# Ethnobotanical and ecological perspectives on local fruits in South Kalimantan: Cultivation, trade, and conservation

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## Research

## Abstract

*Background*: Many local fruit species from Kalimantan have become rare or endangered because of land conversion and deforestation. This study aimed to document community knowledge of local fruit usage.

*Methods*: The data were examined quantitatively via ethnobotanical measures such as the relative frequency of citation (RFC), family use value (FUV), and plant part value (PPV). We also analyzed the economic value, ecological perspective, and conservation aspects of local fruits in South Kalimantan.

*Results*: The researchers identified 96 fruit species used by the South Kalimantan population. The highest RFC values were recorded for *Artocarpus integer* (0.275)*, Durio dulcis* (0.275)*, Durio kutejensis* (0.333)*, Mangifera casturi* (0.373), and *Mangifera similis* (0.255). The families Anacardiaceae (0.123), Apocynaceae (0.176), and Malvaceae (0.157) presented the highest FUV values. Native plants were used more frequently than introduced plants. The local community has developed these fruits, preferring developed varieties over wild forest fruits. Local fruits are more abundant during the rainy than during the dry season. Most of these fruits are sold, providing economic value to the community. The local population also consumes South Kalimantan's local fruits to fulfill their nutritional needs. Many species also face population declines and are listed on the IUCN Red List.

*Conclusions*: Ethnobotanical studies in South Kalimantan provide insights into the importance of the relationship and utilization of local fruits by the community. Various local fruit species have economic value and potential for further development. Nevertheless, community contributions are needed to preserve the sustainability of South Kalimantan's local fruits.

*Keywords*: Conservation, Ethnobotany, Economic value, Local fruit, South Kalimantan

## Background

The forests of Borneo are home to various endemic plant species, including a diverse range of local fruits (Bompard and Kostermans 1985). This diversity plays an important role in supporting indigenous communities, particularly the Dayak and Banjar tribes, who form a significant portion of the population in South Kalimantan (Bond 2017; Fanselow 2015; Gozali *et al*. 2024; Hafidzi *et al*. 2021; Hawkins 2000; Ihmai *et al*. 2022). These communities rely on natural resources from their surrounding environment to meet their daily needs (Susiarti & Setyowati 2005; Supiandi *et al*. 2019). Local plants, including edible fruits, are used for food and traditional medicine (Sutomo *et al*. 2022; Wahyu, 2022). The ethnobotany of fruit plant utilization by Kalimantan communities is a fascinating field of study because of their unique local wisdom (Suswandari *et al*. 2022). Understanding local wisdom regarding the utilization of local fruits will be help preserve culture and natural resources for the future (Johan *et al*. 2017).

The communities in Kalimantan have utilized these local fruits, harvested from forests or cultivated, for generations. They are essential commodities for the community to fulfill their daily needs and are economic commodities traded within and beyond the region. Thus, the ethnobotanical study of local fruits in South Kalimantan provides valuable insights into their cultural and ecological significance. Fruit genera such as *Mangifera, Durio, Artocarpus*, and *Nephelium* are among the most commonly utilized by local communities (Jarret 1959b, 1960; Siregar *et al*. 1995). Some local and native fruits from Kalimantan such as *Artocarpus odoratissimus* (Wahyuningtyas *et al*. 2024), *Baccaurea macrocarpa* (Akhmadi & Sumarmiyati 2015), *Limau kulit* (Irwan *et al*. 2017), *Durio kutejensis* (Yusnikusumah *et al*. 2024), *Mangifera casturi* (Gunawan *et al*. 2024), and *cempedak* (*Artocarpus champeden*) (Gozali *et al*. 2024) have been the focus of numerous studies due to their unique characteristics and cultural importance. Moreover, these local fruits often become a symbol of regional identity and are central to traditional ceremonies.

Despite its importance, the diversity and population of local fruit plant species in South Kalimantan have declined. This condition is aggravated by land conversion, extensive logging, forest fires, and shifts in farming systems that degrade forest ecosystems (Siregar 2006) and by a loss of traditional ecological knowledge by young people in the communities. Additionally, the expansion of commercial agriculture, including rubber and oil palm plantations, and the rising preference for popular fruit cultivars have contributed to the reduction of native species. These pressures emphasize the urgent need for conservation efforts.

This study aims to identify and analyze the diversity and utilization of local fruits important to South Kalimantan communities through an ethnobotanical approach. In addition to providing information on the names of local fruit species and their various uses, this research explores how local wisdom contributes to the conservation and sustainability of local fruit biodiversity. Understanding the ethnobotany of local fruits can play a vital role in their preservation. An in-depth study of the ecology and trade of local fruits is also expected to provide information to support sustainable conservation efforts, increase the economic value of these fruits, and promote their importance in the community. Overall, this approach highlights the cultural and economic potential of Borneo's local fruits.

## Materials and Methods

### Study area

The field study was conducted in August 2024 in South Kalimantan (Figure 1). Kalimantan is located on the equator and is characterized by abundant vegetation. The humidity in the region ranges between 66.7% and 81.3%, the altitude ranges from 7 to 205 m above sea level, the temperature ranges from 28.8°C to 37.9°C, and the air humidity ranges from 55% to 77%. The study locations in South Kalimantan included Tabalong Regency, Balangan Regency, Hulu Sungai Tengah Regency, Hulu Sungai Selatan Regency, Hulu Sungai Utara, and Banjar Regency.

Table 1 shows the respondents' demographic details. There were more female respondents than male respondents. The most common age group comprised people between the ages of 20 and 40 years old, also known as the productive age group. Meanwhile, the respondents' highest education levels highly varied, with senior high school being the most common. Most of the community works as farmers

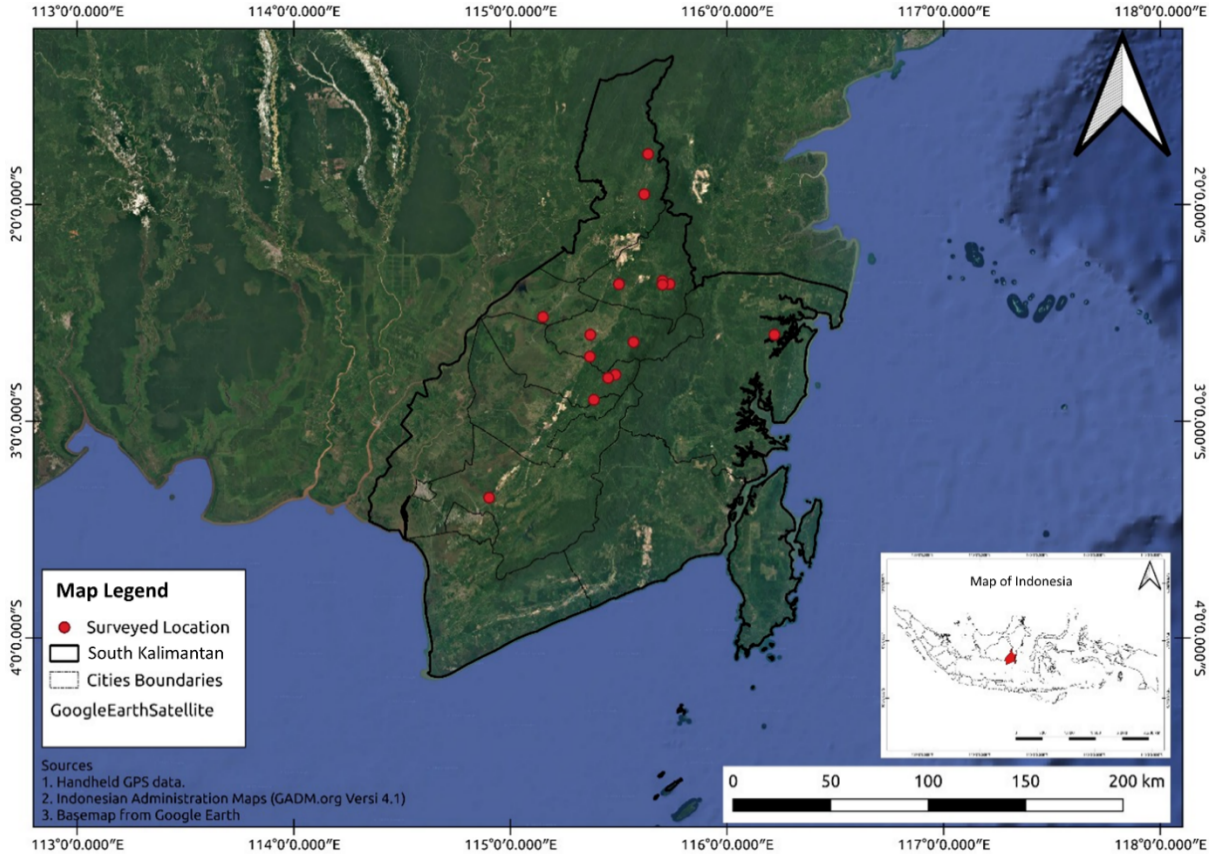


Figure 1. Geographical location of the study area of ethnobotanical local fruit in South Kalimantan

Table 1. Demographic details of the communities in South Kalimantan

| Variables | Categories | Total | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 21 | 41.18 |
| | Female | 30 | 58.82 |
| **Age** | 20-40 | 31 | 60.78 |
| | 41-50 | 14 | 27.45 |
| | >50 | 6 | 11.76 |
| **Education level** | Elementary school | 11 | 21.57 |
| | Junior high school | 6 | 11.76 |
| | Senior high school | 19 | 37.25 |
| | University | 4 | 7.84 |
| | Did not receive formal schooling | 11 | 21.57 |
| **Social Livelihood** | Farmer | 30 | 58.82 |
| | Teacher | 1 | 1.96 |
| | Businessperson | 2 | 3.92 |
| | Housewife | 7 | 13.73 |
| | Government Officials | 3 | 5.88 |
| | Trader | 4 | 7.84 |
| | College student | 3 | 5.88 |
| | Tailor | 1 | 1.96 |

**Ethnobotanical data collection**

This ethnobotanical study involved interviews with 51 respondents from South Kalimantan. The respondents represented a population from diverse educational and social backgrounds. All the respondents were native people of South Kalimantan, comprising the Banjar and Dayak tribes. They were the primary sources of information regarding local fruit knowledge and

its utilization. Data collection was conducted based on existing ethical clearance. Ethnobotanical knowledge regarding edible fruit plants was gathered through in-depth interviews via structured questionnaires (Guimbo *et al*. 2011), which recorded information such as scientific names (binomial), local names, plant parts used (leaves, flowers, fruit, seeds, stems, bark, and roots), and their specific use. Moreover, the study documented whether the plants were native to the forest or introduced and whether they were cultivated or harvested from the wild. The researchers also conducted field visits to determine the wild fruit species' habitat and population (Belayneh & Bussa 2014).

**Plant Identification**

Data regarding local fruit plant usage within the community were collected via plant species identification through direct observation, online plant databases, and relevant flora literature. The researchers used photo vouchers to facilitate effective and efficient identification (Greene *et al*. 2023; LaFrankie & Chua 2015). Experienced local fruit experts, with extensive knowledge of the diversity and uses of local fruits in South Kalimantan, were involved in the fieldwork to support accurate identification. In addition to recording local fruit names, we collected detailed information on morphological characteristics, including the stem, leaves, flowers, fruits, and seeds. The observations were then cross-referenced with relevant botanical literature to verify the identified plants. Then, the researchers verified and standardized the plant list via the Plant of the World Online (2024) and the International Plant Names Index (2024). The endangered species were also identified via the IUCN online database (IUCN 2024).

**Quantitative data analysis**

***Relative frequency of citation (RFC)***

The RFC value indicates the importance of a particular plant species to different tribes. The more useful the plant is, the higher the RFC value.

$$RFC = \frac{FC}{N}$$

FC represents the frequency of respondent citations, and N represents the total number of respondents. An RFC value of 0 indicates that no respondents mentioned the beneficial plant, and a value of 1 indicates that all respondents mentioned the beneficial plant (Gupta *et al*. 2023, Tardío & Pardo-de-Santayana 2008).

***Family use value (FUV)***

The FUV indicates a plant family's usefulness by the local people in South Kalimantan. Its calculation follows Phillips and Gentry's (1993) equation, as shown below:

$$FUV = \frac{\sum UVs}{N} x\ 100$$

∑UVs is the sum of the use values for all species belonging to a particular family and N is the total number of species in the same family (Jadid *et al*. 2020).

***Plant Part Value (PPV)***

The PPV measures the percentage of plant parts used as medicinal bioresources, including stems, leaves, roots, fruit, bark, and flowers. It is calculated via the following equation:

$$PPV\ (\%) = \frac{\sum RU(plant\ part)}{RU} x\ 100$$

∑RU (plant part) is the total number of plant parts cited, and RU is the total number of uses cited for a particular plant (Gomez-Beloz 2002).

## Results

**The diversity and utilization of local edible fruits by South Kalimantan communities**

The results revealed that the local people of South Kalimantan utilize 96 local fruit species, comprising 25 families and 45 genera (Table 2). The Anacardiaceae and Moraceae families are the most diverse. Anacardiaceae is commonly known as the "Mango" family, and Moraceae is often called the "Jackfruit." Anacardiaceae consists of 16 species, and Moraceae consists of 13 species (Figure 2).

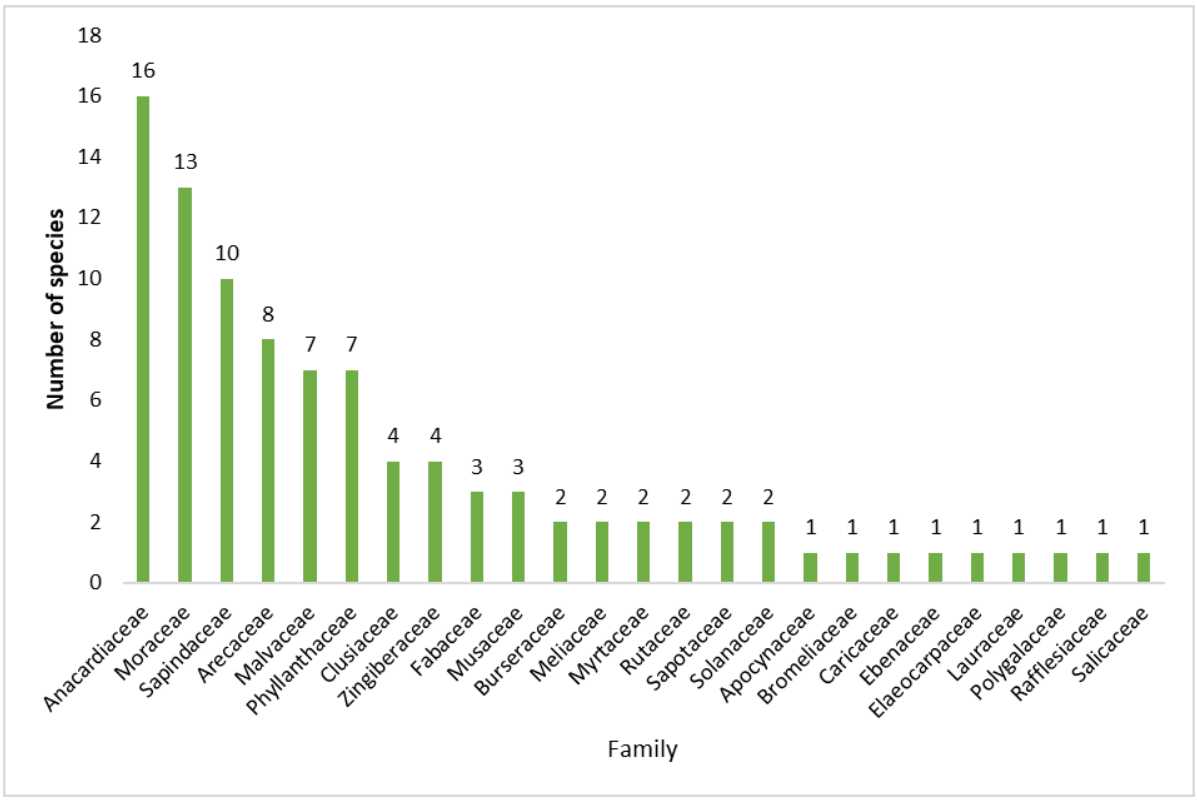


Figure 2. The number of local fruit species per family used by local people in South Kalimantan

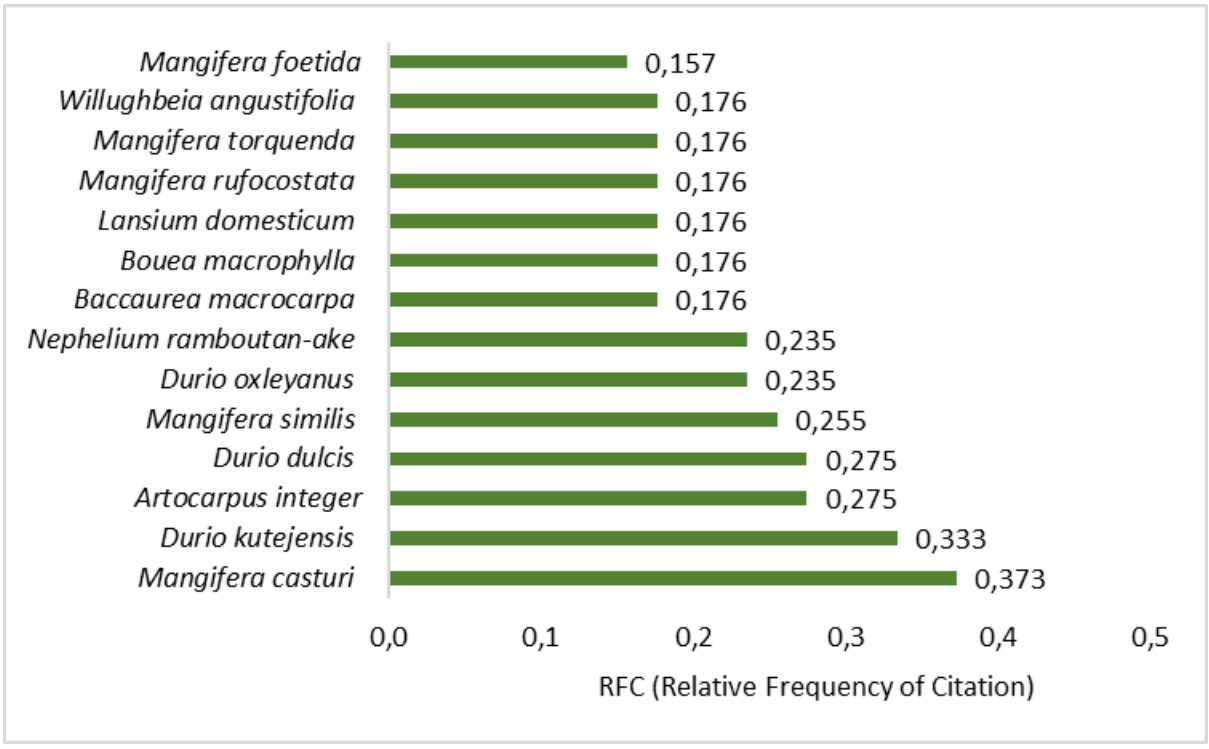


Figure 3. Ten species of local fruits with the highest RFC

Table 2. A list of fruit species utilized by South Kalimantan communities

| No | Family, Species Name | Local Name | Life growth | IUCN Status | Dispersal history | Cultivation | Harvest Months | Utilization and Economic Value | Parts and Ways of the Plant | Use Category: Uses and Preparation | RFC Value | Figure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Anacardiaceae** | | | | | | | | | | | | |
| 1. | *Bouea macrophylla* Griff. | *Ramania* | Tree | LC | Introduced | Wild and Cultivation | December | Self-consumption and Sold; IDR 15,000/kg | Fruit and stem (Fresh fruit and side dish) | **Nutritional**: The ripe fruit is consumed directly; the fruit is mashed with chili and onion for sambal **Medicinal**: the bark is boiled and used as a mouthwash for toothache remedy | 0.176 |  |
| 2. | *Dracontomelon costatum* Blume | *Landur* | Tree | EN | Native | Wild and Cultivation | December-April | Self-consumption and Sold; IDR 2,000/fruit | Fruit and stem (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: Young leaves are crushed and then applied to acne-prone skin **Furniture**: the stem is utilized for furniture | 0.098 |  |
| 3. | *Dracontomelon dao* (Blanco) Merr. & Rolfe | *Sangkuang* | Tree | LC | Native | Wild | January - February | Self-consumed and Sold; IDR 2,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 4. | *Mangifera applanata* Kosterm. | *Palipisan* | Tree | NT | Native | Wild and Cultivation | December | Self-consumed and Sold; IDR 5,000-10,000/kg | Fruit (Fresh fruit, side dish) | **Nutritional**: The ripe fruit is consumed directly; The fruit is also used as a chili paste (sambal) | 0.118 |  |

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| 5. | *Mangifera caesia* Jack | *Binjay* | Tree | NT | Introduced | Wild and Cultivation | January - February | Self-consumption and Sold; IDR 5,000/fruit | Fruit (Fresh fruit, side dish) | **Nutritional**: The ripe fruit is consumed directly; The fruit is also used as a chili paste (sambal) | 0.137 |  |
| 6. | *Mangifera casturi* Kosterm. | *Kasturi* | Tree | EW | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 2,000/fruit or IDR 35,000/plate | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.373 |  |
| 7. | *Mangifera foetida* Lour. | *Hambawang* | Tree | LC | Native | Wild and Cultivation | December - April | Self-consumption and Sold; IDR 1,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly; the way to eat the fruit is to cut it open and then twist it | 0.157 |  |
| 8. | *Mangifera indica* L. | *Hampalam* | Tree | NA | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 3,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 9. | *Mangifera laurina* Blume | *Buluh* | Tree | LC | Native | Wild and Cultivation | December-February | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 10. | *Mangifera macrocarpa* Blume | *Tambusu* | Tree | DD | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 1,000/fruit | Fruit and seed (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: The seeds are boiled and used as a remedy for diarrhea and vomiting. The liquid is consumed three times a day | 0.039 |  |

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| 11. | *Mangifera odorata* Griff. | *Kweni* | Tree | DD | Introduced | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 3,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.098 |  |
| 12. | *Mangifera pajang* Kosterm. | *Rampayang* | Tree | DD | Native | Wild and Cultivation | December-February | Self-consumption; Not for sale | Side dish | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 13. | *Mangifera quadrifida* Jack | *Limus* | Tree | LC | Native | Wild and Cultivation | December-February | Self-consumption; Not for sale | Side dish | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 14. | *Mangifera rufocostata* Kosterm | *Tandui* | Tree | VU | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 5,000-10,000/fruit | Fruit, seed, and bark (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly<br>**Medicinal**: The bark is boiled, the first water is discarded, then boiled again. The resulting liquid is used as a remedy for diabetes. The roots are cut into small pieces and soaked in hot water, and the liquid is consumed for 3 days as a remedy for hemorrhoids | 0.176 |  |
| 15. | *Mangifera similis* Blume | *Rawa-rawa* | Tree | LC | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 500/fruit | Fruit (Fresh fruit, side dish) | **Nutritional**: The ripe fruit is consumed directly; The fruit is also used as a chili paste (sambal) | 0.255 |  |

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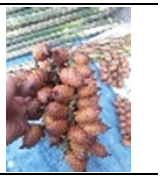
| 16. | *Mangifera torquenda* Kosterm. | *Pulasan* | Tree | LC | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 2,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.176 |  |
| | **Apocynaceae** | | | | | | | | | | | |
| 17. | *Willughbeia angustifolia* (Miq.) Markgr. | *Gitaan* | Climber | NA | Native | Wild and Cultivation | December - February | Self-consumption and Sold; Self-consumed and Sold; IDR 10,000/fruit | Fruit, stem and root (Fresh fruit) | **Nutritional:** The ripe fruit is consumed directly **Medicinal**: Water from the roots or stems is taken, and 3 drops of water are consumed as a remedy for diarrhea | 0.176 |  |
| | **Arecaceae** | | | | | | | | | | | |
| 18 | *Areca cathecu* L. | *Sindawan* | Shrub | NA | Native | Wild | December | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 19. | *Borassodendron borneense* J. Dransf. | *Bindang* | Tree | NA | Native | Wild | January - December | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 20. | *Calamus manan* Miq. | *Manau* | Liana | NA | Native | Wild | December | Self-consumption and Sold; IDR 5,000/bunch | Fruit and stem (Fresh fruit) | **Nutritional**: The fruit is eaten directly or made into rujak **Furniture**: the stem is utilized for chair | 0.059 |  |
| 21. | *Calamus ornatus* Blume | *Minung* | Liana | NA | Native | Wild | August | Self-consumption and Sold; IDR 5,000/bunch | Fruit and stem (Fresh fruit) | **Nutritional**: The fruit is eaten directly or made into rujak **Furniture:** the stem is utilized for chair | 0.039 |  |

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| 22. | *Calamus scipianum* Lam. | *Tu'u* | Liana | NA | Native | Wild | September | Self-consumption and Sold; IDR 5,000/bunch | Fruit and stem (Fresh fruit) | **Nutritional**: The fruit is eaten directly or made into rujak **Furniture**: the stem is utilized for chair | 0.059 |  |
| 23. | *Daemonorops draco* (Willd.) Blume | *Jarinang* | Liana | NA | Native | Wild | December | Self-consumption and Sold; IDR 20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 24. | *Salacca affinis* Griff. | *Salak hutan* | Subshrub | NA | Native | Wild and Cultivation | January - December | Self-consumption and Sold; IDR 10,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.098 |  |
| | **Bromeliaceae** | | | | | | | | | | | |
| 25. | *Ananas comosus* (L.) Merr. | *Nanas pajom* | Perennial herbs | NA | Introduced | Cultivation | January - December | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Burseraceae** | | | | | | | | | | | |
| 26. | *Dacryodes rostrata* (Blume) H. J. Lam | *Kambayau* | Tree | LC | Native | Wild and Cultivation | October - February | Self-consumption and Sold; IDR 35,000/kg | Fruit and seed (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: Seeds are soaked in hot water for 2 minutes, then consumed as a drink. | 0.137 |  |
| 27. | *Scutinanthe brunnea* Thwaites | *Luying* | Tree | LC | Native | Wild and Cultivation | December-January | Self-consumption; IDR 5,000/plate | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.098 |  |
| | **Caricaceae** | | | | | | | | | | | |

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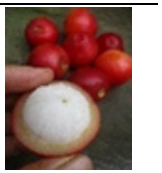
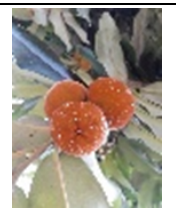
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28. | *Carica papaya* L. | *Pepaya kampung* | Tree | DD | Introduced | Cultivation | January - December | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: The leaves are boiled to treat stomach aches | 0.020 |  |
| | **Clusiaceae** | | | | | | | | | | | |
| 29. | *Garcinia forbesii* King | *Mundar* | Tree | LC | Introduced | Wild and Cultivation | January - March | Self-consumption and Sold; IDR 1,000/fruits | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 30. | *Garcinia mangostana* L. | *Manggis* | Tree | DD | Native | Cultivation | December | Self-consumption and Sold; IDR 20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 31 | *Garcinia morella* (Gaertn.) Desr. | *Bintang Lepe* | Tree | NA | Native | Wild | December | Sold; IDR 10,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 32. | *Garcinia parviflora* Benth. | *Kumanjing* | Tree | NA | Introduced | Wild | December | Self-consumption; Not for sale | Fruit (Fresh fruit, seasoning) | **Nutritional**: The ripe fruit is consumed directly | 0.078 |  |
| | **Ebenaceae** | | | | | | | | | | | |
| 33. | *Diospyros blancoi* A.DC. | *Buah Mentega* | Tree | NA | Native | Cultivation | December-January | Self-consumption and Sold | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: Fresh fruits consumed directly that can help treat gout | 0.039 |  |
| | **Elaeocarpaceae** | | | | | | | | | | | |

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| 34. | *Elaeocarpus glaber* Blume | *Bangkinang* | Tree | LC | Native | Cultivation | December-February | Self-consumption and Sold; IDR 20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed irectly | 0.039 |  |
| | **Fabaceae** | | | | | | | | | | | |
| 35. | *Archidendron jiringa (Jack)* I. C. Nielsen | *Jengkol* | Tree | LC | Native | Cultivation | July - August | Self-consumption and Sold; IDR 10,000-15,000/kg | Fruit and Seed (Side dish) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: The seeds are cooked with spices; urinary inflammation | 0.098 |  |
| 36. | *Dialium indum* L. | *Kuranji* | Tree | LC | Native | Wild | December | Self-consumption and Sold; IDR 20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.059 |  |
| 37. | *Whitfordiodendron nieuwenhuisii* (J.J.Sm.) Dunn | *Buah Akar* | Climbing shrub | NA | Native | Wild | April-May | Self-consumption; Not for sale | Fruit (Snack) | **Nutritional**: Cooked, steamed, or boiled | 0.020 |  |
| | **Lauraceae** | | | | | | | | | | | |
| 38. | *Litsea garciae* S. Vidal | *Kalangkala* | Tree | LC | Native | Wild and Cultivation | December | Self-consumption and Sold; IDR 5,000/plate | Fruit (Fresh fruit) | **Nutritional**: Ripe fruit is soaked in hot water until it cools, then the water is poured off and salt is added | 0.078 |  |
| | **Malvaceae** | | | | | | | | | | | |
| 39. | *Durio dulcis* Becc. | *Lahong* | Tree | VU | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 15,000-20,000/fruit | Fruit and stem (Fresh fruit) | **Nutritional**: medicine and furniture; The ripe fruit is consumed directly **Medicinal**: Fresh fruit is consumed directly, | 0.275 |  |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | and it lowers blood pressure<br>**Furniture**: the stem is utilized for chair | | |
| 40. | *Durio graveolens* Becc. | *Traco* | Tree | VU | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 20,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 41. | *Durio kutejensis* (Hassk.) Becc. | *Pampakin/Lai* | Tree | VU | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 20,000-25,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.333 |  |
| 42. | *Durio oxleyanus* Griff. | *Kerantungan kecil* | Tree | NT | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 10,000-30,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.235 |  |
| 43. | *Durio zibethinus* L. | *Durian* | Tree | DD | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 5,000-25,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.078 |  |
| 44. | *Durio dulcis x D. kutejensis* | *Layong* | Tree | NA | Native | Wild and Cultivation | December-February | Self-consumption and sold; IDR 20,000-50,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 45. | *Durio zibethinus x D. kutejensis* | *Mantawala* | Tree | NA | Native | Wild and Cultivation | December-February | Self-consumption and sold; IDR 20,000-50,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.118 |  |
| | **Meliaceae** | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46. | *Lansium domesticum* Corrêa | *Langsat* | Tree | NA | Native | Wild and Cultivation | December-February | Self-consumption and sold; IDR 5,000-20,000/kg | Fruit and bark (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: Bark is soaked in hot water, and the resulting liquid is consumed as a remedy for chills or mild fever | 0.176 |  |
| 47. | *Sandoricum koetjape (*Burm.f.) Merr. | *Ketapi* | Tree | LC | Native | Wild | September-December | Self-consumption; IDR 15,000-20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Moraceae** | | | | | | | | | | | |
| 48. | *Artocarpus anisophyllus* Miq. | *Mentawak* | Tree | VU | Native | Wild and Cultivation | December | Self-consumption and Sold; IDR 15,000-20,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.078 |  |
| 49. | *Artocarpus heterophyllus* Lam. | *Nangka* | Tree | NA | Introduced | Cultivation | October - February | Self-consumption and Sold; IDR 5,000/fruit | Fruit and Fruit peel (Fresh fruit, side dish and fry snack) | **Nutritional**: The fruit peel is fermented with salt water for 2-4 weeks; this dish is called Mandai | 0.020 |  |
| 50. | *Artocarpus integer* (Thunb.) Merr. | *Tiwadak/ cempedak* | Tree | LC | Native | Cultivation | October - February | Self-consumption and Sold; IDR 5,000-25,000/kg | Fruit, Fruit peel, and Seed (Fresh fruit, side dish) | **Nutritional**: The ripe fruit is consumed directly; The fruit peel is fermented with salt water for 2-4 weeks; this dish is called Mandai | 0.275 |  |

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| 51. | *Artocarpus kemando* Miq. | *Mintawadakan* | Tree | NT | Introduced | Wild | December-March | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 52. | *Artocarpus lanceifolius* Roxb. | *Kulidang* | Tree | LC | Native | Wild and Cultivation | December-March | Self-consumption; IDR 5,000-15,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly, and unripe fruit is cooked for a vegetable dish | 0.118 |  |
| 53. | *Artocarpus mutabilis* Becc. | *Binturong* | Tree | NT | Native | Wild | December | Self-consumption and Sold; IDR 3,000/fruit | Fruit (Fresh fruit, side dish) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 54. | *Artocarpus odoratissimus* Blanco | *Binturung* | Tree | NT | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 25,000/fruit | Fruit (Fresh fruit and vegetable dish) | **Nutritional**: The ripe fruit is consumed directly, and unripe fruit is cooked for a vegetable dish | 0.078 |  |
| 55. | *Artocarpus rigidus* Blume | *Puyian* | Tree | NA | Introduced | Wild | December | Self-consumption and Sold; IDR 3,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 56. | *Artocarpus sericicarpus* F. M. Jarrett | *Tarap* | Tree | LC | Native | Wild and Cultivation | December - January | Self-consumption and Sold; IDR 5,000/kg | Fruit and Seed (Fresh fruit and Snack) | **Nutritional**: The ripe fruit is consumed directly, the seeds are boiled and eaten as a snack | 0.118 |  |
| 57. | *Artocarpus tomentosulus* F. M. Jarrett | *Tampang* | Tree | NA | Native | Wild | January - December | Self-consumption and Sold; IDR 5,000/fruit | Fruit (Fresh fruit) | **Nutritional**: Fruit is sliced and served with palm sugar and chili, known as "Rujak." | 0.039 |  |

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| 58. | *Ficus melinocarpa* Blume | *Dara-dara* | Shrub | NA | Native | Wild | October - November | Self-consumption and sold; IDR 5,000/bunch | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly<br>**Medicinal**: Water is taken directly from the root and drunk as a remedy for stomachache | 0.078 |  |
| 59. | *Ficus uncinata* (King) Becc. | *Dandahle* | Shrub | LC | Native | Wild | October - November | Self-consumption and sold; IDR 2,000/bunch | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 60. | *Prainea limpato* (Miq.) Beumée ex K. Heyne | *Tampang susu* | Tree | LC | Native | Wild | December-February | Self-consumption and Sold; IDR 5,000-10,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly<br>**Medicinal**: The fruit peel is pounded and used as shampoo | 0.078 |  |
| | **Musaceae** | | | | | | | | | | | |
| 61. | *Musa acuminata* Colla | *Pisang mahuli* | Herbaceous tree | LC | Native | Cultivation | January - December | Self-consumption and Sold; IDR 15,000-30,000/bunch | Fruit, leaves (Fresh fruit, Cake) | **Nutritional**: Fruits for cake, mixture leaves for wrapping | 0.118 |  |
| 62. | *Musa borneensis* Becc. | *Bangkaran* | Herbaceous tree | LC | Native | Wild | January - December | Self-consumption; Not for sale | Fruit, petiole (Side dish) | **Nutritional**: Young fruit cooked as a side dish<br>**Medicinal**: Water from the leaf stalk or petiole for fever medicine | 0.059 |  |

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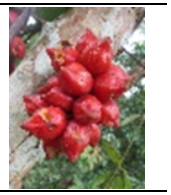
| 63. | *Musa × paradisiaca* L. | *Pisang Talas* | Herbaceous tree | NA | Native | Wild | January - December | Self-consumption and Sold; IDR 500/fruit | Fruit (Side dish) | **Nutritional**: Young fruit cooked as a side dish | 0.059 |  |
| | **Myrtaceae** | | | | | | | | | | | |
| 64. | *Rhodomyrtus tomentosa* (Aiton) Hassk. | *Karamunting* | Shrub | LC | Native | Wild | February | Self-consumption and Sold; IDR 5,000/bundle | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly<br><br>**Medicinal**: The ripe fruit is consumed directly to boost the immune system | 0.039 |  |
| 65. | *Syzygium aqueum* (Burm.f.) Alston | *Jambu air* | Tree | LC | Native | Cultivation | August | Sold; IDR 20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Phyllanthaceae** | | | | | | | | | | | |
| 66. | *Baccaurea angulata* Merr. | *Silulung* | Tree | LC | Native | Wild and Cultivation | December-March | Self-consumption and Sold; IDR 5,000/kg | Fruit and Fruit peel (Fresh fruit, side dish and snack) | **Nutritional**: The ripe fruit is consumed directly; fruit is used as a seasoning in cooking fish | 0.118 |  |
| 67. | *Baccaurea lanceolata* (Miq.) Müll.Arg. | *Limpaso* | Tree | NA | Native | Wild | August - February | Self-consumption and Sold; IDR 5,000/kg | Fruit (Fresh fruit and Mask) | **Nutritional:** The ripe fruit is consumed directly<br><br>**Medicinal**: The fruit is grated and used as a face mask for antibacterial and anti-virus | 0.059 |  |

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| 68. | *Baccaurea macrocarpa* (Miq.) Müll.Arg. | *Kapul* | Tree | LC | Native | Wild and Cultivation | December - January | Self-consumption and Sold; IDR 10,000/kg | Fruit (Fresh fruit, side dish) | **Nutritional**: The ripe fruit is consumed directly; fruit is used as a seasoning in cooking fish | 0.176 |  |
| 69. | *Baccaurea motleyana* (Müll.Arg.) Müll.Arg. | *Rambai* | Tree | LC | Native | Wild | December - January | Self-consumption and Sold; IDR 10,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 70. | *Baccaurea odoratissima* Elmer | *Kungkuni* | Tree | VU | Native | Wild | December – January | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 71. | *Baccaurea polyneura* Hook.f. | *Jantikan* | Tree | LC | Native | Wild | December-February | Sold; IDR 5,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 72. | *Baccaurea pyriformis* Gage | *Kasit/ kapul kasit* | Tree | LC | Native | Wild | December-February | Self-consumption and Sold; IDR 15,000-20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Polygalaceae** | | | | | | | | | | | |
| 73. | *Xanthophyllum stipitatum* var. *pachyphyllum* Chodat | *Manja* | Tree | LC | Native | Wild | December - February | Sold; IDR 10,000-20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Rafflesiaceae** | | | | | | | | | | | |
| 74. | *Rhizanthes lowii* (Becc.) Harms | *Ulur-ulur* | Tree | NA | Native | Wild | February | Self-consumption and Sold; IDR 10,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The fruit is boiled down from 2 glasses of water to 1 glass and consumed **Medicinal**: The fruit is boiled down from 2 | 0.059 |  |

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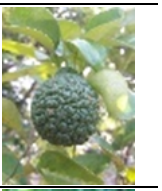
| | | | | | | | | | | glasses of water to 1 glass, a remedy for stomach pain and hemorrhoids | | |
| | **Rutaceae** | | | | | | | | | | | |
| 75. | *Citrus hystrix* DC. | *Limau* | Shrub | LC | Native | Cultivation | January - December | Self-consumption; IDR 2,500-10,000/kg | Fruit (Drinks and side dishes) | **Nutritional**: The fruit is squeezed for drinks, and the fruit is sliced for sambal (chili sauce) | 0.020 |  |
| 76. | *Triphasia trifolia* (Burm.f.) P. Wilson | *Laknum* | Shrub | NA | Native | Wild | July - Augst | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Salicaceae** | | | | | | | | | | | |
| 77. | *Flacourtia rukam* Zoll. & Moritzi | *Rukam* | Tree | LC | Native | Wild and Cultivation | September-November | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| | **Sapindaceae** | | | | | | | | | | | |
| 79. | *Dimocarpus fumatus* (Blume) Leenh. | *Kandupar* | Tree | LC | Native | Wild | December-February | Self-consumption and Sold; IDR 15,000-20,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 79. | *Dimocarpus longan subsp. malesianus* Leenh. | *Babuku* | Tree | DD | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 20,000-25,000/kg | Fruit (Fresh fruit and Seasoning) | **Nutritional**: The ripe fruit is consumed directly; fermented, known as tempoyak, is used as a seasoning | 0.020 |  |

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| 80. | *Lepisanthes alata* (Blume) Leenh. | *Jimalun* | Tree | LC | Native | Wild | January – December | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 81. | *Nephelium cuspidatum* Blume | *Ringkit* | Tree | LC | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 5,000-10,000/bundle | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.059 |  |
| 82. | *Nephelium lappaceum* L. | *Lumuwan/Rambutan* | Tree | LC | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 5,000-10,000/bundle | Fruit and seed (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly<br>**Medicinal**: Seeds for diabetes medicine, the seeds are roasted, ground, and then eaten | 0.078 |  |
| 83. | *Nephelium lappaceum var. xanthioides* (Radlk.) Leenh. | *Buluan* | Tree | NA | Native | Wild and Cultivation | December - February | Self-consumption and Sold; IDR 5,000-10,000/bundle | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 84. | *Nephelium maingayi* Hiern | *Jari-jari* | Tree | LC | Native | Wild and Cultivation | January - March | Self-consumption and Sold; IDR 10,000/bundle | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.059 |  |
| 85. | *Nephelium macrophyllum* Radlk. | *Siwau* | Tree | DD | Native | Wild and Cultivation | March - April | Self-consumption and Sold; IDR 5,000/bundle | Fruit (Fresh fruit) | Nutritional: The ripe fruit is consumed directly | 0.078 |  |

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| 86. | *Nephelium ramboutan-ake* (Labill.) Leenh. | *Maritam* | Tree | LC | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 5,000-10,000/bundle | Fruit, seed, and bark (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly **Medicinal**: The bark is boiled, the first water is discarded, and then it is boiled again to treat diabetes. The seeds are roasted, ground, and then eaten as a remedy for diabetes | 0.235 |  |
| 87. | *Nephelium ramboutan-ake* (Labill.) Leenh. | *Menguning* | Tree | NA | Native | Wild and Cultivation | December-February | Self-consumption and Sold; IDR 5,000-10,000/bundle | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 88. | *Pometia pinnata* J. R. Forst. & G. Forst. | *Kasai* | Tree | LC | Native | Wild | December-February | Self-consumption and Sold; IDR 15,000-20,000/fruit | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Sapotaceae** | | | | | | | | | | | |
| 89. | *Chrysophyllum cainito* L. | *Kenitu* | Tree | LC | Introduced | Cultivation | July -August | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 90. | *Manilkara zapota* (L.) P. Royen | *Sawo* | Tree | LC | Introduced | Cultivation | December-February | Self-consumption and Sold; IDR 1,000-2,000/fruit | Fruit (Fresh fruit, side dish) | **Nutritional**: The ripe fruit is consumed directly; The fruit is also used as a chili paste (sambal) | 0.039 |  |
| | **Solanaceae** | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91. | *Physalis angulata* L. | *Kekupus* | Annual herb | LC | Introduced | Wild | January - December | Self-consumption and Sold; IDR 100,000/kg | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 92. | *Solanum lasiocarpum* Dunal | *Terong asam* | Subshrub | NA | Native | Wild | January - December | Self-consumption; Not for sale | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| | **Zingiberaceae** | | | | | | | | | | | |
| 93. | *Etlingera coccinea* (Blume) S.Sakai & Nagam. | *Patukun* | Rhizomatous geophyte | LC | Native | Wild | November-December | Self-consumption and sold; IDR 10,000/kg | Fruit (Fresh fruit, seasoning) | **Nutritional**: The ripe fruit is consumed directly | 0.039 |  |
| 94. | *Etlingera elatior* (Jack) R.M.Sm. | *Patikala* | Rhizomatous geophyte | DD | Native | Wild and Cultivation | January - December | Self-consumption and sold; IDR 10,000/fruits | Fruit and flower (Fresh fruit, seasoning) | **Nutritional**: The ripe fruit is consumed directly<br>**Medicinal**: Flowers for seasoning. The flower spike is burned over a fire, and the liquid is extracted, then squeezed and applied as a compress to reduce fever | 0.137 |  |
| 95. | *Etlingera hemisphaerica* (Blume) R.M.Sm. | *Asam Tikada* | Rhizomatous geophyte | NA | Native | Wild | December | Self-consumption and sold; IDR 10,000/kg | Fruit (Fresh fruit, seasoning) | **Nutritional**: The ripe fruit is consumed directly | 0.020 |  |
| 96. | *Hornstedtia havilandii* (K.Schum.) K.Schum. | *Asam Tapus* | Rhizomatous geophyte | NA | Native | Wild | January - December | Self-consumption and sold; IDR 5,000/plate | Fruit (Fresh fruit) | **Nutritional**: The ripe fruit is consumed directly | 0.078 |  |

**Note**: 1 USD = IDR 16,400; NA: Not Available; DD: Data Deficient; LC: Least Concern; NT: Near Threatened; EN: Endangered; EW: Extinct in The Wild

The results showed that the five fruits with the highest RFC were *Mangifera casturi*, *Durio kutejensis, Artocarpus integer*, *Durio dulcis*, and *Mangifera similis* (Figure 4). The RFC results indicate that *Mangifera casturi* is the species with the highest RFC value at 0.373 (Figure 3). The local community in South Kalimantan primarily utilizes *Mangifera casturi* for local fruit consumption (Table 2). *Mangifera casturi* is a local fruit with a sweet taste when ripe and can be consumed directly as fresh fruit. This local fruit is commonly called *kasturi* because this mango species is renowned for its juicy and yellow-orange flesh (Figure 4a) with a strong aroma. It is native to Kalimantan (Borneo) and typically grows wild, although local communities occasionally cultivate it in home gardens or nearby areas.

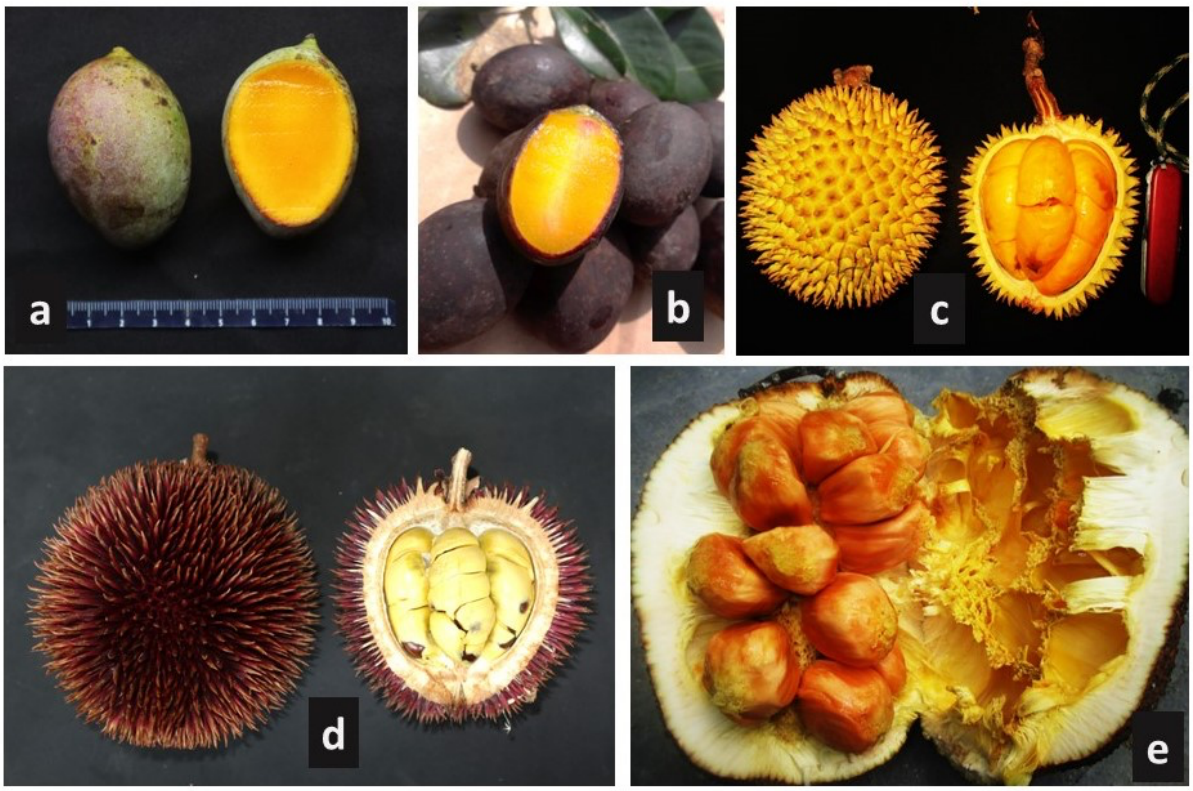


Figure 4. Five local fruits with the highest RFC. a) *Mangifera casturi*, b) *Mangifera similis*, c) *Durio kutejensis*, d) *Durio dulcis*, e) *Artocarpus integer*

Another mango species with the highest RFC is *Mangifera similis* (0.255). This local mango is quite popular among the people of South Kalimantan and is commonly found along highways. The fresh fruit can be directly eaten when ripe. The young fruit is used to make *sambal* by cutting it into pieces, placing it in a jar, adding salt, chili, and onion, and then adding water and fermenting it. The sambal is usually eaten with grilled fish. *M. similis* has a high fiber content, a sweet taste, and bright orange flesh when ripe. The fruit's skin tends to darken as it matures. Its aroma is not as strong as *M. casturi*, but the local community still enjoys *M. similis*.

*Durio kutejensis*, known as *lai*, has the second-highest RFC value of 0.333. *Lai* is a popular local *Durio* species among the people of South Kalimantan. It has a milder aroma than common durians. *Lai* has an attractive flesh color, ranging from orange to red, with a sweet taste. This local fruit can begin producing fruit at the age of five years. Another local durian with a high RFC is *D. dulcis*, with an RFC value of 0.275. *D. dulcis* is also popular among the people of South Kalimantan, where it is locally known as *Lahong*. This fruit is characterized by long yellow or black spines on its skin. *D. dulcis* has a sweet taste and more pungent aroma than other durians. This durian has yellow flesh and, when in season, can be smelled from a distance. Additionally, the ascorbic acid content of *D. dulcis* is slightly greater than that of *D. zibethinus*. *D dulcis* also has potential as a phytochemical source for functional food additives.

Another local fruit with a high RFC is the *Artocarpus integer*, with a value of 0.275. This fruit is locally known as *Tiwadak* and is quite popular because of its delicious taste. The ripe fruit has a strong aroma and a flavor similar to jackfruit but a juicier texture and darker yellow color. The seeds can also be consumed by boiling or roasting.

The RFC (relative frequency of citation) value is important in ethnobotany. A high RFC value indicates that the species has significant value for the community. This value shows that local fruits with high RFC values are economically important to the community and have the potential to be developed as commercial products.

This study recorded 25 families of local fruit used by communities in South Kalimantan. Apocynaceae, Malvaceae, Anacardiaceae, and Burseraceae had high FUV values of 0.176, 0.157, 0.126, and 0.118, respectively (Table 3). The high FUV depends on the use value of each species within the same family. The higher the SUV and the fewer species, the greater the resulting FUV. Apocynaceae has a high FUV because this family only has one species with a high SUV value. The species representing Apocynaceae is *Willughbeia angustifolia*. This local fruit, known by its local name *Gitaan*, is quite popular among the people of Kalimantan. This species has many benefits in addition to its edible fruit.

Table 3. Family use value (FUV) of local fruit by South Kalimantan communities

| No | Family | Number of species | ∑SUV | FUV |
|---|---|---|---|---|
| 1 | Anacardiaceae | 16 | 1.961 | 0.123 |
| 2 | Apocynaceae | 1 | 0.176 | 0.176 |
| 3 | Arecaceae | 8 | 0.392 | 0.049 |
| 4 | Bromeliaceae | 1 | 0.020 | 0.020 |
| 5 | Burseraceae | 2 | 0.235 | 0.118 |
| 6 | Caricaceae | 1 | 0.020 | 0.020 |
| 7 | Clusiaceae | 4 | 0.157 | 0.039 |
| 8 | Ebenaceae | 1 | 0.039 | 0.039 |
| 9 | Elaeocarpaceae | 1 | 0.039 | 0.039 |
| 10 | Fabaceae | 3 | 0.176 | 0.059 |
| 11 | Lauraceae | 1 | 0.078 | 0.078 |
| 12 | Malvaceae | 7 | 1.098 | 0.157 |
| 13 | Meliaceae | 2 | 0.196 | 0.098 |
| 14 | Moraceae | 13 | 0.980 | 0.075 |
| 15 | Musaceae | 3 | 0.235 | 0.078 |
| 16 | Myrtaceae | 2 | 0.059 | 0.029 |
| 17 | Phyllanthaceae | 7 | 0.431 | 0.062 |
| 18 | Polygalaceae | 1 | 0.020 | 0.020 |
| 19 | Rafflesiaceae | 1 | 0.059 | 0.059 |
| 20 | Rutaceae | 2 | 0.039 | 0.020 |
| 21 | Salicaceae | 1 | 0.039 | 0.039 |
| 22 | Sapindaceae | 10 | 0.569 | 0.057 |
| 23 | Sapotaceae | 2 | 0.059 | 0.029 |
| 24 | Solanaceae | 2 | 0.039 | 0.020 |
| 25 | Zingiberaceae | 4 | 0.275 | 0.069 |

Meanwhile, the Malvaceae family, consisting of 7 species with an FUV of 0.157, ranks second. Next, the Anacardiaceae family, with 16 species and an FUV of 0.123, is used exclusively for consumption. *Durio* fruit is well regarded among the people of Kalimantan, with *D. kutejensis* and *D. dulcis* being popular species in South Kalimantan. Kalimantan also holds incredible potential for local mango varieties, with at least 12 *Mangifera* species identified in South Kalimantan, all edible. In addition to *Mangifera*, there are three other species in the Anacardiaceae family: *Bouea macrophylla*, known locally as *Ramania*; *Dracontomelon dao*, known as *Sangkuang*; and *Dracontomelon costatum*, known as *Landur*. These fruits are usually eaten directly when ripe.

There are two families with many species but relatively low FUV values: Moraceae, with 13 species and an FUV of 0.075, and Sapindaceae, with 10 species and an FUV of 0.057. Local fruits from the Moraceae family are also quite diverse. At least 10 species within the *Artocarpus* genus are important commodities for the community. In addition to *A. integer*, other frequently used species include *Artocarpus sericicarpus*, locally known as *Tarap*, and *Artocarpus lanceifolius*, known as

*Kulidang*. One popular species in Sapindaceae is *Nephelium ramboutan-ake*, locally called *Maritam*. This plant's fruit is consumed directly when ripe. It also has medicinal benefits, as the bark can be boiled, and this water is used as a remedy for diabetes.

Furthermore, this study explored the different plant parts used by South Kalimantan communities. The 96 species observed in this study are edible fruits that can be consumed directly or require preparation beforehand. In addition to the plants' fruits, other plant parts are utilized to meet various needs, including medicinal purposes and wood fuel needs. The plant parts include the stem, flower, root, fruit peel, and leaves.

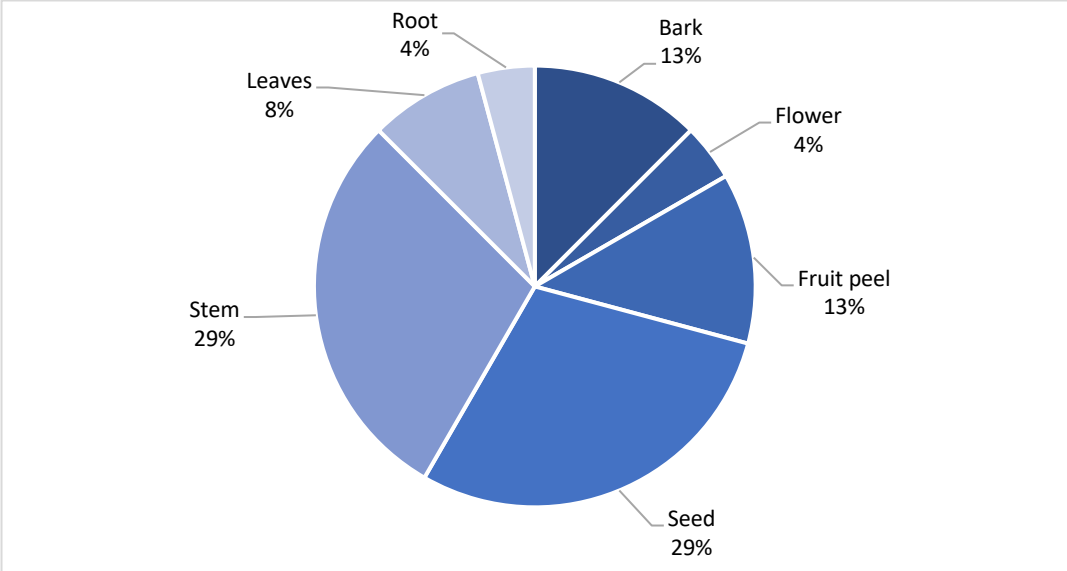


Figure 5. Distribution of non-fruit plant parts across use categories

The study of plant part utilization is crucial for sustainable plant use. Fruit harvesting allows plants to continue producing them, ensuring ongoing benefits. The seeds and stems have the highest PPV (Plant part value) of non-fruit plant parts (Figure 5). Local communities primarily harvest local fruit for consumption. A small portion of fruit plants, such as *Calamus manans* and *Calamus ornatus,* are also used for their stems, which are used to make furniture and crafts such as chairs, hats, and bags.

Some local fruit plant seeds, such as *Archidendron jiringa* and *Artocarpus sericicarpus,* are also utilized. After processing, *Artocarpus* seeds are boiled and eaten as a snack, and *Archidendron seeds* are cooked with spices. Flowers are less commonly used, with *Etlingera elatior* as a notable example.

Moreover, two local fruit species, *Mangifera rufocostata,* and *Nephelium ramboutan-ake,* have multiple uses (seed and bark). The ripe fruit of *Nephelium ramboutan-ake* is consumed fresh, while the bark and seeds are processed to treat diabetes. The bark is boiled (the water discarded) and consumed, and the seeds are roasted, ground, and consumed as a remedy. Thus, the local fruits of Kalimantan are vital to the local community, with knowledge of their uses passed down through generations. The productive age group (20-40 years) still recognizes these fruits and their benefits. The five most utilized species are *Mangifera casturi, Durio kutejensis, Artocarpus integer, Durio dulcis*, and *Mangifera similis*, which hold significant development potential.

**Economic value of local fruits produced by South Kalimantan communities**

The local fruits of Kalimantan have economic value. Approximately 73% (70 species) of local fruits are consumed and sold, 21% are only consumed, and 6% are solely sold (Figure 6). These results indicate that the market potential for local fruits in South Kalimantan can be developed to improve the local community's economies.

Fresh fruit consumption is predominant (75%), with ripe fruits often eaten directly. Some unripe fruits and plants have dual uses; in addition to being consumed fresh, they are prepared as side dishes. For example, the unripe fruits of *Mangifera caesia*, *M. aplanata*, and *M. similis* are processed to become chili paste (*sambal*) commonly eaten with rice. Another example is the unripe fruit of *Artocarpus odoratissimus, which* is often cooked as a vegetable dish.

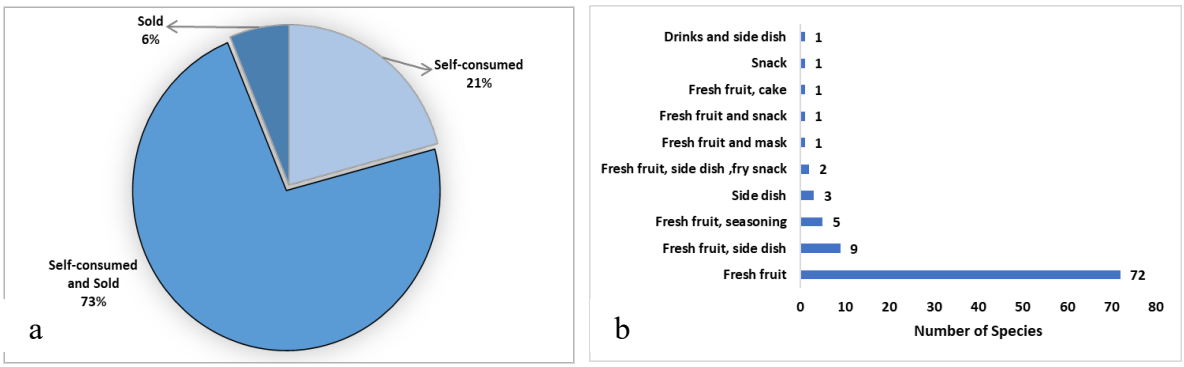


Figure 6. The utilization of local fruits in South Kalimantan. a) Comparison of local fruit utilization for sale or consumption, b) Comparison of local fruit utilization

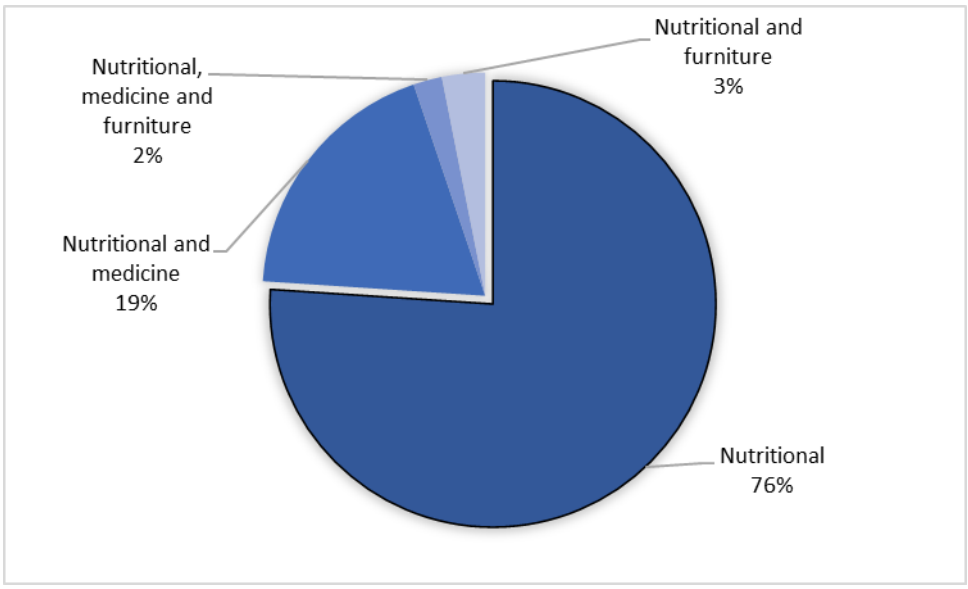


Figure 7. Comparison of the functional properties of local edible fruit plants

The most significant benefit of local fruit plants is their ability to support the nutritional needs of the local community. However, they can also give other benefits to the community. In this study, ninety-six local fruit species are consumed to meet nutritional needs, and some offer additional benefits such as medicinal purposes (Figure 7). The local community still relies on plants to treat certain diseases. Approximately 19% of fruit plants are used for medicine. *Musa borneensis* reduces fever by consuming the water from its leaf stalks. The local community prefers natural remedies from local fruits because they are easy to find in the surrounding environment. Their preference may also be due to the communities' limited access to health centers.

Local fruits are sold at varying prices depending on their abundance during harvest. The selling price is also determined by selling in packs, per unit of fruit, or weight. Some local fruits are also processed before being sold to increase their market value and extend their shelf life. For example, *Mangifera* is a common fruit in South Kalimantan that is sold individually. During the fruiting season, they are priced cheaply at IDR 500 per fruit due to their abundance. Conversely, *Mangifera rufocostata* is sold at a relatively high price, ranging from IDR 5,000-10,000 per fruit. Next, local fruits from the *Nephelium* genus are sold in bunches. Their fruits have economic value because they are sweet and have a high water content. *Nephelium cuspidatum*, *N. macrophyllum*, and *Nephelium ramboutan-ake* are sold at IDR 5,000-10,000 per bunch, and *N. maingayi* is sold at IDR 10,000 per bunch.

*Artocarpus integers* also have economic value. These fruits are sold at relatively high prices. Local people ferment the inner skin of this fruit, known as *mandai*. *Mandai* is typically cooked by frying or sauteing and serves as a side dish. It is often packaged and sold as a souvenir from South Kalimantan (Figure 8). *Tiwadak* fruit is also made into chips to extend its shelf-life. One of the highest-priced *Artocarpus* species is *A. odoratissimus*, which is sold at IDR 25,000 per fruit. Like *A. integer*, *A. odoratissimus* has similar benefits. This fruit, locally known as *Binturung*, makes *mandai* through a fermentation (pickling)

process. Once fermentation is complete, stir-frying or roasting is typically used as a side dish. The other *Artocarpus* fruits also have relatively high prices, including *A. anisophyllus*, which was sold at IDR 15,000–20,000 per fruit. Two *Artocarpus* species are sold at a lower price, *A. sericicarpus* and *A. tomentosulus*, each priced around IDR 5,000 per fruit.

Figure 8. The processed *Artocarpus integer*, known as *mandai*, is sold by the people of South Kalimantan.


Figure 9. Display of local fruits sold in South Kalimantan. a) Local fruits are sold and arranged as such to attract buyers, b) Packaging of *Dialium indum* fruits.

Local fruits are sold through traditional methods, such as traditional markets or along the roadside in stacked displays. The range of fruit species for sale becomes more diverse during the fruiting season. Some fruits are also sold in packed bundles. For example, *Dialium indum*, locally known as *Kuranji*, is packed in bundles and hung to attract buyers (Figure 9). Fruits from *Mangifera casturi* and *M. similis* are arranged on plates to appear more interesting to consumers. The local community in South Kalimantan remains heavily reliant on natural resources, particularly those working as farmers. Thus, local fruits are important for improving community welfare and have significant development potential. Compared with other regions, the local fruits of Kalimantan have unique characteristics. The processed products from these fruits can also add substantial value to their prices. For example, some local fruits have been processed into high-economic-value products. A well-known example is *A. integer,* which is processed into *mandai*, a dish known for its distinctive taste.

Furthermore, local durians are an important genetic resource for breeding local fruit plants in South Kalimantan. Local durians are sold at relatively high prices. For example, *D. kutejensis* is sold for IDR 25,000 per fruit, and *Durio oxleyanus* is sold for up to IDR 30,000 per fruit. Natural crossbreeding occurs between several species of Durio, resulting in fruits with distinct characteristics. The community refers to these crossbred fruits by local names. One such example is *Mantawala*, a natural hybrid between *Durio zibethinus* and *D. kutejensis*, which is sold for up to IDR 50,000 per fruit. Another example is *Layong*, a natural hybrid of *Durio dulcis* and *D. kutejensis*, which is also sold for up to IDR 50,000 per fruit. The durian fruit is also processed into a sweet dessert known as *lempok*, which has high economic value. *Dimocarpus longan* subsp. *malesianus*

is another fruit that can be consumed fresh and after fermentation (*tempoyak*) as a traditional seasoning. This species is extensively cultivated for its high economic value, with processed fruit products marketed as regional souvenirs. Moreover, developing local fruit cultivation and production can be further supported through outreach programs for farmers. Increasing local fruit production would allow for a wider distribution area of Kalimantan fruit. Campaigns promoting local fruits must also introduce Kalimantan's unique fruits to a broader audience. Many local fruits remain unfamiliar in urban areas. Thus, optimizing the potential of local fruits and products can help improve the standard of living of local communities.

Table 4. Summary of local fruits based on economic value in South Kalimantan

| Aspect | Summary |
|---|---|
| Local fruit with high price and popularity in South Kalimantan | - *Durio kutejensis* is sold for IDR 25,000 per fruit<br>- *Durio oxleyanus* is sold for up to IDR 30,000 per fruit<br>- *Mangifera casturi* is popular and sells well at a relatively high price IDR. 35,000/plate or IDR 2,000/fruit<br>- *Artocarpus anisophyllus*, is sold for IDR 15,000–20,000 per fruit<br>- *Artocarpus odoratissimus*, is sold for IDR 25,000 per fruit<br>- *Nephelium maingayi* is sold for IDR 10,000 per bunch |
| Local hybrid fruit with high economic value | - *Mantawala*, a natural hybrid between *Durio zibethinus* and *D. kutejensis*, is sold for up to IDR 50,000 per fruit<br>- *Layong*, a natural hybrid of *Durio dulcis* and *D. kutejensis*, is also sold for up to IDR 50,000 per fruit |
| Local fruits that produce processed economic products | - *Artocarpus integer* and *A. odoratissimus* are fermented and processed into a product called *mandai*, which is sold as a local souvenir<br>- The fruit of *Durio spp*. is processed into a sticky dessert known as *lempok*, which also has high economic value<br>- *Dimocarpus longan* subsp. *malesianus* is fermented into *tempoyak* and marketed as regional souvenirs |
| Local fruit with medicinal value | - 19% of fruit plants are used for nutritional and medicinal purposes<br>- *Mangifera rufocostata* offers nutritional and medicinal benefits. Its bark is used to treat hemorrhoids. It is cultivated for its high economic value as is marketable at an affordable price.<br>- The young fruit of *Musa borneensis*: is cooked as a side dish and the water from the leaf stalk or petiole is used for fever medicine |
| Traditional selling method of local fruits | - *Dialium indum*, locally known as "*Kuranji*", is packed in bundles and hung to attract buyers<br>- *Mangifera casturi* and *M. similis* fruits are arranged on plates along the roadside to attract buyers |

**Ecological perspective and conservation of local fruits in Kalimantan**

Native fruits are more widely utilized by South Kalimantan communities than introduced fruits (Figure 10a). Approximately 86% of local fruit plants are native to Borneo, and the remainder are introduced. Native fruits are species that evolved together in a specific place (Norcini 2006). Endemic species are typically found in small numbers in a particular location and have difficulty adapting outside their original habitat. Among the local fruits used by the local communities of South Kalimantan are endemic fruits whose distribution is limited to Borneo, such as *Borassodendron borneense*, *Durio dulcis*, *Durio kutejensis*, *Mangifera casturi*, *Nephelium macrophyllum*, and *Rhizanthes lowii*.

In addition to native fruits, the communities also utilize introduced fruit plants. These plants do not originate from Kalimantan but benefit the community. Some of the introduced plants utilized include *Physalis angulata*, which is sold relatively cheaply. Fruits such as *Manilkara zapota*, *Carica papaya*, and *Ananas comosus* have also become part of Kalimantan's fruit culture, as they have long been consumed by the community, leading them to cultivate these plants. Nevertheless, it is important to prioritize preserving native fruits from the Kalimantan region.

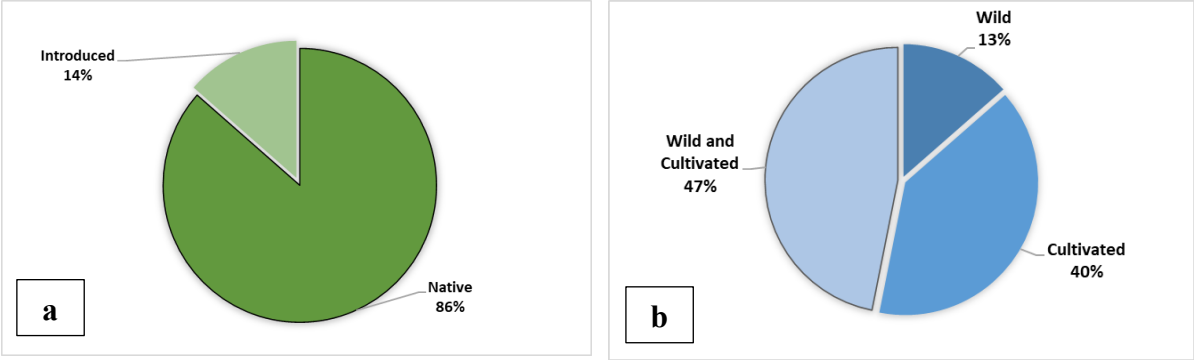


Figure 10. a) Comparison of native and introduced fruits. b) Comparison of wild and cultivated fruits produced by South Kalimantan communities.

Local fruits contribute significantly to helping South Kalimantan populations meet their nutritional and dietary needs. Unfortunately, the availability of local fruits is declining due to the introduction of exotic fruits, which have received increasing attention in research and development. Moreover, knowledge of cultivating local fruits remains limited in the community. Generally, they plant only local fruit trees, hoping to harvest the fruits once the trees mature. The people of South Kalimantan recognize the benefits of local fruits, so they plant them around their homes and in gardens. Larger trees are usually planted on larger plots of land. Most of the fruit they use comes from cultivated sources, with only approximately 13% sourced from forests without cultivation (Figure 10b). Approximately 87% of the fruits consumed by South Kalimantan communities are from plant cultivations. However, they also still rely on the wild forest fruits that have been growing around their communities long before settlements. This knowledge encourages people to preserve fruit trees around their homes.

Moreover, the South Kalimantan communities do not only use local fruits from trees. This study identified 11 growth forms (habitus) of local fruits, with trees being the dominant growth type at 75% (Figure 11). The local fruits in Kalimantan are tropical and thrive in lowlands and wet and humid environments. The families Anacardiaceae, Moraceae, Malvaceae, and Sapindaceae found in Kalimantan include tree-growing species. A smaller proportion comprised rhizomatous geophytes from the Zingiberaceae family (ginger). Other growth types include shrubs, 7% comprising genera *Rhodomyrtus* and *Citrus*; liana, 4% comprising *Calamus*; and herbaceous trees, which constitute 3% of the genus *Musa*.

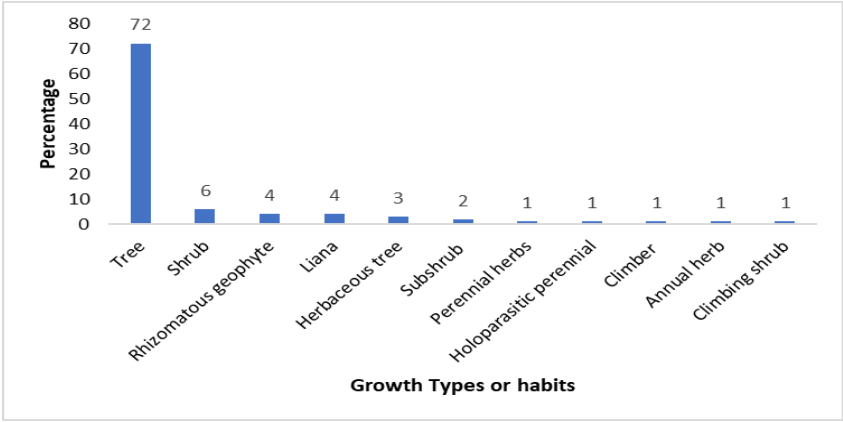


Figure 11. Comparison of the growth types or habits of local fruits

The availability of local fruits in Kalimantan follows a seasonal pattern. Some fruits are available during the dry season, and others are available during the rainy season. Most local fruits in Kalimantan (83%) are available during the rainy season (October to March) (Figure 12). Meanwhile, 9% of local fruits in Kalimantan are available in the dry season (April to September), and 8% bear fruit year-round (January to December). Kalimantan is a tropical region, and the reproductive phase of plants generally occurs during periods of low photosynthetic activity or after a significant accumulation of reserves, with drought often being a prerequisite for flowering (Borchert *et al*. 2002). In South Kalimantan, many fruits have a fruiting season from December to February. Examples of fruits commonly found on the market during this period include those from *Durio*, *Mangifera*, and *Nephelium*.

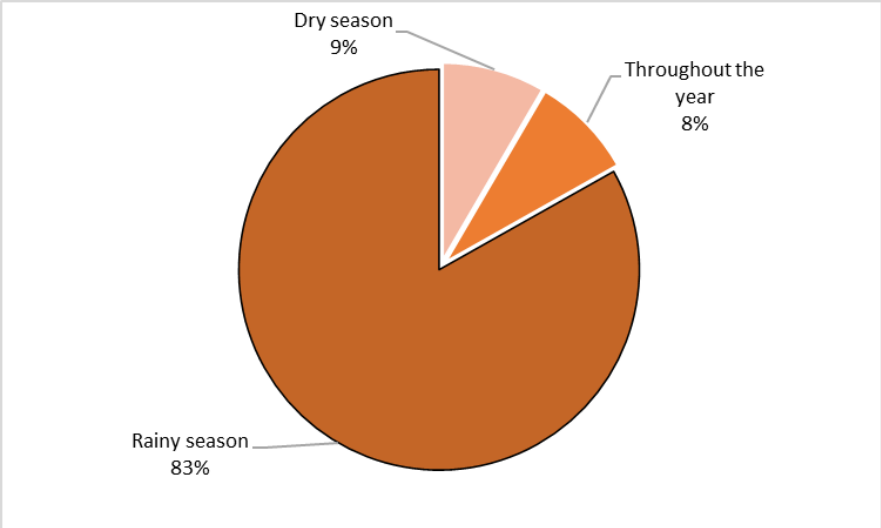


Figure 12. Comparison of the seasonal availability of local fruits in South Kalimantan

As one of the world's centers of plant diversity, Kalimantan is home to various local fruit species. The tropical forests of Kalimantan provide suitable habitats for the growth of fruit plants. Unfortunately, many local fruit species are threatened with extinction. The population decline is evidenced by the fact that various local fruit plants are listed on the IUCN Red List. Among these, one species is categorized as Extinct in the Wild, one as Endangered, six as Vulnerable, and six as Near Threatened. The most common category is least concern, with 43 species (45%) falling into this category (Figure 13). Notably, data for 30 out of 96 local fruit species are unavailable, likely because they have not yet been assessed for their conservation status. Additionally, nine species are listed as data deficient, indicating that limited information is available to evaluate the conservation status of these local fruit species.

One of the local fruits that has garnered attention is *Mangifera casturi*. In South Kalimantan, *M. casturi* grows near residential areas (Figure 14a). Local communities report that these trees have been growing there for a long time, even before the establishment of current settlements, and are considered wild mangoes preserved by the community. It is believed that these mangoes originally grew naturally in the area, which was once forested before being converted for other uses. To date, no scientific reports have confirmed the presence of *M. casturi* in the wild, such as in protected forests, nature reserves, or national parks. However, the local community in South Kalimantan recognizes several well-known varieties of *M. casturi*, including *palipisan* and *mawar*. These variations are believed to result from natural hybridization.

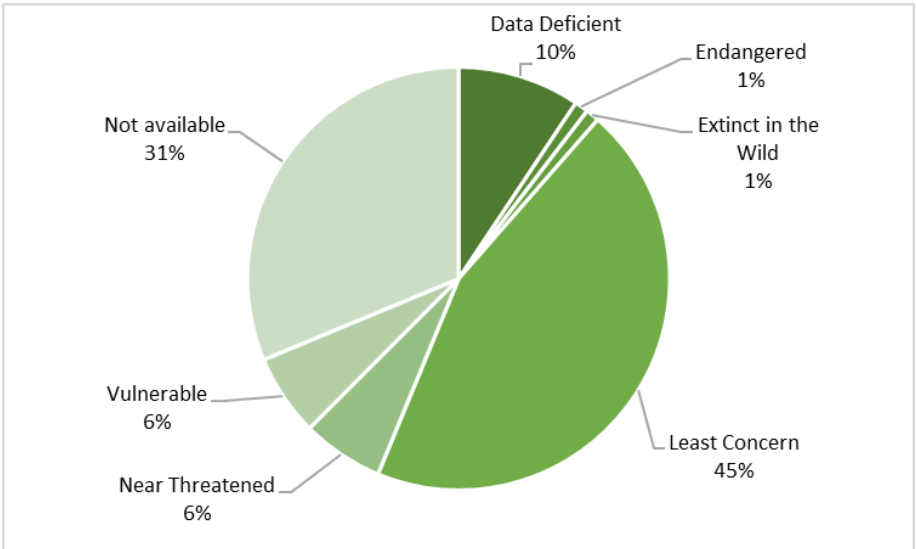


Figure 13. Comparison of the conservation status of local fruits in South Kalimantan

Vulnerable local fruit species include *Baccaurea odoratissima*, *Artocarpus anisophyllus*, *Durio dulcis*, *Durio graveolens*, and *Mangifera rufocostata*. The population of local durians in Kalimantan has declined significantly due to deforestation. As a

result, only a few individual trees remain in the region (Figure 14.b). Mature *D. dulcis* trees can regenerate naturally, with seeds sprouting around the parent tree from fallen fruits (Figure 14.c).

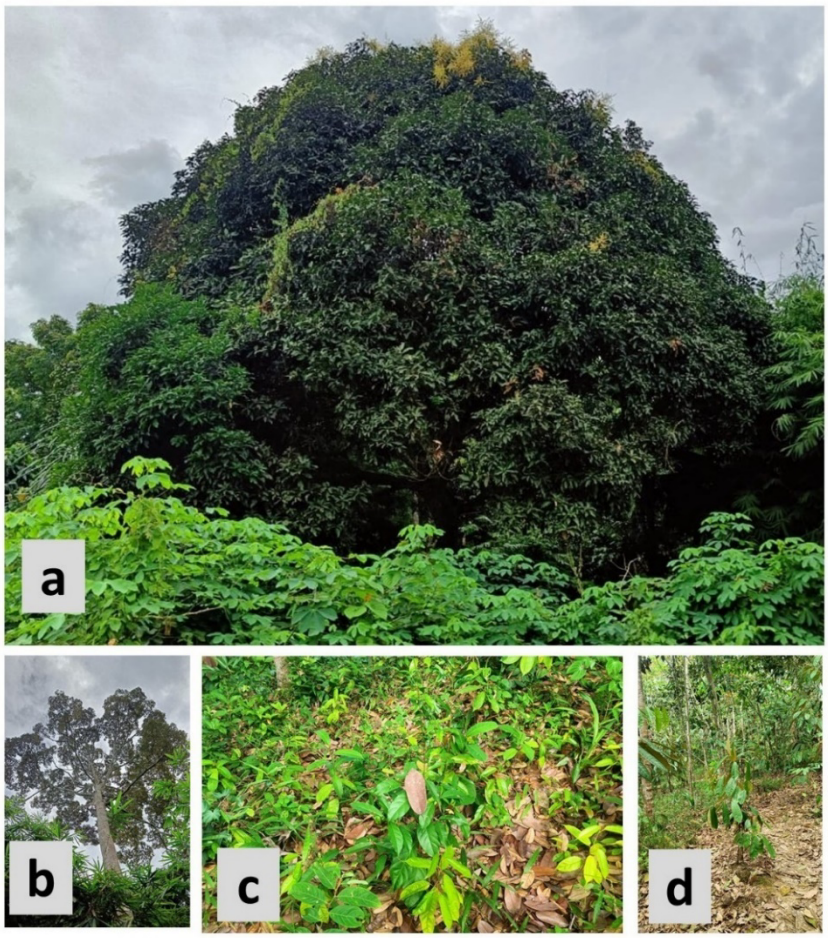


Figure 14. Local fruits growing in their natural habitats: a) *Mangifera casturi*, b) *Durio dulcis* (mature) in its natural habitat, c) *Durio dulcis* seedlings around the parent tree, d) *Durio kutejensis* cultivated by the community in gardens.

One species of the *Durio* genus that has gained attention from the local community is *Durio kutejensis*. Native to Kalimantan, this durian species is widely cultivated on community plantations, and its populations are still easily found in the wild. A key advantage of *D. kutejensis* is its ability to bear fruit after just five years of cultivation. Additionally, the fruits are easier to harvest as they grow on low-hanging branches. *D. kutejensis* thrives in the South Kalimantan region, where thousands of trees can still be observed. Local communities cultivate this species by planting its seeds on plantations far from their homes (Figure 14d). Continued cultivation of *D. kutejensis* is expected to reduce this species' extinction threat. Thus, the local community plays a significant role in preserving South Kalimantan's native fruits.

## Discussion

**The diversity and utilization of local edible fruits by South Kalimantan communities**

*Mangifera casturi*, the species with the highest Relative Frequency of Citation in this study, is known for its good nutritional value fruit. Based on research, the *kasturi* fruit has a high fiber content with a firm texture when ripe (Ayala-Silva et al. 2013). Other studies have also shown that its bark has antioxidant and antileukemic activities (Pardade & Koketsu 2017; Nuraini *et al*. 2019). The respondents also mentioned another fruit, identified as *Nephelium ramboutan-ake*. This fruit is also a popular medicinal plant. Research shows this fruit has biological activities, such as antiaging, antineoplastic, antimicrobial, and hypoglycemic effects (Tsong *et al*. 2021).

The local people of South Kalimantan not only consume the fruits of edible fruit plants but also utilize the plant's stems, leaves, roots, flowers, and seeds. The respondents only mentioned one flower species in the survey, *Etlingera elatior*. This

ginger species, native to Kalimantan, has edible fruits and flowers and is used as a seasoning and traditional medicine. The flower's extract is used as a fever remedy. *Etlingera* is known for its pharmacological properties, as it is cytotoxic, antioxidant, antibacterial, and has other health benefits (Chan *et al*. 2011).

In contrast to *Etlingera*, the stems or shoots of the *Calamus* species are more commonly used. However, harvesting *Calamus* stems often requires felling, which threatens plant populations. Moreover, as *Calamus* is locally and globally valuable, overharvesting from natural populations risks extinction for many rattan species (Sarath et al. 2024). *Durio*'s presence in Kalimantan is also notable. The respondents mentioned two *Durio* species that they frequently use and were found to have high RFC values. Kalimantan's Durio species exhibit diverse characteristics, especially their physicochemical properties (Belgis *et al*. 2016). These fruits represent valuable genetic resources, making their cultivation and conservation promising areas for further exploration.

**Economic value of local fruits produced by South Kalimantan communities**

Various local fruit species in South Kalimantan have economic value and potential for further development. The high RFC values of *Mangifera casturi, Durio kutejensis, Artocarpus integer, Durio dulcis*, and *Mangifera similis* highlight how local fruits are valuable to the community. They benefit the community by helping them to fulfill their daily nutritional needs. However, most local fruits are also sold to supplement their income. Overall, indigenous fruits are important food, income, and medicinal sources essential for supporting rural communities (Kalaba *et al*. 2009).

At least 73% of the total fruit species in Kalimantan are sold. Fruit sellers usually sell their produce on the side of the road during the fruiting season. During the local fruit season, it is expected that the fruit price will start to decline due to the high supply of local fruit. Thus, price control is important so the community will still benefit during the fruiting season. It can also help the community to preserve the local fruits around them. Some steps that can be applied to increase the economic value of local fruits include processing the fruits, such as processing *Artocarpus integer* into *Mandai*, which is sold at a higher price. This food has been preserved naturally and has a longer shelf life. The fruit's inner skin is often fermented with lactic acid by the people of South Kalimantan to form *Mandai* (Gozali *et al*. 2024).

Additionally, some Banjar people utilize various unripe fruits from *Artocarpus* to be processed as food, including jackfruit gravy, served with *lontong* (Yayuk *et al*. 2022). Thus, people would sell this fruit before it is ripe. Moreover, *A. integer*, commonly known as *tiwadak*, is a tasty fruit with notable nutritional value. Research has shown that the *tiwadak* fruit contains organic acids, succinic acid, high levels of α-carotene and β-carotene (Ghazali *et al*. 2018), and high antioxidant content (Gopinathan *et al*. 2020).

In addition to *Artocarpus*, other mango species support the community's livelihoods. Some mangoes are sold when ripe, but others are traded when it is still unripe. This practice aligns with reports reporting that people in Borneo consume many local mango species from the same species, either fresh or mixed with spices (Ledesma & Campbell 2014; Yayuk et al. 2022). Many mango species are also used for traditional medicine. For example, *Mangifera rufocostata* stems are used to treat diabetes, and its roots are used to treat hemorrhoids (Mustikasari *et al*. 2024).

Furthermore, local fruits are essential for meeting the nutritional needs of people in South Kalimantan. They are nutritious, contain beneficial natural fibers, and are more affordable than imported fruits. Thus, local fruits play a vital role as a food source and means of income for rural communities, given their abundance and availability for seasonal trade in local markets. They also contain vitamins, minerals, and phytochemicals that help combat various diseases and are naturally free from synthetic chemicals (Shaffiq *et al*. 2013). The consumption of local fruits also supports the local economy. Previous studies have also shown that *Durio kutejensis* and *Durio graveolens* are rich in protein and energy (Hoe & Siong 1999), and *Artocarpus odoratissimus* and *Dialium indum* have high fructose contents. Thus, consuming local fruits can help prevent diseases such as obesity, and it is recommended for a healthy diet (Shaffiq *et al*. 2013).

Moreover, some local fruit development has been done through natural hybridization selection. For example, natural crosses between *Durio* species have produced durian fruits characterized by fleshy fruit with a sweeter flavor. Support for developing local fruits can be done through counseling efforts to the community and local fruit farmers. Local fruits can also be promoted so that they can have a more significant contribution to the community's welfare.

**Ecological perspective and conservation of local fruits in South Kalimantan**

The preservation of local fruits contributes to the preservation of native species from Kalimantan. Native fruits are species that evolved together in a specific place, in this case, Kalimantan (Norcini 2006). Almost 86% of the local fruits the respondents utilize are native species from Kalimantan. The community plays a significant role in preserving local fruits, indicated by how 87% of the community hasvb5 local fruits planted in their garden or yard. Local fruits are generally more available in the rainy season, and about 83% of these species bear fruit in the rainy season. Kalimantan is a tropical region, and the reproductive phase of plants generally occurs during periods of low photosynthetic activity or after a significant accumulation of reserves, with drought often being a prerequisite for flowering (Borchert *et al*. 2002). Therefore, more fruits are found in the rainy season.

However, many local fruit species are under threat of extinction due to land use changes and timber exploitation. This threat is primarily due to land conversion and deforestation, which lead to the loss of local fruit habitats (World Conservation Monitoring Centre, 1998). Several local fruit species have experienced population declines and require attention (Suwardi *et al*. 2020). For example, *D. dulcis*, a native species of Kalimantan, has experienced an estimated 30% population decline over the past 120 years (Rahman 2021), driven by forest degradation and illegal logging. In South Kalimantan, locals report that *D. dulcis* wood is often used as timber, making the species highly susceptible to exploitation.

Furthermore, about 76% of local fruits are tree-bearing, making them vulnerable to logging for timber utilization, such as the *Durio* and *Mangifera* timber. Land conversion also threatens various natural plant habitats, especially local fruits (Curran *et al*. 2004). The government has implemented various policies to address this issue. However, policies related to biodiversity management have not been optimally enforced (Normalina *et al*. 2021). One of the local fruits that has garnered attention is *Mangifera casturi*. This fruit is listed as Extinct in the Wild (Rhodes & Maxted 2016). *Mangifera casturi* is an endemic mango species from South Kalimantan. The extinction of this species in the wild is attributed to agricultural expansion. Currently, the species is extinct in its natural habitat and can only be found in cultivated areas (Bompard 1989).

The local fruit trees of Kalimantan contribute to the diversity of tropical fruits in Indonesia. Kalimantan's local fruits possess unique characteristics and play a role in fulfilling the nutritional needs of the local community. However, the consumption of local fruits has declined due to the increasing presence of exotic fruits in society. Additionally, the availability of local fruits has decreased in parallel with population growth and deforestation. A potential strategy to overcome this issue involves engaging the community and promoting the consumption of local fruits, as communities have demonstrated their ability to cultivate local fruits, evidenced by the existing plantations for various local fruit species established by local communities. Therefore, these efforts should receive support from the local government.

Conservation efforts can also be made by introducing a variety of local fruits, particularly in urban areas with lower general knowledge about local fruits. Introduced fruits are also more commonly found in modern or traditional markets than local fruits in urban areas. However, they also benefit the public. Some introduced plant fruits include *Physalis angulata*, which is sold at a relatively high price. Scientific evidence shows that *P. angulata* has anti-diabetic, anti-inflammatory, anticancer, antiparasitic, antibacterial, and antifibrotic properties (Novitasari *et al*. 2024).

However, a lack of awareness about the taste and uses of these fruit trees can impact ecosystem conservation (Marcuzzo & Fagundes 2022). Studies on phenology, taxonomy, and propagation are necessary for the sustainable development of local fruits (Okafor & Lamb 1999). This research emphasizes that efforts to conserve local Kalimantan fruits can be made by increasing community knowledge of the cultivation and utilization of local fruits. The role of government policy in providing habitat protection for Kalimantan local fruits, especially those threatened with extinction, must also be improved to preserve local fruits.

## Conclusion

This ethnobotanical study in South Kalimantan provides insights into the local community’s utilization of local fruits and the importance of their relationship. All local fruits mentioned in this study were used to meet local communities’ nutritional needs as they can be consumed directly or processed beforehand. Native local fruits are utilized more frequently than introduced varieties. The local community has also practiced the cultivation of local fruits, as evidenced by the respondents’ preference for cultivated fruits over wild ones. Local fruits in Kalimantan are more abundant during the rainy season and contribute to the community's economy and living standard, as a portion of these fruits are sold and contribute to the community’s income. Due to declining populations, several species of local fruits are listed on the IUCN Red List. Conservation efforts are needed to preserve the sustainability of native local fruits from Kalimantan. This research can serve as a

foundation for the government in formulating policies on biodiversity conservation and local economic development based on local fruits. Further research can focus on improving market access, conservation education for young people, and exploring methods of preserving and packaging local fruits to improve their market value in the global market.

## Declarations

**List of abbreviations:** RFC: relative frequency of citation, FUV: family use value, PPV: plant part value

**Ethics approval and consent to participate:** Permission was obtained from the respondents before data collection. This research obtained ethical clearance from the Social Humanities Ethical Commission of the National Research and Innovation Agency, with approval number 080/KE. 01/SK/02/2024 dated 15th February 2024.

**Consent for publication:** Not applicable.

**Availability of data and materials:** The data will be available from the corresponding author upon special request.

**Competing interests:** The authors declare that they have no competing interests**.**

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## Literature cited

Akhmadi NR, Sumarmiyati S. 2015. Exploration and characterization of kapul (*Baccaurea macrocarpa*) fruit in West Kutai District, East Kalimantan. Prosiding seminar nasional masyarakat biodiversitas Indonesia 1(4):923-929. doi: 10.13057/psnmbi/m010448.

Ayala-Silva T, Gubbuk H, Urbina C. 2013. Physico-chemical Evaluation of 'Casturi'Mango. Proceedings of the Florida State Horticultural Society 126: 17−20.

Belgis M, Wijaya CH, Apriyantono A, Kusbiantoro B, Yuliana ND. 2016. Physicochemical differences and sensory profiling of six lais (*Durio kutejensis*) and four durians (*Durio zibethinus*) cultivars indigenous Indonesia. International Food Research Journal 23(4): 1466.

Bompard JM. 1989. Wild Mangifera species in Kalimantan (Indonesia) and in Malaysia. Final report on the 1986–1988 collecting missions. WWF Project No. 3305. IBPGR, IUCN-WWF, Rome.

Bond N. 2017. Dayak identification and divergent ethnogenesis among Tidung in North Kalimantan and Sabah. Borneo Research Bulletin 48:265−282.

Borchert RGR, Hagnauer W. 2002. Modification of Vegetative Phenology in a Tropical Semi-deciduous Forest by Abnormal Drought and Rain 1. Biotropica 34(1):27-39. doi: 10.1111/j.1744-7429.2002.tb00239.x.

Chan EW, Lim YY, Wong SK. 2011. Phytochemistry and pharmacological properties of *Etlingera elatior*: a review. Pharmacognosy Journal 3(22): 6−10. doi: 10.5530/pj.2011.22.2

Curran LM, Trigg SN, McDonald AK, Astiani D, Hardiono YM, Siregar P, Kasischke E. 2004. Lowland forest loss in protected areas of Indonesian Borneo. Science 303(5660): 1000−1003.

Fanselow F. 2015. Indigenous and anthropological theories of ethnic conflict in Kalimantan. Zinbun 45: 131−147.

Ghazali HM, Pui LP, Karim R, Yusof YA, Wong CW. 2018. Physicochemical and sensory properties of selected 'cempedak' (*Artocarpus integer* L.) fruit varieties. International Food Research Journal 25(2): 861−869.

Gopinathan M, Yusof YA, Pui LP. 2020. Effects of different drying methods on the physicochemical and antioxidant content of "cempedak" (*Artocarpus Integer* L.) powder. Journal of Food Processing and Preservation 44(12): e14966. doi: 10.1111/jfpp.14966.

Gomez-Beloz A. 2002. Plant use knowledge of the Winikina Warao: The case for questionnaires in ethnobotany. Economic Botany 56(3):231−241.

Gozali G, Setyawati R, Duari IPHH, Zulkarnain Z, Nooryastuti N, Yudistira S, Purwaningrum H. 2024. Exploring "Mandai": gastronomy of Banjar ethnic in Kalimantan, Indonesia. Journal of Ethnic Foods 11(1): 40. doi: 10.1186/s42779-024-00246-2

Greene AM, Teixidor-Toneu IG. 2023. To pick or not to pick: Photographic voucher specimens as an alternative method to botanical collecting in ethnobotany. Journal of Ethnobiology 43(1):44-56. doi: 10.1177/02780771231162190

Guimbo ID, Muller J, Larwanou M. 2011. Ethnobotanical knowledge of men, women and children in rural Niger: A mixed-methods approach. Ethnobotany Research and Applications 9:235−242.

Gunawan G, Muhamat M, Maghfiroh M. 2024. Ethnobotany and conservation of Kasturi (*Mangifera casturi* Koesterm.) by Banjar Tribe in South Kalimantan, Indonesia. Biodiversitas Journal of Biological Diversity 25(4):1420-1426. doi: 10.13057/biodiv/d250410

Gupta N, Agarwal AK, Singhal RK, Jindal SK, Yadav VK. 2023. Ethnomedicinal and conservation evaluation of the traditional medicinal plant species employed by the Van Gujjar Tribe in the Dehradun Shivalik Hills, Uttarakhand, India. Ethnobotany Research and Applications 25:1−17. http://dx.doi.org/10.32859/era.25.2.1-17

Hafidzi A, Umar M, Hani MHM, Rusdiyah R. 2021. A review on cultural customs of marriage traditions among Banjar ethnic women in Banjarmasin, Indonesia. Potret Pemikiran 25(1):112−118.

Hawkins M. 2000. Becoming Banjar. The Asia Pacific Journal of Anthropology 1:24−36. doi: 10.1080/14442210010001705830

Hoe VB, Siong KH. 1999. The nutritional value of indigenous fruits and vegetables in Sarawak. Asia Pacific Journal of Clinical Nutrition 8(1):24−31.

Ilhami MR, Abbas EW, Mutiani M, Jumriani J, Rusmaniah R. 2022. The Social Values of the Banjar People in Traditional Markets. The Innovation of Social Studies Journal 4(1):71−83. https://ppjp.ulm.ac.id/journals/index.php/iis

International Plant Names Index (IPNI). 2023. Database. https://www.ipni.org/ (Accessed 18/12/2024).

Irwan A, Mustikasari K, Ariyani D. 2017. Chemical Preliminary Evaluation of Leaves, Peels, and Fleshs Fruit of Limau Kuit: Local Orange of South Kalimantan. Jurnal Berkala Ilmiah Sains dan Terapan Kimia 11(2): 71−79. https://dx.doi.org/10.20527/jstk.v11i2.4040

Jadid NK, Kurniawan K, Himayani CES, Andriyani, Prasetyowati I, Purwani KI, Muslihatin W, Tjahjaningrum ITD. 2020. An ethnobotanical study of medicinal plants used by the Tengger tribe in Ngadisari village, Indonesia. PLoS ONE15(7):e0235886. doi: 10.1371/journal.pone.0235886

Jarrett FM. 1959b. Studies in Artocarpus and allied genera, III. A revision of Artocarpus subgenus Artocarpus. Journal of the Arnold Arboretum 40: 113−155; 298-368. https://www.jstor.org/stable/43817432?seq=1

Jarrett FM. 1960. Studies in Artocarpus and allied genera, IV. A revision of Artocarpus subgenus Pseudojaca. Journal of the Arnold Arboretum 41: 73-88. https://www.jstor.org/stable/43782465

Haeruddin, Johan H, Hairah U, Budiman E. 2017. Ethnobotany database: Exploring diversity medicinal plants of Dayak tribe Borneo. 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI). doi: 10.1109/EECSI.2017.8239094

Kalaba FK, Chirwa PW, Prozesky H. 2009. The contribution of indigenous fruit trees in sustaining rural livelihoods and conservation of natural resources. Journal of Horticulture and Forestry 1(1):1-6.

LaFrankie JVJr, Chua AI. 2015. Application of digital field photographs as documents for tropical plant inventory. Applications in Plant Sciences 3(5):1400116. doi: 10.3732/apps.1400116

Ledesma N, Campbell R. 2014. Conservation and commercial development of Mangifera species (wild mangos) in Florida. In Proceedings of the Florida State Horticultural Society 127:10−13.

Marcuzzo SB, Fagundes MB. 2022. Know to preserve: Can the taste of native fruits change perceptions in favor of environmental conservation?. Trees, Forests and People 10:100337. doi: 10.1016/j.tfp.2022.100337

Mustikasari K, Santoso M, Bakar MFA, Fatmawati S. 2024. Antioxidant, α-glucosidase inhibitory, and cytotoxic activities of Mangifera rufocostata extract and identification of its compounds by LC-MS/MS analysis. Arabian Journal of Chemistry 17(1)105391. doi: 10.1016/j.arabjc.2023.105391

Novitasari A, Rohmawaty E, Rosdianto AM. 2024. *Physalis angulata* Linn. as a medicinal plant. Biomedical Reports 20(3):1−16. doi: 10.3892/br.2024.1735

Nuraini FR, Setyaningsih R, Susilowati A. 2019. Antioxidant activity of bioactive compound produced by endophytic fungi isolated from endemic plant of South Kalimantan Mangifera casturi Kosterm. AIP conference proceedings 2120 (1):080013. doi: 10.1063/1.5115751

Normalina MH, Hafizianoor H. 2021. Policy Analysis and Sustainable Environmental Development: Green Leadership in Natural Resource Management. Rigeo 11(5):1.

Norcini JG. 2006. Native plants: an overview. Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. ENH1045.

Okafor JC, and Lamb A. 1994. Fruit trees: diversity and conservation strategies. Institute Of Terrestrial Ecology Symposium 29: 34−34.

Pardede A, Koketsu M. 2017. Antioxidant and antileukemic activity of chemical components from bark of *Mangifera casturi*. Comparative Clinical Pathology 26: 499−504. doi: 10.1007/s00580-016-2387-x

Phillips O, Gentry AH. 1993. The useful plants of Tambopata, Peru: I. Statistical hypotheses tests with a new quantitative technique. Economic Botany 47(1):15−32. doi: 10.1007/BF02862203

Plant of the World Online (POWO). 2023. Royal Botanic Gardens Kew. Database. https://powo.science.kew.org/ (Accessed 8/12/2024).

Rahman W. 2021. *Durio dulcis*. The IUCN Red List of Threatened Species 2021: e.T34565A167012376. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T34565A167012376.en (Accessed 8/12/2024).

Rhodes L, Maxted N. 2016. *Mangifera casturi*. The IUCN Red List of Threatened Species 2016: e.T32059A61526819. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T32059A61526819.en (Accessed 8/12/2024).

Sarath P, Parveen ABM, Sreekumar VB, Dasgupta MG, Bohra HR, Dev SA. 2024. Genetic diversity and population structure of threatened Calamus species in India: implications for in situ and ex situ conservation. Tree Genetics & Genomes 20(6):39. doi: 10.1007/s11295-024-01671-9

Shaffiq S, Sidik BJ, Harah ZM, Devi RS. 2013. Marketable wild fruits of Sarawak, Borneo: Their mode of consumption, uses and sugar profiles. Indian Journal of Traditional Knowledge 12 (2):195−201.

Siregar M. 2006. Species diversity of local fruit trees in Kalimantan: Problems of conservation and its development. Biodiversitas Journal of Biological Diversity 7(1):94−99. doi: 10.13057/biodiv/d070123

Supiandi MI, Mahanal S, Zubaidah S, Julung H, Ege B. 2019. Ethnobotany of traditional medicinal plants used by Dayak Desa community in Sintang, West Kalimantan, Indonesia. Biodiversitas 20(5):1264−1270. doi: 10.13057/biodiv/d200516

Suswandari, Armiyati L, Azid N. 2022. Local wisdom of Dayak ethnic groups in Central Kalimantan, Indonesia. ETNOSIA Jurnal Etnografi Indonesia 7(1):67−85. doi: 10.31947/etnosia.v7i1.20633

Susiarti S, Setyowati FM. 2005. Traditional spices of Dayak Kenyah society in East Kalimantan. Biodiversitas 6(4):285−287. doi: 10.13057/biodiv/d060415

Sutomo S, Awaliyah VV, Arnida A. 2022. Ethnobotanical study and phytochemical screening of medicinal plants used by local people in Belangian Village, South Kalimantan. Borneo Journal of Pharmacy 5(1):1−8. doi: 10.33084/bjop.v5i1.2717

Suwardi AB, Navia ZI, Harmawan T, Syamsuardi, Mukhtar E. 2020. Ethnobotany and conservation of indigenous edible fruit plants in South Aceh, Indonesia. Biodiversitas Journal of Biological Diversity 21(5): 1850−1860. doi: 10.13057/biodiv/d210511

Tardío J, Pardo-de-Santayana M. 2008. Cultural importance indices: A comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). Economic Botany 62:24−39. doi: 10.1007/s12231-007-9004-5

Wahyu W. 2022. Local wisdom in Banjarese culture perspective. In Annual Civic Education Conference Advances in Social Science, Education and Humanities Research 636, Atlantis Press. doi: 10.2991/assehr.k.220108.116

Wahyuningtyas RS, Humaida N, Hani A, Aziza LN, Gunawan G, Fitriani A. 2024. Potential and challenges of utilizing *Artocarpus odoratissimus* (Binturung) fruit in Kalimantan. In IOP Conference Series: Earth and Environmental Science 1315(1): 012026. doi: 10.1088/1755-1315/1315/1/012026

Yayuk R, Jahdiah J, Ariestya SA. 2022. Banjar Traditional Food: Between Religion, Treatment, Daily Menu and Habits. In Proceedings of the First International Conference on Democracy and Social Transformation, ICON-DEMOST 2021, 15th September, 2021, Semarang, Indonesia. http://dx.doi.org/10.4108/eai.15-9-2021.2315612

Yusnikusumah TR, Sari UK, Sitepu BS, Nugroho AW, Mukhlisi. 2024. *Durio kutejensis* (Hassk.) Becc., the potential species of Kalimantan endemic Durian as nontimber forest products: A review. In AIP Conference Proceedings 3001(1). doi: 10.1063/5.0184205