:

B : Qibla direction azimuth. A positive value indicates that the azimuth is measured from true North, whereas a negative value indicates measurement from true South.

¹⁹David A. King, *Islamic Astronomy and Geography, Islamic Astronomy and Geography*, 2022.

²⁰Izzudin, *Ilmu Falak Praktis*.

²¹A. Jamil, Sakirman, and Moelki Fahmi Ardliansyah, "Penentuan Arah Kiblat Dengan Posisi Matahari Di Pusat Ibu Kota Kabupaten Lampung," *Al-Manahij: Jurnal Kajian Hukum Islam* 16, no. 1 (2022): 133-48, <https://doi.org/10.24090/mnh.v16i1.6169>.

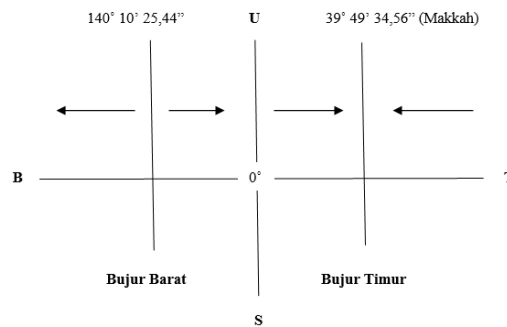
²²Moelki Fahmi Ardliansyah, "Kajian Perangkat Hisab Rukyat Nusantara (Rubu' Mujayyab Dan Astrolabe Dalam Hisab Awal Waktu Salat)," *Jurnal Bimas Islam* 8 No. 1 (2015).

ϕ_{56m} : Latitude of Makkah ($21^{\circ} 25' 21.17''$ N)

ϕ_x : Latitude of the location being measured

C : Difference in longitude between the longitude of Makkah ($\lambda_m = 39^{\circ} 49' 34.56''$ E) and the longitude of the location (λ_x)

The determination of the longitudinal difference (C) follows the rules below:



Eastern Longitude	Formula	Direction
$0^{\circ} - 39^{\circ} 49' 34,56''$	Longitude of the Ka'bah - longitude of the location ($\lambda^m - \lambda^x$)	East
$39^{\circ} 49' 34,56'' - 180^{\circ}$	longitude of the location - Longitude of the Ka'bah ($\lambda^x - \lambda^m$)	West
Western Longitude	Formula	Direction
$0^{\circ} - 140^{\circ} 10' 25,44''$	Longitude of the Ka'bah + longitude of the location ($\lambda^m + \lambda^x$)	East
$140^{\circ} 10' 25,44'' - 180^{\circ}$	360° - Longitude of the Ka'bah - longitude of the location ($360^{\circ} - \lambda^m - \lambda^x$)	West

Grazing Behavior of Cattle

Cattle exhibit herd behavior, gathering in large groups and orienting their bodies in the same direction. Traditionally, livestock farmers believed that this alignment occurred in response to environmental conditions. For example, in the morning cattle often face north when the sun rises, presumably to expose their bodies to sunlight that contains beneficial vitamins. During strong winds, they may

orient themselves toward the direction of airflow to reduce pressure on their bodies.²³

In a research paper by Sabine Begall from the University of Duisburg–Essen, Germany, satellite imagery from Google Earth was used to study the alignment patterns of cattle and deer. The study found that grazing cattle consistently aligned their bodies in a north–south orientation, similar to a compass. German scientists examined 300 samples of cattle worldwide and discovered that cattle predominantly face north or south while grazing and avoid facing east or west. The researchers hypothesized that these animals possess an internal biological mechanism capable of detecting the Earth’s magnetic field, allowing them to navigate relative to the north and south magnetic poles. Such behavior is believed to be beneficial for survival.



Figure 1.16. Cattle Grazing in Pasture²⁴

According to John Phillips in *Moo North: Cattle and Deer May Sense Earth’s Magnetic Field* (Scientific American), evidence of magnetoreception in cattle and deer suggests that the north–south grazing alignment serves as a fundamental tool for mentally mapping their daily environment and learning new terrain. Interestingly, deer exhibit the same behavioral pattern. This instinct cannot be fully explained by experiential learning; instead, it is thought to be transmitted genetically as an

²³Ismail Ismail, Dikson T. Yasin, and Zulfiah, “Toleransi Pelencengan Arah Kiblat Di Indonesia Perspektif Ilmu Falak Dan Hukum Islam,” *Al-Mizan* 17, no. 1 (June 30, 2021): 115–38, <https://doi.org/10.30603/am.v17i1.2070>.

²⁴David Catchpoole, *Cows: a magnetic sign for evolutionist*, Creation Ministries Internasional, 2008, <https://creation.com/cows-a-magnetic-sign-for-evolutionists>

inherited survival mechanism passed across generations. These biological impulses guide behavior under specific environmental conditions, representing a manifestation of genetic strategy aimed at species survival.²⁵

Burda et al. conducted satellite-based observations of livestock herds across six continents, identifying 8,510 beef and dairy cattle. When aligned with a compass, the animals showed a uniform orientation toward the geographic north or south, with a variation of only ± 5 degrees.²⁶ Further analysis revealed that in regions where the angle between the magnetic and geographic poles is greatest – such as extreme latitudes or areas with unique geophysical properties – cattle align themselves according to the magnetic pole rather than the geographic pole.²⁷

Cattle orient their bodies north–south not only while grazing but also while resting, aligning themselves with the geomagnetic north–south (NS) axis. This behavior cannot be attributed to wind direction, sunlight position, or terrain slope; instead, it demonstrates the animals' ability to detect magnetic fields around them. Deer exhibit similar magnetoreceptive tendencies, supported by five observational studies involving hundreds of deer populations and tracking patterns in snow, all confirming north–south alignment. The sensory ability to detect magnetic fields is known as magnetoreception. Based on these findings, cattle may function as a natural directional indicator or natural compass.²⁸

Besides cattle and deer, other grazing animals such as buffalo and sheep also tend to orient themselves north–south while grazing. However, further research is required to verify whether these animals possess the same magnetoreceptive capabilities.

²⁵Guru Gembul, *Kenapa Sapi Tak Pernah Menghadap Ke Barat Saat Merumput?*, 2022, https://youtu.be/-mJMUVbGdbw?si=K8NG8mJlb_yop9b4

²⁶Hynek Burda, Sabine Begall, dkk, "Extremely Low-frequency Electromagnetic Fields Disrupt Magnetic Alignment of Ruminants", *Proceedings of the National Academy of Sciences (PNAS)*, Vol. 106, No. 14, (German: University of Duisburg-Essen, 2009), 5712.

²⁷Sabine Begall, Jaroslav Cerveny, dkk, "Magnetic alignment in grazing and resting cattle and deer", *Proc Natl Acad Sci USA*, 2008), 13451

²⁸Arwin Juli Rakhmadi et al., "Frequency-Based Analysis of Mosque Qibla Errors in Medan," *Al-Hilal: Journal of Islamic Astronomy* 7, no. 1 (2025): 37–50, <https://doi.org/10.21580/AL-HILAL.2025.7.1.24203>.



Figure 1.17. Sheep Grazing

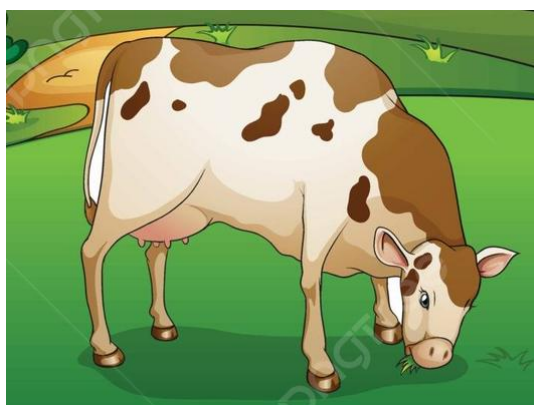


Figure 1.18. Buffalo Grazing

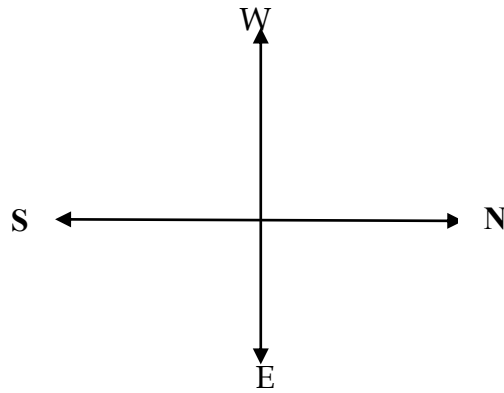
Determination of Cardinal Directions Using the Position of Grazing Cattle

Determining cardinal directions based on the body alignment of grazing cattle is a simple process, as cattle typically orient their bodies along a **north-south axis** while grazing. The steps are as follows:

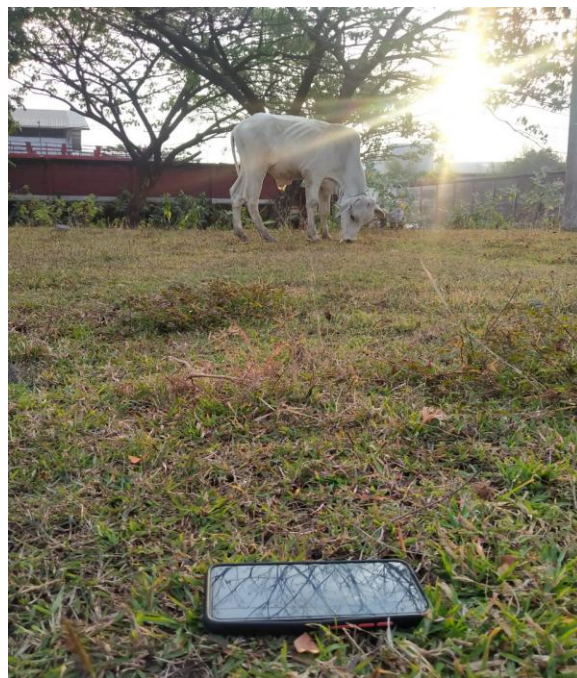
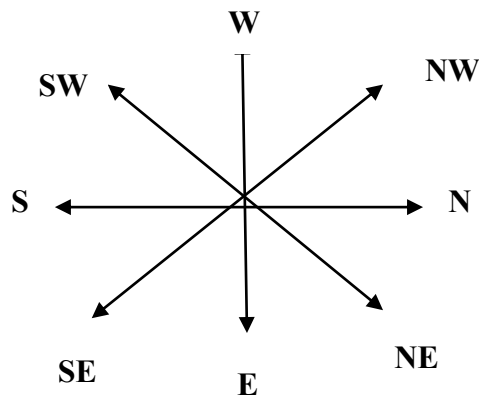
- a. Draw a line parallel to the orientation of the cattle's body, as grazing cattle position themselves along the north-south direction.



b. Draw a perpendicular line from the north-south axis to establish the east-west direction.



c. Draw additional lines at 45° angles to the right and left of the north, south, east, and west directions to identify intermediate compass directions.



Determining the Qibla Direction Using Cattle Orientation with Simple Tools

a. Calculate the Qibla Azimuth

$$\text{Cotan } B = \tan \phi^m \times \cos \phi^x : \sin C - \sin \phi^x : \tan C$$

B : Qibla Azimuth

ϕ^m : Latitude of Mecca

ϕ^x : Latitude of the observation site

C : Longitudinal difference (SBMD)

- a. Determine the north-south direction by drawing a line parallel to the body orientation of grazing cattle, then determine the other cardinal directions.
- b. Once the cardinal directions are established, use a protractor by placing the 0° mark at the North point, then mark the degree corresponding to the Qibla Azimuth. The resulting direction indicates the Qibla.²⁹

Accuracy Level of Qibla Direction Determination Using the Orientation of Grazing Cattle

Determining the Qibla direction must be conducted with precision, as facing the Qibla is one of the essential requirements for the validity of prayer. The author tested the accuracy of this cattle-based method using a Qibla compass instrument. The experiment was conducted in the Candi Industrial Zone, Ngaliyan, Semarang City, where large numbers of cattle graze in open pasture. Measurements were repeated multiple times to obtain reliable results, considering the religious importance and sensitivity of Qibla determination.³⁰ The results demonstrate that the method provides a reasonably accurate indication of the Qibla direction, as grazing cattle consistently align their bodies towards the north or south, allowing the Qibla compass to immediately detect the Qibla line.

²⁹Ahmad Izzuddin, "The Problems of the Relationship between Science and Religion in Qibla Direction Calibration at the Great Mosque of Demak and Baiturrahman Mosque in Semarang, Indonesia," *Journal of Islamic Law (JIL)* 3, no. 2 (August 1, 2022): 111-31, <https://doi.org/10.24260/JIL.V3I2.823>.

³⁰Ismail Ismail, "Urgensi Dan Legitimasi Fatwa Majelis Permusyawaratan Ulama Aceh Nomor 3 Tahun 2018 Tentang Penetapan Arah Kiblat," *Al-Manahij: Jurnal Kajian Hukum Islam* 14, no. 1 (June 2, 2020): 87-98, <https://doi.org/10.24090/MNH.V14I1.3669>.



The advantages of using cattle orientation include its simplicity, low cost, practicality, and ease of application. However, the method also has several limitations, as cattle are living creatures that move constantly and do not always maintain a strict north-south alignment. Therefore, further research is required to strengthen the scientific reliability of this method. In addition, caution must be exercised when observing cattle in the field due to the risk of aggressive behavior when they feel threatened.

Conclusion

Cattle possess a unique ability to detect the Earth's magnetic field, as evidenced by their consistent tendency to orient their bodies toward the north or

south while grazing. This phenomenon enables cattle to be used as a natural indicator for determining cardinal directions, which can subsequently be utilized for determining the Qibla direction. Determining cardinal directions through cattle orientation is straightforward: draw a line parallel to the cattle's body orientation to establish the north-south axis; then draw a perpendicular line to obtain the east-west axis; and finally, draw 45-degree intermediate direction lines. To determine the Qibla direction using this method, first calculate the Qibla azimuth; second, establish the north-south direction from cattle orientation and derive the remaining cardinal directions; and third, use a protractor by positioning the 0° mark at the north point and marking the azimuth value corresponding to the Qibla direction.

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