

# THE LOCAL WISDOM IN AGROFORESTRY SYSTEMS: THE CASE STUDY IN WANGA VILLAGE, EAST MOTOLING SUB- DISTRICT, SOUTH MINAHASA REGENCY, INDONESIA

*by* Elsje Pauline Manginsela

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**THE LOCAL WISDOM IN AGROFORESTRY SYSTEMS: THE CASE STUDY IN WANGA VILLAGE, EAST MOTOLING SUB-DISTRICT, SOUTH MINAHASA REGENCY, INDONESIA**

**Samuel Paulus Ratag**<sup>1</sup>  
**Euis Francoise S. Pangemanan**<sup>2</sup>  
**Frangky Jessy Paat**<sup>3</sup>  
**Sarah Mokoagouw**<sup>4</sup>  
**Elsje Pauline Manginsela**<sup>5</sup>  
**Charles Reijnaldo Ngangi**<sup>6</sup>  
**Lyndon Reinhardt J. Pangemanan**<sup>7</sup>  
**Lis Melissa Yapanto**<sup>8</sup>  
**Christine F. Mamuja**<sup>9</sup>

**ABSTRACT**

**Purpose:** The purpose of this study is to ascertain how the Wanga Village community manages land using agroforestry technologies. Based on the observations, different component kinds are found in the sites of the respondents. Agrisilviculture, agrosilvofishery, agrosilvopasture and agroforestry patterns employed by the residents of Wanga village.

**Method:** The approach is a survey that combines field observations and interviewing methods. Purposive sampling was used to select respondents, and the indigenous inhabitants of Wanga Village who oversee agroforestry land met the selection criterion. Interviews with respondents using questionnaires. Following the research results, a descriptive analysis was conducted on the data.

**Results and conclusion:** The Wanga Village community still uses an agroforestry technique to manage their land with the help of local knowledge. The agroforestry system in Wanga Village is still used to manage land utilizing the traditional knowledge of "mapalus" or "maendo," "toki bulu," and moon observation.

**Research implications:** The way the residents of Wanga Village observe the "New Moon" phase which comes once a month when the moon is in the west, appears at sunset and the moon adopts the appearance of a crescent. The young quartile moon phase follows the "new moon" phase, which lasts for three days during which people are believed to not plant anything. After the young quartile phase, people wait six days for the big moon phase, during which they believe they cannot plant any fruit plants because they will not bear fruit.

<sup>1</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [semuelratag@unsrat.ac.id](mailto:semuelratag@unsrat.ac.id)

Orcid: <https://orcid.org/0009-0005-9776-1352>

<sup>2</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [euisfspangemanan@gmail.com](mailto:euisfspangemanan@gmail.com)

Orcid: <https://orcid.org/0000-0002-8441-8388>

<sup>3</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [frangkypaat@unsrat.ac.id](mailto:frangkypaat@unsrat.ac.id)

Orcid: <https://orcid.org/0000-0003-2986-3275>

<sup>4</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [sarahmokoagow@gmail.com](mailto:sarahmokoagow@gmail.com)

<sup>5</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [elsjeprm@unsrat.ac.id](mailto:elsjeprm@unsrat.ac.id)

Orcid: <https://orcid.org/0000-0002-6078-4850>

<sup>6</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [charlesr.ngangi@gmail.com](mailto:charlesr.ngangi@gmail.com)

Orcid: <https://orcid.org/0000-0002-1903-4193>

<sup>7</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [lyndonpangemanan07@gmail.com](mailto:lyndonpangemanan07@gmail.com)

Orcid: <https://orcid.org/0009-0001-2248-8698>

<sup>8</sup> Universitas Negeri Gorontalo, Gorontalo Province, Indonesia. E-mail: [lizrossler@ung.ac.id](mailto:lizrossler@ung.ac.id)

Orcid: <https://orcid.org/0000-0002-5602-8219>

<sup>9</sup> Universitas Sam Ratulangi, Manado, North Sulawesi, Indonesia. E-mail: [mamujachristine@unsrat.ac.id](mailto:mamujachristine@unsrat.ac.id)

Orcid: <https://orcid.org/0000-0003-3952-260X>



**Originality/value:** "Toki Bulu" is a community activity on agrosilvofishery land in providing fish food. Based on the results of interviews, the community's unique way of feeding fish is by "Toki Bulu" (tapping the feathers) first to call the fish. "Mapalus" is a social activity originating from Minahasa culture and is usually called mutual cooperation. "Mapalus" for the Tountemboan people is called "Maendo" which means taking the day or taking advantage of the day to work together with other people. The Wanga Village community still carries out this activity, especially in land preparation.

**Keywords:** Local Wisdom, The Agroforestry System, Wanga Village.

## A SABEDORIA LOCAL EM SISTEMAS AGROFLORESTAIS: O ESTUDO DE CASO NA VILA WANGA, SUBDISTRITO DE MOTOLING LESTE, REGÊNCIA DE MINAHASA DO SUL, INDONÉSIA

### RESUMO

**Objetivo:** O objetivo deste estudo é verificar como a comunidade da Vila Wanga administra a terra usando tecnologias agroflorestais. Com base nas observações, diferentes tipos de componentes são encontrados nos sites dos entrevistados. Padrões de agrossilvicultura, agrossilvopescaria, agrossilvopastoril e agroflorestal empregados pelos moradores da aldeia Wanga.

**Método:** A abordagem é uma pesquisa que combina observações de campo e métodos de entrevista. Amostragem proposital foi usada para selecionar os entrevistados, e os habitantes indígenas da Aldeia Wanga que supervisionam as terras agroflorestais atenderam ao critério de seleção. Entrevistas com entrevistados por meio de questionários. Após os resultados da pesquisa, foi realizada uma análise descritiva dos dados.

**Resultados e conclusão:** A comunidade da Aldeia Wanga ainda utiliza uma técnica agroflorestal para manejar suas terras com a ajuda do conhecimento local. O sistema agroflorestal na aldeia de Wanga ainda é usado para gerir a terra utilizando o conhecimento tradicional de "mapalus" ou "maendo", "toki bulu" e observação da lua.

**Implicações da pesquisa:** A forma como os moradores da Vila Wanga observam a fase da "Lua Nova" que ocorre uma vez por mês quando a lua está no oeste, aparece ao pôr do sol e a lua adota a aparência de um crescente. A fase da lua jovem do quartil segue a fase de "lua nova", que dura três dias durante os quais se acredita que as pessoas não plantam nada. Após a fase do quartil jovem, as pessoas esperam seis dias pela fase da lua grande, durante a qual acreditam que não poderão plantar plantas frutíferas porque não darão frutos.

**Originalidade/valor:** "Toki Bulu" é uma actividade comunitária em terras agrossilvopescarias no fornecimento de alimentos para peixes. Com base nos resultados das entrevistas, a forma única de a comunidade alimentar os peixes é "Toki Bulu" (bater nas penas) primeiro para chamar os peixes. "Mapalus" é uma atividade social originária da cultura Minahasa e costuma ser chamada de cooperação mútua. "Mapalus" para o povo Tountemboan é denominado "Maendo" que significa tirar o dia ou aproveitar o dia para trabalhar em conjunto com outras pessoas. A comunidade da Aldeia Wanga ainda realiza esta atividade, principalmente no preparo do terreno.

**Palavras-chave:** Sabedoria Local, Sistema Agroflorestal, Aldeia Wanga.

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## 1 INTRODUCTION

Agroforestry is a land management system that combines trees, shrubs and agricultural plants in one production unit. Agroforestry land has the potential to store more carbon than fallow land, bushland or monoculture agriculture. The carbon storage process in an agroforestry system occurs through two pathways: increasing plant biomass and increasing soil organic matter, while other plants in the agroforestry system help increase soil organic matter.



Indigenous communities have their own local wisdom in caring for and managing the land and environment where people live in each region (He *et al* 2023). Agroforestry of the Wallacea region, as a means of expanding understanding of the ecological potential of the Wallacea Region, including the agroforestry plant-tree Interaction, the selection of plant types, and the Features, Species, and Advantages of Multipurpose Trees (Ratag *et al* 2023).

Local wisdom is often associated with conservation. Therefore, the application of local wisdom in agroforestry systems can contribute to environmental conservation. The wisdom and traditional knowledge of local communities is an important component in efforts to utilize and manage local natural resources. Forms of resource management knowledge can be in the form of farming systems, plantation systems and simple conservation systems carried out traditionally (Ortiz *et al* 2023)

The benefits of agroforestry compared to monoculture farming systems for biodiversity conservation and climate change mitigation prompted this research to investigate how local wisdom is applied in the agroforestry system in Wanga Village. The people of Wanga Village still apply their traditional knowledge in carrying out farming activities. The traditional method they apply is to pay attention to the “New Moon” phase. This “New Moon” phase is the beginning of the lunar cycle which lasts around 29-30 days. The New Moon appears in the sky at sunset, where the moon is almost invisible from the earth because of its bright side or what is usually called a crescent moon.

This research aims to determine the local wisdom of the Wanga Village community in managing land using an agroforestry system.

## 2 RESEARCH METHODS

### 2.1 Location and Time of Research

This research was conducted in Wanga Village, East Motoling District, South Minahasa Regency in June 2023. The method used was a survey using interview techniques and field observations. The determination of respondents was carried out using purposive sampling with the criteria for respondents being the indigenous people of Wanga Village who manage agroforestry land. Interviews with respondents using questionnaires. The data obtained from the research results were then analyzed descriptively.

## 3 RESULTS AND DISCUSSION

### 3.1 Agrisilviculture

The types of components available on the respondent's site vary according to the observations made. Agrisilviculture, agrosilvofishery, agrosilvopasture and homestead agroforestry are agroforestry patterns used by the Wanga Village community. This local wisdom includes several of the same farming activities, but each pattern has its own local wisdom (Daniel Coq-Huelva *et al* 2017)

Agrisilviculture is a system that combines agricultural and forestry crops on one land, known as agrisilviculture (Huang *et al* 2023). Based on observations made, the people of Wanga Village use an agrisilviculture system by combining various types of plants based on their benefits, such as spice plants, fruit plants and woody plants. The people of Wanga Village usually use spices such as chili, cloves and vanilla as food ingredients to add flavor and taste. Apart from that, the people of Wanga Village consume various types of fruit for nutrition and well-being, such as durian, avocado, chocolate, langsung, mango, matoa, jackfruit, papaya and banana. Some respondents rely on these fruit plants as a source of side income. Apart from fruit



plants, woody plants such as cempaka, sugar palm, gamal, coconut, nantu, female ironwood and pangi are also used by the community as a source of wood and raw materials for furniture, fuel and building materials for houses. Community agricultural activities are carried out on silvicultural agricultural land, where agricultural crops are planted between rows of forest plants.

**Table 1.** Types of Plants on Agricultural Land in Wanga Village

Number	Plant Name	Local Name	Scientific name	Number of Respondents
1	Avocado	Alpukat	<i>Persea americana</i>	20
2	Breadfruit	Sukun	<i>Artocarpus altilis</i> Fosberg	1
3	Taro	Bete	<i>Colocasia esculenta</i> L.	27
4	Dragon fruit	Buah naga	<i>Selenicereus undatus</i> Haw.	1
5	Cempaka	Campaka	<i>Magnolia champaca</i> L.	7
6	Clove	Cingkeh	<i>Syzygium aromaticum</i> L.	27
7	Cocoa beans	Cokelat	<i>Theobroma cocoa</i> L.	26
8	Durian	Durian	<i>Durio zibethinus</i> L.	27
9	Ironwood	Kayu besi	<i>Homalium foetidum</i> Benth.	3
10	Coconut	Kalapa	<i>Cocos nucifera</i> L.	27
11	Lansat	Langsa	<i>Lansium domesticum</i> Correa	25
12	Gamal	Gamal	<i>Gliricidiasepium</i> Kunth	25
13	Mango	Pangga	<i>Mangifera indica</i> L.	12
14	Matoa	Matoa	<i>Pometia pinnata</i> J.R. Forst & G. Forst	1
15	Jackfruit	Nangka	<i>Artocarpus heterophyllus</i> Lam.	3
16	Nantu	Nantu	<i>Palakum</i> sp	1
17	Pangi	Pangi	<i>Pangium edule</i> Reinw.	4
18	Banana	Pisang	<i>Musa paradisiaca</i> L.	27
19	Papaya	Popaya	<i>Carica papaya</i> L.	25
20	Rambutan	Rambutan	<i>Nephelium lappaceum</i> L.	6
21	Chilli	Rica	<i>Capsicum annum</i> L.	25
22	Sugar palm	Seho	<i>Arenga pinnata</i> Wurmb.	26
23	Cassava	Ubi	<i>Manihot esculenta</i> Crantz	27
24	Sweet potato	Ubi jalar	<i>Ipomoea batatas</i> L.	27
25	Vanilla	Vanili	<i>Vanilla planifolia</i> Andrews.	27

### 3.2 Agrisilvofisheries

Agrisilvofishery is a land management system that combines fisheries, forestry, and agricultural crops for sustainable and environmentally friendly land use (Niu *et al* 2023). From the results obtained, various types of plants and fish can be found in the agrisilvofishery land of Wanga village. The types of fish cultivated by the community are tilapia, tilapia and goldfish. The implementation of the agrisilvofishery pattern carried out by the people of Wanga Village really helps their daily economy because it uses different components in one piece of land. This agrisilvofishery approach has the potential to provide multiple benefits for farmers, the environment and society by optimizing available natural resources (Pauletto *et al* 2023). Plants and trees planted around ponds help maintain water quality, regulate water flow, and prevent erosion. Table 2 below shows the types of plants found on the agrosilvofishery land in Wanga Village.

**Table 2.** Types of Plants on the Agrisilvofishery Land in Wanga Village

Number	Plant Name	Local Name	Scientific name
1	Avocado	Alpukat	<i>Persea americana</i>
2	Cempaka	Campaka	<i>Magnolia champaca</i> L.
3	Clove	Cingkeh	<i>Syzygium aromaticum</i> L.





4	Cocoa beans	Cokelat	<i>Theobroma cocoa</i> L.
5	Durian	Durian	<i>Durio zibethinus</i> L.
6	Coconut	Kalapa	<i>Cocos nucifera</i> L.
7	Lansat	Langsa	<i>Lansium domesticum</i> Correa
8	Gamal	Gamal	<i>Gliricidia sepium</i> Kunth
9	Mango	Mangga	<i>Mangifera indica</i> L.
10	Matoa	Matoa	<i>Pometia pinnata</i> J.R. Forst & G. Forst
11	Jackfruit	Nangka	<i>Artocarpus heterophyllus</i> Lam.
12	Nantu	Nantu	<i>Palaquium</i> sp
13	Banana	Pisang	<i>Musa paradisiaca</i> L.
14	Papaya	Popaya	<i>Carica papaya</i> L.
15	Straw	Rumbia	<i>Metroxylon sago</i> Rottb.
16	Chilli	Rica	<i>Capsicum annum</i> L.
17	Sugar palm	Seho	<i>Arenga pinnata</i> Wurmb.
18	Cassava	Ubi	<i>Manihot esculenta</i> Crantz
19	Sweet potato	Ubi jalar	<i>Ipomoea batatas</i> L.
20	Vanilla	Vanili	<i>Vanilla planifolia</i> Andrews

Source: Prepared by the Authors (2024)

### 3.3 Agrisilvopasture

Agrosilvopasture is a land management system that combines livestock, woody plants and annual crops in one area. The people of Wanga Village raise pigs and use ripe papaya and taro as feed. The pigs are kept in pens and fed conga rice and corn every day. The types of plants planted on agrosilvopasture land in Wanga Village are shown in **Table 3** below.

**Table 3.** Types of Plants on the Agrisilvopasture Land in Wanga Village

Number	Plant Name	Local Name	Scientific name
1	Taro	Ubi Bete	<i>Colocasia esculenta</i> L.
2	Cempaka	Campaka	<i>Magnolia champaka</i> L.
3	Clove	Cingkeh	<i>Syzygium aromaticum</i> L.
4	Cocoa beans	Cokelat	<i>Theobroma cocoa</i> L.
5	Coconut	Kalapa	<i>Cocos nucifera</i> L.
6	Lansa	Langsa	<i>Lansium domesticum</i> Correa
7	Gamal	Gamal	<i>Gliricidia sepium</i> Kunth
8	Matoa	Matoa	<i>Pometia pinnata</i> J.R. Forst & G. Forst
9	Banana	Pisang	<i>Musa paradisiaca</i> L.
10	Papaya	Popaya	<i>Carica papaya</i> L.
11	Sugar palm	Seho	<i>Arenga pinnata</i> Wurmb.
12	Sweet potato	Ubi jalar	<i>Ipomoea batatas</i> L.
13	Vanilla	Vanili	<i>Vanilla planifolia</i> Andrews

Source: Prepared by the Authors (2024)

Table 3 above shows that the agrosilvopasture land in Wanga Village is planted with fruit plants such as langsa, matoa, banana and papaya; spices such as cloves and vanilla; and woody plants such as cempaka, coconut, and palm. The distance and types of plants on agrosilvopasture land are random and irregular (Maskell *et al* 2023). The agrosilvopasture land managed by the Wanga Village community grows various types of plants. However, they argue that the location of the livestock pen must be open and receive lots of sunlight so that air can flow and air circulation is good (Yoman *et al* 2017). The people of Wanga Village understand that if the plants on the land are too dense or dense, plant growth will be hampered due to lack of sunlight. The livestock pens on this land are surrounded by cocoa, cempaka, cloves and taro plants. The livestock on the Silvopastura land in Wanga village are pigs.



### 3.4 Agroforestry

Homestead ecosystems play an important role in the livelihoods of rural communities and provide various ecosystem service functions (Budau *et al* 2023), effective yard management must pay attention to the socio-cultural, economic and biological aspects of society. Homestead agroforestry is a type of complex agroforestry that has a diverse structure and species composition that meets social and environmental sustainability (Chen *et al* 2023). In homestead agroforestry, livestock and plants such as trees, annual plants and ornamental plants can live together on one land (Flanagan *et al* 2023). Yard agroforestry is a system for managing household yard land with a diversity of yard plants consisting of various types of tubers, vegetables, fruit, spices, wood and ornamental plants. Types of home garden agroforestry plants in Wanga Village are presented in Table 4 below.

**Table 4.** Types of Plants on the Agroforestry ground in Wanga Village

Number	Plant Name	Local Name	Scientific name
1	Taro	Ubi bete	<i>Colocasia esculenta</i> L.
2	Cotton	Gedi	<i>Abelmoschus moschatus</i> Medic
3	Gamal	Gamal	<i>Gliricidiasepium</i> Kunth
4	Cassava	Ubi Kayu	<i>Manihot esculenta</i> Crantz
5	Pine	Pinus	<i>Pinus merkusii</i>
6	Banana	Pisang	<i>Musa paradisiaca</i> L.
7	Mango	Mangga	<i>Mangifera indica</i> L.
8	Coconut	Kalapa	<i>Cocos nucifera</i> L.
9	Durian	Durian	<i>Durio zibethinus</i> L.
10	Lemongrass	Sereh	<i>Cymbopogon citratus</i> Stapf
11	Galangal	Lengkuas	<i>Alpinia galanga</i> Willd.
12	Vanilla	Vanili	<i>Vanilla planifolia</i> Andrews
13	Pandan	Pondang	<i>Pandanus amaryllifolius</i> Roxb.
14	Rambutan	Rambutan	<i>Nephelium lappaceum</i> L.
15	Sugarcane	Tebu	<i>Saccharum officinarum</i> L.
16	Andong	Andong	<i>Cordyline fruticosa</i> L.
17	Water apple	Jambu udara	<i>Syzygium aqueum</i> Alston
18	Banyan	Beringin	<i>Ficus</i> sp.

Source: Prepared by the Authors (2024)

Based on observations of agroforestry yards in Wanga village, the types of fruit plants found on this land include bananas, mangoes, water apples, durian and rambutan. Ornamental plants such as horse carts or tawaang are generally used by people to beautify gardens and as garden borders. People also grow spices for daily needs (Guan *et al* 2023). They also planted trees around their yard. Trees are usually planted on the edge of the yard to reduce carbon emissions.



### 3.5 Local Wisdom In Agroforestry Systems

The local wisdom of farmers applied in the agroforestry system in Wanga Village is "Mapalus" or "Maendo, moon observation, and "Toki Bulu". The three local wisdoms are described below.

#### 3.5.1 "Mapalus" or "Maendo"

"Mapalus" is a social activity originating from Minahasa culture and is usually called mutual cooperation. "Mapalus" for the Tountemboan people is called "Maendo" which means taking the day or taking advantage of the day to work together with other people. The Wanga Village community still carries out this activity, especially in land preparation.

#### 3.5.2 Moon Observations

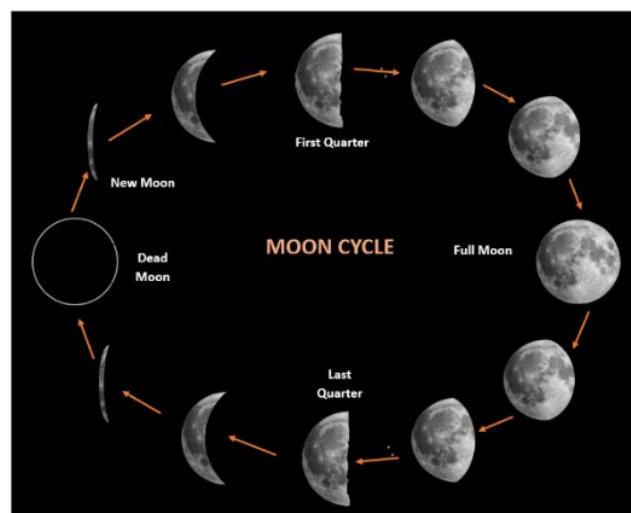


Figure 1. Lunar Cycle

Source: Prepared by the Author (2024) modification [https://cdn.idntimes.com/content-images/post/20190429/photo-1481819613568-3701cbc70156-b9b263de451a3c387d75e0eebe09f720\\_600x400.jpg](https://cdn.idntimes.com/content-images/post/20190429/photo-1481819613568-3701cbc70156-b9b263de451a3c387d75e0eebe09f720_600x400.jpg) Accessed November 14, 2023.

The new moon is a science that is still applied by people when carrying out several agricultural management activities by looking at the moon. Where when people see the "New Moon" they do not carry out agricultural activities such as planting, carrying out maintenance processes, and harvesting. By looking at the moon, they are sure that the harvest they will harvest will produce good results.

The people of Wanga Village themselves, if they do not implement this, will have a bad impact on the plants, for example if they plant on the "new moon" the plants will wither because according to the knowledge gained, the seeds will wither. planted has new roots. When the maintenance process is carried out in terms of clearing land during the "new moon" ants will appear because ants tend to gather in disturbed areas. When harvesting, which is also carried out during the "new moon" phase, the plants must not be touched because if they are not cared for it can delay the next harvest.

The way the people of Wanga Village view the "New Moon" phase which occurs once a month when the moon is in the west, appears at sunset and the moon takes the shape of a





crescent. This "new moon" phase lasts for 3 days where it is believed that people should not carry out the planting process, after the new moon is finished it continues with the young quartile moon phase, then after the young quartile moon, wait 6 days. To get the big moon phase where people believe that during this phase they are not allowed to plant fruit plants because they will not produce fruit, except for plants that do not produce fruit such as feather plants where if this plant is planted during the big moon it will be big like the moon, after the moon just wait 6 days to get the old quartile phase, this phase is the lunar phase that people wait for when planting. The dead moon phase occurs after the old quartile phase, which is believed by the people to be good for logging, after this process is complete it returns to the phase, namely the new moon phase.

This local wisdom is what the people of Wanga village really pay attention to when carrying out planting, plant maintenance and harvesting activities.

### 3.5.3 "Toki Bulu"

"Toki Bulu" is a community activity on agrosilvofishery land in providing fish food. Based on the results of interviews, the community's unique way of feeding fish is by "Toki Bulu" (tapping the feathers) first to call the fish.

Table 5. Local Wisdom and Application in the Agroforestry System in Wanga Village

Number	Local wisdom	Application
1	"Mapalus" or "Maendo"	Applied to land clearing activities as in Table 2 Sequence #2, Table 4 Sequence #1, and Table 6 Sequence #1.
2	Moon Observation	This point applies to planting activities in Table 2 Serial Number 4, Table 4 Serial Number 3, Table 6 Serial Number 3, and Table 8 Serial Number 3, as well as for maintenance activities in Table 2 Serial Number 5, Table 4 Serial Number 4, Table 6 Serial number 4, and Table 8 Serial number 4. For harvesting activities, point b also applies as seen in table 2 serial number 6, table 4 serial number 6, table 6 serial number 6, and table 8 serial number 5.
3	"Toki Bulu"	Applies to fish feeding activities listed in Table 2, serial number 5.

## 4 CONCLUSION

The Wanga Village community still applies local wisdom in managing their land using an agroforestry system. The local wisdom of the Wanga Village community which is still applied in land management using an agroforestry system is "mapalus" or "maendo", observing the moon, and "toki bulu".

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