THE BADUY'S CALENDAR IN BANTEN: A BEGINNING OF YEAR DETERMINATION

THESIS

Submitted to the Faculty of Shari'ah and Law in Partial
of the Requirements for the Master of Law
in Department of Islamic Astronomy

Written By:

Maulida Inayah
NIM: 2202048005

MEGISTER OF ISLAMIC ASTRONOMY
FACULTY OF SHARI'AH AND LAW
STATE ISLAMIC UNIVERSITY OF WALISONGO
SEMARANG
2023

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Dr. Junaidi Abdillah, M.Si.

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Dr. Junaidi Abdillah, M.Si.
NIP: 197902022009121001

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Academic Supervisor II

Dr. Ahmad Adib Rofi'uddin, M.S.I.
NIP: 19891102 2018011001

KEMENTERIAN AGAMA
UNIVERSITAS ISLAM NEGERI WALISONGO
PASCASARJANA
Jl. Walisongo 3-5, Semarang 50185, Indonesia, Telp.- Fax: +62 24 7614454,
Email: pascasarjana@walisongo.ac.id, Website: http://pasca.walisongo.ac.id/

RATIFICATION

This thesis is written by:

Name	:	**Maulida Inayah**
NIM	:	**2202048005**
Title	:	**The Baduy's Calendar in Banten: A Beginning Of Year Determination**

Was examined on the 20th of December 2023 and revised as suggested. This thesis is accepted as one of the requirement for fulfilling the Master of Law in Islamic Astronomy on 2023.

Ratified by:

Name & Position	Tanggal	Tanda tangan
Dr. Mahsun, M.Ag Chairman of Meeting	2/1-2024	
Dr. Ahmad Adib R., M.Si. Secretary of Meeting	3/1-2024	
Prof. Dr. Muslich Shobir, MA Examiner 1	2/1-2024	
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MOTTO

Yeah we all shine on, like the moon, and the stars, and the sun

~ John Lennon
(Singer, Songwriter, Lead vocal of The Beatles)

DEDICATION

All praises and thanks are due to Allah SWT,
the lord all that exist

This thesis is dedicated to:
An extraordinary feeling of gratitude to my beloved parents, my respected teachers,
and all of my families.

DECLARATION

With full honesty and responsibility, the author certifieds that this undergraduate thesis does not contain material that has been written by someone else or published. Likewise, this work does not contain any other people's thoughts, except the information contained in the references that are used as the reference material. The author is completely responsible for all the contents of this undergratuate thesis.

Semarang, 15th December, 2023

Declarator

Maulida Inayah

2202048005

TRANSLITERATION

I. Single Consonant

Letter	Name	Romanization	Letter	Name	Romanization
ء	Hamzah	’	ظ	ẓā’	ẓ
ا	Alif	Ā	ع	ʿayn	ʿ
ب	bā’	B	غ	ghayn	gh (g͟h)
ت	tā’	T	ف	fā’	F
ث	thā’	th (th)	ق	Qāf	Q
ج	Jīm	J	ك	Kāf	K
ح	ḥā’	ḥ	ل	Lām	L
خ	khā’	kh (k͟h)	م	Mīm	M
د	Dāl	D	ن	Nūn	N
ذ	Dhal	dh (d͟h)	ه	hā’	H
ر	rā’	R	و	Wāw	w; ū
ز	zayn/zāy	Z	ي	yā’	y; ī
س	Sīn	S	آ	alif maddah	ā, ’ā
ش	Shin	sh (s͟h)	ة	tā’ marbūṭah	h; t
ص	ṣād	ṣ	ال	alif lām	al-
ض	ḍād	ḍ	ى	alif maqṣūrah	Á
ط	ṭā’	ṭ			

This undergraduate thesis is using ALA-LC (American Library Association – Library of Congress) romanization, which is used internationally in scientific publication by Arabist.

II. Double Consonant

Double consonant, including syaddah, is written in double. For example:

ربك is written rabbaka

الحد is written al-haddu

III. Vowel

1. Short vowel

   Vowel or *harakat fathah* is written as *a*, *kasrah* as *I*, and *dammah* as *u.*

2. Long vowel

   Long vowel (māddah), which in arabic uses harakat and hurûf, is written as hurûf and stipe (-) above it: ā, ī, ū. For example:

   قال is written as *qāla*

   قيل is nettirw as *qīla*

   يقول is written as *yaqūlu*

3. Double vowel

   - *Fathah+ ya'sukun* is written ai

     For example: كيف is written as *kaifa*

   - *Fathah+wawu sukun* is written as au

     For example: حول is writen as *haula*

IV. Ta' Marbūthah (ة) in the End of Word

1. Ta' Marbūṭah (ة) in the end of word with sukūn is written as h, except Arabic word that is used as Indonesian word, such as salat, zakat, tobat, etc. For example:
   تلحة is written as tahlah
   التوبة is written as al-taubah
2. Ta' Marbūṭah (ة) that is followed by (ال) if they are separated or read as sukun, it must be written as h. For example:
3. روضة الأطفال is written as rauḍah al-aṭfāl
   But if they are read a unit, it must be written as t. For example:
   روضة الأطفال is written as rauḍatul aṭfāl

V. Article Alif +Lam

1. Article (ال) that is followed by *hurūf shamsiyah* is written as how it is read and separated by stripe (-). For example:
   الرحيم is written as *ar-Raḥīmu*
   السيد is written as *as-sayyidu*
   الشمس is written as *asy-shamsu*
2. Article (ال) that is followed by *hurūf qamariyah* is written as *al* and separated by stripe (-). For example:
   الملكis written as *al-Maliku*
   اكفرون is written as *al-kāfirūn*

VI. Word as Part of Phrase or Sentence

1. If the structure or words does not change the way to read it, it is then separately each word, or
2. If the structure of words changes the way to read it and unites them, then it must be written as the way it is read, or separated in the structure. For example:
   خير الرازقين is written as *khair rāziqīn or khairurrāziqīn.*

ABSTRACT

The first day of the year in Baduy calendar coincides with the beginning of their annual cycle of farming activities and traditional ceremonies. The beginning of the year in the Baduy tribe is called *nanggalkeun kidang*. It's the beginning of the appearance of *Bentang Kidang* in march and *Bentang Kartika* two weeks earlier. People generally recognize these two stars as the Orion Belt and Pleiades stars. But there has not been a further research that discusses this problem scientifically.

This is a qualitative research with a literature research (library research). To obtain the data needed in this study, this research used the documentation and interview method. This study used an analytical descriptive data. While, the researcher also used the astronomical approach in answering the formulation of this research problem (calculated astronomically to find out the stars rising times with Jean Meeuss celestial calculation in Astronomical Algorithm).

This research results are two findings. *First,* The Baduy's calendar year begins with the observation of *Bentang Kidang*, also known as the Orion's Belt, on the eastern horizon (during the karo/katiga month, or March in the Gregorian calendar) and the *Bentang Kartika*, also known as the Pleiades Star (two weeks earlier). It's used because the Baduy's society believed that these two stars is the sign of they beginning of year in their calender since long ago. *Second,* In astronomical rising time calculation, the appearance of the *Bentang Kidang* or Orion's Belt in March and *Bentang Kartika* or Pleiades Star in 2 weeks before (between mid-February to mid-March) are the appearance on the horizon towards the time of setting star in the west in the night after sunset. "The rising" in this case does not mean rising, but it's closer to "visible" by the observer eye.

Keywords: Baduy's Calendar, Banten, Beginning Of Year Determination, Bentang Kidang, Bentang Kartika.

تجريد

أول اليوم من السنة في التقويم البدوي يقع في بداية الزراعة العامية و والإحتفال التقليدي. وأول السنة في قبيلة بدوي المسمى "نانجكلكون كيدانج". وهو أول ظهور "بنتانج كيدانج" في شهر مارس و "بنتانج كارتيكا" في الأسبعين الأتيين.

وهذه الدراسة هي الدراسة النوعية المشتملة بالدراسة البحثية (أبحاث المكتبة). وللحصول على البيانات اللازمة في هذه الدراسة، استخدم المؤلف أسلوب التوثيق. تستخدم هذه الدراسة البيانات الوصفية التحليلية. الطريقة بالوصف والتحليل. بينما أستخدم المنهج الفلكي في الإجابة على صياغة مشكلة البحث هذه (الحساب الفلكي لمعرفة أوقات صعود النجوم باستخدام حساب جان ميوس السماوي بالخوارزمية الفلكية)

وتتلخص نتيجة هذا البحث في نتيجتين. أولا، تبدأ السنة التقويمية لبدوي بمراقبة "بنتانج كيدانج"، المعروف أيضًا باسم "حزام أوريون"، في الأفق الشرقي (خلال شهر "كارو/كاتيجا"، أو مارس في التقويم الغريغوري) و"بنتانج كارتيكا"، المعروف أيضًا باسم الثريا النجمة (قبل اسبوعين). يتم استخدامه لأن مجتمع البدوي يعتقد أن هذين النجمين هما علامة بداية العام في التقويم منذ فترة طويلة. ثانيًا، في حساب وقت الشروق الفلكي، فإن ظهور "بنتانج كيدانج" أو "حزام أوريون" في شهر مارس ونجم "بنتانج كارتيكا" أو نجم الثريا قبل أسبوعين (بين منتصف فبراير ومنتصف مارس) هو الظهور في الأفق قريب بوقت غروب النجم في الغرب في الليل بعد غروب الشمس. "الصعود" في هذه الحالة لا يعني الارتفاع، لكنه أقرب إلى "الرؤية" بالعين الراصدة.

الكلمة الرئيسية : التقويم البدوي, بانتن, تحديد بداية السنة, بنتانج كيدانج, بنتانج كارتيكا.

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12. Thank you to the few individuals in my life who have listened, helped, understood, cared and loved me unconditionally. May Allah return all your kindness.

Semarang, 15th December 2023

Maulida Inayah
2202048005

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CHAPTER I
INTRODUCTION

A. Research Background

Talking about time, it's discussing an event, past, present or future.[1] The process of organizing time in recording various phenomena and major events that occur to oneself or the general public by studying and utilizing the regularity of celestial bodies motions, commonly referred as a calendar system.[2] This calendar system is part of astronomy as knowledge of the universe phenomena.[3]

The development of astronomy in Indonesia produces a variety of diverse patterns as diverse as the diversity of ethnicities, races and cultures scattered in various parts of Indonesia,[4] while the discussion of the dating system is based on the customs and understanding of a community group. Its existence was born as a form of community cultural heritage passed down from generation to generation with various

[1] Zico Farlin dkk, "Pemanfaatan Waktu Bagi Manusia Dalam Karya Seni Grafis", *Serupa: Journalof Art Education 6.2 (2018): 2-4,* Accessed on 12 of Mei 2022.

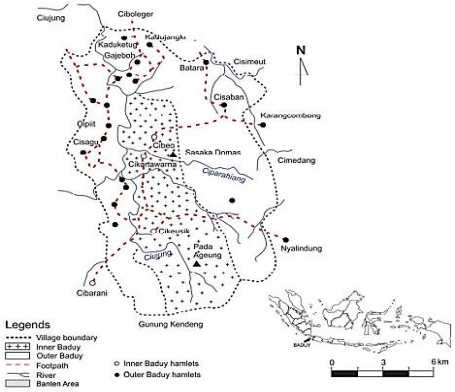
[2] Hendro Setyanto & Fahmi Fatwa Rosyadi Satria Hamdani, "Kriteria 29: Cara Pandang Baru Dalam Penyusunan Kalender Hijriyah", *Journal Ahkam 25 (2015),* accessed on 11 of Mei 2022.

[3] Arwin Juli Rakhmadi Butar-Butar, *Khazanah Astronomi Islam Abad Pertengahan,* (Purwokerto: UM Purwokerto Press nggota APPTI), 2018), 35 – 36.

[4] Vega Febry Yanti dkk., "Keberagaman dan Toleransi Sosial Siswa SMP di Jakarta", *Nusantara: Journal Ilmu Pengetahuan Sosial 6.2 (2019)*, accessed on 11 of Mei 2022.

forms and signs. Furthermore, it is inherited through various media, both orally and in writing,[5] then applied directly as a guide for activities in community.[6]

Baduy's tribe is part of the Sundanese community[7] who still lives side by side. About 5,000 Baduy people live in the mountains 150 km west of Jakarta.[8] The Baduy tribe is still one of the icons of Banten Province until now.[9]



Picture 1.1
Location of Baduy Tribe Area Kanekes Village, Leuwidamar Sub-district, Lebak District, Banten [10]

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[5] Ni Wayan Sartini, "Menggali Nilai Kearifan Lokal Budaa Jawa Lewat Ungkapan (Bebasan , Salka, dan Paribasa)", *Journal Ilmiah Bahasa dan Sastra 5.1* (2009), accessed on 30 of March 2023

[6] Ilham Ibrahim, "Prinsip-Prinsip Kalender Islam Global Menurut Prof. Syamsul Anwar", accessed on 15 of December 2022.

[7] Apri Subagiyo, *Mengenal Suku Bangsa Di Nusantara (Mengenal Suku-Suku Di Indonesia)*, (Jakarta Timur: CV. Indradjaya, 2017), 23.

[8] Jatna Supriatna, *Melestarikan Alam Indonesia,* (Jakarta: Yayasan Obor Indonesia, 2008), 39.

[9] Apriyanto Dwi Santoso, *Pesona Wisata Banten*, (Surakarta: PT. Aksarra Sinergi Media, 2018), 48.

[10] Nurhadi Rangkuti, *Orang Baduy Dari Inti Jagat*, (Jakarta: Bentara Budaya, 1988).

No	Differences	Kala Saka Sunda Calender	Kala Caka Sunda Calender	Baduy Calender
1.	Day	Ahad, Senen, Salasa, Rebo, Kemis, Jumaah, Saptu	Ahad, Senen, Salasa, Rebo, Kemis, Jumaah, Saptu	Ahad, Senen, Selasa, Rebo, Kemis, Jumahat,Saptu.
2.	Pasaran	Manis, Pahing, Pon Wage, Kliwon.	Manis, Pahing, Pon, Wage, Kliwon.	Pahing, Pon, Wage, Kaliwon, Manis.
3.	Month	Kasa, Karo, Katiga, Kapat, Kalima, Kanem, Kapitu, Kadalapan, Kasalapan, Kasapuluh, Hapit Lemah, Hapit Kayu. (30/31 days in a month)	Kartika, Margasira, Posya, Maga, Palguna, Setra, Wesaka, Yesta, Asada, Srawana, Badra, Asuji. (29/30 days in a month)	Kapat/Sapar, Kalima,Kanem Katujuh or Kapitu, Kadalapan, Kasalapan, Kasapuluh, Hapit Lemah, Hapit Kayu, Kasa, Karo, Katiga/Kapitu. (30 days in a month)
4.	Year	*Sewindu* is 8 years. 3 times a short year, the fourth year is a long year until the 128th year.	*Sewindu* is 8 years. The 2nd, 5th, and 8th are long years.	*Sewindu* is 8 years. The Addition of 1 month to the long year (the rice can't be harvested at specified time)
5.	Astronomical Reference	Sun and Orion's Belt	Moon	Sun, Pleiades Star and Orion's Belt

Tabel 1.1
The Differences of Baduy's Calendar and Sunda's Calendar Table[11]

[11] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 158-161. See Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi*

The time organization of Baduy community in daily life is organized in a calendar system known as Baduy tribe calendar. Baduy calendar is included in the lunisolar calendar where one year on average is same as one tropical year (365 solar days 5 hours 48 minutes 45.19 seconds) and an intercalary month in few years. In addition, Baduy calendar also considers the observation factor of the sky and season.[12] The appearance of Kidang or Kijang Star (Waluku or Orion's Belt), Kartika Star (Gumarang or Pleiades), and the sun's positions, become the sign of the annual cycle beginning of Baduy calendar. As in the expression of the Baduy community:

Bentang kidang jumlahna tilu
Rupana meneos katukang aya tutumbakan nunjuk ka kidang
Nepi katanggal 15 bentang anu hiji hurung masih leslesan, kadang leungit kadang timbul
Mimiti tanggal 16 bentang hurung kabeh
Muncul bentang kidang bulan sapar
Marem bentang kidang dina bulan Katiga
Dua bulan bentang kidang leungit

Masyarakat Baduy Di Desa Kanekes Provinsi Banten, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007). See More Janatun Firdaus, *Analisis Penanggalan Sunda Dalam Tinjauan Astronomi*, (Semarang: Undergraduate thesis, IAIN Walisongo, 2013). See Nurul Amalia, *Sistem Penanggalan Tradisional Sukra Kala Saka Sunda*, (Semarang: Undergraduate Thesis, Iain Walisongo, 2021).

[12] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 158-161. Lihat juga https://id.wikipedia.org/wiki/Kalender_Baduy Accessed on Monday, 11 September 2023 at 15.32 WIB.

Bintang kartika jumlahna 7 ngaronyok
Muncul bentang kartika dua minggu leuwih awal ti kidang

The number of Bentang kidang is three
It appears as the tip of a lance pointing to the main group
Before the fifteenth day of Sapar, one of the bentang kidang group can be seen flickering
After the sixteenth day of Sapar, none of the bentang kidang can be seen to flicker
Bentang kidang appears in the month of Sapar Bentang kidang disappears in the month of Katiga
For approximately two months each year bentang kidang cannot be seen
Bentang kartika appears two weeks earlier than bentang kidang[13]

As in the other expression of the Baduy community: *"Mun matapoe geus dengek ngaler lantaran jagad urang geus mimiti tiis, tah dimimitian ti wayah eta kakara urang nanggalkeun kidang, tanggal kidang mah laju turun kujang"*. (If the sun has leaned north, when our earth has begun to cool down, it's the time to observe the calendar with the appearance of the Kidang Star, when the Kidang Star appears we start using agricultural tools (*kujang*)).[14]

In Baduy's society, *tanggal kidang turun kujang* means when *Kidang* appears, the kujang knife is used. Although Orion had already appeared, the clearing of the

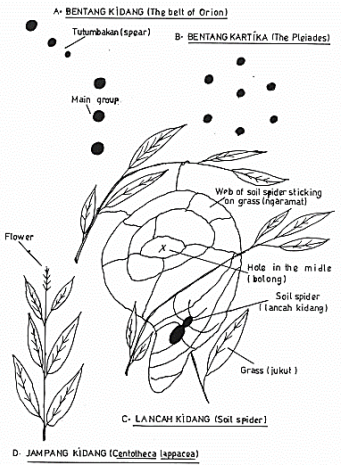
[13] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998), 266.
[14] Ivan Masdudi, *Keunikan Suku Baduy di Banten*, (Banten: Talenta Pustaka Indonesia, 2010), 33.

bushes in the attacking huma was only carried out on Kalima. Then, *Kidang ngarangsang kudu ngahuru*. When Kidang begins to rise overhead, bush burning is required. Although Orion has already begun to rise in mid-April, bush burning in the attack huma is carried out on Kanem. *Kidang mancer kudu ngaseuk.* When Kidang is overhead, rice must be planted. Although Orion is already at zenith in early June, the planting of rice in the attacking huma is carried out on Katujuh. *Kidang marem turun kungkang*. When Kidang sets, the insect pests descend. Rice planting in the huma serang should not extend beyond the month of Kadalapan. But this research will only focus on the rising time of kidang star.[15]

In their daily practice, Baduy tribe community utilizes other natural phenomena as well. There is a kind of *"grass spider"* (nesting in the grass), whose the nest becomes hollow when the kidang star appears. This symptom is utilized. When the spider's nest is visible, it is the first sign of Bentang Kidang's appearing. This type of spider is called "lancah kidang" (kidang spider).[16]

[15] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007)

[16] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 123.



Picture 1.2
Bentang Kidang* (sabuk Orion), *Bentang Kartika* (Pleiades Star), *Lancah Kidang* and *Jampang Kidang [17]

In addition, *lancah kidang* (the soil spider) indicates the time when Baduy community should start planting rice. The *lancah kidang* usually make its nest on grasses growing in swidden fields. If the web has a hole in the middle (bolong tengahna), and it stays most of the time on the edge of the nest, rice planting should start.[18]

The first day of the year in Baduy calendar coincides with the beginning of their annual cycle of farming activities[19]

[17] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998), 266.

[18] Johan Iskandar dan Budiawati S Iskandar, *Agroekosistem Orang Sunda*, (Bandung: Dunia Pustaka Jaya, 2011), 64.

[19] Johan Iskandar dan Budiawati S Iskandar, *Agroekosistem Orang Sunda*, (Bandung: Dunia Pustaka Jaya, 2011), 59.

and traditional ceremonies.[20] The beginning of the year in the Baduy tribe is called *nanggalkeun kidang* (the beginning of the appearance of the kidang star which is the beginning of cultivating the *huma*). [21]

Based on the practice carried out by the Baduy tribe, they use the stars as a reference for calculating their time, then it has indicated this tribe has been able to interpret the revelation of Allah and the hadith of the Prophet muhammad related to astronomy pragmatically in everyday life. As explained in the Qur'an about one of the roles of the stars:

وَهُوَ ٱلَّذِى جَعَلَ لَكُمُ ٱلنُّجُومَ لِتَهْتَدُوا۟ بِهَا فِى ظُلُمَٰتِ ٱلْبَرِّ وَٱلْبَحْرِ ۗ قَدْ فَصَّلْنَا ٱلْـَٔايَٰتِ لِقَوْمٍ يَعْلَمُونَ[22]

"And He is the One Who has made the stars as your guide through the darkness of land and sea. We have already made the signs clear for people who know." (Q.S. Al-An'am/6: 97)[23]

[20] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 111.

[21] As one of the agrarian societies in Indonesia, the livelihood of Baduy is rice farming (pahumaan). See Moh. Farukhi, *Mengenal 34 Provinsi Indonesia (Banten)*, (Surakarta: Sinergi Prima Magna, 2018), 33.

[22] Al Quran dan Terjemah Departemen Agama RI, (Bandung: Sygma Examedia Arkanleema, 2009), 140.

[23] Taken from the website Qur'an.com Surah Al-An'am - 97 - Quran.com, (Accessed on Sunday, 29 of October 2023 at 18.42 WIB.

Meanwhile the Prophet Muhammad, once said about how important the role of stars is for the sky and the balance in, in the hadith he said:

وَعَن قتادةَ قَالَ: خلقَ اللَّهُ تَعَالَى هَذِه النجومَ لثلاثٍ جَعَلَهَا زِينَةً لِلسَّمَاءِ وَرُجُومًا لِلشَّيَاطِينِ وَعَلَامَاتٍ يُهْتَدَى بهَا فَمن تأوَّلَ فِيهَا بِغَيْرِ ذَلِكَ أَخطَأَ وَأَضَاعَ نَصِيبَهُ وَتَكَلَّفَ مَالا يَعْلَمُ. رَوَاهُ الْبُخَارِيُّ تَعْلِيقًا وَفِي رِوَايَةِ رَزِينٍ: «تكلّف مَالا يعنيه ومالا عِلْمَ لَهُ بِهِ وَمَا عَجَزَ عَنْ عِلْمِهِ الْأَنْبِيَاء وَالْمَلَائِكَة»

وَعَن الربيعِ مِثْلُهُ وَزَادَ: وَاللَّهِ مَا جَعَلَ اللَّهُ فِي نَجْمٍ حَيَاةَ أَحَدٍ وَلَا رِزْقَهُ وَلَا مَوْتَهُ وَإِنَّمَا يَفْتَرُونَ عَلَى اللَّهِ الْكَذِبَ وَيَتَعَلَّلُونَ بِالنُّجُوم[24]

"Qatada said God most high created these stars for three purposes; He made them an adornment for the sky, missiles for the devils, and signs by which people find their way. If anyone explains them differently he makes a mistake, squanders what is allotted to him, and occupies himself with something he does not know."

Bukhari transmitted it without a full isnad. Razln's version has, "occupies himself with what does not concern him, what he has no knowledge of, and what prophets and angels are incapable of knowing." On the authority of ar-Rabi' (Ar-Rabi' b. Ziyad, Qatada's authority) there is something to the same effect with the addition, "I swear by God that God has not set in a star anyone's life, provision, or death. They are only speaking lies against God and attributing causes to the stars."[25]

[24] Mishkat al-Masabih, *Medicine and Spells* (Book 23, Hadith 86), 4602-4603.

[25] Taken from the website sunnah.com, Mishkat al-Masabih 4602, 4603 - Medicine and Spells - كتاب الطب والرقى - Sunnah.com - Sayings and Teachings of

Based on the explanation above, the beginning of the year determination in the Baduy calendar seems different from the various calendars. The majority of calendars refer to the Sun, the Moon or the Sun and the Moon. Other calendars refer to the constellation such as Scorpio, Orion, and Pleiades. While Baduy calendar utilizes three celestial bodies at once. Those are Pleiades star, Orion Belt and the Sun.

For this reason, the author wants to research the study about the beginning of year determination in Baduy's calendar in astronomic perspective, due the fact that there has been no academic study on this subject. In the other hand, this research aims to add to the treasures of Astronomy in the field of traditional calendar and preserving culture. Therefore, the authors would to raise this discussion for the purpose of an academic research entitled "THE BADUY'S CALENDAR IN BANTEN: A BEGINNING OF YEAR DETERMINATION IN ASTRONOMIC PERSPECTIVE".

B. Research Questions

Based on the description of the background research above, the main problems will be discussed are:

1. Why the Baduy's calendar refers to *Bentang Kidang* and *Bentang Kartika* in their beginning of the year?

Prophet Muhammad (صلى الله عليه و سلم) (Accessed on Sunday, 29 of October 2023 at 19.27 WIB)

2. How is the astronmical analysis of the beginning year determination in the Baduy's calendar?

C. Purposes Research

1. To find out the reason of the Baduy's calendar refers to *Bentang Kidang* and *Bentang Kartika* in their beginning of the year
2. To find out astronmical analysis of the beginning year determination in the Baduy's calendar

D. Significances Research

This study was expected to give contribution on Astronomy in Indonesia to enrich knowledge about Baduy Calendar, give benefits to students and people generally that can become a referral source for further research, including:

Theoretically, this research enriches the treasures of Astronomy in Indonesia, especially in the study of local dating as an indigenous cultural heritage. It is hoped that this research can also provide insights, information, and scientific contributions for other academics to develop further research on similar issues.

Practically, this research can provide a comprehensive understanding to the general public, especially the Baduy tribe itself, regarding their dating system as a local culture and is a contribution to the Baduy tribe's calendar to be able to

combine it between cultural treasures and the development of science.

While the benefits of this thesis in general are:

1. To add, develop and enrich the knowledge of all society in Indonesia, especially regarding calendar
2. Provide information related to the Baduy Calendar.
3. As a scientific work, it is hoped that in the future it can become a reference, reference and source of information for students and society in general.
4. To examine the opinions of medieval Muslim scientists in order to know the history and development of astronomy as an important thing.
5. It is hoped that this scientific work can encourage and motivate Muslims in general and astronomy activists in particular to dig deeper into astronomy, which can then teach other Muslims and produce scientific works of astronomy.

E. Literatures Rieview

In conducting this research, I use several literatures related to the calendar system of Baduy tribe, generally and specifically. As far as the my research, there is no research or writing specifically discusses the determination of the beginning of the year of the Baduy tribe's calendar system.

However, based on some sources that have relevance to this research, the author gets the following information.

The work conducted by Johan Iskandar with the title *Swidden as a Form of Cultural Identity: The Baduy Case* as Ph.D. Dissertation in University of Kent Canterbury 1998. This research mentions that the practice of shifting cultivation of the Baduy tribe is carried out based on their calendar. The beginning of this asctivity is based on the astronomical phenomena of the Pleiades star, the Orion Belt and the position of the Sun.[26] The research conducted by Johan Iskandar provides information for the author that the determination of the beginning of the year of the Baduy tribe's calendar system is very important in the practice of shifting field agriculture of the Baduy community. However, this research has not explained the astronomical aspect of determining the beginning of the year of the Baduy tribe's calendar.

The article written by Syafitri Hidayati, F. Merlin Franco and Aznah Suhaimi with the title *Folk Plant Names Are Condensed Forms of Traditional Knowledge: Case Study with The Urang Kanekes of Banten, Indonesia*. Based on the results of this research, the author knows that rice is the most

[26] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998).

important food crop for the Kanekes community (one of the villages inhabited by the Baduy tribe). They believe that Nyi Pohaci, the Goddess of Rice gives goodness and blessings to the community in the form of rice. Therefore, farming is also one of the *pikukuh* (customary mandates) that must be carried out by every person in Kanekes. (Danasasmita dan Djatisunda 1986; Senoaji 2012).[27] This emphasizes how important farming is to their lives. Not only as a fulfillment of life's needs, but also as a form of ceremony and obedience to customary rules.

An article entitled *Mengkaji Kearifan Ekologi Komunitas Baduy dalam Menghadapi Kekeringan* by Johan Iskandar. The result of this research explains that the national economic crisis and El Nino drought in 1997 and 2002 put pressure on the Baduy's cultivation system. In responding to these problems, Baduy community has implemented various strategies, which are a combination of traditional and innovation. This paper discusses how the Baduy community develops a traditional agricultural calendar, utilizing various astronomical, botanical indicators, and variations in the

[27] Syafitri Hidayati, F. Merlin Franco, dan Aznah Suhaimi, Folk Plant Names Are Condensed Forms of Traditional Knowledge: Case Study with the Urang Kanekes of Banten, Indonesia, Case Studies in Biocultural Diversity from Southeast Asia (Traditional Ecological Calendars, Folk Medicine and Folk Names), *Asia in Transition*, Vol. 19, 2022, 215.

harvest time of *huma serang* (sacred field).[28] However, this paper has not explained the astronomical analysis of the determination of the beginning of the calendar year of the Baduy tribe in depth.

The work compiled by Andika Arisetyawan and Supriadi Supriadi with the title *Ethnomathematics Study in Calendar System of Baduy Tribe* in Ethnomathematics Journal Vol. 7, No. 1, March 2020. Based on the result of this research, there is a unique pattern in Baduy calendar, which is the first day of the previous month + 2 days after the first day of the previous month is the same as the first day of the next month.[29] Therefore, Andika Arisetyawan and Supriadi Supriadi's research focused on the mathematical aspect of the Baduy tribe's calendar system. Meanwhile, the author research will focus on the astronomical aspects of determining the beginning of the year of the Baduy tribe's calendar system.

The work by Johan Iskandar and Budiawati S. Iskandar with the title *Ethnoastronomy-The Baduy Agricultural Calendar and Prediction of Environmental Perturbations* in *Biodiversitas Journal* Volume 17, Number 2, October 2016. Based on this research, Baduy tribe's rice

[28] Johan Iskandar, Mengkaji Kearifan Ekologi Komunitas Baduy dalam Menghadapi Kekeringan, *Jurnal Sosiohumaniora*, Vol. 6, No. 2, Juli 2004, 108 – 121.

[29] Andika Arisetyawan dan Supriadi Supriadi, Ethnomathematics Study in Calendar System of Baduy Tribe, *Ethnomathematics Journal* Vol. 7, No. 1, March 2020.

farming cycle is set annually based on their agricultural calendar system and traditional argoforestry whose production can be used for both subsistence and commercial purposes.[30] The research in this Biodiversity Journal discusses the Baduy tribe's calendar system, which focuses more on its agricultural aspect and has not provided a comprehensive explanation of the astronomical aspects of determining the beginning of the Baduy tribe's calendar year.

The work entitled *Eksplorasi Etnomatematika Pada Kepercayaan Penentuan Hari Baik Masyarakat Baduy* by Imat Sopiah in Jurnal Peka (Jurnal Pendidikan Matematika) Volume 4 No. 1, 2020. From this research, it is known that mathematical concepts in determining the good days of the Baduy community's beliefs, namely the concept of number, the concept of sets in the Javanese Sundanese alphabet, and the concept of modulo arithmetic in determining the good days for traveling and starting work, as well as the concept of algebra in determining the good days of marriage.[31] Therefore, according to the author, Imat Sopiah's research explores the mathematical aspect of the Baduy tribe's calendar system in

[30] Johan Iskandar dan Budiawati S. Iskandar, Ethnoastronomy-The Baduy Agricultural Calendar and Prediction of Environmental Perturbations, *Biodiversitas Jurnal* Volume 17, Number 2, October 2016.

[31] Imat Sopiah, Eksplorasi Etnomatematika Pada Kepercayaan Penentuan Hari Baik Masyarakat Baduy, *Jurnal Peka (Jurnal Pendidikan Matematika)* Volume 4 No. 1 2020.

determining the good days of the Baduy tribe. Meanwhile, the astronomical aspect of determining the beginning of the Baduy calendar year has not been reviewed further in this study.

The article entitled *Hari Baik dan Buruk Menurut Kalender Pertanian Baduy* by Siska Wulandari explain that the Baduy calendar is a solar calendar. One average year is equal to one tropical year. Primarily, this calendar is used to determine the good and bad days of work in the field.[32] This article only explains the Baduy tribe's calendar system in general, but has not provided an astronomical analysis of the determination of the beginning of the Baduy tribe's calendar year.

The article entitled *Tourism Revitalization Based on Local Wisdom in 'Saba Budaya' of Baduy* written by Bagja Waluya, Elly Malihah, Mamat Ruhimat, Erlina Wiyanarti in Geografi Gea Vol. 22 No. 1 April 2022. Although this research focuses on the revitalization of Baduy tourism through 'Saba Culture', it mentions that Baduy community also uses their own calendar system in the implementation of various traditional ceremonial activities. Among the traditional ceremonial activities mentioned in this journal are saba and

[32] Siska Wulandari, Hari Baik dan Buruk Menurut Kalender Pertanian Baduy, *ICoSLaw* (International Conference on Sharia and Law State Islamic University of Sunan Ampel Surabaya), Agustus 2022.

kawalu ceremonies.[33] This journl has not explained an astronomical analysis of the determination of the beginning of the Baduy tribe's calendar year.

The book entitled *Badujs en Mosmilms - Kajian Etnografis Masyarakat Adat di Lebak Parihiang, Banten Selatan* written by Nicholas J.C. Geise and translated by Tristam P. Moeliono. A dissertation written in Dutch.[34] In this book, Geise examines the cultural details surrounding the relationship between the Baduy community and the Muslim community in South Banten. How the division between Kajeroan (inner) and Panamping (outer) areas along with the details of its institutions, the differences in religious beliefs between the successors of pre-Islamic traditions and the Muslim community, the forms of ceremonies, the stories regarding the origin and condition of the customary environment, especially in relation to the cultivation of rice in huma, are discussed.[35] Based on the results of this research, the author knows that the implementation of the determination of the beginning of the

[33] Bagja Waluya, Elly Malihah, Mamat Ruhimat, Erlina Wiyanarti, Tourism Revitalization Based on Local Wisdom in 'Saba Budaya' of Baduy, *Jurnal Geografi Gea* Vol. 22 No. 1 April 2022.

[34] Nicholas J.C. Geise, *Badujs Moslims - Kajian Etnografis Masyarakat Adat di Lebak Parahiang, Banten Selatan*, diterj. Oleh Tristam P. Moeliono, (Bogor: Grafika Mardi Yuana, 2022).

[35] Gramedia Online, https://ebooks.gramedia.com/id/buku/badujs-moslims-kajian-etnografis-masyarakat-adat-di-lebak-parahiang-banten-selatan accessed on Sunday, 10 of September 2023 at 15.08 WIB.

calendar year of the Baduy tribe is not only in agronomic practices, but also in various series of their traditional ceremonies. However, there is no explanation or comprehensive astronomical analysis on the determination of the beginning of the calendar year of the Baduy tribe.

The book conducted by Johan Iskandar and Budiawati S Iskandar with the title *Agroekosistem Orang Sunda* in 2011. Based on the result of this research, the beginning of the annual cycle of Baduy community's farming activities coincides with the first day of the new year of their calendar, which is usually called *tindak tahun* or *tunggul tahun*.[36] Although the title and discussion of this book do not provide relevance to what the author will research, based on the results of this research, the author knows that the agroecosystem practices carried out by the Baduy tribe as one of the communities that communicate in Sundanese, the Baduy tribe's calendar system and the cycle of their farming activities are greatly affected by the determination of the beginning of their year. Therefore, the astronomical aspect of Baduy tribe's calendar system needs to be studied further.

The book *Saatnya Baduy Bicara* written by Asep Kurnia and Ahmad Sihabudin explains various aspects of the

[36] Johan Iskandar dan Budiawati S Iskandar, *Agroekosistem Orang Sunda*, (Bandung: Dunia Pustaka Jaya, 2011).

Baduy community's life. All of this information is obtained based on the explanations, answers, and confessions of Ayah Mursid as the customary figure of Inner Baduy and other customary figures about their tribe. Origin, Geographical and Demographic Location, Education, Health, and Sociology are some of the aspects discussed in this book.[37] One of the discussions mentioned in this book is the dating system of Baduy tribe. However, this book only gives the concept of Baduy's calendar in general. Meanwhile, the astronomical aspect of determining the beginning of the Baduy calendar year has not been explained.

Book entritled *Studi Tentang Religi Mayarakat Baduy Di Desa Kanekes Provinsi Banten* yang published by the Department of Culture and Tourism based on research conducted by Toto Sucipto and Julianus Limbeng, discusses the belief system of the Baduy community in Kanekes. The basis of the Baduy people's religion is respect for the spirits of ancestors and belief in one power with the religion they embrace is *Sunda Wiwitan*.[38] One of the discussions in this book is the dating system of Baduy tribe. However, there is no in-depth discussion about the beginning year determination in

[37] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010).

[38] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007).

Baduy calendar system in this book and the analysis of its astronomical aspects.

Based on the author reviewed of various literatures, there has been no source of literacy or research studied the astronomical aspects of determining the beginning of the Baduy tribe's calendar year. Therefore, the research related the beginning year determination of the Baduy calendar year is considered necessary.

F. Research Methods

In supporting the implementation of the research to be carried out by the author, a relevant method is needed to discuss the object of research. This research method includes the type of research, data sources, collection methods, and data analysis methods:

1. Types Of Research

I used a qualitative method in this study. It's a research procedure that produces qualitative descriptive data in the form of written or spoken words from people and observed behaviors, opinions.[39] This research is conducted by emphasizing process analysis of the inductive thinking process related to the dynamics of the

[39] Imam Gunawan, *Metode Penelitian Kualitatif Teori dan Praktik*, (Jakarta: PT Bumi Aksara, 2013), 22.

relationship between observed phenomena, and using scientific logic.[40]

This type of research is library research, the research where data is not obtained from the field but from libraries or from other places that store references, documents containing data that have been tested for validity.[41] While I use the astronomical approach in answering the formulation of this research problem[42] (calculated astronomically to find out the stars rising times with Jean Meeuss celestial calculation in Astronomical Algorithm[43]).

2. Resources Of Research

[40] Imam Gunawan, *Metode Penelitian Kualitatif,* (Jakarta: Bumi Aksara, 2013), 80.

[41] Prof. Sugiyono, *Metode Penelitian Pendidikan (Kuantitatif, Kualitatif, Kombinasi, R&D dan Penelitian Pendidikan)*, (Bandung: Alfabeta, 2019), 14.

[42] Approach is a way of looking at an object or problem. scientific approach requires certain ways or steps in order to achieve true knowledge. See Nanang Martono, *Metode Penelitian Kualitatif: Analisis Isi dan Analisis Data Sekunder*, (Jakarta: PT Raja Grafindo Persada, 2010), 11. See more on Sumardi Suryabrata, *Metode Penelitian*, (Jakarta: PT Raja Grafindo Persada, 2013),3. Then, astronomy is defined as the study of the objects that lie beyond our planet Earth and the processes by which these objects interact with one another. We will see, though, that it is much more. It is also humanity's attempt to organize what we learn into a clear history of the universe, from the instant of its birth in the Big Bang to the present moment. Read on Andrew Fraknoi, David Morrison, and Sidney C. Wolff, *Astronomy*, (Texas:OpenStax, Rice University, 2016),13.

[43] Jean Meeus, *Astronomical Algorithm*, (Virginia: Willmann-Bell, 2nd edition, 1998).

Sources of data used in this study are *Saatnya Baduy Bicara*, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, *Agroekosistem Orang Sunda* dan *Swidden as a Form of Cultural Identity: The Baduy Case,* Journal *Ethnoastronomy-The Baduy Agricultural Calendar and Prediction of Environmental Perturbations, Ethnomathematics Study in Calendar System of Baduy Tribe,* and *Badujs en Moslims – Kajian Etnografis Mayarakat Adat di Lebak Parahiang, Banten Selatan*. The results obtained will be in the form of words and images obtained from interview transcripts, field notes, photos, personal documents, official documents, memos, and other documents. The numerical data only clarifies the qualitative data in this research. This numerical data is taken from *The Hipparcos and Tycho Catalogues* (the most popular and up-to-date star catalog that can be used today)[44] before calculated

[44] The Hipparcos & Tycho star catalog is the main product of an astrometric mission initiated by the European Space Agency (ESA) called "Hipparcos (High Precision Parallax Collecting Sattelite)". The satellite operated for four years processing high-quality scientific data from November 1989 to March 1993. The Hipparcos mission was the first space mission dedicated to astrometry. The objective of the mission was to produce highly accurate astrometric data such as position, annual stellar self-motion, and absolute trigonometric precalax each at a level of about 2 arc seconds for about 100,000 stars. See European Space Agency, *The Hipparcos and Tycho Catalogues*, (Noordwijk: ESA Publications Division), 1.

The Hipparcos & Tycho star catalog is the main product of an astrometric mission initiated by the European Space Agency (ESA) called "Hipparcos (High Precision Parallax Collecting Sattelite)". The satellite operated for four years

astronomically to find out the stars rising times with Jean Meeuss celestial calculation in Astronomical Algorithm.[45]

3. Focus Of Research

The focus of research is useful for limiting the object of research raised. So, the researchers are not trapped in the amount of data obtained. Determination of the research focus is more directed at the level of novelty of the information to be obtained to limit qualitative studies while limiting research. As according to Sugiyono, the research focus is a limitation in qualitative research which contains subject matter generaly.[46] The

processing high-quality scientific data from November 1989 to March 1993. See more on National Aeronautics and Space Administration (NASA), "Hipparcos - Hipparcos Main Catalog" heasarc.gsfc.nasa.gov/W3Browse/all/hipparcos.html accessed on the 6th of March 2023.

The final products of the Hipparcos mission - the Hipparcos and Tycho Catalogues - were released in June 1997. The catalogues were constructed under the responsibility of large scientific teams collaborating with ESA. The Consortia Leaders were Dr Lennart Lindegren (Lund, Sweden: NDAC) and Professor Jean Kovalevsky (Grasse, France: FAST) together responsible for the Hipparcos Catalogue; Professor Erik Høg (Copenhagen, Denmark: TDAC) responsible for the Tycho Catalogue; and Dr Catherine Turon (Meudon, France: INCA) responsible for the Hipparcos Input Catalogue. Read on the Hipparcos and Tycho Catalogues, Catalogues - Hipparcos - Cosmos (esa.int) accessed on Thursday, the 23rd of Nobemner 2023 at 12.40 WIB.

[45] Jean Meeus, *Astronomical Algorithm*, (Virginia: Willmann-Bell, 2nd edition, 1998).

[46] Sugiyono, *Metode Penelitian Kombinasi (Mixed Methods)*, (Bandung: Alfabeta, 2014), 287.

focus of this research includes how to determine the beginning of the Baduy calendar year astronomically.

4. Collecting Data Method

Data is every information regarding a matter related to the purpose of research. So, not all of the information is research data.[47]

The collecting data in this study will be carried out using documentation methods. The documentation method is a data collection technique by looking at or recording an available report.[48] In addition, with this documentation method, data or facts directly from the research site are analyzed, which include books, papers, documents, and related data that can be obtained.[49] Therefore, this technique is used to trace things or variables in the form of notes, transcripts, books, newspapers, journals, magazines, inscriptions, meeting minutes, and agendas,[50] writings, notes, pictures, photos,

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[47] Muhammad Idrus, *Metodologi Penelitian Ilmu Sosial: Pendekatan Kualitatif dan Kuantitatif*, (Yogyakarta, Erlangga,2009), 61.

[48] Ambo Upe, *Asas-Asas Multiple Researches*, (Yogyakarta: Tiara Wacana, 2010),166.

[49] Sudaryono, *Metodologi Penelitian*, (Depok: PT Raja Grafindo Persada), 219.

[50] In a broader sense, documents (documentation) are any evidentiary process based on any type of source, be it written, oral, pictorial or archaeological. Seet Eko Murdiyanto,*Penelitian Kualitatif, (Teori dan Aplikasi Disertasi Contoh Proposal),* (Yogyakarta: Lembaga Penelitian dan Pengabdian Pada Masyarakat UPN "Veteran" Yogyakarta Press, 2020), 64.

videos including news in the mass media related to the determination of the beginning of the Baduy calendar year.

In addition to the documentation method, this research data was also obtained through interviews. In an interview there are two parties involved, namely the interviewer and the interviewee.[51] This interview method is the process of obtaining information for research purposes by means of question and answer while face to face between the interviewer and the respondent.[52] In this case, the writer digs up direct information related to how the Baduy tribe's calendar system is.

5. Analysis Method

This data analysis aims to provide the meaning and help to solve problems in research.[53] After all the necessary data is collected, then the data is studied, processed and analyzed descriptively qualitatively. This technique aims to provide an explanation and description related to the determination of the beginning of the calendar year of the Baduy tribe.

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[51] Lexy J Moleong, *Metodeologi Penulisan Kualitatif*, (Bandung: PT. Remaja Rosdakarya, 1999), 135.

[52] Moh Nazir, *Metode Penelitian*, (Bogor: Ghalia Indonesia, 2014), 170.

[53] Beni Ahmad Saebani, *Metode Penulisan*, (Bandung: Pustaka Setia, 2008), 95.

G. Systematics Writing

The writing of this research refers to the second type of qualitative method writing from "Panduan Penulisan Karya Tulis Ilmiah Pascasarjana UIN Walisongo Semarang Tahun 2022". Consist of five chapters which each chapter consists of sub-discussion sections, those are:

The first chapter is the introductory part of this research. This chapter also explains the author's arguments to conduct research based on the chosen theme. Then, this chapter contains of the background of the problem, the definition of terms, the formulation of the problem, the research objectives, the literature review, and the research methodology.

The second chapter is an overview in the form of a theoretical basis for the subject matter of this research. This section will explain about calendar systems in general (including definitions, legal bases, history, classifications and the tribal calendars in Indonesia).

The third chapter is the data presentation part of the research. This part reviews about Baduy tribe (history, location and condition, population and livelihood, and religion) as well as its calendar system.

The fourth chapter is the main discussion of the writer in this thesis. This chapter contains an explanation of

the answer to the research problem formulation. It contains an astronomical analysis of the beginning calendar year of the Baduy tribe determination.

The fifth chapter is the closing part of the research. This chapter describes the conclusion presented according with the data, which have been analyzed in the previous chapter as well as suggestions for further research.

CHAPTER II
THE CALENDER SYSTEM

A. Calendar's Definition

Calendar in has several terms contemporary and classical literature such as *takwim, tarikh,* and *almanac*,[54] these terms have the same meaning.[55] This calendar system is better known as a calendar in the modern understanding of the general public.[56] Calendar comes from modern English, derived from the old French, *calendier* which originated from the Latin *kalendarium* which means a book records of money lenders. In Latin itself *kalendarium* is derived from *kalendae* or *calendae* which means the day of the beginning of a month.

According to the term, a calendar[57] is defined as a table or series of pages showing the days, weeks, and months of the

[54] Muhyiddin Khazin, Ilmu Falak Dalam Teori *Teori dan Praktek* (Yogyakarta: Buana Pustaka), 81.

[55] Susiknan Azhari, *Ilmu Falak: Perjumpaan Khazanah Islam dan Sains Modern*, (Yogyakarta: Suara Muhammadiyah, Cet. II, 2007), 82.

[56] Muhammad Himmatur Riza dan Ahmad Izzuddin, "Pembaruan Kalender Masehi Delambre Dan Implikasinya Terhadap Jadwal Waktu Salat", Ulul Albab, Vol. 3, 2020, 156.

[57] In general, a calendar is a long-term time tracking system. The calendar is not only for work planning but also helps to remember or reconstruct various spiritual meanings and events, meanings and events of natural phenomena, social meanings and events, meanings and events in individual human life, etc. The series of meanings and events will be recorded on the dates in the calendar. A series of meanings and events will be recorded on the dates in the calendar. See on Moedji Raharto and Novi Sopwan, Pros. Seminar Pend. IPA Pascasarjana UM, Vol. 2, 2017, ISBN: 978-602-9286-22-9 Judul Makalah Ditulis dengan Huruf Times New Roman 14 pt Bold Centered (core.ac.uk)

year[58] as it explained in Kamus Besar Bahasa Indonesia.[59] Calendar is a system of time that reflects the power and strength of a civilisation.[60] Calendar is an organised system for dividing time according to years, months, weeks and days. The term calendar is derived from calendae, which is the term for the first day of the month in the Roman calendar, related to the verb *calare* meaning to call, which refers to the naming of the new Moon when it was first seen. *Calendarium* in Latin means a book of accounts, a list (as accounts are settled and debts are have been settled and debts are collected on the calendar every month). The Latin term was adopted in old Peracis as Calender and from there in Middle English Calender in the 13th century (early modern spelling Calender).

While in terminology, in Slamet Hambali explained that, *an almanac is a calculation system that aims to organise time in a certain period. The month is a unit that is part of the almanac. The day is the smallest almanac unit, then the time system of hours, minutes and seconds*.[61] But according to

[58] Elva Imeldatur Rohmah, "Kalender Cina Dalam Tinjauan Histor Dan Astronomis", Al-Marshad: Jurnal Astronomi Islam Dan Ilmu-Ilmu Berkaitan, Juni 2018.

[59] Kamus Besar Bahasa Indonesia (Jakarta: Pusat Bahasa Departemen Pendidikan Nasional, 2008), 622.

[60] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 35.

[61] Slamet Hambali, *Almanak Sepanjang Masa*, (Semarang: Program Pascasarjana IAIN Walisongo Semarang, 2011), 3.

Susiknan Azhari, *the system of organising units of time, for the purpose of marking and calculating time in the long term. calendars are closely related to humans, as they play an important role in determining the timing of hunting, farming, migration, worship, and celebrations.*[62] Then Ahmad Izzuddin defined that, *a system of time for identifying or marking hysterical events in human civilisation*.[63]

In the other side, Arwin Juli R. B. classified as, *a means of organising time precisely and effectively as well as a recorder of history. As for religious people, the calendar is a means of determining religious days properly and easily*.[64] Just like in Moedji Raharto's opinion that*, a system that aims to invoke a touch of nostalgia in relation to recording the events of human cultural and historical journeys*. Simply from the others, Moh. Ilyas simplified *a calendar is a system of time that reflects the power and strength of a civilisation".*

From some of the definitions above, there is some information related to the calendar: first, the calendar is a system of organising time in the long term, second, the calendar plays an important role in human civilisation and

[62] Susiknan Azhari, "Kalender Jawa Islam: Memadukan Tradisi dan Syar"i", *Journal Asy-Syiri'ah*, 42. No.I. (2008): 15.

[63] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015),

[64] Arwin Juli Rakhmadi B., *Kalender – Sejarah dan Arti Pentingnya dalam Kehidupan*, (Semarang: CV. Bisnis Mulia Konsultama, 2015), 2.

third, the calendar not only affects social life but also affects religious life. It's as a basis for determining the activities of worship and other important work.[65]

Calendars can be on paper or electronic devices.[66] Generally, a calendar contains information about the date of the calendar beginning (month and year), the rules of the calendar system, the definition of a day, the definition of a larger cycle (seven days, a month, a year), the boundary line for the date of the consistency of the rules of the calendar system, and various notes needed to avoid confusion in the future. The determination of the various beginning calendar systems is based on the search for the intersection of various calendar systems, the birth of prophets Muhammad, phenomena of historical value, and so on.[67]

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[65] Muhammad Awaludin, *Sistem Musim Kalender Rowot Sasak Perspektif Astronomis (Studi kasus di Desa Kidang Lombok Tengah)*, (Semarang: Tesis Pascasarjana UIN Walisongo Semarang, 2017), 37-38. The regularity of natural phenomena that has been repeated for millions and even billions of years has become an inspiration as a unit of time. Human interest in celestial phenomena, human closeness and familiarity with the sky encourages humans to understand, observe and ultimately explain the lapse of regularity of natural phenomena. Long before humans invented binoculars, before humans recognized reading and writing at a time when humans only relied on their eyes, humans were familiar with the sky, recognizing planets and stars. with the sky to recognize planets and stars. See more on Moedji Raharto and Novi Sopwan, Pros. Seminar Pend. IPA Pascasarjana UM, Vol. 2, 2017, ISBN: 978-602-9286-22-9 Judul Makalah Ditulis dengan Huruf Times New Roman 14 pt Bold Centered (core.ac.uk)

[66] Abu Sabda*, Ilmu Falak: Rumusan Syar'i & Astronomi 2*, (Bandung: Persis Pers,2019), 15.

[67] Moedji Raharto, *Dasar-Dasar Sistem Kalender*, (Bandung: Penerbit ITB, 2013), 81.

The name given to each day is known as a date. The periods in a calendar (such as years and months) are usually synchronised with the cycles of the Sun or Moon.[68] Many civilisations have developed calendars, usually derived from other calendars that used a system that suited their particular needs.[69] The calendar system and the calculation of days were born from astrology, the science of the celestial bodies movement such as the Sun, Moon and constellations. Astrology originated in Mesopotamia, the land between the Tigris and Euphrates rivers, the home of the ancient Babylonians (present-day Southeast Iraq). This science developed since the time of the reign of Ancient Babylon, approximately 3100 BC.[70]

The use of calendars has long been used as a time marker in carrying out various activities in daily life, even in the implementation of religious rituals. The use of calendars is also related to human civilization because it has an important role in various time determinations both in hunting, farming, immigration, and in determining certain celebrations. Read on Susiknan Azhari, *Ilmu Falak: Perjumpaan Khazanah Islam dan Sains Modern*, (Yogyakarta: Suara Muhammadiyah, 2007), 155. 22

[68] The general reference of a calendar is a phenomenon that repeats itself over a very long period of time. These natural phenomena are easy to recognize and observe with the human eye. Therefore, (1) the daily motion cycle of celestial bodies, the rising and setting of celestial bodies, (2) the recurring cycle of lunar phases, (3) the annual cycle of the Sun are used. See on Moedji Raharto and Novi Sopwan, Pros. Seminar Pend. IPA Pascasarjana UM, Vol. 2, 2017, ISBN: 978-602-9286-22-9 Judul Makalah Ditulis dengan Huruf Times New Roman 14 pt Bold Centered (core.ac.uk)

[69] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 35.

[70] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 5.

Based form this division of the celestial bodies movement that the month, day, hour, second and minute are derived, which is a small part of the calendar. By convention, the day is the smallest unit of the calendar. Hours, minutes and seconds are used for the measurement of a day.[71]

B. Calendar's Legal Basis of Syari'ah

The alternation of night and day proves that everything has been determined, arranged and adjusted to its position or axis respectively. The verses of the Qur'an and Hadith that emphasize the legal basis of the calender include:

1. Q.S. Yunus Verse 5 and 6

هُوَ الَّذِي جَعَلَ الشَّمْسَ ضِيَاءً وَالْقَمَرَ نُورًا وَقَدَّرَهُ مَنَازِلَ لِتَعْلَمُوا عَدَدَ السِّنِينَ وَالْحِسَابَ مَا خَلَقَ اللَّهُ ذَٰلِكَ إِلا بِالْحَقِّ يُفَصِّلُ الآيَاتِ لِقَوْمٍ يَعْلَمُونَ ٥ إِنَّ فِي اخْتِلافِ اللَّيْلِ وَالنَّهَارِ وَمَا خَلَقَ اللَّهُ فِي السَّمَاوَاتِ وَالأَرْضِ لآيَاتٍ لِقَوْمٍ يَتَّقُونَ[72]

"He is the One Who made the sun a radiant source and the moon a reflected light, with precisely ordained phases, so that you may know the number of years and calculation ˹of time˺. Allah did not create all this except for a purpose. He makes the signs clear for people of knowledge. Indeed, in the exchange of the night and the

[71] Ahmad Adib Rofiuddin, "Penentuan Hari dalam Sistem Kalender Hijriah", *Al-Ahkam Jurnal Pemikiran Hukum Islam*, Vol. 26, No. 1, April 2016, 118.

[72] Taken from the website alqur'anmulia.wordpress.com, Tafsir Ibnu Katsir Surah Yunus ayat 5-6 | alqur'anmulia (wordpress.com) (Acessed on Sunday, 29 of October 2023 at 21.06 WIB)

day, and in what Allah has created in the heavens and the earth, there are signs (of His power) for those who believes." [73]

The verse above is evidence of the rotation of the Earth and the center of the celestial bodies or solar system is the Sun rotating on its axis, and the Earth, which is the third planet from the Sun, rotates on its axis in a period of approximately 24 hours. This is what causes the alternation of day and night. In addition to rotating on its axis, the Earth also rotates around the Sun or in its journey is called a revolution. The Earth's path around the Sun is called an orbit.[74]

This verse explained that Allah Swt. has made the Sun shine and the moon shine. Then Allah Swt. has set their positions so that humans can know the calculation of time. When looking at the history of dating, humans cannot escape the use of the Sun and the moon, although with different systems and ways of determining the calendar.[75] From this we know that the wheels of life will always alternate, according to the time of day. that the wheel of life will always take turns,

[73] Taken from the website qur'an.com Surah Yunus - 5 - Quran.com (Acessed on Sunday, 29 of October 2023 at 21.08 WIB)

[74] Slamet Hambali, *Almanak Sepanjang Masa*, 2.

[75] Musa Al-Azhar, "Kalender Hijriah Dalam Al-Quran", *Al-Marshad: Jurnal Astronomi Islam dan Ilmu-Ilmu Berkaitan,* Desember 2018, 229.

in accordance with the alternation of day and night. with the alternation of day and night. Humans will also changes, which indicates that the universe universe has no boundaries and only Allah knows everything.[76]

2. Q.S. At-Taubah Verse 36

إِنَّ عِدَّةَ ٱلشُّهُورِ عِندَ ٱللَّهِ ٱثْنَا عَشَرَ شَهْرًا فِى كِتَٰبِ ٱللَّهِ يَوْمَ خَلَقَ ٱلسَّمَٰوَٰتِ وَٱلْأَرْضَ مِنْهَآ أَرْبَعَةٌ حُرُمٌ ۚ ذَٰلِكَ ٱلدِّينُ ٱلْقَيِّمُ ۚ فَلَا تَظْلِمُوا۟ فِيهِنَّ أَنفُسَكُمْ ۚ وَقَٰتِلُوا۟ ٱلْمُشْرِكِينَ كَآفَّةً كَمَا يُقَٰتِلُونَكُمْ كَآفَّةً ۚ وَٱعْلَمُوٓا۟ أَنَّ ٱللَّهَ مَعَ ٱلْمُتَّقِينَ ٣٦

"Indeed, the number of months[77] ordained by Allah is twelve—in Allah's Record[l] since the day He created the heavens and the earth—of which four are sacred. That is the Right Way. So do not wrong one another during these months. And fight the polytheists together as they fight together against you. And know that Allah is with those mindful ˹of Him˺.[78]

M.Quraish Shihab explained in his book, Tafsir Al-Mishbah, that Allah, the Almighty, explains that the

[76] Slamet Hambali, *Almanak Sepanjang Masa*, 2.

[77] These months are 29 or 30 days long. The lunar month begins on the night in which the new moon appears. The lunar year consists of 354 11/30 days. The calendar is organized according to the proper lunar cycle by adding 11 days in a 30-year period, so as not to shift far. So, during the 30-year period there are 19 ordinary years, of which there are 354 days. And there are 11 leap years with 355 days, the 2nd year, 5th year, 7th year, 10th year, 13th year, 16th year, 18th year, 21st year, 24th year, 26th year and 29th year. See: Ahmad Fauzi, "Pemikiran Kalender Muhammad Basil Ath-Tha'I in 'Ilm Al-Falak Wa At-Taqawim, Setia Wali Sembilan Semarang, 84.

[78] Taken from the website qur'an.com Surah At-Tawbah - 36 - Quran.com (Acessed on Sunday, 29 of October 2023 at 21.15 WIB)

number of months in the sight of Allah, that is, according to His reckoning and decree, cannot be increased or decreased, nor can its place be reversed. This number was established by Allah long ago when He first created the heavens and the Earth, upon whose existence time was created. The twelve months include four specific months, not just four in a year. The four that are certain are haram, that is, great. That is the decree of the straight religion, so do not wrong yourselves in them, i.e. in the four forbidden months, by any sin whatsoever and against anyone, including by increasing or decreasing the number of months. It is possible that the above prohibition is also understood as a prohibition against fighting to defend oneself from the persecution of others, so to refute that understanding, the verse goes on to state and fight the polytheists all as they also fight you all whenever it is necessary for you to fight; and know that Allah is with those who believe.[79]

What this verse means by months is the calculation of months according to the Kamariah calendar, which is the calculation of time according to

[79] M.Quraish Shihab, *Tafsir Al-Mishbah Jilid 5* (Jakarta: Lentera Hati, 2002). 585.

the circulation of the lunar planet. Indeed, the number of months based on the Shamsiyah calendar is also twelve months, but since this verse also talks about the unlawful months, while this is only related to the rotation of the lunar planet, then of course what is meant here is none other than based on the Kamariah calculation. The number of days in a year in the Kamariah reckoning is 355 days, while in the Shamsiyah reckoning it is 365.25. Therefore, every year there is a difference of about ten days between the Kamariah and Shamsiyah calculations. This makes Hajj and fasting, for example, not always occur in the month of Ramadan. Shamsiyah/the same Gregorian calendar. Every three years, fasting and Hajj have different Shamsiyah even though in the Kamariah month Hajj is is always in the month of Dhu al-Hijja and fasting is always in the month of Ramadan. Ramadan.[80]

3. QS. Al-Isra' Verse 12

[80] M.Quraish Shihab, *Tafsir Al-Mishbah Jilid 5* (Jakarta: Lentera Hati, 2002). 586.

وَجَعَلْنَا ٱلَّيْلَ وَٱلنَّهَارَ ءَايَتَيْنِ فَمَحَوْنَآ ءَايَةَ ٱلَّيْلِ وَجَعَلْنَآ ءَايَةَ ٱلنَّهَارِ مُبْصِرَةً لِّتَبْتَغُوا۟ فَضْلًا مِّن رَّبِّكُمْ وَلِتَعْلَمُوا۟ عَدَدَ ٱلسِّنِينَ وَٱلْحِسَابَ وَكُلَّ شَىْءٍ فَصَّلْنَٰهُ تَفْصِيلًا ١٢

"We made the day and night as two signs. So We made the sign of the night devoid of light, and We made the sign of the day ˹perfectly˺ bright, so that you may seek the bounty of your Lord and know the number of years and calculation ˹of time˺. And We have explained everything in detail."[81]

This verse mentions the benefits that can be derived from the presence of night and day by stating, and that you may know the number of years and the reckoning of months, days and the period of your transactions and everything that brings benefit.[82] And We have detailed and explained everything clearly so

[81] Taken from the website qur'an.com Surah Al-Isra - 12 - Quran.com (Acessed on Sunday, 29 of October 2023 at 21.40 WIB)

[82] These natural phenomena, such as day and night, the phenomenon of day being longer than night, the phenomenon of night being longer than day, the length of day being the same as night for the latitude of the subtropical region, inspired the unit of one day. The regularity of the Moon's phases, the repeated changes in the shape of the Moon's face from one full moon to the next full moon, inspires the unit of one month. The position of the rising and setting of the Sun, which shifts from the East to the West, the constellations that accompany the setting of the Sun or that precede the rising of the Sun, inspire the unit of one year. The existence of the planet Venus on an 8-year cycle (or about 5 times the synodic Venus) the cycle of Venus' appearance as the morning or evening star was used in the maya calendar. This response to the heavens created the various calendar systems of Qamariah, Shamsiah, or Luni-Solar, etc. See on Moedji Raharto and Novi Sopwan, Pros. Seminar Pend. IPA Pascasarjana UM, Vol. 2, 2017, ISBN: 978-602-9286-22-9 Judul Makalah Ditulis dengan Huruf Times New Roman 14 pt Bold Centered (core.ac.uk)

that it may be a convincing proof for you all. The word āyatain is the dual form of *āyah*, which means sign. Some understand the word to refer to the night and the day, so His words āyah al-lail/the sign of the night means the sign that is the night, as well as āyah an-nahār, the sign in this case is the day. Removing the sign of the night is understood in the sense of removing the light, so that the night loses its light, is dark, and what was visible is hidden. On the other hand, the sign that is the day is made by Allah so bright that it's as if the day itself sees.[83]

In this verse Allah explains that He made the night and the day as two signs of His power, then He also explains that He abolishes the sign of the night by making the sign of the day bright, this verse is intended, so that man can seek the gifts of his Lord, and so that man can explore his mind to know the number of years and calculations (time) which is currently more famous as a calendar.[84]

4. Q.S Al-An'am Verse 96 and 97

[83] M.Quraish Shihab, *Tafsir Al-Mishbah Jilid 7* (Jakarta: Lentera Hati, 2002). 424.

[84] Vivit Fitriyanti, "Penerapan Ilmu Astronomi Dalam Upaya Unifikasi Kalender Hijriyah di Indonesia",Annual Conference on Islamic Studies (ACIS) ke-12, (Surabaya, 2012), 2125.

فَالِقُ ٱلْإِصْبَاحِ وَجَعَلَ ٱلَّيْلَ سَكَنًا وَٱلشَّمْسَ وَٱلْقَمَرَ حُسْبَانًا ۚ ذَٰلِكَ تَقْدِيرُ ٱلْعَزِيزِ ٱلْعَلِيمِ ٩٦ وَهُوَ ٱلَّذِى جَعَلَ لَكُمُ ٱلنُّجُومَ لِتَهْتَدُوا۟ بِهَا فِى ظُلُمَٰتِ ٱلْبَرِّ وَٱلْبَحْرِ ۗ قَدْ فَصَّلْنَا ٱلْءَايَٰتِ لِقَوْمٍ يَعْلَمُونَ ٩٧

"It is Allah Who divides the light of dawn, and makes the night a resting place, and makes the sun and the moon to measure time (according to their revolutions). Such is the decree of Allah, the Almighty, the All-Knowing. And it is He who made the stars for you that you may take guidance from them in the darkness (of the night) on land and sea. Indeed, We have explained the signs of Our greatness one by one for those who know." [85]

Through the above verse Allah Subhanahu Wa Ta'ala also made the sun and the moon circulate based on a very careful calculation, emitting light and light and shining alternately between night and day. The word *husbāna* means a perfect and meticulous calculation. This fragment of the verse is understood by some scholars that Allah Subhanahu Wa Ta'ala makes the circulation of the sun and moon as a tool for calculating time. Then in the 97th verse talks about the stars and their benefits for humans point since the beginning of human civilization until now, celestial

[85] Taken from the website qur'an.com https://quran.com/ms/al-anam/96-97 (Acessed on Wednesday, 02 of November 2023 at 20.46 WIB)

bodies are a sign of guidance for human travel both on land and at sea.[86]

5. Q.S. An-Nahl Verse 16

وَعَلٰمٰتٍۗ وَبِالنَّجْمِ هُمْ يَهْتَدُوْنَ ١٦

"Also by landmarks and stars do people find their way."[87]

The expanse of land and sea is darkness when mankind is guided by the stars.[88] They have been like that since ancient times until today. Their methods of using the stars for direction vary. The scope has expanded with scientific discoveries and experiments. However, the basis remains the same thing, which is to use the heavenly bodies as guidance in navigating the expanse of land and sea. Whether it is in the darkness of the senses or *tashawwur* and thought.

Then, it remains the specialty of the Qur'an in discussing human nature with the nature of the

[86] Even recent astronauts are guided by the sun and stars in determining the direction of travel at any given time. They also use star clusters in determining time. On that basis, if another function of the stars is found, it must be seen as compatible with religious principles.See on M. Quraish Shihab, *Tafsir Al-Misbah: Pesan, Kesan, dan Keserasian Al-Qur'an,* (Jakarta: Lentera Hati, 2002), 204-207.

[87] Taken from the website tafsirweb.com Surat An-Nahl Ayat 16 Arab, Latin, Terjemah dan Tafsir | Baca di TafsirWeb (Acessed on Thursday, 02 of November 2023 at 15.45 WIB)

[88] Read more on Wahid Nur Afif, *Bintang Dalam Perspektif Al-Qur`an (Studi Tafsir Tematik)*, (Skripsi IAIN Ponorogo, 2019).

universe, not in the form of theory but in the form of reality. A form that shows that behind behind it is the hand of the Creator, His arrangement and His mercy. A form that exerts its influence on the mind and heart. A form that encourages contemplation and dhikr, in order to use knowledge to reach the greatest essence. This is because Allah, the Almighty, gave a further wording to the verse about the stars, which Allah made a compass for people when they were navigating[89] through the darkness of the land and sea.[90]

6. Hadits Shahih Al-Bukhari 1774

،حَدَّثَنَا عَبْدُ اللَّهِ بْنُ مَسْلَمَةَ، حَدَّثَنَا مَالِكٌ، عَنْ عَبْدِ اللَّهِ بْنِ دِينَارٍ عَنْ عَبْدِ اللَّهِ بْنِ عُمَرَ . رضى الله عنهما . أَنَّ رَسُولَ اللَّهِ صلى الله عليه وسلم قَالَ " الشَّهْرُ تِسْعٌ وَعِشْرُونَ لَيْلَةً، فَلاَ تَصُومُوا حَتَّى تَرَوْهُ، فَإِنْ غُمَّ عَلَيْكُمْ فَأَكْمِلُوا الْعِدَّةَ ثَلاَثِينَ

[89] In this case the stars are used as directions in the darkness on land and at sea, the meaning shows that the stars can also be used as navigation indicators, in land travel and sea voyages. In the history of human civilization, sailors from the Romans, Vikings, Greeks, Arabs, Spaniards, Portuguese, and others, they used these constellations as navigation indicators for voyages to distant places. In scientific language, navigating the position of the constellations is called Stellar Navigation. constellations is called Stellar Navigation. See on Lajnah Pentashihan Mushaf Al-Qur'an Badan Litbang & Diklat Kementerian Agama RI, *Manfaat Benda-Benda Langit dalam Perspektif Al-Qur'an dan Sains* (Jakarta: Lajnah Pentashihan Mushaf Al-Qur'an, 2012), 148.

[90] Sayyid Qutub, terj. oleh As'ad Yasin dkk. Tafsir Fi Zilalil Qur'an, dibawah Naungan Al – Qur'an,Vol IV (Jakarta: Gema Insani, 2010) 170.

"Narrated `Abdullah bin `Umar: Allah's Messenger said, "The month (can be) 29 nights (i.e. days), and do not fast till you see the moon, and if the sky is overcast, then complete Sha'ban as thirty days."[91]

Based on the hadith above, it is explained that the age of the Moon which amounts to sometimes 29 and 30 it was also explained like that by Adam the teacher Imam Bukhari without any other interpretation. Ibn Baththal said that this hadeeth indicates not to not to pay attention to horoscopes based on the rulings of hisab, but what is to be guided in this matter is to look at the new moon.[92]

C. The Calendar History[93]

[91] Taken from the website sunnah.com Fasting - Sunnah.com - Sayings and Teachings of Prophet Muhammad (صلى الله عليه و سلم) (Acessed on Thursday, 02 of November 2023 at 16.05 WIB)

[92] Ibnu Hajar Al-Asqalani, *Fathul Baari Syarah Shahih Al- Bukhari*, terj. Amiruddin, (Jakarta:Pustaka Azzam, 2014), 81.

[93] There are two traditional functions of any calendar. First, it must keep track of time over the course of long spans, allowing people to anticipate the cycle of the seasons and to honor special religious or personal anniversaries. Second, to be useful to a large number of people, a calendar must use natural time intervals that everyone can agree on—those defined by the motions of Earth, the Moon, and sometimes even the planets. The natural units of our calendar are the day, based on the period of rotation of Earth; the month, based on the cycle of the Moon's phases (see later in this chapter) about Earth; and the year, based on the period of revolution of Earth about the Sun. Difficulties have resulted from the fact that these three periods are not commensurable; that's a fancy way of saying that one does not divide evenly into any of the others. Read on Andrew Fraknoi, David Morrison, and Sidney C. Wolff, *Astronomy*, (Texas:OpenStax, Rice University, 2016),114.

In the history and civilisation of the world calendar, at first the emergence of calendars was motivated by practical considerations such as agricultural considerations such as agriculture (economics, travel (business) and religious rituals religious rituals. In addition, social-political demands also cannot be separated from the history of the calendar in a country. the history of the calendar's presence in a world society.

The birth of a calendar does not escape the observation of astronomical phenomena. Astronomical phenomena, these natural phenomena natural phenomena have a cycle of change that is continuously repeated[94] and such as the regularity of the Sun's apparent journey in changing the annual seasons and the of the Sun in changing the annual seasons and the position of its rising and setting or its appearance and sunset or its appearance, which is always different in each season in the Northern or Southern hemisphere. Likewise with other celestial bodies, such as the Moon and Stars or Star Clusters that move the instinct of human curiosity to know and research more deeply behind these phenomena.

[94] Arwin Juli Rakhmadi B., *Kalender – Sejarah dan Arti Pentingnya dalam Kehidupan*, (Semarang: CV. Bisnis Mulia Konsultama, 2015), 14.

The repetition of observed astronomical phenomena is used as a standard of time, activities, activities and even religious rituals. From here, humans began to utilise nature by observing the regularity and recurrence of natural phenomena, especially celestial bodies that they witnessed every day, such as the movement of the Sun during the day, and the Moon at night. This regularity inspired human intellect to build a time recording system known today as the calendar.

The ability to observe astronomical phenomena and supported by high civilisation, people in ancient times have been able to arrange the regularization of days grouped into months and months grouped into years.[95] Thus, we recognise the three most important construction units in a calendar consisting of days, months and years. Just like the Stonehenge, it is generally believed that at least one function of the monument was connected with the keeping of a calendar.[96]

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[95] Ruswa Darsono, *Penanggalan Islam, Tinjauan Sistem, Fiqh dan Hisab Penanggalan*, (Yogyakarta: Labda Press, 2010), 29.

[96] Even the earliest cultures were concerned with the keeping of time and the calendar. Some interesting examples include monuments left by Bronze Age people in northwestern Europe, especially the British Isles. The best preserved of the monuments is Stonehenge, about 13 kilometers from Salisbury in southwest England (Figure 4.12). It is a complex array of stones, ditches, and holes arranged in concentric circles. Carbon dating and other studies show that Stonehenge was built during three periods ranging from about 2800 to 1500 BCE. Some of the stones are aligned with the directions of the Sun and Moon during their risings and settings at critical times of the year (such as the summer and winter solstices), and it is generally believed that at least one function of the monument was connected with the keeping of a calendar.

Picture 2.1.
The ancient monument known as Stonehenge was used to keep track of the motions of the Sun and Moon

Some of the history of the world calendar recorded in history include;

a. Ancient Egyptians

The Ancient Egyptians (around 4000 BC) were first able to solve arithmetic calculations involving fractions, correctly calculate the area of triangles, cylinders, pyramids, rectangle, and travezoid.[97] The Ancient Egyptians were also known as a nation that likes to make observations of the universe. According to them, celestial bodies such as the Sun, Moon and stars are goddesses. Stars are goddesses who always protect them. They also believed that the movement

Read on Andrew Fraknoi, David Morrison, and Sidney C. Wolff, *Astronomy*, (Texas:OpenStax, Rice University, 2016),116.

[97] Muh Nasirudin, *Kalender Hijriah Universal – Kajian Atas Sistem dan Prospeknya Di Indonesia*, (Semarang: El Wafa, 2013), 30.

of celestial bodies and have an influence on the fate of creatures on Earth.

From continuous observation, they were able to recognise patterns and then calculate them into a simple calendar that they could use as a prediction. This simple calendar, according to their expert astronomers, recognises that a day is divided into 24 hours, 1 hour consists of 60 minutes, and 1 minute consists of 60 seconds, including a full circle of 360 degrees.[98]

b. Roman[99]

The Roman calendar was first introduced by Romulus, the first King of Rome in the VIIth century BC or 700 BC. At the beginning of its compilation, a year consisted of 304 days or 10 months, where the first 6 months were 30 days and the next 4 months

[98] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 4.

[99] As explained in Fundamental Astronomy, our calendar has its origin in the Roman calendar, which, in its earliest form, was based on the phases of the Moon. From around 700 B.C. on, the length of the year has followed the apparent motion of the Sun; thus originated the division of the year into twelve months. One month, however, still had a length roughly equal to the lunar cycle. Hence one year was only 354 days long. To keep the year synchronised with the seasons, a leap month had to be added to every other year. Hannu Karttunen, Pekka Kröger, Heikki Oja, Markku Poutanen, and Karl Johan Donner, *Fundamental Astronomy*, (Finland: University of Helsinki, 2016), 40.

were 31 days. Among the names of the months in the early ancient Roman calendar are Martius (March), Aprilis (April), Maius (May), Junius (June), Quintilis (July), Sextilis (August), September (September), October (October), November (November) and December (December).[100]

At a later stage, the Roman calendar was again changed and refined during the reign of the emperor Julius in 46 BC.[101] The average year length amounted to 365.25 days where every 3 years there are 365 days called the Basithah year and every 4th year there are 366 days, referred to as the Leap year. However, there is a loophole in this calendar, namely the determination of Easter Day which becomes inaccurate when using this Julius (Julian) calendar. This is due to the excess difference of about 0.007801 days (11 minutes 14 seconds) in every 1 year, and when added up then within 128 years the calendar system is filed 1 day.[102] However, the determination

[100] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 29.

[101] Arwin Juli Rakhmadi B., *Kalender – Sejarah dan Arti Pentingnya dalam Kehidupan*, (Semarang: CV. Bisnis Mulia Konsultama, 2015), 49.

[102] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 33.

of the day of Easter at that time was actually more of a church authority carried out by Christian priests.[103]

It was this error in the calendar system that inspired Pope Gregory XIII to reform it again to make corrections. provide corrections. On 4 October 1582 AD, Pope Gregory XIII gave a decree so that the next day not to be counted on 5 October 1582 AD, but instead to be counted on 15 October 1582 AD.[104] The length of the year in the calendar system known as Georgerian is in one leap year. leap year is 366 days, while the ordinary year is 366 days. year/bashitah year (common year) totalling 365 days.

c. Babylon[105]

[103] Jean Meeus, *Astronomical Algorithms*, (Virginia: William Bell 1991), 68.

[104] Kementrian Agama, *Almanak Hisab Rukyat*, (Jakarta: Dirjen Bimbingan Masyarakat Islam Kemenag RI, 2010), 105.

[105] Astrology as the beginning thing began in Babylonia about two and half millennia ago. The Babylonians, believing the planets and their motions influenced the fortunes of kings and nations, used their knowledge of astronomy to guide their rulers. When the Babylonian culture was absorbed by the Greeks, astrology gradually came to influence the entire Western world and eventually spread to Asia as well. By the 2nd century BCE the Greeks democratized astrology by developing the idea that the planets influence every individual. In particular, they believed that the configuration of the Sun, Moon, and planets at the moment of birth affected a person's personality and fortune—a doctrine called natal astrology. Natal astrology reached its peak with Ptolemy 400 years later. As famous for his astrology as for his astronomy, Ptolemy compiled the Tetrabiblos, a treatise on astrology that remains the "bible" of the subject. It is essentially this ancient religion, older than Christianity or Islam, that is still practiced by today's astrologers. Read on Andrew Fraknoi, David Morrison, and Sidney C. Wolff, *Astronomy*, (Texas:OpenStax, Rice University, 2016),50.

The Babylonian civilisation (Southern Iraq) was a continuation of the Sumerian civilisation that had emerged around 4500 BC which is thought to be the forerunner of the birth of Astronomy and Astrology for later civilisations.[106] They assumed that the movements of the heavenly bodies were signals from the Gods of nature for life on Earth that had to be interpreted. From here came the predictions intended for the future of a country. In later developments, these predictions were also intended for the life of fate and fortune for daily lives of humans.[107]

The Babylonians had a calendar system[108] based on their observations of the movement of celestial bodies. The determination of the beginning of the month in this calendar was marked by the

[106] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 19.

[107] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 20.

[108] The Babylonian calendar was a lunisolar calendar with years consisting of 12 lunar months, each beginning when a new crescent moon was first sighted low on the western horizon at sunset, plus anintercalary month inserted as needed by decree. The calendar is based on a Sumerian (Ur III) precedecessor preserved in theUmma calendar of Shulgi (c. 21st century BC). Taken from www.scribd.com, Babylonian Calendar | PDF | Lunisolar Calendars | Ancient Near East (scribd.com) (Acessed on Thursday, 02 of November 2023 at 17.53 WIB).

appearance of the new moon (*hilal*) and began at sunset.[109]

Two baked clay tablets produced around 700bce by the Babylonians of present-day Iraq summarize information on the motions of stars and planets. The list of stars and constellations known to the Babylonians is clear evidence of a long-standing tradition of celestial observation. Some constellations, such as Leo and Scorpius, have come down to us virtually unchanged. The Babylonians made another lasting contribution to astronomy: having measured the length of the year as approximately 360 days, they divided the circle of the sky into 360 degrees, subdivided each degree into 60 parts, and introduced the 24-hour day, with each hour also divided into 60 parts.

Picture 2.2

[109] Muh Nasirudin, *Kalender Hijriah Universal – Kajian Atas Sistem dan Prospeknya Di Indonesia*, (Semarang: El Wafa, 2013), 52.

One of a pair, this Babylonian tablet is inscribed with lists of constellations in cuneiform script. Just 3.3in (8.4cm) high, it is a masterpiece of miniature writing[110]

d. Hijri[111]

Before the arrival of Islam, the Arabs knew the lunisolar calendar system or a combination of the lunar (Moon) and solar (Sun) systems.[112] But then the Arab community recognised the Hijri calendar system or Islamic calendar (1 Muharram 1 Hijri). The Hijri calendar is named because it coincides with the Hijrah of the Prophet Muhammad SAW from the city of Makkah to the city of Medina. However, the validity of the Hijri calendar was only during the reign of Umar ibn Khatab.[113]

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[110] Dorling Kindersley Limited DK, a Division of Penguin Random House LLC, *Astronomy: A Visual Guide*, (United States: DK Publishing, 2018), 16.

[111] Moslems use an uncorrected lunar calendar, and as a result their holidays slip through the seasons at a rate of about 11 days per year. The reason is not ignorance of astronomy but a deliberate effort to follow a different schedule from that of any other faith.

This creates a problem with the month of Ramadan, during which faithful Moslems are expected not to eat or drink from sunrise to sunset. When Ramadan falls in mid-winter, this imposes no great hardship, since days are short and cool. Fifteen years later, however, Ramadan falls in mid-summer, when days are long and the heat makes people quite thirsty. That is when Arab cities wait impatiently for the boom of the cannon which traditionally announces every evening the end of the fast. The Calendar (nasa.gov) (Acessed on Thursday, 02 of November 2023 at 17.23 WIB)

[112] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 64.

[113] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 14.

The Hijri calendar is a calendar based on the Moon phase cycle. This is in line with the understanding given by Moedji Raharto where he defines the Hijri calendar as a calendar system that does not require correction thinking because it relies on the phenomenon of the moon phase.[114] One year in this Hijri calendar consists of 12 months, with the length of the day totalling 29 or 30 days. the names of the months in this calendar follow the names of the months that have been used by the Arab community before, Muharram, Shafar, Rabiul Awal, Rabiul Akhir, Jumadil Awal, Jumadil Akhir, Rajab, Sya'ban, Ramadhan, Syawal, Dzulqa'dah, and the last month is Dzulhijjah.[115]

D. The Calendar's Classification

1. Calculation System

The history of human civilisation records that there have been various calendar systems created by humans.[116] There are many calendar systems that have

[114] Asrof Fitri, Ahmad, "Observasi Hilal dengan Teleskop Inframerah dan ompromi menmuju unifikasi kalender Hijriah", *Al-ahkam: Jurnal Penelitian Hukum Islam*, 22, (2012): 214.

[115] Nachum Dershowitz, "Celendrical Calculation", (United Kingdom: Cambridge University Press, 1997), 64.

[116] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), ii.

developed in this world, both from ancient times to modern times. Not only various systems, but each calendar also has different methods and resulting in different calculations. Based on variations in the fundamental units of days, months, and years, the calendar systems that have evolved globally can be divided into two categories, those are the arithmetic calendar and the astronomical calendar.

a. Arithmetic Calendar

An arithmetic calendar is the calender that can only be calculated using arithmetic operations.[117] It is because the arithmetic calendar relies only on arithmetic computations and formulas. Put differently, an arithmetic calendar is one that can be quickly and simply calculated using basic formulas or computations.

To be specific, this calendar can be used without requiring any astronomical observations or references to astronomical observations. In astronomy, observation plays a crucial role, but theory-based modeling plays

[117] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 36.

an equally significant role in computations based on collected observational data. Because astronomers will be able to forecast phenomena based on the models created, allowing them to prepare observations in advance of the phenomena.[118] It's just like characters of arithmetic calendar below.

- Only arithmetic computations, not observations, are used to compile arithmetic calendars. It is employed for routine administrative or civil activities.
- The date between observations and this calendar system might not line up. The astronomical calendar and the arithmetic calendar could be off by one day. As mentioned in Muhammad Odeh (Jordan)'s Accurate Times software for the Hijriyah - Masehi conversion, a one-day discrepancy in the date conversion is possible because it is not based on observation.[119]

[118] Hendro Setyanto, *Membaca Langit*, (Jakarta: al-Guraba, 2008), 16.

[119] Muh. Hadi Bashori, *Penanggalan Islam: Peradaban Tanpa Peninggalan, Inikah Pilihan Kita*, (tt, tp, tth), 7-14.

- The date discrepancies could arise from the fact that this system is used globally, even though it's possible that two extremely distant locations may have different observations from each other.[120]

b. Astronomic Calendar

Unlike an arithmetic calendar, an astronomical calendar is based on ongoing observations of the positions of celestial bodies and involves far more intricate astronomical computations.[121] The moon is one of the celestial bodies used as a reference, and its computation requires the use of a fairly complicated formula. This is due to the moon's average circulation not exactly matching the new moon's shape at the start of the month. The following are some clues that a calendar is an astronomical calendar: *First,* it describes how a celestial body revolves around the Earth.

[120] Muh. Hadi Bashori, *Penanggalan Islam: Peradaban Tanpa Peninggalan, Inikah Pilihan Kita*, (tt, tp, tth), 7-1

[121] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 41.

Secondly, the system also makes use of contemporary astronomical theories.[122]

2. Astronomical Reference

Meanwhile, as a time system that reflects the power and strength of a civilization,[123] astronomically, the calendars are still based on the Sun called *Solar Calendar* and based on the Moon called *Lunar Calendar* or using both known as *LuniSolar Calender*.[124]

a. Solar Calendar

The Solar Calender is a system of time based on the relative circulation of the Earth around the Sun that occurs through the period of ending and passing of two positions on the Sun from the point of Aries (the point of spring)[125] in apparent motion around the

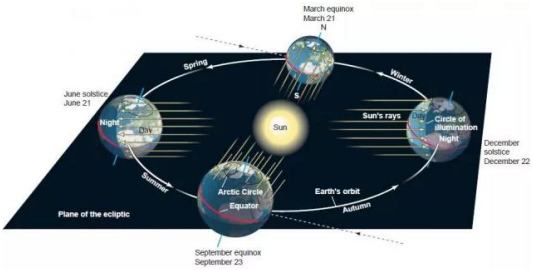
[122] Susiknan Azhari, *Pembaharuan Pemikiran Hisab Di Indonesia, Studi Atas Pemikiran Saadoe'ddin Djambek,* (Yogyakarta: Pustaka Pelajar, 2002), 24.

[123] Ilyas, *The Quest for A Unified Islamic Calender*, (Malaysia: International Islamic Calender Programme, 2000), 15.

[124] Susiknan Azhari, *Ensiklopedi Hisab Rukyat*, (tt, Pustaka Pelajar, 2005), 119. There are three kinds of calendars used in various religious holidays Solar (Shamsiah), Lunar (Qamariah) and Luni - Solar (Moon - Sun) systems. Luni - Solar (Moon - Sun) system. See on Moedji Raharto and Novi Sopwan, Pros. Seminar Pend. IPA Pascasarjana UM, Vol. 2, 2017, ISBN: 978-602-9286-22-9 Judul Makalah Ditulis dengan Huruf Times New Roman 14 pt Bold Centered (core.ac.uk)

[125] The Solar Spring Point marks the start of astronomical spring. It occurs around March 20 in the Northern Hemisphere and September 23 in the Southern Hemisphere. Equinoxes are averaged over a specific date. While the true equinox is

Earth.[126] It is said solar calendar because this calendar is based on the calculation refers to the apparent movement of the Sun with regular movements in each annual cycle. This calendar is also called the Shamsiah calendar.[127]



Picture 2.3
The Revolution of The Earth Around The Sun[128]

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the intersection of the ecliptic with the true (instantaneous) equator, which is the equator affected by Nutation. See: Jean Meeus, *Astronomical Algorithmn*, (Richmond, Virginia: Willmann-Bell, 1991),cet.2,137.

[126] Arwin Juli Rakhmadi B., *Kalender – Sejarah dan Arti Pentingnya dalam Kehidupan*, (Semarang: CV. Bisnis Mulia Konsultama, 2015), 10.

[127] Abu Sabda, *Ilmu Falak: Rumusan Syar'i & Astronomi 2*, (Bandung: Persis Pers,2019),15.

[128] https://geography.name/the-earths-revolution-around-the-sun/ Accessed on Sunday, 11 of Jun 2023 at 15.14. **Solar calendar**, any dating system based on the seasonal year of approximately 365 1/4 days, the time it takes the Earth to revolve once around the Sun. The Egyptians appear to have been the first to develop a solar calendar, using as a fixed point the annual sunrise reappearance of the Dog Star—Sirius, or Sothis—in the eastern sky, which coincided with the annual flooding of the Nile River. They constructed a calendar of 365 days, consisting of 12 months of 30 days each, with 5 days added at the year's end. The Egyptians' failure to account for the extra fraction of a day, however, caused their calendar to drift gradually into error.

Ptolemy III Euergetes of Egypt, in the Decree of Canopus (237 BC), introduced an extra day every four years to the basic 365-day calendar (this practice also having been introduced in the Seleucid calendar adopted in 312 BC). In the Roman Republic, Julius Caesar in 45 BC replaced the confused Roman republican calendar, which probably was based on the lunar calendar of the Greeks, with

The regularity of the Sun's movement when rising and sunset caused by the regularity of the Earth's rotation and its appearance in each season due to the revolution of the Sun. As well as its appearance in each season as a result of the Earth's revolution. However, there are two important notes in the solar calendar system:

Firstly, this calendar system is based on the period of time taken by the Earth to revolve around the Sun. The period of the Earth's revolution of the Sun based on the length of time taken in one year is divided into two, namely the sidereal year and the tropical year. The sidereal year is the period of the Earth's revolution around the Sun one full elliptical rotation that takes 365.2564 days or 365 days 6 hours 9 minutes 10 seconds. While the tropical

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the Julian calendar. The Julian calendar assigned 30 or 31 days to 11 months but fewer to February; it allowed for a leap year every four years. The Julian calendar, however, made the solar year slightly too long by adding a full quarter of a day annually—the solar year actually runs 365.2422 days. By mid-16th century the extra time had resulted in an accumulated error of about 10 days. To correct this error, Pope Gregory XIII instituted the Gregorian calendar in 1582, dropping October 5–14 that year and omitting leap years when they fell on centurial years not divisible by 400—*e.g.,* 1700, 1800, 1900. Read more on the website www.britannica.com, Solar calendar | Ancient Egypt, Mayan, Aztec | Britannica (Acessed on Thursday, 02 of November 2023 at 17.31 WIB)

year is the period needed for the sun to move around the earth starting from equinox 1 to equinox 2 and then back to equinox 1 which is 365.2422 days.[129]

Secondly, this calendar has a number of days that is close to the number of days in the tropical year, this is what makes this calendar has compatibility with seasonal changes, so it can be used as a means to understand in general the pattern of seasonal changes in each year.[130]

The arrangement of the solar calendar is based on the revolutionary motion of the Earth around the Sun. In practical use, 1 year is 365 days.[131] However, the Earth's circular motion is not a perfect circle but an ellipse. So, the calculation of the Solar calendar is actually not

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[129] Muhammad Awaludin, *Sistem Musim Kalender Rowot Sasak Perspektif Astronomis (Studi kasus di Desa Kidang Lombok Tengah)*, (Semarang: Tesis Pascasarjana UIN Walisongo Semarang, 2017), 49-50.

[130] Muhammad Awaludin, *Sistem Musim Kalender Rowot Sasak Perspektif Astronomis (Studi kasus di Desa Kidang Lombok Tengah)*, (Semarang: Tesis Pascasarjana UIN Walisongo Semarang, 2017), 49-50.

[131] The year is the time needed by the Earth for one full orbit around the Sun. At the end of that time, the Earth is back to the same point in its orbit, and the Sun is therefore back at the same apparent position in the sky. It takes the Earth 365.2422 days to complete its circuit (average solar days), and any calendar whose year differs from this number will gradually wander through the seasons. The ancient Roman calendar had 355 days but added a month every 2 or 4 years: it wasn't good enough, and by the time Julius Caesar became ruler of Rome, it had slipped by three months. The Calendar (nasa.gov) (Acessed on Thursday, 02 of November 2023 at 17.10 WIB)

fixed with an average solar year of 365h 6h. Therefore, a leap year is defined (a year with a total of 366 days, with the addition of 1 day in February so that the age becomes 29 days) with the following conditions, If the number of the year under review is divisible by 4 and If the year number is a century (e.g. 1900, 2000, 2100) then the year is divisible by 4 and divided by 400.[132]

Some of the calendars that use the Solar system are Ancient Egyptian, Ancient Roman, Mayan, Julian Almanac, Gregorian, Japanese, Baha'I, Coptic (Iran), Suriyakhati (Thailand).[133]

b. Lunar Calender

The Lunar Calendar is a system of time circulation based on changes in the phases of the moon,[134] from one crescent (*hilal*) to the

[132] Slamet Hambali, *Pengantar Ilmu Falak: Menyimak Proses Pembentukan Alam Semesta*, (Banyuwangi: Bismillah Publisher, 2012), 216-217.

[133] Abu Sabda, *Ilmu Falak: Rumusan Syar'i & Astronomi 2*, (Bandung: Persis Pers,2019),15.

[134] The Moon's orbital period, measured by the stars ("sidereal period") is 27. 321662 days. However, the monthly cycle of the Moon--thin crescent to half-moon, to full and back to crescent--takes 29. 530589 days, because it depends on the position of the Sun in the sky, and that position changes appreciably in the course of each orbit. The different shapes of the Moon represent different angles of illumination, and the

next crescent phase (*hilal*) or from the conjuntion to the next conjuntion.[135] Unlike the solar calendar, which is based on the changing seasons, this calendar system refers to the changing phases of the Moon based on the synodic month. The Moon has phases that change from time to time.

Picture 2.4

appearance of the Moon in the night sky gives a fair idea of where the Sun would be (e. g. the Moon observed in the east before sunrise appears illuminated from below). The duration of the Moon's cycle ("synodic period") gave rise to the division of time known as month.

Many ancient calendars were based on the month. The most successful of these is the "Metonic" calendar, named after the Greek Meton, who noted that adding 7 months in the course of 19 years kept the calendar almost exactly in step with the seasons. That would make the length of the average year (12 + 7/19) months, and with a calculator you can easily find its value as

(12 + 7/19) x 29.530589 = 365.2467 days

pretty close to the full value 365. 2422. The Metonic calendar is thus more accurate than the Julian one, though less so than the Gregorian. It is still used by Jews, on whose calendar each month begins at or near the new moon, when the Moon's position in the sky is nearest to the Sun's. The traditional Chinese calendar also uses of a formula like Meton's, which was probably invented by the ancient Babylonians, inhabitants of what is today's Iraq. The Calendar (nasa.gov) (Acessed on Thursday, 02 of November 2023 at 17.20 WIB)

[135] Arwin Juli Rakhmadi B., *Kalender – Sejarah dan Arti Pentingnya dalam Kehidupan*, (Semarang: CV. Bisnis Mulia Konsultama, 2015), 12.

Phases of the Moon [136]

This calendar uses the lunar system, meaning the journey of the Moon as it orbits the Earth (evolving with respect to the Earth). The lunar calendar, on the other hand, has no effect on seasonal changes. Because the appearance of the Moon in one year for twelve times and easily observed. The Moon's revolution around the Earth is an ellipse that is not fully circular. [137]The speed of rotation of the Moon is not the same, sometimes it can be travelled in 30 days and at other times 29 days.[138] A lunar calendar year has 12 months, each month has an average number of days of 29.5 and the total period of revolution of the Moon with respect to the Earth is 354 days 48 minutes 34 seconds. Thus, a lunar year is 11 days shorter than a tropical solar year.

The lunar calendar includes the Hijri (Islamic) calendar, the Saka calendar, the Islamic Javanese calendar. Lunar calendar has actually been used among the Arab community long before the arrival of

[136] https://solarsystem.nasa.gov/resources/676/phases-of-the-moon/ Accessed on Sunday, 11 of Jun 2023 at 15.01

[137] Abu Sabda, *Ilmu Falak: Rumusan Syar'i & Astronomi 2*, (Bandung: Persis Pers,2019),13.

[138] Except on the 12th (Dhulhijjah) for the Hijri calendar specifically.

Islam. It's just that at that time there was no standardised calculation of the year. Important events that occur are usually only recorded in dates and months. Even if the year is mentioned, the designation of the year was usually attributed to a major event that occurred in that year.[139]

c. Luni-Solar Calendar

The Lunisolar calendar is also called the Suryacandra calendar. It is a calendar that uses the phases of the Moon as the main reference but also adds the seasons in the calculation of each year.[140] It is a combination of the Solar and Lunar Calendars in which months are changed based on the synodic cycle[141] of the Moon every few years with an additional month (Intercalary Month) to bring the calendar back to the length of the Sun's tropical cycle.[142]

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[139] For example, the year of the Elephant (‘Am al-Fil), the year of mourning (‘Am-al-Huzn), the year of the Opening of Mecca (‘Am Fath Makkah), etc. See: Ahmad Musonif,, *IImu Falak: Metode Hisab Awal Waktu Salat, Arah Kiblat, Hisab Urfi dan Hisab Hakiki Awal Bulan*, (Yogyakarta: Teras, 211), 107.

[140] Abu Sabda, *Ilmu Falak: Rumusan Syar’i & Astronomi 2*, (Bandung: Persis Pers,2019),13.

[141] Synodic is the time it takes from one new Moon to the next, 29 days and 31 hours. See: Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 8.

[142] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 83-84.

However, this calendar is not accurate with the Earth's circulation around the Sun. Originally both the lunar and solar systems were combined, but later the lunar and solar calendar systems became independent.[143] The lunisolar calendar is synchronised with the Sun. Since the lunar calendar is 11 days ahead of the solar calendar in a year, it has an intercalation month (extra month, 13th month) every three years to bring it back in line with the Sun.

E. The Tribal Calendars in Indonesia

1. Nias Calendar[144]

The Nias tribe is a society that lives in a high cultural and customary environment. Nias customary law is generally called fondrakö which regulates all aspects of life from birth to death.[145]

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[143] Slamet Hambali, *Almanak Sepanjang Masa*, (Program Pascasarjana IAIN Walisongo Semarang, 2011), 18.

[144] The Nias tribe is a group of people who live on Nias Island. In their native language, the Nias people call themselves Ono Niha (Ono: child/offspring; Niha: human) and the island of Nias as Tanö Niha (Tanö: land). While their native language is called Li Niha it literally means the language of the people or the language of humans. Most of them live on Nias Island which is regionally located in North Sumatra and there are those who migrate scattered in Medan and Pekanbaru. Ingatan Gulő, "Unique Characteristic Of Nias Language", *Journal Of English and Education*, vol. 3, no.3, July 2014, 26.

[145] Samudra Kamurniaman Zendrato, *Kebudayaan & Pariwisata Nias*, (Jakarta: Mitra Wacana Media, 2014), 47.

Nias people in the past did not recognize clocks. Their division and naming of time refers to daily activities such as farming, raising livestock, domestic work (cooking, eating, sleeping), and other natural phenomena.[146] This Nias tribe has its own daily calendar, which they call the traditional Nias daily calendar, Fanötöi ginötö (naming time). In addition to the Gregorian calendar and the daily calendar (system of determining and dividing time), the Nias community has an annual leisure period calendar used for agricultural activities which refers to the circulation of the Orion Star based on the local wisdom of the traditional Nias community. This calendar is relatively different from the Gregorian calendar[147] established by Pope Gregory XIII in 1582.

In the daily work of families on Nias is based on the factors of season, gender, ability and age. The work season in the fields is between April-June and July-September in Sawah. In the fields, villagers grow sweet potatoes, various vegetables. Harvest season followed by cleaning the fields is usually between January-March. Bambowo Laiya, *Solidaritas Kekeluargaan dalam Salah Satu Masyarakat Desa Di Nias-Indonesia*, (Yogyakarta: Gadjah Mada Universuty Press, 1983), 60.

[147] The Gregorian calendar or Gregorian calendar or Gregorian alamanak is the calendar that is now most widely used in the Western world. It is a modification of the Julian calendar. Julian Day is a system of time calculated from January 1, 4731 BC and counted from 12 noon to 12 noon the next day. The person who first proposed it was Dr. Aloysius Lilius of Napoli-Italy and was approved by Pope Gregory XIII, on February 24, 1584. The calendar year is based on the Gregorian year which was created because the Julius calendar was considered inaccurate, because of the the onset of spring (March 21) was advanced so that the celebration of Easter, which had been which had been agreed upon since the Council of Nicea I in 325 was no longer precise in date and month.

The Gregorian calendar refers to the position of the sun relative to the vernal equinox (Aries constellation point)[148]. While the traditional Nias annual calendar refers to the position of the *Sara*[149] *Wangahalö* Star for agricultural activities.[150]

The constellation Orion[151] was known in various ancient civilizations. The Javanese saw Orion as resembling a rice plow (Waluku), the Sumerians said it resembled a sheep, the Egyptians considered it the form of Osiris (the God of Death) carrying a staff

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Paus Gregory at the suggestion of Claphius made corrections to the current the calendar that was in effect at that time, namely by cutting 10 days by ordering the next day. ordered that the next day no longer read Thursday Pahing, October 5, 1582 AD. Instead, it was read on Friday Pahing, October 15, 1582 M. See: Slamet Hambali, *Almanak Sepanjang Masa*, (Semarang: Program Pascasarjana IAIN Walisongo Semarang, 2011), 35-38. And Suryadi Siregar, *Gerak dan Posisi Benda Langit*, (Bandung: ITB, 2012),Bab IV.4.

[148] The Solar Spring Point marks the start of astronomical spring. It occurs around March 20 in the Northern Hemisphere and September 23 in the Southern Hemisphere. Equinoxes are averaged over a specific date. While the true equinox is the intersection of the ecliptic with the true (instantaneous) equator, which is the equator affected by Nutation. See: Jean Meeus, *Astronomical Algorithmn*, (Richmond, Virginia: Willmann-Bell, 1991), cet.2, 137.

[149] In other book references, *Sara* is written as *Zara*, the same pronunciation as *Onozitoli*. Later, it became *Gunositoli* due to the influence of Latin into *Gunungsitoli*.

[150] Victor Zebua, *Jejak Cerita Rakyat Nias*, (Yogyakarta: Posko Delasiga, 2010),1-2.

[151] Orion will be in the Indonesian sky at dawn in July and will become visible earlier in December. In March it will be in the center of the sky at sunset. In this constellation there are three stars in a row. Those are *Mintaka, Alnilam* and *Alnitak*. Which if you extend the direction of the three stars in a row towards the West then the Qibla direction can be known. See: Ahmad Izzuddin, *Menentukan Arah Kiblat Praktis*, (Semarang: Walisongo Press, 2010),47. And see more: David A. King, *Astronomy In Te Service Of Islam*, (Great Britain: Variorum, 1993), chapter XI,1.

of command. In Nias folkloric tradition[152], the star that makes up the constellation Orion is called *Sara Wangahalö*.[153] In Nias society, the star *Sara Wangahalö* is categorized as customary folklor. According to Danandjaja, folklor consists of three groups: oral, customary and material.[154] The Three Stars are the Nias version of AlnitakAlnilam-Mintaka. While Bintang Eleven is the eleven Stars nearby, also called döfi Zara (döfi = Star, year and zara from felezara meaning eleven) aka ndröfi Sara (Sara's Star). In the Ono Niha perspective, the stars that make up the constellation Orion are representations of story characters,[155] not images of objects as imagined by the Greeks, Javanese, Sumerians and Egyptians. Because

[152] Folklore is a very important part of Nias culture.See: Ketut Wiradnyanga, *Legitimasi Kekuasaa Pada Budaya Nias: Paduan Penlitian Arkeologi dan Antorpologi*, (Jakarta: Yayasan Pusaka Obor Indonesia anggota IKAPI DKI Jakarta, 2010), 2. Folklore is traditional customs and folklore that have been passed down from generation to generation but are not recorded; or the knowledge of traditional customs and folklore that are not recorded; See: https://kbbi.web.id/folklor Accessed on Monday, 12 of Jun at 12.53.

[153] Victor Zebua, *Jejak Cerita Rakyat Nias*, (Yogyakarta: Posko Delasiga, 2010), 3.

[154] James Danandjaja, Folkor Amerika Cermin Multikultural dan Manunggal, (2003), 28.

[155] Nias people, especially South Nias, can be said to be a group of people who always use symbols in their lives. Whether it is in traditional houses, carvings of various ornaments are all related to symbols. See: Ketut Wiradnyanga, *Legitimasi Kekuasaa pada Budaya Nias: Paduan Penlitian Arkeologi dan Antorpologi*, (Jakarta: Yayasan Pusaka Obor Indonesia anggota IKAPI DKI Jakarta, 2010), 201.

the Sara Star marks the Wangahalö (agricultural) season, then she is called *Sara Wangahalö*.[156]

Nias people in villages still rely on pragmatic ways of expressing or estimating time throughout the day. These pragmatic ways of dividing time were of course linked to the daily activities that were common at that time.[157] In the Nias tribe, there is such a thing as a bright moon and a dead moon. This is usually based on the lunar cycle or phases of the moon. It consists of 30 days with the first 15 days (1 to 15) called the bright moon. The second 15 days (16 to 30) are called dead months, depending only on the first appearance of the small crescent Moon (*hilal*).[158]

The first day of the month is when the small crescent moon (*hilal*) becomes visible on the Western horizon at sunset.[159] This small crescent is called *hilal*[160] in the Hijri calendar. So, the number of days

[156] Victor Zebua, *Jejak Cerita Rakyat Nias*, (Yogyakarta: Posko Delasiga, 2010),5.

[157] Victor Zebua, *Jejak Cerita Rakyat Nias*, (Yogyakarta: Posko Delasiga, 2010), 1.

[158] Novi Arisafitri, *Sistem Penanggalan Suku Nias*, (Skripsi Fakultas Syariah & Hukum Universitas Islam Negeri Walisongo, 2021), 8.

[159] Victor Zebua, *Jejak Cerita Rakyat Nias*, (Yogyakarta: Posko Delasiga, 2010), 9.

[160] Hilal is the first visible crescent Moon after sunset after Ijtimak. The crescent that appears after Ijtimak before sunset cannot be said to be hilal. This opinion was expressed and explained by Djamaluddin that hilal is the first crescent Moon observed after maghrib. However, according to him, observing the young hilal is very

sometimes consists of 30 and sometimes 29 days like the Lunar calendar with the period of the Moon around the Earth is 29 days 12 hours 44 minutes 2.5 seconds.[161] Therefore, the calculation of the number of days 29 and 30 is also not an exact thing because the beginning of the month depends on the appearance of the Crescent Moon.[162]

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difficult, because the appearance of the very thin hilal is often disturbed by the influence of twilight / (shafa) due to the scattering of the Sun's light by the atmosphere. See: F. Fatwa Rosyadi S. Hamdani, *Ilmu Falak: Menyelami Makna Hilal Dalam Al-Qur'an*, (Bandung: Pusat Penerbitan Universitas/ P2U,2017), 4.

[161] Ahmad Izzuddin, *Sistem Penanggalan*, (Semarang: CV. Karya Abadi Jaya, 2015), 66.

[162] Novi Arisafitri, *Sistem Penanggalan Suku Nias*, (Skripsi Fakultas Syariah & Hukum Universitas Islam Negeri Walisongo, 2021), 8.

In addition to relying on the phases of the Moon, traditional Nias society also uses the circulation of the Orion Star (Sara Wangahalö) as a star to mark the agricultural season. So, the traditional Nias calendar system or what is commonly referred to as the Ndröfi sara calendar (Sara Wangahalö Star Year) includes a lunisolar calendar which is a combined calendar between the Sun and the Moon where the turn of the Moon is based on the Synodic cycle (the time it takes from one new Moon to the next new Moon, 29 days 13 hours long) and once every few years an additional month (Intercelacy Month) is inserted so that the calendar is equal to the length of the tropical cycle of the Sun. But uniquely, this calendar does not have the name of the month for a cycle of 29 or 30 days, there are only the names of the days, they call it the Moon. So the course of a lunar cycle is based on the phases of the Moon that continue for 30 or 29 days.

Traditional Nias people do not recognize the name of the day of the week so they do not have a weekly calendar. The names of their days have a duration of a calendar month (monthly calendar). Thus, the essence of a day in the traditional Nias monthly calendar is a date. The calendar is useful mainly for determining good days and bad days, days that are considered to provide coolness, luck and happiness.[162] As for naming the months in the current Gregorian calendar, they use the Nias language in accordance with the numerical designations in the Nias language.See on Victor Zebua, *Jejak Cerita Rakyat Nias*, (Yogyakarta: Posko Delasiga, 2010), 11.

2. Batak Calendar

Batak is one of the ethnic groups in Indonesia. Based on data from the Central Bureau of Statistics in accordance with the results of the 2010 population census, it was found that the Batak tribe is the fourth largest tribe in Indonesia based on its population. This tribe is a group of social units from the sub-tribal part of the Batak tribe community in the North Sumatra area. This Batak sub-tribe consists of Batak Toba, Batak Dairi/Pakpak, Batak Karo, Batak Simalungun, Batak Angkola and Batak Mandailing.[163]

The Batak calendar system is one aspect of Batak culture that is used to determine the times of religious and traditional activities in the Batak tribe commonly called *Parhalaan*. *Parhalaan* is a Batak language term that means calendar. Parhalaan comes from the word *hala* which means Scorpion, which is a venomous animal.[164]

Since ancient times Batak people have been interested in astrology and astrology. They recorded this knowledge on bamboo, bone and bark. *Parhalaan*

[163] Aris Ananta, *Demography of Indonesia's Ethnicity* (Singapura: Institute of Shoutheast Asian Studies, 2015).

[164] Arwin July Butar Butar, *Etno Arkeo Astronomi* (Surabaya: Media Sahabat Cendekia, 2019), 34.

on bamboo is called *Bulu Parhalaan*, on bone is called *Holi Parhalaan* and on bark is called *Pustaha Parhalaan*.[165] Since thousands of years calendars have been created by their creators, according to the patterns and systematics that underlie them.

Almost all activities of the Batak people in the past were determined based on Parhalaan. And this activity in detail organized by the division of hours, days and months. month. The activities include parties marriage, harvesting, building a house, birth, health, and others. In reality this calendar has more of a religious or belief function rather than for civil purposes.

This is related to the meaning of the use of Perhalaan, as a means of knowing the schedule of activities to be carried out. mainly used for religious ceremonies organized by the Malim religion.[166] This is commonly known as a *"good day"* or specifically in the Batak tribe known as "*Panjujuron Ari"*.

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[165] A.M Lubis et al., *Kalender* Peramalan *Batak* (Medan: Kanwil Depdikbud, 1985), 35.

[166] Etymologically, *Malim* is a group or a number of clean and holy potions. Meanwhile, according to the term, *Malim* religion is an encounter between humans and Debata through offerings that are clean again holy (*dalan pardomuan ni hajolmaon tu Debata marhite palian na ias*).See: Ibrahim Gultom, *Agama Malim Di Tanah Batak* (Jakarta: Bumi Aksara, 2010), 198.

In practice, the Batak people calculate the day by looking at the patterns of celestial bodies, especially circulation of the Moon around the Earth, the Sun and the stars. This observation is done repeatedly so as to produce numerical conclusions *Parhalaan* is associated with life. According to Batak's own ancestors, the mapping of celestial bodies was based on years of observation and continued to be tested for accuracy.

The Batak calendar has one 30-day month and one year equals 12 months. While in one year 360 days. Uniquely, the number of days in one month (30 days) is not based on numerical order, but each has its own day name. The names of these days are *artia, suma, anggara, muda, boraspati, singkora, samirsa, antian ni aek, suma ni mangadop, anggara sampulu, muda ni mngadop, boraspati tinangkop, singkora full moon, samirsa full moon*, and so on.[167]

The beginning of the year or called *bona ni taon* can be determined when the constellation Scorpio (*sihala poriama*) rises on the eastern horizon and the constellation Orion (*sihala sungsang*) sets on the

[167] A.M Lubis et al., *Kalender Peramalan Batak* (Medan: Kanwil Depdikbud, 1985), 37.

western horizon.[168] When a very thin crescent moon is seen at sunset to the north of Orion before it sets on the western horizon, it is the beginning of the new year of the Batak calendar. Fourteen days later the full moon rises on the eastern horizon and takes up a position north of the constellation Skorpio. It is from the Skorpio constellation (*hala/kala*) that the Batak calendar takes its name, *Parhalaan*. Calendar diagrams with 12 months and 30 days are often carved on bamboo segments. In each month there is a picture of a *hala* that occupies 3-4 days. In the first month the the full moon on the 14th day is still close to the Scorpio, while in the following months the full moon moves further away from the constellation.[169]

3. Jawa Calendar

[168] The first day of the month is called *bona ni bulan*, usually occuring on the day of the dead moon. As in other parts of Nusantara, the new day begins at sunset. Observations can be made with the naked eye after sunset because the intensity of the crescent moonlight which is still very thin is very dim compared to sunlight. Because, the Batak people did not yet have adequate tools to witness the turn of the New Moon and the knowledge of the Batak people in the past could not determine the position of the moon mathematically, the beginning of the month was determined by observation. There are similarities in this calendar with other lunar calendar systems, such as the Hijriyah calendar.

[169] Fadly Rahmadi, *Sistem Penanggalan Perhalaan Suku Batak Dalam Perspektif Astronomi*, (Skripsi Fakultas Syariah & Hukum Universitas Islam Negeri Walisongo, 2022),114-115.

Islam brought the Hijriyah calendar, which is based on the circulation of the moon, Sultan Agung[170] with his creative ijtihad integrated and preserved the two calendars with traditions and syar'i demands.[171] The number way of the Saka year in progress was used as a benchmark for the beginning of the calculation of this calendar, while the age of the moon refers to the hijriyah calendar system.[172] This decision was followed by Sultan Abdul Mafakhir Mahmud Abdul Kadir (1569-1651) of Banten, so the Saka

[170] After the arrival of Islam, the Saka calendar was replaced by the Javanese Islamic calendar which was first coined by Sultan Agung Ngabdurrahman Sayidin Panotogomo Molana Matarami (1613-1645) from Mataram. He is a Muslim with the Kejawen belief, which is an Islamic religion that has acculturated with the culture and beliefs of the Javanese people who were previously Hindu-Buddhist. See more on Hikmatul Adhiyah Syam, "The Essentiality Of The Nusantara Traditional Calendar", *Al-Hilal: Journal of Islamic Astronomy*, Vol. 3, No. 1, 2021

[171] According to Sultan Agung's history, the acculturation of the Javanese Islamic calendar was motivated by the desire to harmonize the day of the traditional grebeg ceremony (grebeg ceremony is a procession carried out by Hindus to worship the spirits of their ancestors. After the the Islamization of Kejawen, the garebeg ceremony was preserved by revising the with prayers in Islam which are held in conjunction with Islamic holidays. with Islamic days) with Islamic days, those are the month of Ramadan, Eid al-Fitr, Eid al-Adha, and Maulid Nabi. See on Siti Marhamah, Kalender Jawa Islam Sultan Agungan di Kesultanan Yogyakarta. (thesis, Universitas Islam Negeri Walisongo Semarang,2022). See another the reference on Irma Rosalina, "Penyesuaian Penanggalan Saka Dengan Penanggalan Hijriyah dan Aplikasinya Dalam Penentuan Awal Bulan Qomariyah", (Skripsi, UIN Maulana Malik Ibrahim Malang, 2013), 19.

[172] Hudi, Implementasi Penanggalan Jawa Islam Sistem Aboge Dalam Upacara Ritual Di Desa Sukodono Tahunan Jepara, *Isti'dal: Jurnal Studi Hukum Islam*, Vol. 3 No. 1, 2016. Acessed on https://ejournal.unisnu.ac.id/JSHI/issue/view/125

calendar system was no longer used and replaced with the Islamic Javanese calendar.[173]

There are similarities and differences in the Hijriyah calendar system and the Islamic Javanese calendar. The similarity of these two calendars is a system that refers to the circulation of the moon when orbiting the earth so that the Islamic Javanese calendar is also commonly referred to as the Javanese calendar *chandrasang kala*, while the difference is that one year in the hijriyah calendar is 354 days 8 hours 48 minutes or 354 11/30 days, while the Javanese calendar is 354 days 9 hours or 354 3/8 days.

Javanese Islamic calendar determines that the turn of the day at the turn of the month with the exact time of the comma is at sunset (between 17.00 - 18.00), while the turn of the day at the turn of the month in the hijriyah calendar is determined through hilal and ruqyah point the difference between the hijriyah year and the Javanese year is a difference of

[173] According to Ronggowarsito, the beginning of the Javanese Islamic calendar began on Saturday Pahing. This refers to the year Sunan Giri II formulated the calendar in the year 1443 Saka. Meanwhile, according to historians, the Javanese Islamic calendar, which Sultan Agung initiated began in 1555 Saka, which was the beginning of the year which fell on *Legi* Friday. Ronggowarsito explained that the Javanese use a five-day cycle, which is a typical Javanese day cycle. See more on Hikmatul Adhiyah Syam, "The Essentiality Of The Nusantara Traditional Calendar", *Al-Hilal: Journal of Islamic Astronomy*, Vol. 3, No. 1, 2021

3 days point but now only a difference of 1 day because according to the determination of the solo palace has been exceeded 2x1 days, in 1674 and 1748 Javanese year.[174]

4. Sunda Calendar

One of the sinking and missing calendar, that has not received attention from academics is the Sundanese calendar. Many Sundanese people in West Java do not know about the Sundanese calendar. The Sundanese calendar (*kalangider*) or what is called *Kala Sunda* is a calendar that was believed by the Sundanese people in ancient times.[175]

According to a member of Dewan Pakar Bengkel Studi Budaya (BESTDAYA Foundation) Supardiyono Sobirin explained in general, that the Sundanese calendar is divided into three types, *Suryakala Saka Sunda*, *Candrakala Caka Sunda*, and *Sukrakala Saka Sunda*. *Suryakala Saka Sunda* (Solar

[174] Basically, both years are leap years that are designated as basitah years. Therefore, the difference between the Javanese year and the Hijri year is only 1 day. Ali Mas'udi, *Penentuan Awal Bulan Kamariah Menggunakan Sistem Aboge dan Implementasinya : Studi Kasus Di Desa Sukolilo Kecamatan Sukolilo Kabupaten Pati*, (Skripsi IAIN Walisongo, 2014), 69.

[175] Hazmirullah, "Kalender Sunda dan Revisi Sejarah", https://artshangkala.wordpress.com/2009/09/02/kalender-sunda-dan-revisi-sejarah/ Accessed on Tuesday, 12 Jun 2023 at 18.54.

System), *Candrakala Caka Sunda* (Lunar System), and *Sukrakala Saka Sunda* (Luni-Solar System). [176]

Suryakala Saka Sunda is usually used for agriculture, which coincides with the Gregorian calendar. Candrakala Caka Sunda is usually used for life, religion, can also be the ebb and flow of sea water. And Sukrakala Saka Sunda is combined with the position of the stars that we see or more precisely with time markers, usually this is also used to plant rice in Ciptagelar village, Sukabumi West Java. By filling a bamboo with water to measure the height of the waluku star. The waluku star usually appears in the western part, it is used to find out the right planting season, you can also put rice seeds in the palm of your hand and then directed to the waluku star.[177]

But if in the book entitled "Kalangider" by Ali Sastramidjaja explains that the Sundanese calendar system has a little uniqueness compared to the calendar in general. If the calendar in general only uses one of the systems such as lunar and solar or combining the two into lunisolar, then the Sundanese

[176] Hendro Susilo Susodo, Kalender Sunda Mulai Dilirik Para Peneliti, dalam History dan Culture Nusantara

[177] Supardiyono Sobirin, "Wanoh Jero Kana Kalender Sunda dalam Pranata Lingkungan Hidup Tingkat Intelektual Suatu Bangsa Terletak pada Keakuratan Kalender", Live Zoom, (Bandung, Sunday 10 of Mei 2020).

calendar uses both systems, namely solar (kala saka Sunda) and lunar (kala caka Sunda). The two systems are both used in the Sundanese calendar without merging like the lunisolar system.[178]

5. Tengger Calendar[179]

The Tengger tribe has its own calendar that is different from the usual calendar. The calendar is used to determine various farming activities to traditional ceremonies such as marriage ceremonies, weddings and others. The Tengger tribe when doing activities, they take into account the right times to do them. When doing activities such as planting rice, they see whether today is a good day to plant rice or not, if it is not on a good day, it is expected that the harvest will fail. They strongly believe that if the activity is not carried out on a good day, then what is expected does

[178] In the Sundanese astronomical sukra kala saka dating system, the fall of the rice planting season is determined by the appearance of the Kidang (Orion) star in the first week of October. Determination of the fall of the rice planting season is determined by the disappearance of Kidang (Orion) in early January, the disappearance of Kidang (Orion) is commonly referred to as "Kidang ilang turung Kungkang" which means "Kijang (Orion) disappears, then down comes the pest (plant disease). See on Ali Sastramidjaja, *Kalangider, Jilid I*, (Bandung, 1990), 3.

[179] The Tengger tribe is a tribe that occupies Taman Nasional Bromo Tengger Semeru (TNBTS) area in East Java. The Tengger tribe lives on the slopes of the mountain. The Tengger tribe is one of the tribes that still exists today. The Tengger tribe lives in four districts, starting from Lumajang, Malang, Pasuruan, and Probolinggo. Capt. R.P. Suyono, *Mistisisme Tengger*, (Yogyakarta: Lkis Yogyakarta, 2009), 26.

not happen. This makes the Tengger people inseparable from their calendar.

In Tengger calendar in one year there are 12 months, including *Kasa, Karo, Katelu, Kapat, Kalimo, Kanem, Kapitu, Kasongo, Kasepoloh, Desta*, and *Kasada*.[180] Every month there is a *mangsa* or *season* which certainly affects the lives of the Tengger people, especially in agriculture. In a week the Tengger calendar has different naming days in each week, here are some terms in the Tengger Sadwara / Paringkelan calendar where in one week there are six days, including *Aryang, Wurukung, Paniron, Uwas, Mawulu,* and *Tungle*.

In determining the calendar, the Tengger Tribe uses the circulation cycle of the sun and the moon or commonly referred to as surya candra permana, so it is a Lunisolar calendar. We can see this from the determination of one month, which is equal to the synodic moon cycle of 29 or 30 days. or 30 days. While in determining the year, it is the same as one teropian year of 365 days. In its calculations, the Tengger calendar uses the Hisab / Arithmetic

[180] Shidqi Irba Dan Dwi Nikmah Puspitasari, "Perhitungan Dan Makna Waktu Bagi Suku Tengger Di Desa Ngadas, Bromo", Seminar Nasional & Call For Paper: Psikologi Indigenous Indonesia, 2016, 141.

method[181], but they do not use the method of observation or observation of celestial objects. So, Tengger calendar is a systematic calendar based on detailed calculations. Tengger traditional leaders or commonly referred to as *Dukun Pandhita* in calculating the calendar must be very careful, because if there is an error in the calculation it will have an impact on chaos in the customs activities of the Tengger Tribe.[182]

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[181] Hisab is a mathematical and astronomical calculation to determine the position of the moon in determining the beginning of the month. See: Muhyiddin Khazin, *Kamus Ilmu Falak*, (Yogyakarta: Buana Pustaka, 2005), 30.

[182] The interesting thing about the Tengger calendar is the *Mecak* system. *Mecak* is useful for determining when the full moon falls and when the *tilem* or dead moon falls. *Mecak* is when one day has two dates. This happens because of the difference in calculations between the circulation of the Sun and the Moon. This system is what distinguishes the Tengger calendar from other calendars. *Mecak* is used to determine the traditional ceremonies of the Tengger people. Because the calculation uses a formula, so that the Tengger people can immediately determine which date the *mecak* will occur. With this *Mecak* system, the Tengger people can make a calendar for the next 120 years. *Mecak* has three groupings or commonly called *sengker*. *Mecak* starts from *wuku Sungsang Buda* day (Wednesday) and market Pon, and ends also until it returns to *wuku Sungsang Buda* day (Wednesday) and pasaran Pon. The cycle repeats three times, when it reaches the last cycle, it's called *Nemu Gelang*.

Because of this *mecak* system, there are months that have excess dates. So to replace the excess, in the Tengger calendar every five years an insert month is added, so that there is a year consisting of 13 months. But even though there are additional months to 13 months, it is still calculated 12 months by counting two months into one month. The additional months occur in the months of *Kadestha, Karo*, and *Kelima*. Because there are 13 months, according to customs, a ceremony is held to remove 1 month, that's the *Unan-Unan* ceremony. This ceremony is carried out by the Tengger Tribe once every 5 years, not only to remove 1 month, this method is also done to purify themselves and also to eliminate evil influences. Read on Maftukhah Ihtiyati, *Perspektif Astronomis Sistem Penanggalan Kalender Tengger dan Manfaatnya Dalam Peribadatan Umat Hindu*, (Skripsi Fakultas Syariah & Hukum Universitas Islam Negeri Walisongo, 2021),8.

6. Dayak Wahea Calendar[183]

The Wehea Dayak calendar system provides many benefits in their lives. This calendar is a time reference used by the Dayak community in carrying out farming activities, hunting and other related activities such as the implementation of traditional ceremonies.[184] The Wehea Dayak calendar is mostly used for farming activities because the majority of the Wehea Dayak people work as farmers and they spend their time farming in the forest, or hunting in the forest while other activities are only additional activities in their lives.

The Wehea Dayak calendar system has its own name for the date with the name of the moon which actually applies according to the physical form of the moon from the smallest which is almost invisible to

[183] The Dayak Wehea tribe is one of the Dayak sub-tribes in East Kalimantan, located in Muara Wahau, East Kutai Regency. Dayak Wehea is spread across six villages, namely Nehes Liah Bing Village, Long Wehea Village, Diaq Leway Village, Dea Beq Village, Diaq Lay Village, and Bea Nehas Village. The Wehea Dayak still use the dayak calendar in their lives. The Wehea Dayak community's life which is still dependent on nature makes the Wehea Dayak calendar still used in life. The Dayak Wehea dating system uses references to the phases of the moon caused by changes in the relative positions of the Moon, Sun, and Earth. Read on Danang Endarto, *Kosmografi*, Yogyakarta: Penerbit Ombak, 2014), 354.

[184] Inyo Yos Fernandez*, Penanggalan Peladangan Dayak Bahau di Kalimantan Timur dan Lamaholot-Flores Timur di Nusa Tenggara Timur Tinjauan Kearifan Lokal Antar Budaya*, (Yogyakarta, 2008), 104

the full form that can be seen with the eyes.[185] The naming of the moon in the Dayak Wehea calendar uses repetition of words up to three times in accordance with the phases of the moon from the beginning of the new moon to the full moon and from the full moon to the dead moon. The naming of the month is used as a date by the Dayak tribe so they do not use numbers in dates. However, they also do not say now is the date but say now is the month. The names of the months according to the Dayak Wehea tribe are *Mailih, Mes liet, Cepkeal Laneng, Cepkeal Welguak, Cepkeal Lawet, Kelang Laneng, Kelang Welguak, Kelang Lawet, Seb bling laneng, Seb bling Welguak, Seb bling Lawet, Seb bling laneng, Seg loh wel guak, Seg loh Lawet, Keslih guak*.[186]

The naming of the month is adjusted to the shape of the moon that day and adjusted to the needs of the Dayak community. Naming the month is also very influential in birth for the Dayak community. In births they do not mention the date of birth but

[185] Inyo Yos Fernandez, *Penanggalan Peladangan Dayak Bahau di Kalimantan Timur dan Lamaholot-Flores Timur di Nusa Tenggara Timur Tinjauan Kearifan Lokal Antar Budaya,* (Yogyakarta, 2008), 104.

[186] Nur Robbaniyah, *Sistem Penanggalan Suku Dayak Wahea Kalimantan Timur Dalam Perspektif Ilmu Falak dan Astronomi*, (Skripsi Fakultas Syariah & Hukum Universitas Islam Negeri Walisongo, 2018),8.

mention the name of the month of birth. In determining the month until now there is no specific reference that explains in detail. The existing explanation only discusses the naming of the month.[187]

Dayak's calendar is a lunar system because in determining the date the Dayak tribe uses the movement of the moon. In fact, the Dayak people determine the beginning of the month sometimes by observing the new moon, but moon observations are not only carried out at the end of each month. Moon observations are always carried out in the 29th month and every few days before traditional activities. It's only observed by certain people.[188]

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[187] Inyo Yos Fernandez, *Penanggalan Peladangan Dayak Bahau di Kalimantan Timur dan Lamaholot-Flores Timur di Nusa Tenggara Timur Tinjauan Kearifan Lokal Antar Budaya*, (Yogyakarta, 2008), 106.

[188] The Wehea Dayak calendar does not recognize the number of years. This calendar also does not follow other calendars in determining the number of years. Therefore, until Wehea Dayak calendar has never been mentioned. The beginning of the calendar is also unknown, making it difficult to make observations and trace when the the beginning of the Wehea Dayak calendar.

The Wehea Dayak calendar system also does not have a number of months consisting of a collection of days. This is because according to the Dayak Wehea tribe, they do not need a Months that consist of a collection of days. The month that applicable in this calendar is a month that changes every day. So, one month is worth one day, or it can be said that the month in Dayak calendar is the same as the date in other calendar. This calendar also has no day names or not recognizing days such as Monday, Tuesday, Wednesday does not exist in the Dayak Wahea calendar. See Nur Robbaniyah, *Sistem Penanggalan Suku Dayak Wahea Kalimantan Timur Dalam Perspektif Ilmu Falak dan Astronomi*, (Skripsi Fakultas Syariah & Hukum Universitas Islam Negeri Walisongo, 2018),10.

7. Sasak Calendar

Sasak tribe is the people who inhabit the island of Lombok in the Nusa Tenggara (Sunda Kecil) chain of islands. The main livelihood of the Sasak people is farming in the fields (*lendang*) or in the rice fields (*subak*). In addition, there are also hunting, fishing and making woven items.[189]

The Sasak people in ancient times saw the movement of the Sun using a measuring instrument made of a wooden board called *Warige*. *Warige* is a board that contains the movement of the Sun, Moon, and Stars. The calculation of the Sasak calendar is influenced by the movement of the Sun, Moon and Stars. The Sasak calendar system is called Rowot Sasak.

The Sasak calendar (Rowot) is a traditional calendar of the Sasak tribe developed and guided by the Sasak people to this day. The Sasak community guides the calendar as a reference for organizing gawe (celebration), *betaletan* (farming), seasonal division, dragon direction, and *wuku* (the influence of the position of constellations on events on the earth's

[189] Zulyani Hidayah, *Ensiklopedi Suku Bangsa Di Dindonesia*, (Jakarta: yayasan Pustaka Obor Indonesia, 2015), 218.

surface).[190] The purpose of the formation of the Sasak calendar (Rowot) currently in the form of a wall calendar is to make it easier for people to read the Sasak calendar which originally in the form of a *Warige board*. The *warige board* at first glance, if you pay attention to the symbols that exist, it is complicated to be read and understood by beginners and ordinary people. In general, this board is used to find good days and for celebrations.[191]

8. Maluku Calender[192]

The people of Saparua Island have a calendar system related to waters, specifically in the form of a traditional boat making process. Saparua Island is a small island in the Central

[190] Lalu Ari Irawan dkk., *Mengenal Kalender Rowot Sasak*, (Mataram: Genius, 2014), 2.

[191] Heri Zulhadi, *Sistem Penanggalan Adat Bau Nyale Sasak Dalam Perspektif Astronomi*, (Tesis Fakultas Syariah & Hukum Universitas Islam Negeri Walisongo, 2019),1-2.

[192] Maluku is known as the Thousand Islands. Maluku is also categorized as an archipelago province with 92.4% sea area and 7.5% land area of its total area. In other words, the Maluku sea area is about 12 times its land area. Read Reny H. Nendissa, "Eksistensi Lembaga Adat Dalam Pelaksanaan Hukum Sasi Laut Di Maluku Tengah," Jurnal Sasi 16, No. 4 (2010).

Maluku region, about 50 miles from Ambon, the capital city of Maluku.[193]

The people of Saparua Island specifically use ancient astronomical calculations to build traditional boats. This ancient astronomical calculation system is known as *tanoar* (calculation of good times or days) which is enshrined in a guidebook,[194] the nats. Nats are

[193] Arwin Juli Rakhmadi Butar-Butar, *Astronomi*, (Surabaya: Media Sahabat Cendekia, 2019),48.

[194] Meanwhile in Negeri Soya, tanoar is used in determining the timing of the implementation of the Cuci Negeri. Negeri (typical Ambonese-Maluku Tengah term for village) Soya is in the Sirimau sub-district, Ambon City, Maluku Province. Geographically, it is located in the mountainous region of Sirimau with an altitude of about 464 meters above sea level, about 6 km from the center of Ambon City. Negeri Soya correlates with the Soya kingdom in the past, which was the forerunner to the birth of Ambon City. This is because Negeri Soyais one of the oldest customary government areas in Ambon and Maluku.

Cuci Negeri Soya tradition is a phenomenal tradition common among the people of Maluku and especially the people of Ambon. This is proven by the establishment of Cuci Negeri Soya customs as an Intangible Cultural Heritage by the government of the Republic of Indonesia through the Ministry of Culture and Tourism, on 20 October 2015. Through its 12 stages, Cuci Negeri Soya tradition is carried out by articulating various expressions of cultural order. Examples include their traditional ritual practices, the symbols they use, the underlying myths, musical performance, dance, language and food, to the hybrid religiosity that colors them. As a fact, the encounter between adatist beliefs and beliefs of modern religions, especially Christianity.This tradition is carried out in places that are considered sacred by the local community, one of which is in certain locations around Mount Sirimau.

This tradition has a background story related to the myth of a dragon that swallows youth. Then, regurgitated it after five days in the stomach of the dragon. With the essence as renewal, the process of circulation of life requires cleansing oneself from the environment. As Roland Barthes suggests that myth is a form of message (signification method). Furthermore, this is part of the communication

written by hand. In the book, there are time standards based on the type of animal, moon and stars. This book is a guide and is owned by every boat maker.

Research shows that the Saparua people have certain astrological calculations when making traditional boats by counting the number of full moons. Tanoar is done when choosing wood for the boat. Astronomical calculations are made based on the full moon, the number of times the moon is light and the number of times the moon is dark. Based on these calculations, it can be seen the strength of the wood used to make boats. If the wood is taken at the wrong month, the wood will be eaten by termites. However, it is necessary to use wood from special trees planted by the local community.[195]

system, which wraps a meaning in a sign system, in the form of stories, pictures, writings, etc. Ferry Nahusona, *Tradisi dan Kebudayaan Nusantara* (Semarang: Lembaga Studi Sosial dan Agama (eLSA)Press, 2019), 2. Read more on Hikmatul Adhiyah Syam, The Essentiality Of The Nusantara Traditional Calendar, *Al-Hilal:Journal Of Islamic Astronomy*, Vol 3, No 1 (2021).

[195] Arwin Juli Rakhmadi Butar-Butar, *Astronomi*, (Surabaya: Media Sahabat Cendekia, 2019),49.

CHAPTER III
THE BADUY'S CALENDAR TRIBE

A. The Baduy's Geography

Baduy's tribe is part of the Sundanese community[196] who still lives side by side. About 5,000 Baduy people live in the mountains 150 km west of Jakarta.[197] The inhabited area by the Baduy tribe is recognized as *tanah ulayat*.[198] The Baduy tribe is still one of the icons of Banten Province until now.[199]

The Baduy area of Desa Kanekes is located at approximately latitude 6° 27' 27"-6° 30' North and longitude 106° 3'9"-106° 4' 5" East. Geologically, the Baduy area is composed of young limestone, covered with thin humus. A 43 general feature of the geology of the Banten region is the lack of volcanoes to provide lime, magnesia, iron, potassium, and

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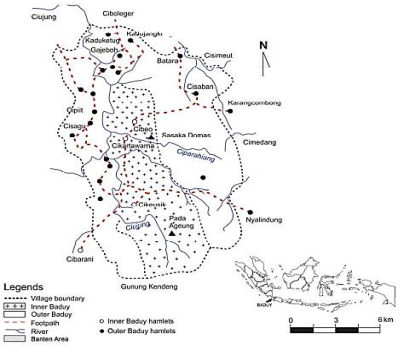
[196] Apri Subagiyo, *Mengenal Suku Bangsa Di Nusantara (Mengenal Suku-Suku Di Indonesia)*, (Jakarta Timur: CV. Indradjaya, 2017), 23.

[197] Jatna Supriatna, *Melestarikan Alam Indonesia,* (Jakarta: Yayasan Obor Indonesia, 2008), 39.

[198] Tanah ulayat is land whose highest control lies with certain customary law communities as a common property area. By customary law, this communal land is handed over to the management and utilization of each existing tribe. This custom has been going on for generations, so the status of customary land is highly recognized. This is as explained in Pasal 3 Undang-Undang Pokok Agraria (UUPA) which gives recognition to the existence of customary rights in national land law. See Arina Novizas Shebubakar, Marie Remfan Raniah, "Hukum Tanah Adat/Ulayat" Program Studi Magister Ilmu Hukum, Pascasarjana Universitas Al azhar Indonesia, Vol. IV No. 1 January, 2019, 15.

[199] Apriyanto Dwi Santoso, *Pesona Wisata Banten*, (Surakarta: PT. Aksarra Sinergi Media, 2018), 48.

phosphoric acid. For this reason, it poses particular problems in conducting effective agriculture.[200]



Picture 3.1

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[200] Mohr, E.J.C. 1945. The relation between soil and population density in the Netherlands Indies. In Science and scientists in the Netherlands Indies, P. Honig and F.Verdoord (eds). New York: Board for the Netherlands Indies, Surinam and Curacao, 257.

The land designated through Peraturan Daerah Kabupaten Lebak No. 32 2001, with area 5.136,58 h. Geographically, Baduy Village is located in 6^0 27' 27"(- 6^0 30') LS and 106^0 3' 9"-106^0 4' 5" BT. Based on its culture, Baduy area can be divided into two main groups, namely Inner Baduy (Baduy Jero, Baduy Dalam) and Outer Baduy (Baduy Luar, Baduy Panamping). Inner Baduy consists of 3 permanent hamlets (*dusun*), Cikeusik, Cikartawarna, and Cibeo, while Outer Baduy consists of 59 villages. The villages are scattered along the valley near the Ciujung river and its tributaries, or near other water sources, at an altitude of between 170 m and 410 m above sea level. Administratively, the entire area of the Baduy tribe is included in Kanekes village, Leuwidamar sub-district, Lebak regency (kabupaten), Banten province (province), Indonesia (Picture 1). Therefore, the Baduy people themselves prefer to refer themselves as *urang Kanekes*. See Johan Iskandar dan Budiawati S.Iskandar, Ethnoastronomy-The Baduy agricultural calendar and prediction of environmental perturbations, *Jurnal Biodiversitas* Vol. 17, Number 2, October 2016, 698. Another more Saleh *Danasasmita* dan Anis *Djatisunda*., *Kehidupan masyarakat Kanekes*, (Bagian Proyek Penelitian dan Pengkajian Kebudayaan Sunda (Sundanologi), Direktorat Jendral Kebudayaan, Departemen Pendidikan dan Kebudayaan, 1986). See more Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998).

Location of Baduy Tribe Area Kanekes Village, Leuwidamar Sub-district, Lebak District, Banten [201]

The main river flowing through the area is the Ciujung. The upstream is located in the forest area of Gunung Kendeng, south Cikeusik hamlet in Inner Baduy, where a sacred place called Area Domas is found. The river flows in a northerly direction from Cikeusik passing the Outer Baduy hamlets of Cisadane, Batubeulah and Gajeboh, downstream to Rangkasbitung, Serang and eventually into the north Java. 'Sungai Ciujung' has many cultural functions for the Baduy, such as bathing, washing and fishing, while downstream it has been used for irrigation, fishing, bathing, for sand, and as a navigable river using bamboo rafts.[202]

Topographically, the Banten[203] regency can be divided into two zones: a lowland coastal zone and a highland zone. the lowland coastal zone is located in north Banten, the former core area of both the Pajajaran Kingdom and the Sultanate of Banten. In this area the elevation ranges between 0 to 200 m

[201] Nurhadi Rangkuti, *Orang Baduy Dari Inti Jagat*, (Jakarta: Bentara Budaya, 1988).

[202] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 44.

[203] Banten province is a division of the province of West Java. Banten Province is one area that is quite large, especially the forest area, namely the total forest area itself is around 282,105, 64 ha. The forest area includes 8% protection forest, 27% production forest and 65% conservation forest, by having a hilly and wavy topography with an average soil slope of 45%, which is volcanic soil (in the north), sedimentary soil (in the middle), and mixed soil (in the south). Hakiki, K. M., Identitas Agama Orang Baduy, *Al-Adyan: Jurnal Studi Lintas Agama*, 6(1), 2011. 63-64.

above sea level; the soil is rather poor compared with that of the plain between Cirebon and Japara or in the Solo and Brantas delta, due to lack volcanoes in the upstream of south Banten.[204] In the lowland, wet rice fields (sawah) predominate.

The highland zone or *"daerah pegunungan"* (in the past, combined with the Priangan area, and called the Sunda area by Geertz), is located in southern Banten, including the region of Pandeglang and Lebak. Until relatively recently this area was predominantly forest and very thinly populated.[205] The main form of agriculture was swidden cultivation (huma).[206] It is in this area that the Baduy are located. Topographically, the area consists of moderately steep to very steep hill and mountain, and forms a ridge-and- valley complex.

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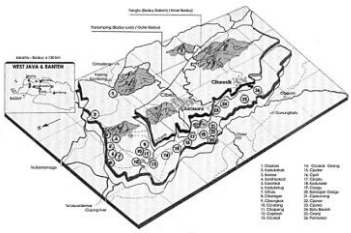
[204] Clifford **Geertz**, *Agricultural Involution: The Processes of Ecological Change In Indonesia,* (Berkeley and Los Angeles: University of California Press, 1963), 42-43.

[205] Mohr, E.J.C., *The Relation Between Soil and Population Density In The Netherlands Indies. In Science And Scientists In The Netherlands Indies,* P. Honig and F.Verdoord (eds). (New York: Board for the Netherlands Indies, Surinam and Curacao, 1945), 257.

[206] Kools, J.F., Hoema's, *Hoemablokken en Boschreserves in de residentie Bantam*, (Wageningen: H.Veenman & Zonen, 1935)



Picture 3.2
The Location Map of the Baduy Tribe[207]

B. The Baduy's History

Since the early nineteenth century various names have been given by scholars to the traditional Sundanese minority who live in the area of 'Desa Kanekes': urang Baduy (Baduy people), urang Rawayan (Rawayan people), urang Kanekes (Kanekes people), and urang Parahiang (Parahiang people) (Kruseman, 1888; Jacobs and Meijer, 1891; Penning, 1902; Pleyte, 1909; Van Tricht, 1929; Geise, 1952). It has been variously suggested that these names are derived from rivers (Cibaduy, Cikanekes, Ciparahiang), religion (Budha), mountains (Gunung Baduy), the distinctive bamboo bridge (Rawayan), or even from the Arabic Badoewi, Badu or Badaw, meaning nomadic desert people.[208]

Although the Baduy tribe have appeared in the scholarly literature for a long time, the history of this

[207] See Ethnoastronomy-The Baduy Agricultural Calendar and Prediction Of Environmental Perturbations, *Biodiversitas Journal*, Volume 17, Number 2, October 2016.

[208] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998).

community is still not clear. There are three main opinions regarding the origin of the Baduy tribe. First, they are descendants of people who managed to escape from the Hindu kingdom of Pajajaran (near Bogor)[209] before the Islamic forces of the Banten Sultanate destroyed it in 1579 AD.[210] Second, they are descendants of Hindus who originally lived in Banten but then fled to present-day Kanekes from the Islamic forces of the Banten Sultanate.[211] Thirdly, based on ancient

[209] The beginning of the exile occurred when the Banten region was controlled by Sunan Gunung Jati who brought the mission of spreading Islam. A number of people led by Prabu Pucuk Umun chose to flee to the south of Java (Banten), leaving their royal palace called Megah. On the run for many days, the group then arrived at the upper reaches of the Ciujung River in the heart of the Kendeng Mountains. The place is now referred to as Panembahan Arca Domas or Petak 13 (this location is a restricted and closed area). See on *Potret Kehidupan Masyarakat Baduy*, (Banten: Cipta Pratama, 1987).

[210] The first version states that the early history of the existence of Baduy community originated from Padjajaran kingdom. Around the 12th and 13th centuries AD, Pajajaran kingdom controlled the whole Pasundan land, including Banten, Bogor, Priangan to Cirebon area. At that time, the Kingdom of Padjajaran was ruled by a King named Prabu Bramaya Maisatandrama or better known as Prabu Siliwangi. known as Prabu Siliwangi. When there was a battle around the 17th century AD between the kingdom of Banten and the kingdom of Sunda. The Sunda kingdom which was then led by Prabu Pucuk Umun (a descendant of Prabu Siliwangi) suffered a heavy defeat. Because of that, Perabu Pucuk Umun with some of his retainer Umun with some of his courtiers fled to the inland forest area. inland forest area. From here then they settled down and developed into a community that later referred to as the Baduy tribe. Read on Uten Sutendi, Kearifan Hidup Orang Baduy, Damai dengan Alam, Kota Tangerang Selatan: Media Komunika, BSD City, 2010, 9.

[211] In contrast to the first opinion, the Baduy community does not originate from the remnants of the fleeing Padjajaran kingdom, but the indigenous people of the area who have a strong resistance to outside influences. This opinion is almost the same as the opinion believed by the Baduy community themselves who say that they are the chosen community who are given a task by the king, to carry out mandala (a sacred area) in the kebuyutan area (ancestor worship place) Jati Sunda or Sunda Asli or Sunda Wiwitan, which is now inhabited by the Baduy community. See more

Sundanese texts, they are descended from a group of ascetics who lived in a sacred part of the forest in pre-Islamic times.[212]

The difference of opinion makes some observers of Baduy tribe suspect that in the past their identity and history were deliberately closed, as an excuse to protect Baduy community itself from the attack of Padjajaran and Banten enemies. These three opinions are indeed difficult to combine because each of them (Baduy community and historian) has their own reasons that each other considers to be right. Therefore, the wise step is to give the difference of opinion as an interesting and unique historical reality.[213]

Baduy is a term given by outsiders. It started from the Dutch researchers who equated them with the Badawi Arab group or Bedoin Arab, which is a nomadic wandering tribe. Another possibility of the name Baduy tribe is due to the presence of Baduy River and Baduy Mountain in the northern

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Lukman Hakim, *Baduy Dalam Selubung Rahasia*, (Banten: Biro Humas dan Protokol Setda Provinsi Banten, 2012), 33.

[212] Edi S. Ekadjati, *Kebudayaan Sunda: Suatu Pendekatan Sejarah*. (Jakarta: Pustaka Jaya, 1985). See more **Robert** Wessing **et Bart** Barendregt, *Tending The Spirit's Shrine: Kanekes and Pajajaran In West Java*. (Moussons, 2005), 8: 3-26.

According to historical records, based on the synthesis process of discovery of inscriptions, folklore travel records about Sunda Tatar, the existence of the Baduy itself is associated with the existence of the kingdom, which before its collapse in the 16th century was centered in Pakuan Pajajaran (around Bogor today). Read on Lukman Hakim, *Baduy Dalam Selubung Rahasia*, (Banten: Biro Humas dan Protokol Setda Provinsi Banten, 2012), 47.

[213] Kiki Muhammad Hakiki, Identitas Agama Orang Baduy, *Al-Adyan*, Vol. VI, No. 1/Jan-Juni/ 2011, 86-91.

part of their area. Or they are also called *'rawayan'* people because when they walk together by *ngarawayan*, walking one after the other backwards.[214]

Based on the aforementioned versions, they agreed that the Baduy people are runaways from their place of origin. Thus, both versions reject the assumption that Kanekes area is the origin place of Baduy community. This confusion and unclear origin of Baduy community actually lies in the closedness of Baduy community itself. According to them, the origin of Baduy community life is taboo to be revealed. The beliefs and legends that develop also tend to leave their history. Their assumption that the past is the same as the present makes Baduy community relatively has no clear historical evidence.[215]

Since the 1980s, with the introduction of a government identity card (KTP) for some Outer Baduy, the status Sunda Wiwitan was formally recorded as their religion. Since that time they have accepted their designation as Baduy.[216] The full range of names used by outsiders to

[214] Deny Riana, *Jelajah Wisata Budaya Negeriku Provinsi Banten*, (Bandung: CV. Angkasa, 2021), 28. See more Nurul Akhmad, *Ensiklopedia Keragaman Budaya*, (Semarang: ALPRIN, 2019), 92-93. See Asep Ruhimat dkk, *Ensiklopedia Kearifan Lokal Pulau Jawa, Banten*, (Solo: PT Tiga Serangkai Pustaka Mandiri, 2020), 16.

[215] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998).

[216] Garna, J. 1993. Masyarakat Baduy di Banten Selatan. In Masyarakat terasing di Indonesia, Koentjaraningrat (ed). Jakarta: Gramedia Pustaka Utama, 120.

designate Baduy include: urang Baduy, urang Kanekes, urang Rawayan, urang Baduy dalam, Urang Tangtu or Baduy jero (particularly for Inner Baduy), urang Baduy luar or urang Baduy panamping (Outer Baduy), urang Cibeo (if they come from Cibeo hamlet), urang Cikeusik, urang Cikartawarna, urang Kaduketug, urang Kadujangkung and various other local names based on places of origin. In addition, Baduy are also called urang tonggoh (hill or mountain people), urang girang (upstream people), particularly by the neighbouring moslem community, who on the whole live in the lowlands. Conversely, the moslem community are called by Baduy: urang are (valley people), urang landeuh (low land people) and urang islam (moslem people).[217]

Along with the course of their history, they are a group of people who in their daily lives are not familiar with the culture of writing, until now adat has prohibited them from formal schooling, they do not have complete genealogical records of their descendants and ancestors. All matters relating to customary law, the stories of their ancestors and their beliefs are passed down and passed on to their children and grandchildren orally and by choice (all information and details relating to customary law, the history of their ancestors, their

[217] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998), 91.

beliefs and tribal secrets are not given to all descendants, but to descendants who are considered to have the ability to secure and save their tribe). This has led to a lack of historical sources that can be used as a reference in investigating their origins. However, behind all of this is actually a condition deliberately created by their ancestors so that their tribal secrets are preserved and difficult to trace.[218]

C. The Baduy's Lifelyhood

Picture 3.3
The Baduy Tribe's Gate [219]

[218] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 19-20.

[219] *See Saatnya Baduy Bicara, (Jakarta: Bumi Aksara, 2010)*

The Baduy tribe is one of the ethnic groups known for its unique customs and culture.[220] Despite living together in society, the Baduy tribe still upholds their traditional customs[221] and isolate their tribal life.[222] Protection of customs and traditions as a way of prospering life for the Baduy tribe.[223] So the life of Baduy community is closed from various changes and civilizations exist apart from their own culture.[224]

In April 2015, the number of heads of households had reached 3,395; in Baduy Dalam, there are 308 heads of households. If at least each household head needs half a hectare to farm, this year will need 1,697.5 Hectares of wasteland, in Baduy Dalam needs 154 Hectares.[225] In 2017, the total population of Baduy was recorded as 11,699 people

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[220] Erwinantu, *Saba Baduy: Sebuah Perjalanan Wisat Budaya Insiratif*, (Jakarta: PT. Gramedia Pustaka Utama, 2012), 1.

[221] Yulia Nursetyawathie, dkk. *Khazanah Keunikan Bumi Jawa, Banten,* (Solo: PT Tiga Serangkai Pustaka Mandiri, 2020), 27.

[222] Bagja Waluya, *Sosiologi: Menyelami Fenomena Sosial di Masyarakat,* (Jakarta: PT. Grafindo Media Pratama, 2007), 50.

[223] Kun Maryati dan Juju Suryawati, *Sosiologi: Jilid 3*, (tt, Esis: tth), 24. Lihat juga Budiaman, Ahmad Mukrim, Urman Maulana, Muhammad Nova Firdaus, dan Muhammad Ilham Tachril, *Dilema Transformasi Kearifan Lokal Masyarakat Adat Baduy,* (Depok: Rajawali Pers, 2020).

[224] Indra Karisman, *Tradisi Perkawinan Masyarakat Suku Baduy Lebak Banten (Studi Terhadap Rukun Hirup Dalam Masyarakat Adat Suku Baduy),* (Jakarta: Skripsi Program Studi Hukum Keluarga Fakultas Syariah & Hukum UIN Syarif Hidayatullah, 2019), 1.

[225] Kholil Lur Rochman, et.all, Ngahuma (Planting Rice In The Fields) And Tilled Land Limitation Of The Baduy Tribe In Indonesia, *GeoJournal of Tourism and Geosites*, Year XIV, vol. 34, no. 1, 2020, 66.

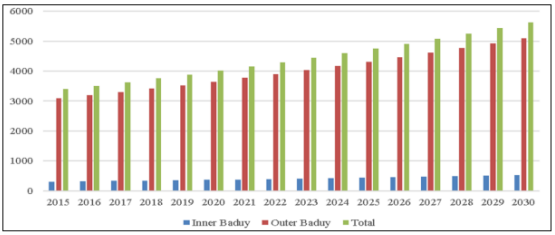
(5,911 males and 5,798 females) representing 3,413 households. The population was dominated by Outer Baduy people with a total of 10,488 people (89.64 %) and the rest were Inner Baduy people recorded as 1,211 people (10,36%) (Statistics of Kanekes village 2017). The Baduy population has increased over time. For example, in 1888, the Baduy population was recorded as 1,476 people, whereas in 2017, it was recorded 11,699 people (Tabel 3.1).[226]

No.	Year	Time Period (Year)	Population (People)	Change in Number of People
1.	1988-1908	20	1,476-1,547	71
2.	1908-1928	20	1,547-1,521	-26
3.	1928-1966	38	1,521-3,935	2414
4.	1966-1969	3	3,935-4,063	128
5.	1969-1980	11	4,063-4,057	524
6.	1980-1983	3	4,057-4,574	517
7.	1983-1984	1	4,574-4,587	13
8.	1984-1986	2	4,587-4,850	263
9.	1986-1994	8	4,850-6,483	1633
10.	1994-2000	6	6,483-7,317	834
11	2000-2008	8	7,317-10,941	3624
12.	2008-2010	2	10,941-11,172	231
13.	2010-2015	5	11,172-11,620	448
14.	2015-2017	2	11,620-11,699	79
15.	1988-2017	129	1,476-11,699	10,233

[226] Budiawati Supangkat Iskandar, Johan Iskandar, and Ruhyat Partasasmita, Strategy of The Outer Baduy Community of South Banten (Indonesia) to Sustain Their Swidden Farming Traditions By Temporary Migration To Non-Baduy Areas, *BIODIVERSITAS* ISSN: 1412-033X Volume 19, Number 2, March 2018, 456.

Tabel 3.1
The Population of Baduy over the period 1888 to 2017 [227]

Currently, in 2019 the number of heads of households has more than 3,500. It means that this year needs wasteland to be cultivated into a Huma is 1,750 hectares. The difference if the need for one year's wasteland is 53 hectares. Simultaneously the arable land area of ± 2,136.58 hectares in the Ulayat area continues to be used as a new settlement and currently (2019) has reached 67 villages. Baduy Dalam residents are prohibited from a farm outside of Baduy Dalam ulayat land. The area of arable land and for Baduy Dalam residents based on their claim is not more than 700 hectares for three villages because 3000 -hectare land has been pegged as "Leuweung Kolot" that can not be used for farming (Tabel 3.2).



Tabel 3.2

[227] Budiawati Supangkat Iskandar, Johan Iskandar, and Ruhyat Partasasmita, Strategy of The Outer Baduy Community of South Banten (Indonesia) to Sustain Their Swidden Farming Traditions By Temporary Migration To Non-Baduy Areas, *BIODIVERSITAS* ISSN: 1412-033X Volume 19, Number 2, March 2018, 456.

Estimated Growth of Baduy Household 2015-2030 (BPJS, 2019)[228]

The main livelihood of the Baduy people is farming in *huma* (fields), which cannot be *"separated"* from rice.[229] *Huma*'s location is the outside the settlement, and it's on the outskirts of the forest.[230] The *huma* is farmed by all family members. During the cultivating season (7-9 months), they spend more time in the *huma*. All harvests each season are put into the *leuit* (granary). Rice in *leuit* is generally taken as a provision for old age when they are incapable to plant again. In particular circumstances (death, wedding, or circumcision), the rice may take from the *leuit*. To eat, they buy with the

[228] Kholil Lur Rochman, et.all, Ngahuma (Planting Rice In The Fields) And Tilled Land Limitation Of The Baduy Tribe In Indonesia, *GeoJournal of Tourism and Geosites*, Year XIV, vol. 34, no. 1, 2020, 66.

[229] tp, Masyarakat Baduy Desa Kanekes, Lewidamar Lebak, Banten, (Yogyakarta: Program Studi Pendidikan Geografi, FISE UNY, 2011),10.

The main livelihood of Baduy community is dry land rice farming. The cultivation system is shifting cultivation with a fallow period (resting the land) for 5 years. Side livelihoods while waiting for harvest time are making handicrafts from bamboo or bark, looking for rattan, pete, ranji, fruits and honey, hunting, making roofs from leaves, making agricultural tools such as machetes, kored, and so on. Baduy women, besides helping their husbands in the fields, their spare time activities are weaving using simple tools that they make themselves. For Baduy-Luar, besides these activities, other livelihoods are tapping sap to make sugar, farming seasonal plants such as coffee and cloves, planting sengon wood, trading, and becoming a laborer. The work they do is solely to fulfill their needs and they are prohibited from overproducing. See Gunggung Senoaji, Pengelolaan Lahan Dengan Sistem Agroforestry Oleh Masyarakat Baduy Di Banten Selatan, *Jurnal Bumi Lestari*, Volume 12 No. 2, Agustus 2012, 285.

[230] Suparmini, Sriadi Setyawati, dan Dyah Respati Suryo Sumunar, Pelestarian Lingkungan Masyarakat Baduy Berbasis Kearifan Lokal, *Jurnal Penelitian Humaniora,* Vol. 18, No.1, April 2013, 15.

money from the sale of sugar or fruit. In addition to marketable crops, they plant various crops in their fields to fulfill their daily needs. In addition, the Baduy people produce honey and make sugar for sale.[231] So do fruits from *huma.* Then they produce their handicrafts (such as bracelets, waist bags, belts, koja and jarog (bags); all made from wood fiber) to be sold. It's because the influence of migrants entering their area.[232]

No.	The Kinds of Leuit	Outer Baduy	Inner Baduy
1.	Leuit For Each House	1.2 ± 0.6	1.6 ± 0.5
2.	Leuit Size	3.8 ± 2.1 (m)	3.3 ± 1.5 (m)
3.	Leuit Capacity	796 ± 702 (Rice Bundle)	590 ± 303.5 (Rice Bundle)
4.	Inside of Leuit	457 ±672 (Rice Bundle)	415 ± 276.9 (Rice Bundle)

Tabel 3.3
Statistics of Leuit (rice barn) in Baduy [233]

The food availability of Baduy community is maintained because they generally have leuit (granary). From Table, it can be seen that most Baduy households have one granary, and a small number of them have two or more

[231] Nurul Akhmad, *Ensiklopedia Keragaman Budaya,* (Semarang: ALPRIN, 2019), 94.

[232] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 2.

[233] Ali Khomsan and Winati WignaSosio-Budaya Pangan Suku Baduy (Socio-Cultural Aspects Of Food Of Baduy Tribe), *Jurnal Gizi dan Pangan*, Juli 2009 4(2):68.

granaries. Traditional communities such as the Baduy tribe still maintain the ownership of this granary because they generally rely on the subsis- tence of basic food provision from their own agricultural products. At the time of direct research (2008), the average granary in Outer Baduy contained 457 bundles of paddy and 415 bundles in Inner Baduy. The paddy stored in the granary is mainly to fulfill their own household needs. In Muslim Baduy, there is no granary; the storage of rice in Muslim Baduy is in sacks.[234]

Picture 3.4
Rice Barn (Leuit) Baduy Kanekes Tribe[235]

Irrigated rice cultivation was first introduced and established during the Banten Sultanate, and was of three kinds: sawah laid out at the command of the sultan or his appanageholder or royal domain (sawah negara), sawah

[234] Ali Khomsan and Winati WignaSosio-Budaya Pangan Suku Baduy (Socio-Cultural Aspects Of Food Of Baduy Tribe), *Jurnal Gizi dan Pangan*, Juli 2009 4(2):68.

[235] See Pelestarian Lingkungan Masyarakat Baduy Berbasis Kearifan Lokal, *Jurnal Penelitian Humaniora,* Vol. 18, No.1, April 2013.

granted to officials, relatives, and personal favourites of the sultan (sawah ganjaran), and sawah opened up by employing compulsory service attached to 'pusaka land' (sawa jasa).[236]

Most of the Outer Baduy people have jobs as farmers (98.6% for husbands and 90.7% for wives) as in the table. Other occupations are trading and weaving (especially for wives), because it can be done at home while taking care of children. There are not many types of work done by Baduy people because their life is still fully relying on natural resources. Likewise, for Inner Baduy, even 100% of their work is as a farmer because their domicile is far away in the interior area so there is no choice of work, if there is a trade, it is only one or two people and always done by migrants. For Muslim Baduy, there are more variations in the type of work. Besides being a farmer, there are also those who work as teachers, laborers or housewives. By custom, Muslim Baduy is not considered as Baduy people, so Muslim Baduy is like other villages in Indonesia.

No.	Jobs	Outer Baduy				Inner Baduy			
		Husband		Wife		Husband		Wife	
		n	%	N	%	n	%	n	%
1.	Farmer	275	98.6	175	90.7	10	100	2	20
2.	Trader	1	0.4	6	3.1	0	0	0	0.0

[236] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 20-22.

3.	Weaver	1	0.4	12	6.2	0	0	0	0.0
4.	Others	2	0.8	0	0.0	0	0	0	0.0

Tabel 3.4
Distribution of Husband/Wife in Outer Baduy, Inner Baduy, and Muslim Baduy by Occupation[237]

The livelihood of Baduy people is farming by planting rice. Rice can only be planted on dry land without irrigation called huma. Rice may not be sold and must be stored properly for daily use. Besides ngahuma, Baduy people also farm to get additional food ingredients. The types of plants they grow are fruits such as durian, banana, coconut, and corn as well as tubers such as cassava, taro, and yam. They get seeds from generation to generation, which is from the previous harvest that is replanted.[238]

Apart from farming, each family also raises chickens, with an average number of more than 5. The chickens are risen in the yard and under the house. Raising chickens is not for their consumption, but for sale and parties or ceremonies. They abstain from raising livestock other than chickens.[239]

[237] Ali Khomsan and Winati WignaSosio-Budaya Pangan Suku Baduy (Socio-Cultural Aspects Of Food Of Baduy Tribe), *Jurnal Gizi dan Pangan*, Juli 2009 4(2):65.

[238] Ali Khomsan and Winati WignaSosio-Budaya Pangan Suku Baduy (Socio-Cultural Aspects Of Food Of Baduy Tribe), *Jurnal Gizi dan Pangan*, Juli 2009 4(2):65.

[239] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 20-22.

Picture 3.5
Various Sides of Baduy Kanekes Community Settlements [240]

D. The Baduy's Belief

The basis of the Baduy religion is respect for the spirits of their ancestors and belief in one power, *Batara Tunggal*.[241] Orientation, concepts, and religious activities are

[240] *See Saatnya Baduy Bicara*, (Jakarta: Bumi Aksara, 2010)

[241] The concept of Batara Tunggal is the concept of divinity in monotheistic religion, because Baduy people believe that human life and destiny are governed by something powerful and abstract, which they call Batara Tunggal (Adimihardja, 1976, p.51). According to GA. Kruseman (1976) who has written about Baduy, Eenige dagen onder de Badoewis suggests that Baduy people believe that Batara Tunggal is of human origin, lives like the Baduy people and then dies in ngahiang (disappears). Baduy people also believe and believe that their ancestors and also Puun (traditional leaders) are direct descendants of Batara Tunggal. As explained above, that the Sunda Wiwitan religion emerged simultaneously with the birth of the Padjadjaran kingdom in West Java, so that the Sunda Wiwitan religion is a religion adhered to by the Sundanese in West Java, while the Baduy are a sub-Sundanese ethnic group. See Michrab, H., *Sejarah Perkembangan Arsitektur Kota Islam Banten: Suatu Kajian Arsitektur Kota Lama Banten Menjelang Abad XVI Sampai Dengan Abad* XX. 1 ed. (Jakarta: Yayasan Baluwarti, 1993), 9.

aimed at pikukuh (adat). The Baduy people are tasked with bringing prosperity to the world through tapa (deeds, work) and pikukuh with the principle "If Kanekes as the core of the universe, it's always well cared for, then all life in the world will be prosperous." Therefore, they are referred to as Animists, worshiping the spirits of their ancestors.[242]

Baduy people believe they are direct descendants of Adam. They are tasked with prospering the world through asceticism and pikukuh with the principle that if Kanekes as the core of the universe is always well maintained, then all life in the world will be safe and prosperous. That is, this discourse formulates the Baduy, as themselves who are bound to their ulayat land, as the core of the world that they must protect. They are not outside their territory, because life outside their

After the defeat of the Padjadjaran Kingdom in the war against the Islamic sultanate in Banten, they called themselves the Baduy tribe with a religion and belief that they believed was the Sunda Wiwitan religion. Later, the Sunda Wiwitan religion was mixed with Islam, because they lost the war against the Islamic sultanate of Banten so that they became part of the Islamic sultanate in Banten. This is even though their religion is influenced by Islam but in daily practice they still believe in their old beliefs. So, the basic beliefs of the Baduy people, ranging in the form of beliefs before Islam are animistic, although in the practice of religious life today there are also influences from Buddhism, Hinduism and Islam. See Halwany Michrab, &. A. Chudari., *Catatam Masa Lalu Banten*, (Serang: Saudara, 1989), 12 and Sodikin, Understanding the Concept of Sunda Wiwitan Religion in the Baduy Community in Indonesia Related to Environmental Management, *International Journal of Social Science and Education Research Studies*, Volume 02 Issue 12 December 2022.

[242] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 57-58.

territory is not their obligation. By occupying their territory as the core of the universe and the Baduy as the heirs of Adam.[243]

Their belief is a religion entered by the elements of Hinduism and Islam. According to their admission and recorded on the resident card, the religion adopted by the Baduy people is the Sunda Wiwitan religion.[244] Wiwitan means first start, origin, principal, and teak. The Baduy believe the Prophet Adam as their direct ancestor and claim them to be the oldest community in the world. They are a group of descendants from the first human sent down by Allah to earth as a single Adam, then the *ulayat land* they now

[243] Salma Qowiyatun Naziaha and Holy Rafika Dhonab, Islamic Discourse and Baduy in Tanah Ulayat Kanekes: Contestations and Connections, Asian Journal of Media and Communication E-ISSN: 2579-6119, P-ISSN: 2579-6100 Volume 5, Number 1, April 2021, 75.

[244] The Sunda Wiwitan religion is a sect of worship of natural forces and ancestral spirits which is commonly called animism and dynamism. Sunda Wiwitan is believed to be the 'religion' of the Sundanese people in the past, which later became a religion attached to the Baduy tribe. The next development, the Sunda Wiwitan religion cannot be separated from the concept of monotheism because there is a supreme power, namely Sang Hyang Kersa which is equated with God Almighty. This study analyzes the concept of Belief in the Baduy customary law community related to environmental management as part of their belief. The orientation, concept, and practice of the Sunda Wiwitan religion is only aimed at pikukuh for the welfare of life in the world. The highest power that until now is believed to be the spirits of ancestors who when cared for will give strength both physically and mentally to their descendants. For this reason, Baduy people until now consider worship to their ancestors so sacred or they call them karuhun. Karuhun is a strict customary provision in the form of taboos (pamali) that must be followed by all communities. The karuhun is related to the natural surroundings that should not be damaged, so that environmental management is an order of the Sunda Wiwitan religion. Sodikin, Understanding the Concept of Sunda Wiwitan Religion in the Baduy Community in Indonesia Related to Environmental Management, *International Journal of Social Science and Education Research Studies*, Volume 02 Issue 12 December 2022.

occupy is also believed to be the initial ground for the single Adam to descend to this earth. Then, they consider that area to be the core of the Universe and the forerunner of human existence on this earth. All of these beliefs are what they call the Sunda Wiwitan religion.

In their opinion, the Sundanese Wiwitan religion is specifically teaching only for their ethnicity, not outsiders. This religion believes in the existence of Gusti Allah with his prophet Adam, and other prophets as his brothers. The Prophet Muhammad is a prophet who completes the teachings, particularly in this world. In the Sunda Wiwitan diving belief, several creeds are known, including the shahada of the Prophet Muhammad. The shahada in the Sundanese Wiwitan teachings is a series of sentences or prayers or *jampe-jampe* which are specifically read and conveyed to the natural writer by the needs, activities, and problems, pronounced with any manners.[245] This teaching does not recognize an order to have prayers but do fasting. This teaching does not have a holy

[245] The shahada of Urang Kajeroan are: Asyhadu syahadat sunda (Asyhadu Syahadat Sunda), jaman Allah ngan sorangan (Allah is only one), kaduanana Gusti Rosul (second, the Prophets), ka tilu Nabi Muhammad (third, Prophet Muhammad), ka opat umat Muhammad (fourth, the people of Muhammad), nu cicing di bumi angaricing (who lives in a crowded world), nu calik di alam keueung (who sits in the realm of fear), ngacacang di alam mokaha (exploring in the realm of lust), salamet umat Muhammad (congratulations to Muhammad's people), See Wahid, M., Sunda Wiwitan Baduy; Agama Penjaga Alam Lindung di Desa Kanekes Banten, The paper on Seminar Internasional Annual Conference on Islamic Studies (ACIS) Ke-10, Banjarmasin: ACIS, 2010.

book like other religions. It's preaching to residents and their descendants through oral narratives and examples.[246]

E. The Baduy's Calender

The knowledge of the Baduy tribe about space and time, cannot be separated from elements of religion, used to find safety, and fortune, determine good and bad days, and so on. All activities of their daily life, especially those related to farming, are carefully calculated based on their trust. So, when unwanted things happen, they are ready to deal.[247]

The Baduy people call this period of time, one week, *Sajumahat*. Regarding the 24-hour time shift, the Baduy community divides the time in detail in Sajumahat using a benchmark, even though it is not acknowledged in accordance with a specific clock. The community divides the time into distinct day and night segments using a benchmark. A night

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[246] Masykur Wahid, *Sunda Wiwitan Baduy:Agama Penjaga Alam Lindung Di Desa Kanekes Banten*, IAIN Sultan Maulana Hasanuddin Banten.

[247] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 110 - 111.

The Sunda Wiwitan religion was actually born after the Padjadjaran kingdom in West Java which was then followed by the emergence of an Islamic sultanate in the Banten region (into the West Java region), but the origin of the Baduy religion is not widely known. The belief of the Baduy people is very respectful and afraid of their lelembut (ancestral spirits). They think that the spirits of their ancestors (lelembut) are the ones who cause and revive all kinds of things that exist, while the noblest among the lelembut is the "Batara Tunggal". According to their belief, the spirit or the lelembut is located in the south of the village, which is near the Ciujung and Cisimeut springs, the place they named the "Arca Domas" place. AS, M., *Kehidupan Suku* Baduy,1 ed. (Bandung: Rosda Karya, 1986), 18.

and a day. The three basic periods of a day and night are *peuting* (evening), *beurang* (afternoon), and *isuk-isuk* (early morning). Each time period and its own term provide additional details about the division. The majority of the terms are equivalent to those found in Sundanese. are essentially the same as Sundanese language terms. The following are various time terms used by Baduy tribe community.[248]

No.	Terms	Explanations	Times
1.	Carangcang Tihang	Waktu Sahur/Fajar	04.00-05.00 WIB
2.	Sabarabayna	Matahari Terbit	06.00 WIB
3.	Tengah Naek	Duha Time	08.00-09.00 WIB
4.	Ngarangsang	Into The Midday	10.00-11.00 WIB
5.	Tangange	Mid-Day	12.00 WIB
6.	Poe Lohor	Zuhur Time	12.00-13.00 WIB
7.	Lohor Kolot	Zuhr to Asr	13.00-15.00 WIB
8.	Asar Awal	Into The Asar	15.00-16.00 WIB
9.	Asar	Asar Time	16.00-17.00 WIB

[248] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 126.

10.	Poe Umpang-Umpang	Into The Sunset	17.00-18.00 WIB
11.	Magrib	Magrib Time	18.00 WIB
12.	Isya	Isya Time	19.00 WIB
13.	Sadugna	Wait for Sleepiness	20.00 WIB
14.	Saleureuhna	The Bed Time	21.00 WIB
15.	Recak-Racak	Wake & Sleep	22.00 WIB
16.	Tengah Peuting	Middle Night	23.00-02.00 WIB
17.	Kongkorongok Hayam	Cock Crowing	03.00 WIB

Table 3.5
Times in Baduy's Calendar[249]

As in the general calendar, one week or what is commonly called as saptawara in Baduy's calendar consists of 7 days. The names of days in the Baduy calendar are Ahad, Senen, Selasa, Rebo, Kemis, Jumahat and Sabtu.[250] The names of pasaran in the Baduy's calendar are Pahing, Pon, Wage, Kaliwon and Manis.[251]

Each month in the Baduy calendar consists of 30 days. After passing 12 months, it will accumulate into one year. The names of the months in the Baduy community calendar are

[249] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 158-161.

[250] Siska Wulandari, Hari Baik dan Buruk Menurut Kalender Pertanian Baduy, *ICoSLaw* (International Conference on Sharia and Law State Islamic University of Sunan Ampel Surabaya), Agustus 2022, 197.

[251] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 116.

Kapat/Safar/Sapar, Kalima, Kanem, Katujuh/Kapitu, Kadalapan, Kasalapan, Kasapuluh, Hapit Lemah, Hapit Kayu, Kasa, Karo, and Katiga/Kapitu.[252]

Since there are only 30 days in each month, the number of days in one year in the Baduy calendar is 360 days. There is a difference day between the Baduy calendar and the tropical year (Gregorian calendar). This difference is not included in the previous year or the next year, which is called ngawagekeun. This ngawagekeun event does not happen every year and the number of days that are diwagekeun is not always fixed depending on the decision of the customary meeting.

In addition, the Baduy community does not use numbers as a reference for the year in their calendar. Every year in the Baduy calendar system is represented by a name and its symbol. The following is the name of the year in the Baduy tribe's calendar and its symbol.[253]

No.	The Year's Names	Symbols
1.	Alif / Alip	Buffalo
2.	He / Ehe	Shrimp
3.	Jim / Jim Awal	Scorpion

[252] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 112-116.

[253] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 158-161.

4.	Je	Crab
5.	Dal	Deer
6.	Be	Spider
7.	Wau / Wawu	Dragon
8.	Dim / Jim Akhir	Gold Fish

Tabel 3.6
The Year's Names in Baduy's Calendarand The Symbols [254]

After passing 8 years, then it will enter the wind cycle in the calendar of the Baduy. As the seven-based calculation system used by the Baduy community. This calculation consists of Windu (1 Windu = 8 years), Padalung (1 Padalung = 7 Windu), Margasana (1 Margasana = 7 Padalung), and Sareat (1 Sareat = 7 Margasana). Then the result is added with 500 years as the epoch[255] of Baduy tribe's calendar (Baduy tribe people call it as the pioneering period or world improvement).

[254] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 158-161.

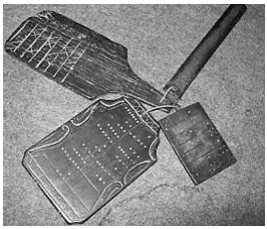
[255] Epoch is a term often used in the computer science and mathematics. In general, epoch can be defined as the starting point or zero point in a time or calculation system. Epoch can also refer to a specific period of time in the history or development of something. In calendar, epoch can be defined as the starting point of a system of organizing time. See https://rifqimulyawan.com/kamus/epoch/ Accessed on Saturday, September 9, 2023 at 20.11 WIB. Every calendar has an epoch or starting date. This date is virtually never the date the calendar was adopted but rather a hypothetical starting point for the first day. For example, the Gregorian calendar was devised and adopted in the sixteenth century, but its epoch is January 1, 1. Because days begin at different hours on different calendars, we follow the convention that a calendar's epoch is the onset of the civil day (the mean solar day, beginning at midnight) containing the first noon. See Edward M. Reingold and Nachum Dershowitz, *Calendrical Calculations (The Ultimate Edition)*, (United Kingdom: University Printing House, Cambridge CB2 8BS, 2001).

Picture 3.7
The Baduy's Calendar [256]

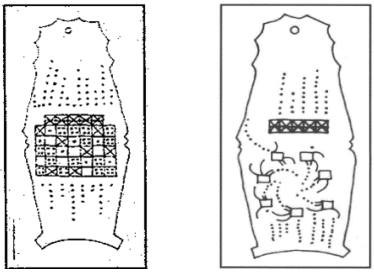
The Baduy people keep track of time using a device known as Kolenjer and Sastra. Kolenjer is constructed from a tiny, 6 by 25 cm board with a hole punched in it to indicate the formation of a picture or box with nontransparent dots and lines. holes as an indicator in the shape of opaque dots and lines to create a picture or box.[257]

[256] Asep Kurnia dan Ahmad Sihabudin, *Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010).

[257] Although the Kanekes community has undoubtedly been using kolenjer for a very long time, there are currently no precise historical documents pertaining to the date of the community's initial recognition of it. This makes perfect sense because kolenjer has evolved into a science or instrument that influences the Kanekes community's day-to-day existence. The Kanekes community values knowledge of kolenjer just as much as society does, and both are dependent on the Gregorian calendar. See Irvan Setiawan, *Kolenjer, Sistem Penanggalan Tradisional Masyarakat Baduy*, Kolenjer, Sistem Penanggalan Tradisional Masyarakat Baduy - Balai



Picture 3.8
The Baduy's Kolenjer [258]



(i) **(ii)**

Picture 3.9
The Baduy's Kolenjer
(i) The Baduy's Day Kolenjer & (ii) The Baduy's Pasaran Kolenjer[259]

According to Chapter 1 Article 1 (Regarding Terminology) of Kaneker Village Regulation No. 1/2007, issued by the Government of Lebak Banten Regency, the kolenjer is an indigenous calendar or calendar system that has

Pelestarian Nilai Budaya Jawa Barat (kemdikbud.go.id) accessed on Thursday, 23rd of November 2023 at 19.54 WIB.

[258] Siska Wulandari, Hari Baik dan Buruk Menurut Kalender Pertanian Baduy, *ICoSLaw* (International Conference on Sharia and Law State Islamic University of Sunan Ampel Surabaya), Agustus 2022, 198.

[259] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 114-115.

been utilized by the Kanekes community for generations. A calendar tool called Kolenjer can be used to find the dates of *naptu*, *naptu poe*, and *wanci*.

In terms of fortune-telling, kolenjer serves three purposes that relate to the different varieties of kolenjer: (1) kolenjer indit-inditan, which is used to decide which day and which direction to travel; (2) kolenjer durujana, which is used by victims of theft; and (3) kolenjer bajo, which is used to harm or destroy other people. The Kanekes people keep the use of kolenjer bajo a secret.

Despite not being able to recognize numbers, Baduy society can recognize numbers that are committed to memory together with their corresponding values, as follows:

No.	Days	Scores	Names
1.	Ahad	Lima (Five)	Hadma
2.	Senen	Opat (Four)	Nenpat
3.	Selasa	Tilu (Three)	Salu
4.	Rebo	Tujuh (Seven)	Bojuh
5.	Kemis	Dalapan (Eight)	Mispan
6.	Jumahat	Genep (Six)	Manep
7.	Saptu	Salapan (Nine)	Tupan

Tabel 3.7
The Number of Days in Baduy's Calendar [260]

[260] Siska Wulandari, Hari Baik dan Buruk Menurut Kalender Pertanian Baduy, *ICoSLaw* (International Conference on Sharia and Law State Islamic University of Sunan Ampel Surabaya), Agustus 2022, 199.

No.	Pasaran	Scores	Names
1.	Pahing	Dalapan (Eight)	Papan
2.	Pon	Opat (Four)	Ponpat
3.	Wage	Tujuh (Seven)	Wajuh
4.	Kaliwon	Salapan (Nine)	Wonpan
5.	Manis	Lima (Five)	Nisma

Tabel 3.8
The Number of Pasaran in Baduy's Calendar [261]

Besides kolenjer, sastra is employed as a method to ascertain a person's activities and attitudes based on their unique set of qualities. This tool is known as the hinis or sembilu, is laced with longitudinal strokes made of bamboo. It is broken up into twenty divisions according to the Sundanese or Javanese script's alphabet (cacarakakan). The literary handle, which is represented by the lines of each space by a tiny circle, is where the initial sequence begins. The alphabet score is indicated by the alphabet's order and line count.[262]

No.	Alphabets	Scores
1.	Ha	4
2.	Na	3
3.	Ca	3

[261] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 120.

[262] Imat Sopiah, Eksplorasi Etnomatematika Pada Kepercayaan Penentuan Hari Baik Masyarakat Baduy, *Jurnal Peka (Jurnal Pendidikan Matematika)* Volume 4. No. 1. 2020, 15.

4.	Ra	2
5.	Ka	2
6.	Da	3
7.	Ta	3
8.	Sa	2
9.	Wa	4
10.	La	5
11.	Pa	2
12.	Dha	5
13.	Ja	3
14.	Ya	8
15.	Nya	9
16.	Ma	1
17	Ga	7
18.	Ba	5
19.	Tha	6
20.	Nga	6

Tabel 3.9
The Alphabetical Order and Sastra Score [263]

It is possible to determine whether or not a person's purpose and labor are appropriate to be completed based on the unique value of each alphabet. In addition to being able to be used to calculate lucky days for a task or aim, it can also be used to identify unlucky days so that individuals can avoid or not take certain activities in order to avoid the negative effects of these actions.

[263] Siska Wulandari, Hari Baik dan Buruk Menurut Kalender Pertanian Baduy, *ICoSLaw* (International Conference on Sharia and Law State Islamic University of Sunan Ampel Surabaya), Agustus 2022, 200.

In order to ascertain whether or not an intention has a chance of succeeding, good and bad days are classified according to their pasaran score and day's worth. attain success or not. For instance, if a person is born on a Thursday and with the pasaran wage intends to travel on Sunday kaliwon, whether it will be a good or bad day. [264]

The computation example then looks like this:

Kamis = 8
Wage = 7
Minggu = 5
Kliwon = 9
Total amount = (8 + 7 + 5 + 9) = 29
Then the amount is divided to 5 = 29 : 5 = 5 left 4

The residual number derived from the computation is linked to the subsequent collection below:

1 = Sri (rice)
2 = Lungguh (position)
3 = Gedong (wealth)
4 = Lara (misery)
5 = Pati (death)

The remaining four, or lara, in the computation above means wretched or misery. Therefore, it is not advisable for

[264] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 121.

the person to travel on Sunday, Kliwon, as he will experience suffering. [265]

Picture 3.10
The Baduy's Sastra [266]

Sastra is often used for the purposes. One of the purpose is for the marriage. The following is how to determine the auspicious day for marriage by locating the auspicious day:

Add one to the alphabet, then deduct the values of the names of the two couples, then add the total of the names of the couple getting married. The day the subtraction results in matches with the value of the day, which is the unlucky day for the pair. By moving the wedding to a different day, it is feasible to choose a nice day by knowing the fatal day. Santeu and Karmi are getting married, for instance. [267]

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[265] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 122.

[266] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 120.

[267] Siska Wulandari, Hari Baik dan Buruk Menurut Kalender Pertanian Baduy, *ICoSLaw* (International Conference on Sharia and Law State Islamic University of Sunan Ampel Surabaya), Agustus 2022, 201.

The computation is:
Santeu: Sa = 2, Na = 3, Tha = 6, The Amount is = 11
Karmi: Ka = 2, Ra = 2, Ma = 1, The Amount is = 5
The Amount of couple's score: 11 + 5 = 16 x + y = k … (1)
Jumlah abjad ditambah 1: 20 + 1 = 21 n + 1 … (2)
Bad day's score: 21 – 16 = 5 (n+1) – k … (3)

Sunday is the fateful day with a value of 5. Sunday is therefore Santeu and Karmi's unlucky day, and it is forbidden for them to get married on that day since the Baduy community believes it would lead to a number of problems in their married life.

One of the other used of *sastra* is for farming in *huma*. The goal of determining an appropriate day to begin work on huma activities is to prevent inappropriate behavior and minimize the huma's population. In order to prevent bad decisions and lower the risks that can result from making bad decisions, the following criteria are used to determine when it is a good time to begin working on human activities: [268]

The initial calculation's foundation is determining what will happen to the husband and wife who will engage in activities in the huma. Choose a day other than the fatal day, and then begin the activity in the huma. The second approach is predicated on the remaining amount after dividing the total

[268] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 122.

scores of the spouses by five. One considers a remnant of zero to be a remainder of one.

The computation is:

Lala: La = 5, La = 5, the amount is: 10
Raka: Ra = 2, Ka + 2, the amount is: 14
The amount of couple score is = 14
Then the amount is divided to 5 = 14/5 = 2 left 4.

Monday is the day with a value of 4, and the remaining 4 is matched with the benchmark of causing lara, or suffering. Monday is an unlucky day, thus the husband and wife should postpone their berhuma activities until later. Furthermore, the meaning of lara indicates that incorrect behaviors, such as being attacked by bugs or diseases, will prevent the huma activities from being beneficial on that day.[269]

Only experts (bujangga) are capable of using kolenjer and sastra. Ordinary Baduy people are still led by customs from their ancestral heritage that have been ingrained in daily life. One such custom is the observation of the kidang star's

[269] Siska Wulandari, Hari Baik dan Buruk Menurut Kalender Pertanian Baduy, *ICoSLaw* (International Conference on Sharia and Law State Islamic University of Sunan Ampel Surabaya), Agustus 2022, 202.

first dawn appearance on the eastern horizon, which marks the start of the year.[270]

The Baduy community has continued to use this time organizing system up to this point. Particularly in terms of belief and agricultural practices as a point in time. They are unable to perform a variety of agricultural and religious tasks without this time-organizing system. These are the used of Baduy calendar in the Baduy socity.[271]

1. Traditional Ceremonial Activities

a. Ngawalu [272]

Ngawalu means a kawalu ceremony (walu= coming back; kawalu = returning). This ceremony is a ceremony after the rice from the fields "returns" to the leuit (granary), and after all this time being at the "husband's house", at "weweg Sampeg Mandala Pageuh" (bumi = fields). Kawalu is three times a year. Those

[270] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 123.

[271] Based on my interview results with Sarmin (Ocit's father) on 28th of January 2023 at 20.35 WIB at his farming house in Baduy Dalam, Lebak, Rangkasbitung, Banten Province.

[272] Which is a ritual carried out by the Baduy people to welcome the month of Kawalu, which is considered a holy month by fasting in three months, namely the months of Kasa, Karo, and Katiga, respectively. The month is held only one day, which is devoted to the residents of the Baduy Dalam. See Abdul Syukur, et, all. Muslim Baduy: Conversion and Changing Identity and Tradition, *Jurnal Penelitian*, *Volume* 18 Number 2, 2021,186.

are kawalu tembey or first kawalu (every 17th of Kasa, the 10th month in the Baduy Kanekes calendar system), middle kawalu or second kawalu (on the 18th of Karo, the 11th month in Baduy Kanekes calendar system), and kawalu tutug or last kawalu (on 17th of Katiga, the 12th month in Baduy Kanekes calendar system). In Cikartawana there is no middle kawalu.[273]

On *kawalu* day, all adult Baduy people, including boys who have been circumcised, have to do fasting begins the night before. Especially for the residents of *Tangtu*, this fasting must begin with *Nyupah* (betel nut/inang eating) as an official banquet at the *Bale Kapuunan* meeting.

[273] Every 15th of the month of Kasa or before fasting, all Inner Bedouin must clean the environment and are prohibited from eating or processing crops. They are only allowed to grind rice in a traditional way called nutu. Jaro Saija said that the Kawalu tradition has been going on for hundreds of years and must be followed by all Inner Bedouin, men and women, young and old. Elderly people with physical limitations or menstruating women are not required to fast. Because it is obligatory, if there are Inner Baduy people who violate except for some who are not required, they will be given customary sanctions or kabendon. during Kawalu they are prohibited from holding weddings and circumcisions because it will cause crowds. Although closed to outsiders, the Inner Baduy community still allows regional officials or state officials to enter, although it is limited to only five people. Taken from www.indonesia.go.id, Indonesia.go.id - Kawalu, Ritual Penyucian Diri Suku Badui Tertutup bagi Wisatawan (Acessed on Sunday, 5 November 2023 at 20.46 WIB).

Breaking the fast on *kawalu* days is usually held in the afternoon at 17.00 in Kapuunan. [274]

b. *Muja*

The *muja* (having worship) activities are carried out at *Pusaka Buana Pusaka* or *Sasaka Pada Ageung* by *Puun Cikeusik* and *Sasaka Parahiyang* or *Sasaka Domas* by *Puun Cibeo*. In practice, the two Puuns are only accompanied by a few trusted *Baris Kolot* people who acted for and on behalf of the Baduy people. *Muja* at *Sasaka Domas* is only held one day (from morning to evening) on every 7th of the month of Kalima. *Muja* at *Pada Ageung* is on three days, the 16th, 17th, and 18th of the month of Kalima.

c. *Ngalaksa*[275]

[274] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007),79-81.

[275] Which is a big ceremony for the Baduy community as a sign of gratitude for having passed the holy months of Kawalu. The term ngalaksa is also known as Lebaran for the Baduy tribe. See Abdul Syukur, et, all. Muslim Baduy: Conversion and Changing Identity and Tradition, *Jurnal Penelitian*, *Volume* 18 Number 2, 2021,186.

Ngalaksa (making laksa) activity is a ceremony at the end of Katiga month, the last month in the Baduy calendar system. It is seven days from the 21st date of activity. The laksa is not only eaten by the people of Kanekes but also eaten by rulers and dignitaries.[276]

d. *Seba*[277]

Seba is an activity of walking on long journeys carrying various crops as a mere form of sincerity. Seba is a routine activity of the Baduy indigenous people and is a passed-down tradition from generation to generation. This activity of meeting the government officially. The main aim of this activity is to strengthen friendship, report on the situation and condition of the Baduy in particular and other environments in general, and convey aspirations

[276] According to Baduy's opinion, laksa contains *"aci bumi"* which is the core power of the motherland (in Sundanese mythology, the earth is considered male. Then, it is considered as the husband of Nyi Pohaci Sangh in Baduy, the beautiful Sangh). Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 81-83.

[277] Which is an activity carried out by the Baduy tribe by visiting the local government which intends to establish friendship between the Baduy tribal community and the regional government of Lebak Regency and Banten Province. See Abdul Syukur, et, all. Muslim Baduy: Conversion and Changing Identity and Tradition, *Jurnal Penelitian*, *Volume* 18 Number 2, 2021,186.

or hopes. So, there is cooperation to protect and pray for each other. It's an interpreted attitude of respect and appreciation to the government by giving some of the residents crops. In the hope, it can be enjoyed by government officials.[278]

In this *seba* activity, the Baduy people bring their crops and rice when their crops are good. Then they will give tubers and vegetables when their crops are not good enough. *Seba* is mandatory once a year in the new year's Sapar month following the Baduy Kanekes calendar system, which is carried out a week after *the ngalaksa* event around the 1st to the 9th of Safar with good time from the 1st to the 6th of Safar and it may not exceed the 10th of the Sapar month.

Picture 3.11

[278] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 264.

Having Traditional Seba By Walking [279]

e. Marriage [280]

According to Baduy tradition, the Baduy people are not allowed to determine their day, date, and month of marriage. For all the Baduy, the months for holding marriages are *Kalima, Kadalapan*, and *Kasalapan*. *Puun* will determine the day and date of mass weddings in one or two villages. Therefore, sometimes there will be three houses or three families holding weddings in the village. The marriage ceremony of a virgin is more lively than the marriage of a widow. Then,

[279] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 264.

[280] The time of the wedding is three days, on the three days that are the standard schedule for the implementation of marriage varies. The first day is a day of preparation to start the event by first intending through prayer by traditional leaders. The second day is more devoted to receiving visits from neighbors and relatives, as well as invited guests, who want to congratulate the bride and groom and the family holding the celebration.The third day is the peak of the Baduy traditional marriage ceremony. The third day is the peak of the event because

on this third day the bride and groom are said to be legally married if they have gone through an event they call turun panganten or panghurip event until the event is dissolved by traditional leaders in the bride's house. See Implikasi Hukum Praktik Perkawinan Adat Suku Baduy Dalam Perspektif Hukum Islam Dan Hukum Positif, *Jurnal Pengabdian Masyarakat dan Penelitian Thawalib*, Volume 1 (2) (2022), 132.

The marriage is taken place at the bride's house.[281]

2. Farming Activities

The Baduy community practice farming traditionally. The same goes for the equipment they use. They do it to protect nature. In their agricultural system, they apply cultivation of the fields (huma).[282] Cultivating the land through the rice field system is still *taboo* for them. Rice (their main crop) is also grown in dry fields without irrigation. It is what is called huma. Apart from that, as pure cultivators, the Baduy people also cultivate cultivation with a shifting cultivation system (*shifting cultivation*).[283]

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[281] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 90-91.

[282] The activity of cultivating agricultural land in Baduy community is called ngahuma, which is planting dry land rice with a fallow system and shifting fields, which is one of the religious pillars of Baduy community. The Inner Baduy community can only make huma in their area, while the Outer Baduy community can make it in their area or outside the Baduy area. The land is owned by adat, they only have the right to cultivate and have various types of plants on it. The area of the cultivated location is determined by the person's ability to cultivate it, or based on the previous year's the previous year's harvest. Without intensification of agriculture, under relatively similar soil and weather conditions soil and weather conditions, the size of the harvest is dependent on the area of land cleared for farming. by the area of land cleared for farming. D. Putranto, Mitologi dalam Kenyataan dalam Orang Baduy dari Inti Jagad. (Yogyakarta: Bentara Budaya, Harian Kompas, Etnodata Prosindo, Yayasan Budhi Dharma Pradesa. 1988).

[283] Ali Khomsan, dkk. *Aspek Sosio-Budaya Gizi dan Sistem Pangan Suku Baduy*, (Bogor: IPB Press, 2012), 41-42.

Picture 3.12
The Ricefield in Baduy[284]

Serving the Baduy people by working in the field or huma is a sign of life. One loses life (life and livelihood) if they are unable to farm. Nevertheless, every kampong has days that cannot be used to work on the huma (holidays), and they are not covered by the general pikukuh. They engage in other activities on those days off.[285]

In the tradition of the Baduy people, there are six types of huma. It has a different functions, ownership, and processing processes. The process of making *huma* also depends on the kind of huma and the Baduy Kanekes calendar system. The types of huma are huma serang (fields that are considered

[284] Isman Pratama Nasution, R.Cecep Eka Permana, and Dian Sulistyowati, Model Sosialisasi Kearifan Lokal Masyarakat Baduy Dalam Pelestarian Hutan Kepada Generasi Muda Di Kampung Balimbing, Baduy Luar*, Paradigma Journal Kajian Budaya*, 5(1), December 2017.

[285] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 124.

sacred, located in the Tangtu area), huma puun (fields specially owned by Puun), huma tangtu (fields owned by Baduy Tangtu residents), huma tuladan (fields jointly owned in Panamping where the proceeds go to village needs), huma panamping or pajaroan (the fields of the Panamping community members), and huma urang baduy (the fields outside Kanekes that are worked on by the Baduy people).

Working in *Huma Serang* is a sacred obligation that is strictly regulated. The members of the *Panamping* and *Tangtucommunities* sent *umpi* (family) representatives so that with a large number, the *ngaseuk* (rice planting) and harvesting process within a day. Maintenance of rice in *Huma Serang* is a duty of joy and *seurat.* Some of these proceeds are saved for their future needs. The other part is for seeds and important ceremonies, such as ngalaksa and kawalu.[286]

Huma Serang (Huma under the control of Puun) is considered a sacred Huma. The selection location must base on conditions determined by tradition also.

[286] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 127.

The land used for *Huma Serang* should be in the east of *Girang Seurat* house (*Puun's* assistant in agricultural ceremonies). Then, it must be located at the easternmost if there are other households belonging to residents nearby. *Huma Sesana*, considered sacred, cannot receive *panonpoe sesana* light (should not receive residual sunlight). Sunlight may not be used by other huma first therefore this *huma* must be located in the easternmost.

Not only for economic function but *Huma Serang* in the life of the Baduy tribe also has a customary and religious side. The good or bad results in *Huma Serang* will affect. It's also a sign of the good and bad of the *Huma Serang* as a whole. Then, the person in charge and manager of *Huma Serang* must be serious about avoiding the various disasters that might befall the rice plants in the *Huma Serang*.[287]

Apart from having to place it in a sacred area, in the kajeroan area, Baduy residents cultivate and work on the *huma serang.* Therefore, all cultivating the *huma* (fields) receive the radiance of supernatural

[287] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 127.

powers. Then every family in Kanakes Village sends a member of their family to represent them, both men and women to cultivate.

In the Kanekes community or the Baduy tribe, one rice planting season is known as *sausum*. The entire agricultural process starts from narawas, from *nukuh* to the harvest takes seven months in approximately. The word *sausum* refers to "a year" just like *usum* is the same as the year.[288]

Because it is considered a sacred huma, the activities carried out in *huma serang* are the start of activities in other fields. So the ceremony at *huma serang* is considered as the implementation of ceremonies at other *huma.* That's why the ceremony does not need at other *huma*. These are the following description of the ceremonies related to the process of *ngahuma* (cultivation) at *huma serang.*

a. *Narawas*

Narawas means opening, and pioneering. It is the activity of clearing the land of huma from shrubs and cutting the branches of large trees.

[288] Ivan Masdudin, *Kunikan Suku Baduy di Banten,* (Banten: Talenta Pustaka Indonesia, 2010), 35.

This area will be an *huma* attack. No *sesajen* in the *narawas* ceremony, but *buyut* (abstinences) is applied to working people. They are not allowed to spit, smoke, fart, speak rudely or dirty, or wear dirty clothes. Men must wear an *iket* (headband). This *narawas* ceremony is carried out in the month of Kapat and starts on the 18th.

b. *Nyacar*[289]

Nyacar (mowing or cleaning) is clearing grass and trimming small branches. So the fields

[289] Each household of the Baduy community must select appropriate site, particularly appropriate good soil fertility by using various indicators, including tall shrubs, soil color, and occurring predominant species of ki sereuh (*Piper aduncum L*), kitepus (*Amomum coccineum* (*Blume*) *K.Schum*), and mardelan (*Macaranga sp*), before beginning cultivates the swidden field. After choosing the land, the first activity in preparing land for swiddens is to cut underbrush (nyacar). Before underbrush is performed, narawas ritual must be performed. The word narawas or narabas is derived from tarawas, means 'clear away' or pioneering effort'. This ritual also intended to put a sign informing the land has been claimed by a family to be used as swidden field. The narawas is usually undertaken in Kanem (June-July) a month in the Baduy calendar. In the narawas ritual, objects, such as strong stone, a whetstone, a bamboo (*Gigantochloa apus* (*Bl ex Schult f) Curz*) internode containing water, incense in a coconut shell, and rhizome of panglay (*Zingiber cassumunar Roxb*), are placed in the center of the field. Incense or menyan gaharu (Gonistylus marcrophyllus (Miq) is burned and panglay is chewed and spat on the soil. In addition, some incantations (jampe) are uttered: such as for chasing away snakes, and evil spirits such as a devil, kunti anak, and kaliboro. The ritual is performed by each male household head, or where newly married man lacks experience, a widow, assisted by relatives. After narawas, cutting underbrush begins; through it need not begin immediately. See Johan Iskandar and Budiawati S. Iskandar, Various Plants of Traditional Rituals: Ethnobotanical Research Among The Baduy Community, *Biosaintifika: Journal of Biology & Biology Education*, 9 (1) (2017), 117.

get more sunlight. The Baduy people's farming method can be said to be *"pruned-burnt"* (*not "slash-burnt"*). [290]

c. *Nukuh*[291]

Activities carried out in this kanem month are collecting and drying grass, twigs, shrubs, and other slashes. The offerings prepared for the nukuh ceremony are congcot (rice shaped by the requester), chicken eggs, flowers, boeh (white cloth), a small knife, and incense. *Sesajen* is for the *dangiang* (spirits) who guard the land that places large trees. This *sesajen* to avoid the anger

[290] According to tradition, the only tool used is a cleaver. The provisions during this ceremony are the same as the *narawas* ceremony. The difference between *nyacar* and *narawas* is the *sesajen* in *nyacar* activity. It is on the month of Kalima (the 2nd month of their calendar).

[291] After cutting the shrubs (nyacar), in the month of Kadalapan, selective felling and pruning takes place. Three days before work begins a special ritual called nukuh is held. Nukuh is conducted on the same day as narawas and in the same place or nearby. Various plants including rane (*Sellaginella willdenowii Desv. ex Poir*), sulangkar (*Leea indica* (Burm.f.) Merrs), areuy geureung (*Stephania javonica* (Thunb) Mers, kapas (*Gossypium barbadense L*), kunir (*Curcuma domestica Val*), kawung (*Arenga pinnata* (Wurmb) Merr), capeu (*Blumea balsamifera* (Linn) DC), ilat mintul (*Scleria purpurascens Steud*), and trumbeusi (*Phyllantus niruri L*) are usually used in this ritual. As in narawas, incense is burned and panglay chewed and spat over the soil. Various incantations (jampe), such as jampe tutulak cakra, tulak pangiwang, tulak sangan jaya, tulak bungapah, tulak sungsung, tulak batara, and tutulak babadon opat are made, symbolized graphically on a bamboo tube called waroge. One of the incantations usually performed to open the ritual is called *Allah Huma Du'a Paneda*. See Johan Iskandar and Budiawati S. Iskandar, Various Plants of Traditional Rituals: Ethnobotanical Research Among The Baduy Community, *Biosaintifika: Journal of Biology & Biology Education*, 9 (1) (2017), 121.

of *dangiang* because their place of residence has been *bukbak* (cleaned). It hopes they will not disturb and give a caring of and maintaining the huma.[292]

d. *Ngahuru*

Ngahuru or *ngaduruk* (burning) is an activity on the 18th of Kapitu or Katujuh month (the 4th month in the Baduy Kanekes calendar system). The things that burned are the *"garbage"* collected during *nukuh* activities. At this ceremony, there is no need to provide *sesajen*. After the ceremonial leader reads *the mantra*, the grass and the dry slashes are burned.

e. *Ngaseuk*[293]

[292] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007),98-99.

[293] *Ngaseuk* comes from the word *aseuk* means *"single"*. Following felling and pruning trees, and cutting burning and reburning, is prepared for planting rice (ngaseuk). Planting rice is usually undertaken in Kasalapan. The ritual performance begins when the head of family enters to the pungpuhunan and sits down in front of woven bamboo basket containing sacred grain. His hands and hair are smeared with coconut oil. Gaharu incense is burned and incantations pronounced. On the basis of Baduy tradition, it is believed that in sowing rice Nyi Pohaci becomes engaged (direremokeun) to the earth, Pertiwi. After the incantations, a couple of seeds of sacred rice, called pare indung (rice mother), are sown in the middle pungpuhunan. In addition, 7 holes inside and 7 holes outside pungpuhunan are sown. Immediately after

Ngaseuk means hammering, which is making a small hole for planting seeds. Putting seeds into the hole is called *muuhan*. The men do n*gaseuk*, While the women do *muuhan*. The series of *ngaseuk* activities start at *Huma Serang* in the month of *Katujuh*, *Huma Puun* in *Kadalapan*, *HumaTangtu* in *Kasalapan*, Huma Tuladan, and lastly *Huma Panamping* in *Kasapuluh*.

This ceremony is only in *Huma Serang* and *Huma Tuladan*. Ceremony activities begin with *nyoo binih* (seed processing) which is held in the afternoon the day before *ngaseuk*. That afternoon, *Girang Seurat's* wife brought *sesajen.* Then she placed it under the special *leuit* (rice stored from *Huma Serang*). S*esajen* is in the form of perfume, lime, and *jawerkotok* leaves. After that, Girang Seurat's wife read *the mantra* to *"awaken the rice"* which was considered an incarnation of the Rice Goddess. Next, take several bunches of rice

conducting the ritual, men walk ahead of the women, making holes in the ground while women place rice seed in the holes. See Johan Iskandar and Budiawati S. Iskandar, Various Plants of Traditional Rituals: Ethnobotanical Research Among The Baduy Community, *Biosaintifika: Journal of Biology & Biology Education*, 9 (1) (2017), 119-120.

to be used as seeds will be planted in the *Huma Serang*.[294]

The *ngaseuk serang* ceremony is togetherness built as a symbol by the Baduy community. After this ceremony, the community members start planting rice seeds on their respective lands. So, before this one ceremony, none of the residents preceded planting rice.[295]

f. *Ngirab Sawan*

Ngirab sawan means removing trash or remnants of twigs from between rice clumps. The work carried out in the month of *Hapit* is done without tools. In the *ngirab sawan* activity, the *sesajen* is from *concongot* rice, chicken eggs, potpourri, betel, and *kemenyan*. The *sesajen* is put in one corner of the *huma*.

[294] See Chairul Umam, Taufik Rihatno and Budiaman, Ethnographic Study of the Physical Activity of Adolescents in the Farming Culture of Ethnic Baduy, *IJMRA: International Journal of Multidisciplinary Research and Analysis*, Volume 4 Issue 3 Maret 2021,1136.

[295] In this physical activity "Ngaseuk" can be done approximately 1 to 2 hours. This activity was carried out jointly by baduy people from various villages to help because help in Baduy is an obligation. See Chairul Umam, Taufik Rihatno and Budiaman, Ethnographic Study of the Physical Activity of Adolescents in the Farming Culture of Ethnic Baduy, *IJMRA: International Journal of Multidisciplinary Research and Analysis*, Volume 4 Issue 3 Maret 2021,1136.

The purpose of this ceremony is to prevent rice plants from being disturbed by pests and evil spirits. It is also to give fertility to the soil. During the ceremony, *ramuan* is sprinkled. The *ramuan* have magical powers that give the soil fertility, in Baduy beliefs. The *ramuan* is various mixtures of fruits and leaves, such as lime fruit, green coconut, *hanjuang leaves*, see/ leaves, *areuy beureum*, and *beuti laja* (galangal). Its finely ground and mixed with furnace ashes. After *ngirab sawan* is *ngored.* It is the cleaning land from the growing grass between the rice clumps with *kored.* This activity is on the month of Hapit while alternating with *ngirab sawan*.[296]

g. *Kawalu* and *Ngalaksa*

Ngalaksa ceremony must be done by all residents Baduy tribe, both Baduy Dalam and Baduy Luar as a representation of inner soul. Ngalaksa ceremony is an expression of gratitude Baduy people to the ancestors remember the

[296] *Ngirab sawan* comes from the word *'kirab'* (*kibas*, throw away) and *'sawan'* (carcass, used, trash). See Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 99-104.

harvest of rice harvest huma that year. Ngalaksa ceremony function for Baduy community is categorized into four; Celebration and thanksgiving of crops, Means of purification (fasting 3 days on kawalu) Census container of the population, and 4) Closing ceremony year. In addition to functioning as a celebration and celebration of the harvest, this ceremony is also a means for self-purification, just like the Eid for Muslims. Therefore, the time of its execution is considered a holy month. The time every year is always fixed, ie every month Katiga (March-April) is held on the fifth-day, kawalu tutug or on the 21st of the month katiga. This activity started from Kampung Baduy Dalam, Baduy Luar, and Baduy Dangka.[297]

[297] The Baduy ceremony lasted for three days in a row. The activities are different every day, from the preparation, the core of the event and the closing. The first day, the heads of the family prepare kiray leaves for the manufacture of teke '. Men are also assigned to prepare firewood for cooking laksa on the second day. On this very day, every household head brings rice to Jaro Dangka's house. The second day, the women prepared laksa made from fresh rice pare (fresh rice) which was given coconut milk, then shaped like noodles, and wrapped in young coconut leaves. On this second day, the men make a teke from the leaves of kiray. The maker of the teke is not limited by age. The third day all the laksa supplies should be ready, as well as the teke. See Nina Maftukha, Variations of Teke on Ngalaksa ceremony (population census) in Baduy Tribe, *International Conference on Design, Engineering and Computer Sciences*, IOP Publishing, 2018, 4-5.

Then, of all the months in a year, there are three sacred months. It concerns the special religious days of the Baduy tribe, the days in the month of *Kawalu*. The month of *Kawalu* is the designation for the months of *Kasa, Karo*, and *Katiga*. There are various traditional activities during these months. It is an activity of purifying oneself physically and spiritually by carrying out one day of fasting every month. But not having sahur first and breaking the fast is regulated according to customary provisions around 06.00 in the afternoon with the following implementation: *Kawalu Tembeuy* (beginning) is on the month of *Kasa,* the 17th in Cikeusik, and Cikartawana, on the 18th in Cibeo, *Kawalu Tengah* is on the month of Karo, the 18th in Cikeusi, and the 19th in Jakarta Wana and Cibeo and *Kawalu Tutug* (end) is on the month of Katiga, the 17th in Cikeusik and Cikertawanan, and the 18th in Cibeo. [298]

Except for fasting activities in this Kawalu month (*kawalu fasting*), a pattern of

[298] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007),105.

environmental cleaning activities about the things from a modern smell outside used by the community. Then, cleaning the environment from dirtiness due to wrong behavior or violations (whether committed by the Baduy community, or the outsider of the Baduy). There are two categories of cleansing activities, physical or material cleansing and spiritual cleansing.

The activities carried out in the month of Kawalu are giving thanks and thanking Mie Pohaci Sanghyang Asri or Dewi Sri for their generosity in giving good harvests or less profitable yields. This month is named prohibition month. The entire Baduy area is closed to visitors or guests, especially the inner Baduy area.[299]

The *kawalu (lebaran)* is a ceremony after the harvest till the rice enters the *leuit* (*granary*). *Kawalu tutug* (*the end kawalu*) is seven days big ceremony called the *ngalaksa* ceremony (making foods from rice

[299] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007),105.

flour). *Ngalaksa* is salvation that serves *laksa*, which is rice flour dough made like noodles. The dough mold is called sangku. The ingredients for making the *laksa* are obtained from pare koneng (yellow rice) as *saseeng* (one drum) from each family.[300]

[300] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007),105.

CHAPTER IV
THE ANALYSIS OF A BEGINNING YEAR DETERMINATION IN BADUY'S CALENDER

C. A BEGINNING YEAR OF THE BADUY'S CALENDAR

In many parts of Indonesia, people use their knowledge of the movements of the stars and patterns of stars, or "asterisms", as markers for annual seasonal changes. In a wide variety of ecological regimes – irrigated, agriculture, and cultivation – the annual movements of stars have been used for cultivation calendars and seasonal environments changes.[301]

The time organization of Baduy community in daily life is organized in a calendar system known as Baduy tribe calendar. Baduy calendar is included in the solar calendar where one year on average is same as one tropical year (365 solar days 5 hours 48 minutes 45.19 seconds). In addition, Baduy calendar also considers the observation factor of the

[301] Ayu Fitri Damayanti, *The Bali Wariga Calculation System: An Analysis of Season Determination in Astronomic Perspective*, (Semarang: Undergraduate Thesis, Faculty of Syariah and Law, State Islamic University of Walisongo, 2021), 87.

sky and season.[302] The appearance of *Kartika Star* (Gumarang or Pleiades) and *Kidang Star* (Waluku or Orion's Belt) become the sign of the annual cycle beginning of Baduy calendar.

No.	Month Names	Corresponds to
1.	Sapar / Kapat	April – Mei
2.	Kalima	Mei –Juni
3.	Kanem	Juni – Juli
4.	Katujuh / Kapitu	Juli – Agustus
5.	Kadalapan	Agustus – September
6.	Kasalapan	September – Oktober
7.	Kasapuluh	Oktober – November
8.	Hapit Lemah	November – Desember
9.	Hapit Kayu	Desember – Januari
10.	Kasa	Januari – Februari
11.	Karo	Februari – Maret
12.	Katiga	Maret – April

Tabel 4.1
The Baduy's Calender and Gregorian Calendar [303]

It is evident from the discussion of the Baduy tribe's calendar above that there are some basic parallels with the others. The calendars of Baduy, Sundanese, Java, and Tengger for instance. These four calendar systems are similar to one another overall. But the calendars are analyzed more closely, we will see the variations every calendars.

[302] Asep Kurnia dan Ahmad Sihabudin, *Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 158-161. Lihat juga https://id.wikipedia.org/wiki/Kalender_Baduy Accessed on Monday, 11 September 2023 at 15.32 WIB.

[303] Asep Kurnia dan Ahmad Sihabudin, *Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 162-168.

There are some general similarities between the Baduy, Sunda, Jawa, and Tengger calendars in terms of days, pasaran, months, and years. Despite the fact that their nomenclature and terminology differ. There are variations in the way each calendar's long year system, as well as the celestial bodies used as a reference. For more discussion, some similarities and differences of each calendar are below (Table 3.10).

No.	Aspects	Sunda Calender	Javanese Calender	Baduy Calender	Tengger Calender
1.	Day	Ahad, Senen, Salasa, Rebo, Kemis, Jumaah, Saptu	Minggu, Senen, Selasa, Rebo, Kemis, Jemuwah, Setu.	Ahad, Senen, Selasa, Rebo, Kemis, Jumahat, Saptu.	Radite, Soma, Anggara, Buda, Waras-pati, Sukra, Saniscara
2.	Pasaran	Manis, Pahing, Pon Wage, Kliwon.	Legi, Pahing, Pon, Wage, Kliwon.	Pahing, Pon, Wage, Kaliwon, Manis.	Legi, Pahing, Pon, Wage, Kliwon.
3.	Month	**Kala Saka:** Kasa, Karo, Katiga, Kapat, Kalima, Kanem, Kapitu, Kadalapan, Kasalapan, Kasapuluh, Hapit Lemah, Hapit Kayu. (30/31 days in a month). **Kala Caka:**	Kasa (41), Karo (23), Katelu (24), Kapat (25), Kalima (27), Kanem (43), Kapitu (43), Kawolu (26/27), Kasongo (25), Kasepuluh (24), Destha	Kapat / Sapar, Kalima, Kanem,Ka-tujuh or Kapitu, Kadalapan, Kasalapan, Kasapuluh, Hapit Lemah, Hapit Kayu, Kasa, Karo, Katiga/Ka-pitu. (30	Kasa, Karo, Katelu, Kapat, Kalima, Kanem, Kapitu, Kawolu, Kasongo, Kase-poloh, Desta, Kasada. (29/30

		Kartika, Margasira, Posya, Maga, Palguna, Setra, Wesaka, Yesta, Asada, Srawana, Badra, Asuji. (29/30 days in a month)	(23), Sadha (41). (Each Month is consist of diffent days)	days in a month)	days in a month)
4.	Year	**Kala Saka:** *Sewindu* is 8 years. 3 times a short year, the fourth year is a long year until the 128th year. **Kala Caka:** *Sewindu* is 8 years. The 2nd, 5th, and 8th are long years.	*wastu* (366 days) and *wuntu* (365 days).	*Sewindu* is 8 years. Adding 1 month to the long year.	Every *Windu* (5 Years), adding a month.
5.	Astronomy Reference	**Kala Saka:** Sun and Orion's Belt **Kala Caka:** Moon	Sun and Orion's Constella-tion	Sun, Pleiades Star and Orion's Belt	Sun and Moon
6.	Usability	Farming Activities	Farming Activities	Farming & Traditional Belief Activities	Traditional Belief Activities

Tabel 4.2
The Differences of Baduy, Sunda, Java, and Tengger Calender Table[304]

[304] Asep Kurnia dan Ahmad Sihabudin*, Saatnya Baduy Bicara,* (Jakarta: Bumi Aksara, 2010), 158-161. See Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007). See More Janatun Firdaus, *Analisis Penanggalan Sunda Dalam Tinjauan Astronomi*, (Semarang: Undergraduate thesis, IAIN Walisongo, 2013). See Nurul Amalia, *Sistem Penanggalan Tradisional Sukra Kala Saka Sunda*, (Semarang: Undergraduate Thesis,

One of the important thing in Baduy's calendar is their beginning year. The observation of the kidang star's first dawn appearance on the eastern horizon marks the start of the year. For common observers, this position is determined from either the right or left. If the point of sunrise is to the right of the star, or to the left of the direction he is looking. It is called the sun has shifted to the north. The baduy community names it *"metopoe geus dengdek ngaler"*. As in the expression of the Baduy community.[305]

Bentang kidang jumlahna tilu
Rupana meneos katukang aya tutumbakan nunjuk ka kidang
Nepi katanggal 15 bentang anu hiji hurung masih leslesan, kadang leungit kadang timbul
Mimiti tanggal 16 bentang hurung kabeh
Muncul bentang kidang bulan sapar
Marem bentang kidang dina bulan Katiga
Dua bulan bentang kidang leungit
Bintang kartika jumlahna 7 ngaronyok

UIN Walisongo, 2021). Read on Maftukhah Ihtiyati, *Perspektif Astronomis Sistem Penanggalan Kalender Tengger dan Manfaatnya Dalam Peribadatan Umat Hindu*, (Semarang: Undergraduate Thesis, UIN Walisongo, 2021). Read more Daldjoeni, Penanggalan Pertanian Jawa, (tt, ttp, tth). Muhammad Himmatur Riza, *Sundial Horizontal Dalam Penentuan Penanggalan Jawa Pranata Mangsa*, (Semarang: Undergraduate thesis, UIN Walisongo, 2018). See Nihayatul Minani, *Penanggalan Jawa Pranata Mangsa Perspektif Ilmu Klimatologi Pada Saat Tahun Terjadinya El Nino Dan La Nina (Implementasi Dalam Penentuan Arah Kiblat)*, , (Semarang: Undergraduate thesis, UIN Walisongo, 2017).

[305] Toto Sucipto and Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 123.

Muncul bentang kartika dua minggu leuwih awal ti kidang

The number of Bentang kidang is three
It appears as the tip of a lance pointing to the main group
Before the fifteenth day of Sapar, one of the bentang kidang group can be seen flickering
After the sixteenth day of Sapar, none of the bentang kidang can be seen to flicker
Bentang kidang appears in the month of Sapar Bentang kidang disappears in the month of Katiga
For approximately two months each year bentang kidang cannot be seen
Bentang kartika appears two weeks earlier than bentang kidang[306]

As in the other expression of the Baduy community: *"Mun matapoe geus dengek ngaler lantaran jagad urang geus mimiti tiis, tah dimimitian ti wayah eta kakara urang nanggalkeun kidang, tanggal kidang mah laju turun kujang"*. (If the sun has leaned north, when our earth has begun to cool down, it's the time to observe the calendar with the appearance of the Kidang Star, when the Kidang Star appears we start using agricultural tools with *kujang* (picture 4.1)).[307]

A common indicator of the start of the farming season is the appearance of the kidang and kartika stars on the eastern horizon at dawn. In comparison to the kidang star, the kartika

[306] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998), 266.

[307] Ivan Masdudi, *Keunikan Suku Baduy di Banten*, (Banten: Talenta Pustaka Indonesia, 2010), 33.

star appears two weeks later. At that moment, the sun is situated in the northern hemisphere. At that point, the land is regarded as "not hot". In contrast, rice should not be planted during the period when the kidang star sinks on the western horizon and does not appear because the soil is deemed "hot" and insect pests arrive during that time. Farming hours in the field are largely determined by the location of the kidang star at dawn. clearing forest, cutting wood, and so on, to determine how long to spend farming in the *huma*.[308]

Picture 4. 1
The *Kujang* Knife in Baduy [309]

In Baduy's society, *tanggal kidang turun kujang* means when *Kidang* appears, the kujang knife (picture 4.1) is used. Although Orion had already appeared, the clearing of the bushes in the attacking huma was only carried out on Kalima. It's called, *Kidang ngarangsang kudu ngahuru*. When Kidang begins to rise overhead, bush burning is

[308] Johan Iskandar dan Budiawati S Iskandar, *Agroekosistem Orang Sunda*, (Bandung: Dunia Pustaka Jaya, 2011), 63.

[309] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998), 279.

required. Although Orion has already begun to rise in mid-April, bush burning in the attack huma is carried out on Kanem. *Kidang mancer kudu ngaseuk.* When Kidang is overhead, rice must be planted. Although Orion is already at zenith in early June, the planting of rice in the attacking huma is carried out on Katujuh. *Kidang marem turun kungkang*. When Kidang sets, the insect pests descend. Rice planting in the huma serang should not extend beyond the month of Kadalapan.[310]

Based on the practice carried out by the Baduy tribe, they use the stars as a reference for calculating their time, then it has indicated this tribe has been able to interpret the revelation of Allah and the hadith of the Prophet muhammad related to astronomy pragmatically in everyday life. As explained in the Qur'an about one of the roles of the stars:

وَهُوَ ٱلَّذِى جَعَلَ لَكُمُ ٱلنُّجُومَ لِتَهْتَدُوا۟ بِهَا فِى ظُلُمَٰتِ ٱلْبَرِّ وَٱلْبَحْرِ ۗ قَدْ فَصَّلْنَا ٱلْـَٔايَٰتِ لِقَوْمٍ يَعْلَمُونَ[311]

"And He is the One Who has made the stars as your guide through the darkness of land and sea. We have already

[310] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 128.

[311] Al Quran dan Terjemah Departemen Agama RI, (Bandung: Sygma Examedia Arkanleema, 2009), 140.

made the signs clear for people who know." (Q.S. Al-An'am/6: 97)[312]

This verse talks about the stars and their benefits for humans point since the beginning of human civilization until now, celestial bodies are a sign of guidance for human travel both on land and at sea.[313] Meanwhile the Prophet Muhammad, once said about how important the role of stars is for the sky and the balance in, in the hadith he said:

وَعَن قتادةَ قَالَ: خلقَ اللَّهُ تَعَالَى هَذِه النجومَ لثلاثٍ جَعَلَهَا زِينَةً لِلسَّمَاءِ وَرُجُومًا لِلشَّيَاطِينِ وَعَلَامَاتٍ يُهْتَدَى بهَا فَمن تأوَّلَ فِيهَا بِغَيْرِ ذَلِكَ أَخطَأَ وَأَضَاعَ نَصِيبَهُ وَتَكَلَّفَ مَالا يَعْلَمُ. رَوَاهُ الْبُخَارِيُّ تَعْلِيقًا وَفِي رِوَايَةِ رَزِينٍ: «تكلّف مَالا يعنيه ومالا عِلْمَ لَهُ بِهِ وَمَا عَجَزَ عَنْ عِلْمِهِ الْأَنْبِيَاء وَالْمَلَائِكَة»

وَعَن الربيعِ مِثْلُهُ وَزَادَ: وَاللَّهِ مَا جَعَلَ اللَّهُ فِي نَجْمٍ حَيَاةَ أَحَدٍ وَلَا رِزْقَهُ وَلَا مَوْتَهُ وَإِنَّمَا يَفْتَرُونَ عَلَى اللَّهِ الْكَذِبَ وَيَتَعَلَّلُونَ بِالنُّجُوم[314]

"Qatada said God most high created these stars for three purposes; He made them an adornment for the sky, missiles for the devils, and signs by which people find their way. If anyone explains them differently he makes a mistake,

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[312] Taken from the website Qur'an.com Surah Al-An'am - 97 - Quran.com, (Accessed on Sunday, 29 of October 2023 at 18.42 WIB.

[313] Even recent astronauts are guided by the sun and stars in determining the direction of travel at any given time. They also use star clusters in determining time. On that basis, if another function of the stars is found, it must be seen as compatible with religious principles.See on M. Quraish Shihab, *Tafsir Al-Misbah: Pesan, Kesan, dan Keserasian Al-Qur'an,* (Jakarta: Lentera Hati, 2002), 204-207.

[314] Mishkat al-Masabih, *Medicine and Spells* (Book 23, Hadith 86), 4602-4603.

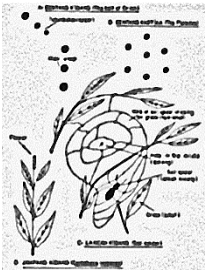
squanders what is allotted to him, and occupies himself with something he does not know."

Bukhari transmitted it without a full isnad. Razln's version has, "occupies himself with what does not concern him, what he has no knowledge of, and what prophets and angels are incapable of knowing." On the authority of ar-Rabi' (Ar-Rabi' b. Ziyad, Qatada's authority) there is something to the same effect with the addition, "I swear by God that God has not set in a star anyone's life, provision, or death. They are only speaking lies against God and attributing causes to the stars."[315]

In their daily practice, Baduy tribe community utilizes other natural phenomena as well. There is a kind of *"grass spider"* (nesting in the grass), whose the nest becomes hollow when the kidang star appears. This symptom is utilized. When the spider's nest is visible, it is the first sign of Bentang Kidang's appearing. This type of spider is called "lancah kidang" (kidang spider).[316]

[315] Taken from the website sunnah.com, Mishkat al-Masabih 4602, 4603 - Medicine and Spells - كتاب الطب والرقى - Sunnah.com - Sayings and Teachings of Prophet Muhammad (صلى الله عليه و سلم) (Accessed on Sunday, 29 of October 2023 at 19.27 WIB)

[316] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 123.



Picture 4. 2
Bentang Kidang (sabuk Orion), Bentang Kartika (Pleiades Star), Lancah Kidang and Jampang Kidang [317]

In addition, *lancah kidang* (the soil spider) indicates the time when Baduy community should start planting rice. The *lancah kidang* usually make its nest on grasses growing in swidden fields. If the web has a hole in the middle (*bolong tengahna*), and it stays most of the time on the edge of the nest, rice planting should start.[318]

The first day of the year in Baduy calendar coincides with the beginning of their annual cycle of farming activities[319] and traditional ceremonies.[320] The beginning of the year in the Baduy tribe is called *nanggalkeun kidang* (the beginning of

[317] Johan Iskandar, *Swidden as a Form of Cultural Identity: The Baduy Case*. (Ph.D. Dissertation, University of Kent Canterbury, 1998), 266.

[318] Johan Iskandar dan Budiawati S Iskandar, *Agroekosistem Orang Sunda*, (Bandung: Dunia Pustaka Jaya, 2011), 64.

[319] Johan Iskandar dan Budiawati S Iskandar, *Agroekosistem Orang Sunda*, (Bandung: Dunia Pustaka Jaya, 2011), 59.

[320] Toto Sucipto dan Julianus Limbeng, *Studi Tentang Religi Masyarakat Baduy Di Desa Kanekes Provinsi Banten*, (tt; Departemen Kebudayaan dan Pariwisata, Direktorat Jenderal Nilai Budaya Seni dan Film, 2007), 111.

the appearance of the kidang star which is the beginning of cultivating the *huma*).[321]

The Baduy community has continued to use this time organizing system up to this time. Particularly in terms of belief and agricultural practices as a point in time. They are unable to perform a variety of agricultural and religious tasks without this time-organizing system. These are the used of Baduy calendar in the Baduy socity.[322]

Narawas (pioneering), nyacar (clearing, pruning), nukuh (drying), ngaduruk (burning), ngaseuk (menugal), ngirab sawan (removing garbage), and ngored (clearing the land of grass) are some of their agricultural activities based on this organaizing time. While seba, muja, marriage and kawalu are some of their traditional ceremonial activities based on this time system.[323]

Then the description above corresponds to the purpose of studying astronomy. First, it's for the mastery and development of science in the field of astronomy. Second, for

[321] As one of the agrarian societies in Indonesia, the livelihood of Baduy is rice farming (pahumaan). See Moh. Farukhi, *Mengenal 34 Provinsi Indonesia (Banten)*, (Surakarta: Sinergi Prima Magna, 2018), 33.

[322] Based on my interview results with Sarmin (Ocit's father) on 28th of January 2023 at 20.35 WIB at his farming house in Baduy Dalam, Lebak, Rangkasbitung, Banten Province.

[323] Read more on the third chapter o this research.

purposes connected with the nature of application and become an important part of every activity and worship.[324]

D. A BEGINNING YEAR DETERMINATION OF THE BADUY'S CALENDAR IN ASTRONOMY

As for today's understanding of astronomy, if it is associated with the names of constellations and stars, Bentang Kartika or the Pleiades,[325] also known as the Seven Sisters, are

[324] Hajar, *Ilmu Falak: Sejatrah, Perkembangan dan Tokoh-Tokohnya*, (Pekanbaru: PT Sutra Benta Perkasa, 2014), 10.

[325] The heliacal rising of a star or of a constellation occurs when it becomes visible above theeastern horizon at dawn, after a period when it was hidden below the horizon. The corresponding rising of a celestial body above the eastern horizon at nightfall is its acronychalrising. Constellations that rise and set were then used for calendars by ancient peoples andused to form a zodiac. As highly

an open cluster in the constellation of Taurus.[326] These stars are among the nearest star clusters and the most obvious to thenaked eye. Blue stars, observed through a faint nebulosity of a dust cloud in the interstellarmedium, which the stars are currently passing through, dominate the cluster. The brighteststars of the cluster are named for the Seven Sisters of Greek mythology, daughters of Atlasand Pleione. Pursued by Orion, they were rescued by Zeus, who immortalised the sisters by placing them in the sky.[327]

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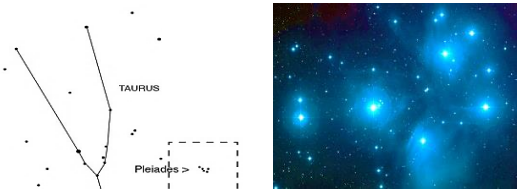
visible heliacal stars, the Pleiades were among the mostimportant celestial body, after the moon, and used for a first astronomic conception. The Pleiades heliacal rising was widely recognised in Austral regions, as the beginning of thenew-year and then of agricultural season. To the Maori of New Zealand, their heliacal risingsignifies the beginning of a new-year.For the Bronze Age people of Europe, the Pleiades started to be associated with mourning andfunerals. Between the autumn equinox and the winter solstice, the cluster rose in the easternsky after the sunset: for Celtic population, these stars were a window into the Otherworld. Notsurprisingly, this rising was coincident with a festival devoted to the remembrance of deadpeople [7]. As a result of precession over the centuries, the Pleiades no longer marked thefestival, but the association nevertheless persists. See Anthony Murphy and Richard Moore, *Island of the Setting Sun: In Search of Ireland's Ancient Astronomers,* (tt: Liffey Press, 2020)

[326] Joachim Herrmann, *Atlante di Astronomia*, (Milano: Sperling & Kupfer, 1992)

[327]A group of stars, the Pleiades, shone in the sky as an important time-marker. The rising,heliacal or acronychal, of these stars announced to ancient populations a special period of theyear or the starting of a new season. Due to a high visibility, these stars gained a special place in many ancient cultures. They arewinter stars in the Northern Hemisphere and summer stars in the Southern Hemisphere: wecan tell that these stars were known since old times, by several cultures all around the world,including the Maori and Australian Aborigines, Chinese, Maya and Aztec and the Nativepeople of North America. The Pleiades are particularly important in Hindu mythology as thesix wives of the six sages. The number is not fixed but changing in the myths between six andseven. See Amelia Sparavigna, *The Pleiades: The Celestial Herd of Ancient Timekeepers*, (PDF) The

No.	Name	Designation	Apparent Magnitude	Stellar Classifica-tion	Distance (ly)
1.	Alcyone	25 Tauri	2.86	B7IIIe	409±50
2.	Atlas	27 Tauri	3.62	B8III	387±26
3.	Electra	17 Tauri	3.70	B6IIIe	375±23
4.	Maia	20 Tauri	3.86	B7III	344±25
5.	Merope	23 Tauri	4.17	B6IVev	344±16
6.	Taygeta	19 Tauri	4.29	B6IV	364±16
7.	Pleione	28 Tauri	5.09	B8IVpe	422±11
8.	Celaeno	16 Tauri	5.44	B7IV	434±10
9.	Asterope	21 Tauri	5.64	B8Ve	431.1±7.5

Tabel 4.3
The Stars On Pleaides Star [328]



Picture 4. 3
The Pleiades Star[329]

In the mythology of ancient Greece, the seven sisters (Alcyone, Electra, Maia, Merope, Taygeta,Celaeno and Asterope) were the daughters of Atlas (the primordial Titan)

Pleiades: the celestial herd of ancient timekeepers (researchgate.net) accessed on Monday, 20th of November 2023 at 21.00 WIB.

[328] Brown, A. G. A.; et al. (Gaia collaboration) (August 2018). "*Gaia* Data Release 2: Summary of the contents and survey properties". *Astronomy & Astrophysics*. 616.
A1. arXiv:1804.09365. Bibcode:2018A&A...616A...1G. doi:10.1051/0004-6361/201833051. Accessed on Sunday, the 26th of November 2023 at 17:55 WIB.

[329] National Aeronautics and Space Administration, *Universe Discovery Guides: March - Pleiades Star Cluster*, Universe Discovery Guides: March - Pleiades Star Cluster (nasa.gov) accessed on Monday, 20th of November 2023 at 21.28 WIB.

and his wife Pleione. All nine stars, including Atlas and Pleione, thus complete the visible cluster. They are easily located in the winter sky by using the three prominent and almost co-linearstars of the so-called belt in the constellation—Orion—as a pointer.[330]

The individual stars of the Pleiades are sized by their relative brightness. This is measuredin an astronomical scale of magnitude (logarithmic), where a larger number indicates a fainter object. The most prominent star in the cluster is Alcyone (magnitude +2.9) while Asterope (magnitude +5.8) is 7.3 times fainter. This is at the limit of what can be resolved

[330] The prominence of this particular star cluster in the sky, as well as its recurring seasonalreappearance, has brought the Pleiades to the attention of many cultures in more recent times,as well as in the prehistoric past. In one example of a bark painting by an unknownindigenous Australian artist, the Pleiades and the three stars in Orion that act as pointers toit are depicted in the composition. These are coloured white and placed inside a boat shownagainst a dark background that represents the sky. In the oral tradition of indigenous Australians (known as 'The Dreaming'), these two star patterns are linked with human voyages. Many North American Indian tribes are also known to have observed the Pleiades,albeit attaching different meanings and legends according to their tribal group. Roe (1993) describes numerous traditions and myths connecting the Pleiades, Hyades and Orion withthe astronomical knowledge of past civilisations in Mesoamerica and South America. At sometemple sites in the Hawaiian Islands, orientation and other contextual evidence shows thesewere linked with the rising sun and the rising Pleiades (Kirch 2004).In Europe, cult worship of the goddess Atemis Orthia at a sanctuary temple in Sparta,Greece, from c. 700–400 BC, has been shown to be associated with the heliacal (close to thesun) rising of the Pleiades and clearly demonstrates 'the role of astronomy in Greek religiouspractice and perceptions of the cosmos' at that time (Boutsikas & Ruggles 2011). See Frank Prendergast, 'The Pleiades'. In O' Connell, A. (Ed.) *Harvesting The Stars: A Pagan Temple At Lismullin*, Co. (Meath Dublin: National Roads Authority,2013), 76-77, (PDF) The Pleiades | Frank Prendergast - Academia.edu accessed on Tuesday, 21st of November 2023 at 20.43 WIB

by the humaneye, situated in a standard state of atmospheric transparency free from the effects of artificiallight pollution. For comparison, a full moon (magnitude -12.9) is 40 times brighter than Alcyone while Sirius (magnitude -1.4), the brightest star in the heavens, is 11 times brighter.[331]

Picture 4. 4
The Pleiades Star [332]

While the Kartika or Waluku identified with the "belt stars" (δ, ε and ζ Ori in table 4.2),[333] where all the stars is in the constellation Orion. Its position on the sky, almost

[331] Frank Prendergast, 'The Pleiades'. In O' Connell, A. (Ed.) *Harvesting The Stars: A Pagan Temple At Lismullin*, Co. (Meath Dublin: National Roads Authority,2013), 76. (PDF) The Pleiades | Frank Prendergast - Academia.edu accessed on Tuesday, 21st of November 2023 at 20.43 WIB.

[332] Frank Prendergast, 'The Pleiades'. In O' Connell, A. (Ed.) *Harvesting The Stars: A Pagan Temple At Lismullin*, Co. (Meath Dublin: National Roads Authority,2013), 75. (PDF) The Pleiades | Frank Prendergast - Academia.edu accessed on Tuesday, 21st of November 2023 at 20.43 WIB.

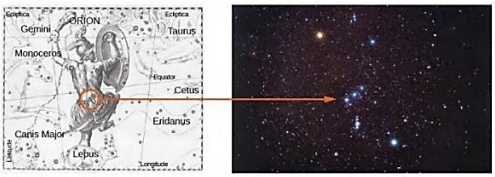
[333] The Orion Belt, located in the central part of the Orion constellation, is an approximately linear asterism of three evenly spaced objects in which the northernmost star, Mintaka (or Orionis), is slightly out of the axis connecting the southernmost object, Alnitak (or ζ Orionis), to the central one, Alnilam (or Orionis). See Gene Ammarell & Anna Lowenhaupt Tsing, *Cultural Production of Skylore in Indonesia*, (New York: Springer Science & Business Media, 2015), 2209 and Vincenzo Orofino, *A Quantitative Astronomical Analysis of The Orion Correlation Theory*, (PDF) A quantitative astronomical analysis of the Orion Correlation Theory (researchgate.net) accessed on Monday, 20th of November 2023 at 21.15 WIB.

perfectly “riding the Equator” means that it is completely visible to all corners of the Earth.[334] This is in accordance with the appearance of Orion which has 3 inline stars used a beginning of year determination in Baduy.

No.	Name	Bayer Designation	Light Years	Apparent Magnitude
1.	Mintaka	δ Orionis	1,200	2.23
2.	Alnilam	ε Orionis	1,344	1.69
3.	Alnitak	ζ Orionis	1,260	1.77

Tabel 4.4
The Stars In Orion’s Belt [335]

These three kings or the three sisters[336] can be seen as the belt of the named hunter's clothes because they are roughly equally spaced in a nearly straight line.The greatest time to see them is in the early evening sky during the Northern Winter/Southern Summer, especially in January at about 9:00 p.m.[337]



Picture 4. 5

[334] Iharka Szücs-Csilik, *Orion’s Belt – Symbol and Sign*, (PDF) Orion's belt - symbol and sign (researchgate.net) accessed on Monday, 20th of November 2023 at 21.39 WIB.

[335] See Orion (constellation) - Wikipedia accessed on Monday, 27th of November 2023 at 10.37 WIB.

[336] Read on Space.com, Orion Constellation: Facts, location and stars of the hunter, Orion Constellation: Facts, location and stars of the hunter | Space accessed on Monday, 27th of November 2023 at 10.55 WIB.

[337] Chris Dolan, "Orion", Orion (archive.org) accessed on Monday, 27th of November 2023 at 11.00 WIB.

The Belt Star of Orion[338]

The Belt of Orion is referred to as Väinämöisen vyö (Väinämöinen's Belt) in Finnish mythology. An asterism known as Kalevanmiekka (Kaleva's sword) is formed by the stars that seem to "hang" off the belt. The belt was referred to as Freyja's distaff or Frigg's Distaff (Friggerock) in pre-Christian Scandinavia.[339] The terms "Jacob's Staff," "Peter's Staff," and "the Three Magi," or "the Three Kings," were also borrowed from European biblical texts. Terms from Finnish mythology include Kalevan Sword and Väinämöinen's Scythe (Kalevala).[340]

As previously mentioned before, the Baduy people use the Orion's Belt and Pleiades Star to determine when their calendar year begins. This start of the year is a point of reference for their customary ceremonies and diverse

[338] Andrew Fraknoi, et. al, *Astronomy*, (Houston: Rice University, 2017), 41.

[339] Ebbe chön, *Asa-Tors Hammare, Gudar Och Jättar I Tro Och Tradition*. (Fält & Hässler, Värnamo, 2004), 228. While, in Portugal, South America, and the Philippines, the three stars in the belt are referred to as "As Três Marias" in Portuguese and Las Tres Marías in Spanish.They served as a distinct indicator for ancient timekeeping and mark the northern night sky at the time when the Sun is at its lowest position. They identify by the name Los Tres Reyes Magos in Mexico. See Kings1 (archive.org) accessed on Monday, 27th of November 2023 at 11.24 WIB.

[340] Richard Hinckley Allen, *Star-Names & Their Meanings*, (New York, Leipzig [etc.] G.E. Stechert, 1890), 314–315. The belt is known as Tautoru (literally, "string of three") by the Māori people of New Zealand, and it is frequently viewed as the stern of Te Waka o Rangi, or the canoe of Rangi, a constellation that reaches its prow at Matariki, or the Pleiades. The Māori New Year occurs in late May or early June, coinciding with the emergence of Matariki in the dawn sky. See E.Merton, "Matariki and Māori astronomy with Dr Rangi Matamua Archived 2022-08-08 at the Wayback Machine," The McGuinness Institute, 21 July 2017. Matariki and Māori astronomy with Dr Rangi Matamua | McGuinness Institute accessed on Monday, 27th of November 2023 at 11.29 WIB.

agricultural endeavors. In Baduy's society, *tanggal kidang turun kujang* means when *Kidang* appears, the kujang knife (picture 4.1) is used. Then, Bentang kartika appears two weeks earlier than bentang kidang.

The rising time of these stars must be determined astronomically in order to examine it in light of what the Baduy society has traditionally understood to be true in scientific way. But there is no explanation provided for how the both of *Bentang Kidang* (Orion's Belt) and *Bentang Kartika* (Pleiades Star) are used to determine the start of the year. They only provide details when these stars are visible.

Both of these stars are visible, before the Baduy calendar year officially begins. Because the beginning of their calendar is indicated by the both of these stars appearance. Sapar/Kapat, which in the Gregorian calendar corresponds to the months of April through May, is when they begin their beginning of year (table 4.1). It means the both of *Bentang Kidang* (Orion's Belt) and *Bentang Kartika* (Pleiades Star) appear before that. According to Baduy tribe, the *Bentang Kidang* (Orion's Belt) already appeared in March. To find out more about the astronomical analysis of these two stars, I will figure out their rising and setting times with a calculation celestial body.

This calculation will use the following symbols: [341]

L = The observer's geographic longitude, expressed in degrees or decimals, is measured *negatively to the east* and *positively to the west from Greenwich*.

φ = The observer's geographic latitude is positive in the north and negative in the south;

h = The "standard" altitude, which is the body's center's geometric altitude at the moment of apparent rising, specifically;

PM α = (Proper motion) Small changes in the Right ascension of the Star over a period of time;

PM δ = (Proper motion) Small changes in the Right ascension of the Star over a period of time;

h_o = (- 0°34') = - 0.5667 for the Stars and Planets;

α = The Star's Right ascension [342]

δ = The Star's Apperent declination

$\mu\alpha$ = The Star's Right ascension correction

$\mu\delta$ = The Star's Apperent declination correction

α^* = The Star's Right ascension corrected

δ^* = The Star's Apperent declination corrected

JD = Julian Day / Julian Datum

JY = Julian Year

D = Day

[341] Jean Meeus, *Astronomical Algorithm*, (Virginia: Willmann-Bell, 2nd edition, 1998), 101.

[342] Star data for the years 1991,25 is compiled in taken from *The Hipparcos and Tycho Catalogues* along with annual correction data that can be used all year long.

M = Month

Y = Year

T = Times in Century

Θ_0 = Sideral Time in Greenwich

H_0 = Hour angel of star in local time

H_0 should be taken from 0^o and $+180^o$

m_0 = Transit time in Greenwich

m_1 = Rising time

m_2 = Setting time [343]

The calculation steps are the following:

- A

  A = INT / 100

- B

  B = 2 - A + INT (A / 4)

- Julian Day

  JD = INT (365.25 (Y + 4716) + INT (30.6001 (M + 1)) +

  D + B – 1524.5

- T

  T = JD – 2451545.0 / 36525

- Julian Year

  JY = T x 100

  - μα

    μα = (PM α / 1000) x JY

[343] Jean Meeus, *Astronomical Algorithm*, (Virginia: Willmann-Bell, 2nd edition, 1998), 101-104.

- $\mu\delta$

  $\mu\delta = (PM\ \delta / 1000) \times JY$

- α^*

  $\alpha^* = \alpha + \mu\alpha$

- δ^*

  $\delta^* = \delta + \mu\delta$

- Θ_0

  $\Theta_0 = 100.46061837 + 36000.770053608 \times T + 0.000387933 \times T^2 - T^3 / 38710000$

- m_0

  $m_0 = \alpha^* + L - \Theta_0 / 360$

- h_o

  $h_o = -0.5667$

- Cos H_0

  $\text{Cos } H_0 = \sin h_o - \sin \varphi \times \sin \delta^* / \cos \varphi \times \cos \delta^*$

- m_1

  $m_1 = m_0 - H_0 / 360$

- m_1 in WIB

  $m_1 = m_1 + 7$

- m_2

  $m_2 = m_0 + H_0 / 360$

- m_2 in WIB

  $m_2 = m_2 + 7$ [344]

[344] Jean Meeus, *Astronomical Algorithm*, (Virginia: Willmann-Bell, 2nd edition, 1998).

Here is the rising and setting time calculation of the Orion's Belt:

No. 26727 (ζ Ori) – Alnitak				
φ **(LS)**	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	1		31	
Month	3		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455256,5		2455286,5	
T	0,101615332		0,102436687	
JY	10,1615332		10,24366872	
A	85,18968672		85,18968672	
Δ	-1,94257841		-1,94257841	
PM α∗	3,99		3,99	
PM δ∗	2,54		2,54	
μα	0,040544517		0,040872238	
μδ	0,025810294		0,026018919	
α∗	85,23023124	85° 13' 48,83"	85,23055896	85° 13' 50,01"
δ∗	-1,916768116	-01° 55' 00,37"	-1,916559491	-01° 54' 59,61"
Θo	3758,690822	3758° 41' 26,96"	3788,260243	3788° 15' 36,88"
	158,6908223	158° 41' 26,96"	188,2602434	188° 15' 36,88"
Mo	0,498553144	00° 29' 54,79"	0,416416774	00° 24' 59,10"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	89,64748954	89° 38' 50,96"	89,64746583	89° 38' 50,88"
m_1	0,24953234	00° 14' 58,32"	0,167396035	00° 10' 02,63"
m_1	5,988776157	05° 59' 19,59"	4,017504849	04° 01' 03,02"
	5,988776157	05° 59' 19,59"	4,017504849	04° 01' 03,02"
m_1 in WIB	12,98877616	12° 59' 19,59"	11,01750485	11° 01' 03,02"
	12,98877616	**12: 59' 19,59''**	**11,01750485**	**11: 01' 03,02''**
m_2	0,747573948	00° 44' 51,27"	0,665437512	00° 39' 55,58"
m2 in WIB	17,94177476	17: 56' 30,39"	15,97050029	15: 58' 13,80"
	24,94177476	**24: 56' 30,39''**	**22,97050029**	**22: 58' 13,80''**

Tabel 4.5
Rising and Setting Time Calculation Of Alnitak in 1st and 31st March 2010

No. 26311 (ε Ori) Alnilam				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	1		31	
Month	3		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455256,5		2455286,5	
T	0,101615332		0,102436687	
JY	10,1615332		10,24366872	
A	84,05338572		84,05338572	
Δ	-1,20191725		-1,20191725	
PM α∗	1,49		1,49	
PM δ∗	-1,06		-1,06	
μα	0,015140684		0,015263066	
μδ	-0,01077123		-0,010858289	
α∗	84,0685264	84° 04' 06,70"	84,06864879	84° 04' 07,14"
δ∗	-1,21268848	-01° 12' 45,68"	-1,212775539	-01° 12' 45,99"
Θo	3758,690822	3758° 41' 26,96"	3788,260243	3788° 15' 36,88"
	158,6908223	158° 41' 26,96"	188,2602434	188° 15' 36,88"
Mo	-0,50467381	-00° 30' 16,83"	-0,586810754	-00° 35' 12,52"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	89,56746229	89° 34' 02,86"	89,56747218	89° 34' 02,90"
m_1	0,24652768	00° 14' 47,50"	0,164390712	00° 09' 51,81"
m_1	5,916664318	05° 54' 59,99"	3,94537708	03° 56' 43,36"
	5,916664318	05° 54' 59,99"	3,94537708	03° 56' 43,36"
m_1 in WIB	12,91666432	12° 54' 59,99"	10,94537708	10° 56' 43,36"
	12,91666432	**12: 54' 59,99''**	**10,94537708**	**10: 56' 43,36''**
m_2	0,744124693	00° 44' 38,85"	0,661987779	00° 39' 43,16"
m_2 in WIB	17,85899262	17: 51' 32,37"	15,8877067	15: 53' 15,74"
	24,85899262	**24: 51' 32,37''**	**22,8877067**	**22: 53' 15,74''**

Tabel 4.6
Rising and Setting Time Calculation Of Alnilam in 1st and 31st March 2010

No. 25930 (δ Ori) Mintaka				
φ **(LS)**	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,06028	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	1		31	
Month	3		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455256,5		2455286,5	
T	0,10161533		0,102436687	
JY	10,1615332		10,24366872	
A	83,0016656		83,00166562	
Δ	-0,2990934		-0,2990934	
PM α∗	1,67		1,67	
PM δ∗	0,56		0,56	
μα	0,01696976		0,017106927	
μδ	0,00569046		0,005736454	
α∗	83,0186354	83° 01' 07,09"	83,01877255	83° 01' 07,58"
δ∗	-0,2934029	-00° 17' 36,25"	-0,293356946	-00° 17' 36,09"
Θo	3758,69082	3758° 41' 26,96"	3788,260243	3788° 15' 36,88"
	158,690822	158° 41' 26,96"	188,2602434	188° 15' 36,88"
Mo	-0,5075902	-00° 30' 27,32"	-0,589727077	-00° 35' 23,02"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	89,4664074	89° 27' 59,07"	89,46640223	89° 27' 59,05"
m_1	0,24389202	00° 14' 38,01"	0,161755139	00° 09' 42,32"
m_1	5,85340857	05° 51' 12,27"	3,882123328	03° 52' 55,64"
	5,85340857	05° 51' 12,27"	3,882123328	03° 52' 55,64"
m_1 in WIB	12,8534086	12° 51' 12,27"	10,88212333	10° 52' 55,64"
	12,8534086	**12: 51' 12,27''**	**10,88212333**	**10: 52' 55,64''**
m_2	0,74092762	00° 44' 27,34"	0,658790707	00° 39' 31,65"
m_2 in WIB	17,7822629	17: 46' 56,15"	15,81097696	15: 48' 39,52"
	24,7822629	**24: 46' 56,15''**	**22,81097696**	**22: 48' 39,52''**

Tabel 4.7
Rising and Setting Time Calculation Of Mintaka in 1st and 31st March 2010

According to the Baduy people, Bentang Kidang or Orion's Belt appears in March. But based on the calculation of the rising and setting times above, Alnitak, the most latest risen from the three stars in Orion's Belt, rose between 12: 54' 59.99" to 11: 01' 03.02" and set between 24:51' 32.37" to 22: 53' 15.74" between the 1st until 31st of March in 2010. This shows that in March, at the noon, this Bentang Kidang (Orion's Belt) is invisible to be seen at the time of rising. The Orion's Belt in March can only be seen for a few hours in the evening before it sets on the western horizon (Alnitak's setting time at 24:51' 32.37" to 22: 53' 15.74"). Therefore, based on this astronomical analysis, the appearance of the Orion's Belt in March is the appearance on the horizon towards the time of setting star in the west in the night after sunset. "The appearing" in this case does not mean rising, but it means "visible" by the observer.

Then, in in the understanding of Baduy society, Bentang Kartika or Pleiades Star appears two weeks earlier than Bentang Kidang. To find out more about the astronomical analysis about this, I will figure out their rising and setting times with a calculation celestial body too. Here is the rising and setting time calculation of the Pleiades Star:

No. 17702 (Alcyone)				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	

Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,101177276		0,101998631	
JY	10,11772758		10,19986311	
A	56,87110065		56,87110065	
Δ	24,10524193		24,10524193	
PM α∗	19,35		19,35	
PM δ∗	-43,11		-43,11	
μα	0,195778029		0,197367351	
μδ	-0,436175236		-0,439716099	
α∗	57,06687868	57° 04' 00,76"	57,068468	57° 04' 06,48"
δ∗	23,66906669	23° 40' 08,64"	23,66552583	23° 39' 55,89"
Θo	3742,920464	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,9204645	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	0,464128159	00° 27' 50,86"	0,381995293	00° 22' 55,18"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	87,08405468	87° 05' 02,60"	87,08431338	87° 05' 03,53"
m_1	0,222228007	00° 13' 20,02"	0,140094423	00° 08' 24,34"
m_1	5,33347217	05° 20' 00,50"	3,362266141	03° 21' 44,16"
	5,33347217	05° 20' 00,50"	3,362266141	03° 21' 44,16"
m_1 in WIB	12,33347217	12° 20' 00,50"	10,36226614	10° 21' 44,16"
	12,33347217	**12: 20' 00,50"**	**10,36226614**	**10: 21' 44,16"**
m_2	0,706028311	00° 42' 21,70"	0,623896164	00° 37' 26,03"
m_2 in WIB	16,94467946	16: 56' 40,85"	14,97350792	14: 58' 24,63"
	23,94467946	**23: 56' 40,85"**	**21,97350792**	**21: 58' 24,63"**

Tabel 4.8

Rising and Setting Time Calculation Of Alcyone in 16th February and 15th March 2010

No. 17847 (Atlas)				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	

JD	2455240,5		2455270,5	
T	0,101177276		0,101998631	
JY	10,11772758		10,19986311	
A	57,29054669		57,29054669	
Δ	24,05352412		24,05352412	
PM α∗	17,77		17,77	
PM δ∗	-44,7		-44,7	
μα	0,179792019		0,181251567	
μδ	-0,45226242		-0,455933881	
α∗	57,47033871	57° 28' 13,22"	57,47179826	57° 28' 18,47"
δ∗	23,6012617	23° 36' 04,54"	23,59759024	23° 35' 51,32"
Θo	3742,920464	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,9204645	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	-0,53475112	-00° 32' 05,10"	-0,616884345	-00° 37' 00,78"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	87,08901521	87° 05' 20,45"	87,08928421	87° 05' 21,42"
m_1	0,22333495	00° 13' 24,01"	0,141200976	00° 08' 28,32"
m_1	5,360038803	05° 21' 36,14"	3,388823436	03° 23' 19,76"
	5,360038803	05° 21' 36,14"	3,388823436	03° 23' 19,76"
m_1 in WIB	12,3600388	12° 21' 36,14"	10,38882344	10° 23' 19,76"
	12,3600388	**12: 21' 36,14"**	**10,38882344**	**10: 23' 19,76"**
m_2	0,707162812	00° 42' 25,79"	0,625030333	00° 37' 30,11"
m_2 in WIB	16,9719075	16: 58' 18,87"	15,000728	15: 00' 02,62"
	23,9719075	**23: 58' 18,87"**	22,000728	**22: 00' 02,62"**

Tabel 4.9
Rising and Setting Time Calculation Of Atlas in 16th February and 15th March 2010

No. 17499 (Electra)				
φ **(LS)**	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,06028	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,10117728		0,101998631	
JY	10,1177276		10,19986311	

A	56,2188481		57,29054669	
Δ	24,1134484		24,05352412	
PM α∗	21,55		17,77	
PM δ∗	-44,92		-44,7	
μα	0,21803703		0,181251567	
μδ	-0,4544883		-0,455933881	
α∗	56,4368851	56° 26' 12,79"	57,47179826	57° 28' 18,47"
δ∗	23,6589601	23° 39' 32,26"	23,59759024	23° 35' 51,32"
Θo	3742,92046	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,920464	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	-0,5376218	-00° 32' 15,44"	-0,616884345	-00° 37' 00,78"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	86,837371	86° 50' 14,54"	87,08928421	87° 05' 21,42"
m_1	0,22116326	00° 13' 16,19"	0,141200976	00° 08' 28,32"
	5,30791818	05° 18' 28,51"	3,388823436	03° 23' 19,76"
m_1	5,30791818	05° 18' 28,51"	3,388823436	03° 23' 19,76"
	12,3079182	12° 18' 28,51"	10,38882344	10° 23' 19,76"
m_1 in WIB	**12: 18' 28,51"**	**10,38882344**	**10: 23' 19,76"**	**12: 18' 28,51"**
m_2	0,7035931	00° 42' 12,94"	0,625030333	00° 37' 30,11"
	16,8862343	16: 53' 10,44"	15,000728	15: 00' 02,62"
m_2 in WIB	**23,8862343**	**23: 53' 10,44"**	**22,000728**	**22: 00' 02,62"**

Tabel 4.10
Rising and Setting Time Calculation Of Electra in 16th February and 15th March 2010

No. 17573 (Maia)				
φ **(LS)**	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,101177276		0,101998631	
JY	10,11772758		10,19986311	
A	56,45663804		56,45663804	
Δ	24,36785796		24,36785796	
PM α∗	21,09		21,09	

PM δ∗	-45,03		-45,03	
μα	0,213382875		0,215115113	
μδ	-0,455601273		-0,459299836	
α∗	56,67002091	56° 40' 12,08"	56,67175315	56° 40' 18,31"
δ∗	23,91225669	23° 54' 44,12"	23,90855812	23° 54' 30,81"
Θo	3742,920464	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,9204645	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	0,463025776	00° 27' 46,89"	-0,619106693	-00° 37' 08,78"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	87,06637963	87° 03' 58,97"	87,06664707	87° 03' 59,93"
m_1	0,221174722	00° 13' 16,23"	0,13904151	00° 08' 20,55"
m_1	5,308193322	05° 18' 29,50"	3,336996238	03° 20' 13,19"
	5,308193322	05° 18' 29,50"	3,336996238	03° 20' 13,19"
m_1 in WIB	12,30819332	12° 18' 29,50"	10,33699624	10° 20' 13,19"
	12,30819332	**12: 18' 29,50''**	**10,33699624**	**10: 20' 13,19''**
m_2	0,704876831	00° 42' 17,56"	0,622745105	00° 37' 21,88"
m_2 in WIB	16,91704394	16: 55' 01,36"	14,94588251	14: 56' 45,18"
	23,91704394	**23: 55' 01,36''**	**21,94588251**	**21: 56' 45,18''**

Tabel 4.11
Rising and Setting Time Calculation Of Maia in 16th February and 15th March 2010

No. 17608 (Merope)				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,101177276		0,101998631	
JY	10,11772758		10,19986311	
A	56,58150135		56,58150135	
Δ	23,94846207		23,94846207	
PM α∗	21,17		21,17	
PM δ∗	-42,67		-42,67	
μα	0,214192293		0,215931102	
μδ	-0,43172344		-0,435228159	
α∗	56,79569364	56° 47' 44,50"	56,79743245	56° 47' 50,76"

δ∗	23,51673863	23° 31' 00,26"	23,51323391	23° 30' 47,64"
Θo	3742,920464	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,9204645	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	-0,53662513	-00° 32' 11,85"	-0,618757583	-00° 37' 07,53"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	87,09521856	87° 05' 42,79"	87,09547625	87° 05' 43,71"
m_1	0,221443705	00° 13' 17,20"	0,139310538	00° 08' 21,52"
m_1	5,314648909	05° 18' 52,74"	3,343452913	03° 20' 36,43"
	5,314648909	05° 18' 52,74"	3,343452913	03° 20' 36,43"
m_1 in WIB	12,31464891	12° 18' 52,74"	10,34345291	10° 20' 36,43"
	12,31464891	**12: 18' 52,74''**	**10,34345291**	**10: 20' 36,43''**
m_2	0,70530603	00° 42' 19,10"	0,623174295	00° 37' 23,43"
m_2 in WIB	16,92734472	16: 55' 38,44"	14,95618308	14: 57' 22,26"
	23,92734472	**23: 55' 38,44''**	**21,95618308**	**21: 57' 22,26''**

Tabel 4.12
Rising and Setting Time Calculation Of Merope in 16th February and 15th March 2010

No. 17531 (Taygeta)				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,06028	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,10117728		0,101998631	
JY	10,1177276		10,19986311	
A	56,3020088		56,30200876	
Δ	24,4673788		24,46737879	
PM α∗	19,35		19,35	
PM δ∗	-41,63		-41,63	
μα	0,19577803		0,197367351	
μδ	-0,421201		-0,424620301	
α∗	56,4977868	56° 29' 52,03"	56,49937611	56° 29' 57,75"
δ∗	24,0461778	24° 02' 46,24"	24,04275849	24° 02' 33,93"
Θo	3742,92046	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,920464	142° 55' 13,67"	172,4898855	172° 29' 23,59"

Mo	-0,5374527	-00° 32' 14,83"	-0,619585518	-00° 37' 10,51"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	86,7973495	86° 47' 50,46"	87,05697016	87° 03' 25,09"
m_1	0,2214436	00° 13' 17,20"	0,138589565	00° 08' 18,92"
m_1	5,31464639	05° 18' 52,73"	3,326149563	03° 19' 34,14"
	5,31464639	05° 18' 52,73"	3,326149563	03° 19' 34,14"
m_1 in WIB	12,3146464	12° 18' 52,73"	10,32614956	10° 19' 34,14"
	12,3146464	**12: 18' 52,73''**	**10,32614956**	**10: 19' 34,14''**
m_2	0,7036511	00° 42' 13,14"	0,622239399	00° 37' 20,06"
m_2 in WIB	16,8876263	16: 53' 15,45"	14,93374558	14: 56' 01,48"
	23,8876263	**23: 53' 15,45''**	21,93374558	**21: 56' 01,48''**

Tabel 4.13
Rising and Setting Time Calculation Of Taygeta in 16th February and 15th March 2010

No. 17851 (Pleione)				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,101177276		0,101998631	
JY	10,11772758		10,19986311	
A	57,29668368		57,29668368	
Δ	24,13682565		24,13682565	
PM α∗	18,71		18,71	
PM δ∗	-46,74		-46,74	
μα	0,189302683		0,190839439	
μδ	-0,472902587		-0,476741602	
α∗	57,48598636	57° 29' 09,55"	57,48752312	57° 29' 15,08"
δ∗	23,66392306	23° 39' 50,12"	23,66008405	23° 39' 36,30"
Θo	3742,920464	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,9204645	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	0,465292347	00° 27' 55,05"	-0,616840665	-00° 37' 00,63"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	87,08443049	87° 05' 03,95"	87,08471103	87° 05' 04,96"
m_1	0,223391151	00° 13' 24,21"	0,14125736	00° 08' 28,53"

m_1	5,361387628	05° 21' 41,00"	3,390176639	03° 23' 24,64"
	5,361387628	05° 21' 41,00"	3,390176639	03° 23' 24,64"
m_1 in WIB	12,36138763	12° 21' 41,00"	10,39017664	10° 23' 24,64"
	12,36138763	**12: 21' 41,00''**	**10,39017664**	**10: 23' 24,64''**
m_2	0,707193543	00° 42' 25,90"	0,62506131	00° 37' 30,22"
m_2 in WIB	16,97264503	16: 58' 21,52"	15,00147144	15: 00' 05,30"
	23,97264503	**23: 58' 21,52''**	22,00147144	**22: 00' 05,30''**

Tabel 4.14
Rising and Setting Time Calculation Of Pleione in 16th February and 15th March 2010

No. 17489 (Celaeno)				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,101177276		0,101998631	
JY	10,11772758		10,19986311	
A	56,20084227		56,20084227	
Δ	24,28957712		24,28957712	
PM α∗	20,73		20,73	
PM δ∗	-44		-44	
μα	0,209740493		0,211443162	
μδ	-0,44518001		-0,448793977	
α∗	56,41058276	56° 24' 38,10"	56,41228543	56° 24' 44,23"
δ∗	23,84439711	23° 50' 39,83"	23,84078314	23° 50' 26,82"
Θo	3742,920464	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,9204645	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	-0,53769489	-00° 32' 15,70"	-0,619827436	-00° 37' 11,38"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	87,0712933	87° 04' 16,66"	87,07155539	87° 04' 17,60"
m_1	0,220440411	00° 13' 13,59"	0,138307132	00° 08' 17,91"
m_1	5,290569867	05° 17' 26,05"	3,319371169	03° 19' 09,74"
	5,290569867	05° 17' 26,05"	3,319371169	03° 19' 09,74"
m_1 in WIB	12,29056987	12° 17' 26,05"	10,31937117	10° 19' 09,74"
	12,29056987	**12: 17' 26,05''**	**10,31937117**	**10: 19' 09,74''**

m_2	0,704169818	00° 42' 15,01"	0,622037995	00° 37' 19,34"
m_2 in WIB	16,90007564	16: 54' 00,27"	14,92891189	14: 55' 44,08"
	23,90007564	**23: 54' 00,27''**	21,92891189	**21: 55' 44,08''**

Tabel 4.14

Rising and Setting Time Calculation Of Celaeno in 16th February and 15th March 2010

No. 17579 (Asterope or Sterope)				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	16		15	
Month	2		3	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455240,5		2455270,5	
T	0,101177276		0,101998631	
JY	10,11772758		10,19986311	
A	56,47693278		56,47693278	
Δ	24,55462128		24,55462128	
PM α∗	19,44		19,44	
PM δ∗	-45,36		-45,36	
μα	0,196688624		0,198285339	
μδ	-0,458940123		-0,462665791	
α∗	56,6736214	56° 40' 25,04"	56,67521812	56° 40' 30,79"
δ∗	24,09568116	24° 05' 44,45"	24,09195549	24° 05' 31,04"
Θo	3742,920464	3742° 55' 13,67"	3772,489886	3772° 29' 23,59"
	142,9204645	142° 55' 13,67"	172,4898855	172° 29' 23,59"
Mo	-0,536964222	-00° 32' 13,07"	-0,619097068	-00° 37' 08,75"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	87,05316939	87° 03' 11,41"	87,05343667	87° 03' 12,37"
m_1	0,221221418	00° 13' 16,40"	0,13908783	00° 08' 20,72"
m_1	5,309314038	05° 18' 33,53"	3,33810793	03° 20' 17,19"
	5,309314038	05° 18' 33,53"	3,33810793	03° 20' 17,19"
m_1 in WIB	12,30931404	12° 18' 33,53"	10,33810793	10° 20' 17,19"
	12,30931404	**12: 18' 33,53''**	**10,33810793**	**10: 20' 17,19''**
m_2	0,704850137	00° 42' 17,46"	0,622718034	00° 37' 21,78"
m_2 in WIB	16,91640329	16: 54' 59,05"	14,94523282	14: 56' 42,84"
	23,91640329	**23: 54' 59,05''**	**21,94523282**	**21: 56' 42,84''**

Tabel 4.15

Rising and Setting Time Calculation Of Asterope or Sterope in 16th February and 15th March 2010

According to the Baduy tribe, Kartika (Pleiades Star) appears 2 weeks before the appearance of the Kartika (Orion's Belt), which is between mid-February to mid-March. Meanwhile, based on the calculation of the rising and setting times of the Bentang Kartika above, Pleione, the most latest risen from Bentang Kartika (Pleiades Star) appear between 12: 21' 41,00" until 10: 23' 24,64" and set between 23: 58' 21,52" to 22: 00' 05,30" between the 16th February to 15th of March in 2010. It shows that just like the Orion's belt before, at the noon, this Bentang Kartika (Pleiades Star) is invisible to be seen at these rising time. The appearance of Bentang Kartika (Pleiades Star) at these time can only be seen for a few hours in the night before it sets on the western horizon (Pleione's setting time at 23: 58' 21,52" to 22: 00' 05,30"). Therefore, based on this astronomical analysis, the appearance of Bentang Kartika (Pleiades Star) is the appearance on the horizon towards the time of setting star in the west in the night after sunset. "The appearing" in this case does not mean rising time, but it means "visible" by the observer.

While there is the other phrase in the Baduy community, it's *Kidang ngarangsang kudu ngahuru*. At dawn, Bintang Kidang or Orion's Belt spans the eastern horizon at this time. The equator passes through the center of the star. Even the Baduy people do not actually observe the Bintang Kidang star or Orion's Belt when they awaken in the morning. They only use of other natural phenomena based on their practical experience. There is a type of "grass spider" that leaves

behind markers and nests in the grass (picture 4.2). It's when all the grass and branches are dry, ready to be burned on Katujuh / Kapitu month in Baduy's calendar or on the middle of July to the middle of August month in Gregorian calendar. However, this more closely relates to the astronomical concept of rising. Before we calculate about the Orion's Belt rising time, we have to find out the Subuh praying time, as below :

Date	12					
Month	7					
Year	2010					
		degree	minute	Secound	decimal	
Latitute	S	6	10	0	-6,1666667	Degree
Longitude	E	106	51	0	106,85	Degree
Local Time	7	hour				
High of place	50	Meter				
Shubuh (15-20)	20	Degree				
Isya' (15-20)	18	Degree				
Praying Times	Decimal	Hour				
Shubuh	**4,69594**	**04:41:45**				
Sunrise	**6,05855**	**06:03:31**				
Zhuhur	**11,96989**	**11:58:12**				
Ashar	**15,33855**	**15:20:19**				
Maghrib	**17,88122**	**17:52:52**				
Isya'	**19,10002**	**19:06:00**				

Tabel 4.16
The Praying Times Calculation in 12nd July 2010

Date	10					
Month	8					
Year	2010					
		Degree	minute	Secound	Decimal	
Latitute	S	6	10	0	-6,1666667	Degree
Longitude	E	106	51	0	106,85	Degree
Local Time	7	Hour				

High of place	50	Meter	
Shubuh (15-20)	20	Degree	
Isya' (15-20)	18	Degree	
Praying Times	decimal	Hour	
Shubuh	**4,69439**	**04:41:40**	
Sunrise	**6,00694**	**06:00:25**	
Zhuhur	**11,96686**	**11:58:01**	
Ashar	**15,32719**	**15:19:38**	
Maghrib	**17,92678**	**17:55:36**	
Isya'	**19,10086**	**19:06:03**	

Tabel 4.17
The Praying Times Calculation in 10th August 2010

As can be seen from the two computation tables above (tables 4.15 and 4.16), there was no significant change in the Baduy society's dawn time between July 12, 2010, to August 10, 2010. The beginning of dawn time only changed by a few seconds during one month, from 04:41:45 to 04:41:40 WIB.[345] So, here is the rising time calculation of Orion's Belt :

No. 26727 (ζ Ori) – Alnitak				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	12		10	
Month	7		8	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455389,5		2455418,5	
T	0,105256674		0,10605065	
JY	10,52566735		10,60506502	
A	85,18968672		85,18968672	
Δ	-1,94257841		-1,94257841	
PM α∗	3,99		3,99	

[345] Read on the attachment of this tesis for more details of this calculation.

PM δ∗	2,54		2,54	
μα	0,041997413		0,042314209	
μδ	0,026735195		0,026936865	
α∗	85,23168413	85° 13' 54,06"	85,23200093	85° 13' 55,20"
δ∗	-1,915843215	-01° 54' 57,04"	-1,915641545	-01° 54' 56,31"
Θo	3889,781922	3889° 46' 54,92"	3918,365696	3918° 21' 56,51"
	289,7819224	289° 46' 54,92"	318,365696	318° 21' 56,51"
Mo	0,134415235	00° 08' 03,89"	0,055016744	00° 03' 18,06"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	89,64738443	89° 38' 50,58"	89,64736151	89° 38' 50,50"
m_1	0,885394723	00° 53' 07,42"	0,805996295	00° 48' 21,59"
m_1	21,24947336	21° 14' 58,10"	19,34391109	19° 20' 38,08"
	21,24947336	21° 14' 58,10"	19,34391109	19° 20' 38,08"
m_1 in WIB	28,24947336	28° 14' 58,10"	26,34391109	26° 20' 38,08"
	4,249473356	**04: 14' 58,10''**	**2,343911092**	**02: 20' 38,08''**

Tabel 4.18
Rising Time Calculation Of Alnitak in 12nd July and 10th August 2010

No. 26311 (ε Ori) Alnilam				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,060277	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	12		10	
Month	7		8	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455389,5		2455418,5	
T	0,105256674		0,10605065	
JY	10,52566735		10,60506502	
A	84,05338572		84,05338572	
Δ	-1,20191725		-1,20191725	
PM α∗	1,49		1,49	
PM δ∗	-1,06		-1,06	
μα	0,015683244		0,015801547	
μδ	-0,01115721		-0,011241369	
α∗	84,06906896	84° 04' 08,65"	84,06918727	84° 04' 09,07"
δ∗	-1,21307446	-01° 12' 47,07"	-1,213158619	-01° 12' 47,37"
Θo	3889,781922	3889° 46' 54,92"	3918,365696	3918° 21' 56,51"
	289,7819224	289° 46' 54,92"	318,365696	318° 21' 56,51"

Mo	-0,86881425	-00° 52' 07,73"	-0,948213294	-00° 56' 53,57"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	89,56750616	89° 34' 03,02"	89,56751573	89° 34' 03,06"
m_1	0,882387121	00° 52' 56,59"	0,802988051	00° 48' 10,76"
m_1	21,1772909	21° 10' 38,25"	19,27171323	19° 16' 18,17"
	21,1772909	21° 10' 38,25"	19,27171323	19° 16' 18,17"
m_1 in WIB	28,1772909	28° 10' 38,25"	26,27171323	26° 16' 18,17"
	4,177290896	**04: 10' 38,25''**	**2,271713233**	**02: 16' 18,17''**

Tabel 4.19
Rising Time Calculation Of Alnilam in 12nd July and 10th August 2010

No. 25930 (δ Ori) Mintaka				
φ (LS)	-6,47875	-06° 28' 43,50"	-6,47875	-06° 28' 43,50"
***L* (BT)**	-107,06028	-107° 03' 37,00"	-107,060277	-107° 03' 37,00"
Date	12		10	
Month	7		8	
Year	2010		2010	
A	20		20	
B	-13		-13	
JD	2455389,5		2455418,5	
T	0,10525667		0,10605065	
JY	10,5256674		10,60506502	
A	83,0016656		83,00166562	
Δ	-0,2990934		-0,2990934	
PM α∗	1,67		1,67	
PM δ∗	0,56		0,56	
μα	0,01757786		0,017710459	
μδ	0,00589437		0,005938836	
α∗	83,0192435	83° 01' 09,28"	83,01937608	83° 01' 09,75"
δ∗	-0,293199	-00° 17' 35,52"	-0,293154564	-00° 17' 35,36"
Θo	3889,78192	3889° 46' 54,92"	3918,365696	3918° 21' 56,51"
	289,781922	289° 46' 54,92"	318,365696	318° 21' 56,51"
Mo	-0,8717304	-00° 52' 18,23"	-0,951129436	-00° 57' 04,07"
Ho	0,5667	00° 34' 00,12"	0,5667	00° 34' 00,12"
Ho	89,4629616	89° 27' 46,66"	89,46637939	89° 27' 58,97"
m_1	0,87976134	00° 52' 47,14"	0,800352843	00° 48' 01,27"
m_1	21,1142722	21° 06' 51,38"	19,20846824	19° 12' 30,49"
	21,1142722	21° 06' 51,38"	19,20846824	19° 12' 30,49"
m_1 in WIB	28,1142722	28° 06' 51,38"	26,20846824	26° 12' 30,49"
	4,11427217	**04: 06' 51,38''**	**2,208468243**	**02: 12' 30,49''**

Tabel 4.20
Rising Time Calculation Of Mintaka in 12nd July and 10th August 2010

Each star in the orion belt rises before dawn, as shown by the three computation tables (tables 4.17, 4.18, and 4.19) above. As the star in the Orion's Belt that rises the later than the other stars in the Orion's Belt, Alnitak started to rise on July 12, 2010, at 04: 14' 58.10', and continued to rise until August 10, 2010, at 02: 20' 38.08". As a result, this Orion's Belt will certainly be observable in the eastern sky at dawn (04:41:45 to 04:41:40).

The year is determined by the appearance of Bentang Kidang in the definition of *tanggal Kidang turun kujang*, but astronomically, this is the time when Bentang Kidang, also known as the Orion's Belt, immediately sinks and is only visible for a few hours in the early night before it disappears into the western sky. However, the term *Kidang ngarangsang kudu ngahuru* refers to ngahuru/ngaduruk activities in the agricultural system of the Baduy tribe, astronomically, this is the time of daybreak when Bentang Kidang, or the Orion's Belt, rises in the eastern sky. For this reason, Bentang Kidang, or the Orion's Belt in the term *Kidang ngarangsang kudu ngahuru* more closely matches to the astronomical term for the rising of celestial bodies than *tanggal Kidang turun kujang* in terms of the Baduy society.

The discussion of this calendar has led us to find out that, in order to make the calendar user-friendly, it employs a straightforward mathematical calculation system. However, due to the simplicity of

the calculation algorithm, time correction astronomically is also required in order for this calendar to continue being useful.

On this case, the Baduy people does have a unique understanding on these two cosmic bodies. This understanding is taught from one generation to the next as an ideological legacy that needs to be preserved as a heritage of civilization and culture. This is one of the native tribal calendars that has been conserved as a priceless cultural treasure. In its implementation, this calendar serves as a timekeeper for a variety of activities related to their traditional beliefs in addition to serving as a reference for farming activities. While even it's not entirely in accordance, the astronomical reviews is required to evaluate, validate and enrich the current understanding of this topic. Because one of a research's achievements is an error-correcting function.[346] The above discussion and explanation is hoped to be a goldmine of scientific advancement.

[346] Carl Sagan, *The Demon-Haunted World (Sains Penerang Kegelapan)*, (Jakarta: Kepustakaan Populer Gramedia, 2018), 31-32.

CHAPTER V
CONCLUSION AND RECOMMENDATION

A. Conclusion

After conducting the research on The Baduy's Calendar in Banten: A Beginning Of Year Determination' which has been described in previous chapters, the results of this research is in conclusions below.

1. The Baduy's calendar year begins with the observation of *Bentang Kidang*, also known as the Orion's Belt, on the eastern horizon (during the karo/katiga month, or March in the Gregorian calendar) and the *Bentang Kartika*, also known as the Pleiades Star (two weeks earlier). It's used because the Baduy's society believed that these two stars is the sign of they beginning of year in their calender since long ago.
2. In astronomical rising time calculation, the appearance of the *Bentang Kidang* or Orion's Belt in March and *Bentang Kartika* or Pleiades Star in 2 weeks before (between mid-February to mid-March) are the appearance on the horizon towards the time of setting star in the west in the night after sunset. "The rising" in this case does not mean rising, but it's closer to "visible" by the observer eye.

B. Suggestion and Recommendation

From the discussion about 'The Baduy's Calendar in Banten: A Beginning Of Year Determination', my riview about the shortcomings of the Baduy's calendar are:

1. Time correction is necessary for the calendar to remain appropriate for continuous use because the calculation algorithm is quite simple.
2. In order for the Baduy tribe community to not only hold to and inherit the ideology as well as insights related to stars and calendars from their ancestors, they need for additional understanding and knowledge related to the star system in accordance with astronomical reviews.

Meanwhile in the other side, the advantages of the Baduy's calendar are:

1. One of the native tribal calendars that has been conserved as a priceless cultural treasure. In its implementation, this calendar serves as a timekeeper for a variety of activities related to their traditional beliefs in addition to serving as a reference for farming activities. Therefore, it is highly possible to become numerous research objects.

2. This calendar's arithmetic calculation algorithm is relatively simple, causing its use easier to put into practice.

Then, my suggestions about the Baduy's calendar for the better one are:

1. The further research on the algorithm pattern system of this calendar is required to prevent misunderstandings and preserve the calendar's compatibility with astronomical and mathematical periodization.
2. Since the Baduy tribe uses the orion belt as an essential part of their calendar, the more research is required to find out how the Orion Belt's movements yearly affect their calendar and how it is implemented.

C. Closing

Alhamdulillah, all praises are due to Allah, the writer is very grateful to Allah the almighty, who has given strength, patience, and guidance to finish writing this thesis. All the shalawat and greetings will also be delivered to Prophet Muhammad SAW. with his words, actions, and *taqrīr* as a complement and explanation of the word of God (Qur'an). Which became a guide for the order of human life to achieve true happiness.

Although I have been tried my best efforts, I realized there are still shortcomings in writing this research. It's far

from the perfection. That's why, with all the humility, the writer apologizes profusely to all parties related to this thing. So, the constructive criticism and suggestions are waited forward to the progress of the better writings.

Finally, I hope this thesis can be useful for society in general, especially for me and this academic environment. Thank you very much for all your attention and appreciation. May we always get forgiveness and guidance from Allah all the way. *Wallahu a'lam.*

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CURRICULUM VITAE

SELF QUALIFICATIONS

Name	: Maulida Inayah
Place, Date of Birth	: Kedondong, 14th Jun 2000
Address	: Telkom Street Number 07 (RT/RW 13/04), Pasar Baru Village, Kedondong, Pesawaran, Lampung.
Contact Number	: +6285896942698 (Whatsapp &Telegram)
E-mail	: inayahmaulida656@gmail.com maulidainyah_1802046113@student walisongo.ac.id

ACADEMIC QUALIFICATIONS

A. Formal Academics :

1) 1st Islamic State Elementary School Pesawaran (2006-2012)
2) Diniyyah Putri Lampung Islamic Junior Boarding School (2012-2015)
3) Diniyyah Putri Lampung Islamic Senior Boarding School (2015 - 2018)
4) Islamic Astronomy, Syari'ah and Law Faculty, State University Walisongo Semarang (2018-2022)
5) The Master Program of Islamic Astronomy, Syari'ah and Law Faculty, State University Walisongo Semarang (2022-2023)

B. Non Formal Academics :

1) Diniyyah Putri Lampung Islamic Boarding School (2012-2018)
2) Two-Month English Proficiency Development Program, Future English Education Course, Kediri (2015)
3) YPMI Al Firdaus Boarding School (2018-2023)

4) Scientific Writting Program (2021)

C. Organizations & Experiences :

1) PMDL Diniyyah Putri Lampung Islamic Junior Boarding School's Organization (2014)
2) PKM Diniyyah Putri Lampung Islamic Senior Boarding School's Organization (2017)
3) Sekertaris Unit Kegiatan Mahasiswa Bimbingan Bahasa Arab-Baca Kitab Kuning (UKM BBA-BBKK) Syari'ah and Law Fculty, State University Walisongo Semarang (2019)
4) CSSMoRA Islamic State University Walisongo Semarang (2018 – 2022)
5) Ngobrol Pintar (Ngopi) Team (2021 – 2022)
6) Magang Batch 1 Planetarium & Observatorium UIN Walisongo Semarang (2022)
7) Asistan Laboran Planetarium & Observatorium UIN Walisongo Semarang (2023)