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Morphological diversity, ethnobotany, and economic value of banana plants (*Musa* spp.) in the Keerom lowland area, Papua Province, Indonesia

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Abstract. *Suharno, Suparno A, Yuliana, Tanjung RHR, Zebua LI, Prabawardani S. 2025. Morphological diversity, ethnobotany, and economic value of banana plants (*Musa *spp.) in the Keerom lowland area, Papua Province, Indonesia. Asian J Agric 9: 215-225.* Bananas (*Musa* spp.) are an agricultural crop of significant economic value, highly sought after as a popular fruit for consumption. The global diversity of bananas is substantial and continues to grow with the emergence of new varieties, including in Papua, Indonesia. This study aims to determine the diversity of bananas based on local knowledge, ethnobotany, and the economic value of bananas in the lowland area of Keerom, Papua. Data were collected from a survey in eight villages representing the Arso, West Arso, and Skanto Districts. The diversity was determined based on morphological characters referring to descriptors for bananas, with 67 characters. Based on the local community's knowledge, 13 varieties of bananas were found. The findings also show that the population and distribution of bananas in Keerom vary. *Kepok boy, kepok abu-abu, raja, barangan*, and *nona* varieties are widely distributed, while *ambon, jarum, goroho, raja nangka, susu*, and *merah* varieties are not as widely distributed. Based on the morphological characters, supported by the results of PCA analysis and Eigenvalue tests, the banana varieties can be divided into four groups. Regarding utilization, the fruit is mostly for consumption, the leaves are for food wrappers, and the blossoms are processed as vegetables. Other parts of bananas have not been utilized optimally. The price of bananas at the consumer level averages IDR 8,500 per bunch (USD 0.5). This selling value has increased by 144.17% from the price of bananas at the farmer level. The findings also show that the banana varieties in Keerom are relatively diverse, yet most of them have not been optimally utilized. However, Indonesia has significant potential for developing food products using bananas as a primary ingredient, offering opportunities to maximize utilization and contribute to national food security.

Keywords: Bananas, food source, Keerom, *Musa*, traditional knowledge

INTRODUCTION

The diversity of natural resources utilized by Indonesian communities is remarkably high (Anggraeni et al. 2017), including bananas (*Musa* spp.) (FAO 2023), which can be consumed in various forms, either directly as fresh fruit or as processed products (Schönhart et al. 2009; Dwivany et al. 2020). Bananas are one of the staple food sources for all groups. Historically, however, bananas were considered a special and luxurious food reserved for leaders in certain parts of the world (Schönhart et al. 2009). Aside from being a food source, bananas serve as a commercial crop and play a significant role in supporting national economies (Subrahmanyeswari and Gantait 2022).

Bananas are classified as herbaceous plants that resemble trees in appearance. The plant features a pseudostem, which is formed by the concentric arrangement of leaf sheaths. Banana leaves are produced sequentially, culminating in the emergence of an inflorescence from the terminal part of the plant (Beaton et al. 2023). Banana plants are highly adaptable to various environmental conditions, particularly drought, making them invaluable for food security programs (Hapsari and Lestari 2016). Several factors, including climate, planting media, and altitude, influence the cultivation and distribution of banana plants (Nugraha et al. 2024).

Carl Linnaeus derived the genus *Musa*, while the name *Musa* was derived from the Arabic word *mauz* by Antonius Musa (Emperor Linnaeus's physician) (Subrahmanyeswari and Gantait 2023). The name banana comes from the Arabic word *banan*, which means finger. Each *banan* resembles a finger. Hence, a bunch of them resemble a hand (Häkkinen et al. 2012; Subrahmanyeswari and Gantait 2023). Bananas are the oldest fruit plants known to humans (Subrahmanyeswari and Gantait 2023), which have been cultivated since the agricultural culture system (Denham et al. 2003). The domestication of the genus *Musa* originated from Southeast Asia, as inferred based on chloroplast and cell nucleus genes (Li et al. 2013), producing various varieties of bananas, including the *raja* variety (which means king in the Indonesian language). Indonesia is considered the center of origin of diverse banana varieties, encompassing rich genetic resources of wild and cultivated bananas (Daniells et al. 2001). There are at least 325 *Musa* cultivars recorded in Indonesia (Valmayor et al. 2002), distributed

across Bali, Java, Kalimantan, Papua, Sulawesi, Sumatra, Maluku, and Nusa Tenggara (Meitha et al. 2020).

As a perennial crop, bananas offer food security for many developing countries (Mertens et al. 2021; Beaton et al. 2023). With a production of more than 144 million tons annually, bananas are considered one of the most important fruit crops in the world (Meitha et al. 2020). The widespread distribution of bananas makes this plant a promising local food source to meet regional fruit needs. Exploring banana diversity is crucial, as it is significant based on the traditional knowledge of local communities (Cenci et al. 2021; Ardiyani et al. 2023). Several conservation efforts have also been made to preserve wild banana germplasm ex-situ in the form of seeds, in vitro, cryopreservation, or as living plants. Most of the available germplasm is stored in the form of in vitro cultures or frozen meristems at the International Musa Germplasm Transit Centre (ITC) in Belgium (Panis et al. 2005).

In Papua, the banana plants are substantially diverse (Zebua et al. 2023), yet the exploration in the areas is limited. Therefore, this study aims to determine the diversity of banana plants, their utilization, and economic value for the community in the Keerom lowlands, Papua. This research benefits the community by contributing to the development of bananas as a source of food and functional food, as well as their potential to increase community income.

MATERIALS AND METHODS

Study area

This study was conducted in three districts, namely Arso District (Arso II-Track 5, Poros Street, and PTPN II Village), West Arso (Yowang, Young, Tuwi, and Sanggaria Village), and Arso Skanto (Arso 7 Village), Keerom District, Papua Province (Figure 1). The Keerom area is partly a lowland area with an altitude of 40-60 masl. The average temperature during observation ranged from 24 to 34°C (Table 1). The land in this area is mostly used for agriculture and oil palm plantations, with some areas being forests. According to data from Statistics Indonesia (BPS - *Badan Pusat Statistik*) of Keerom District (2024)), the average temperature in this area is between 27.1 and 28.7°C, with humidity falling between 74.8 and 76.80% each month throughout the year, and average rainfall being 128.15 mm/year.

Data collection

Data were collected using a survey method in three districts, namely Arso District (consisting of three villages: Arso II-Track 5, Poros Street, and PTPN II), West Arso District (consisting of four villages: Yowang, Young, Tuwi, and Sanggaria), and Arso Skanto (consisting of one village: Arso 7). These districts are located in Keerom lowland, which the government earmarked as a transmigration destination for farmers.

The diversity of banana varieties was determined by describing the morphological characteristics, as specified in the Descriptors for Banana (*Musa* spp.) book published by the joint CIRAD-Inibap-IPGRI. There are 67 characteristics to be observed, including the habitus and the plant organs, such as roots, stems, leaves, fruits, blossoms, and seeds. The similarities in the characteristics form the basis for determining kinship relationships in phylogenetic trees, which was carried out using the NTSYs software. Then, to see the dominant characteristics that set one group of kinship apart from another, the Principal Component Analysis (PCA) method was used through the calculation of Eigenvalues.

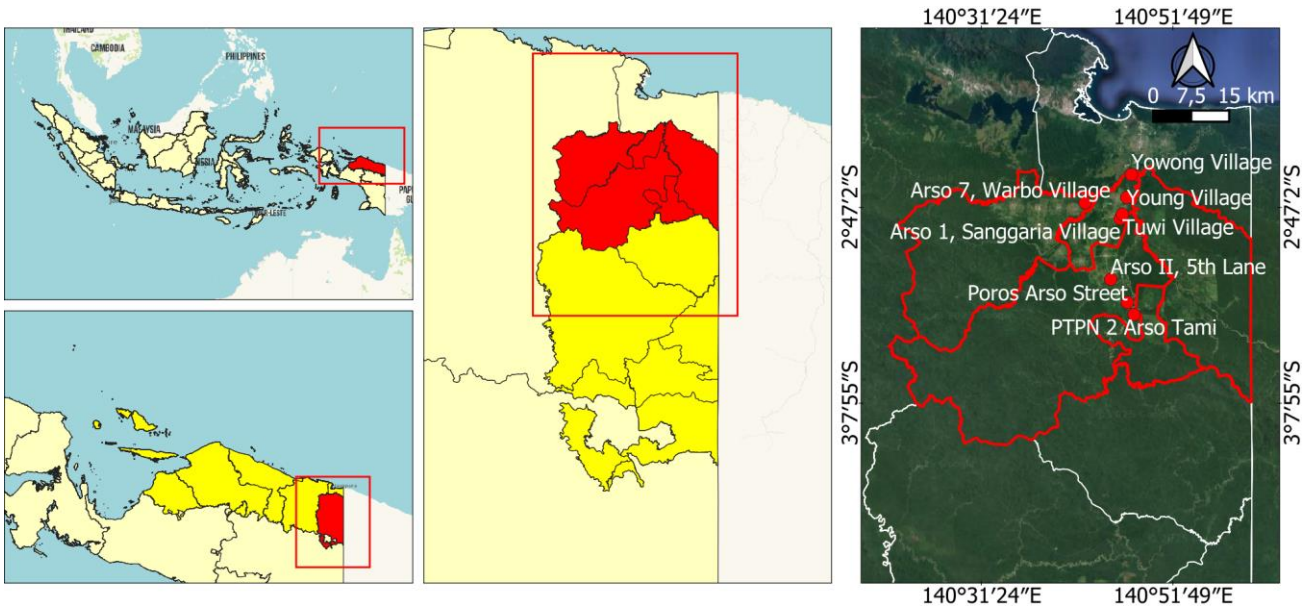

Figure 1. Research locations in the lowland areas in Keerom, Papua, Indonesia

Table 1. Locations and environmental conditions in the Arso area, Keerom, Papua, Indonesia

District	Village	Coordinate points	Location altitude (masl)	Temperature (°C)
West Arso	Young	140,78191°; -2,76645°	40	30 - 34
West Arso	Tuwi	140,77414°; -2,79637°	40	27 - 30
West Arso	Yowong	140,79013°; -2,72569°	60	26 - 30
West Arso	Sanggaria	140,76985°; -2,80423°	49	24 - 31
Skanto	Warbo	140,70773°; -2,77589°	46	25 - 32
Arso	PTPN2 Tami	140,79475°; -2,97447°	54	27 - 32
Arso	Arso II, Track 5	140,75324°; -2,91197°	48	25 - 32
Arso	Poros Street	140,78315°; -2,95297°	42	26 - 33

PCA can find which characteristics have high contribution values to their variations, both positively and negatively. Giuliani and Vici (2024) claimed that PCA can identify kinship relationships and determine characteristics with high contribution values. The Principal Components (PC) are determined based on Eigenvalues, with values <1 excluded from the calculation of the number of principal components.

The banana ethnobotanical survey was conducted using a mixture of qualitative and quantitative methods (Martin 2004; Iskandar et al. 2018). Techniques adopted from various disciplines have been combined to form a collaborative approach called Participatory Rural Appraisal (PRA) (Martin 2004). Some of the techniques used are observation, participant observation, semi-structured interviews, and economic value of banana fruit. The interviews involved 62 respondents spread across the observation points in Keerom District. Meanwhile, the economic values were observed in Keerom District and several markets in Jayapura City since the initial survey results showed that bananas from Keerom were also marketed in Jayapura City. The study also explored how bananas were utilized by the community in Keerom, focusing on the parts of the plant used and their economic value. Most bananas served as a source of family income, with their selling prices surveyed at the farmer, middleman, and consumer levels.

Data analysis

The observation data were analyzed descriptively and qualitatively. The soil physicochemical characteristics were examined to see the level of soil fertility. The samples were sent to the Integrated Laboratory Unit of the Bogor Agricultural Institute (IPB - Institut Pertanian Bogor). The parameters measured included the degree of acidity (pH), organic carbon content, N, P, cation exchange capacity (CEC), K, Ca, Na, and Mg (Table 2). The results were presented in the form of tables and figures.

RESULTS AND DISCUSSIONS

The results show that land in the study area is mostly used for agriculture and oil palm plantations, and is highly suitable for agricultural activities (Tabel 2). According to Suharyanto et al. (2022), entisols and inceptisols are the most suitable soil types for agricultural use in the Arso Keerom area. Inceptisols, in particular, are prevalent across nearly all districts in Keerom and can be developed extensively for agricultural purposes. Environmental conditions substantially affect the adaptation of banana plant varieties. Local bananas are usually more adaptive than imported bananas, which, according to Fettig et al. (2023), includes the adaptation to local agroecological conditions. Local banana varieties are used for various purposes, including traditional medicine and cultural events.

Diversity of banana varieties

Based on the local knowledge, there are 13 varieties of bananas, namely: *Kepok boy, kepok abu-abu, raja, raja nangka, barangan, nona, susu, ambon, merah, hutan, tanduk, jarum,* and *goroh*o (Figure 2). The population and distribution of banana varieties in Keerom vary. *Kepok boy, kepok abu-abu, raja, barangan, and nona* are widely distributed, while *ambon, jarum, goroho, raja nangka, susu* and *merah* are not as widely distributed (Table 3). The populations of certain varieties, such as *kepok boy, kepok abu-abu,* and *raja* are relatively high, while other varieties, such as *goroho, jarum, susu, hutan, merah,* and *raja nangka* are scarce.

Morphologically, the habitus of banana plants in Keerom is diverse (Figure 2), with some plants heights reaching >3 m. Likewise, *barangan, ambon,* and *kepok* have the longest leaf blades among other varieties. The leaf stalk channels (petiole) also vary (Figure 3), including overlapping margins (Figure 3.A), curved inward margins (Figure 3.B), open with spreading margins (Figure 3.C), and wide with erect margins (Figure 3.D-F).

The characteristics of each variety's fruit also vary, especially the number of hands on each bunch and the number of fingers on each hand (Figure 4). *Tanduk* bananas have fewer hands and fingers compared to other varieties, such as *kepok boy* and *kepok abu-abu*. The features of the fruit (including the length and width) and the characteristics of the ovules also vary (Figure 5). Most varieties have different shapes, sizes, and blossom colors. *Hutan* bananas are distinctive with their green fruit and blossoms, while red bananas have red fruit and blossoms. However, most banana blossoms are red, even though the fruit is green, such as in *kepok, susu, raja,* and *jarum* bananas. According to Hapsari and Lestari (2016) and Hastuti et al. (2019), the characteristics of banana fruit and blossoms are key variables in banana diversity.

The shapes of the banana blossom (male bud shape) (Figure 6) are either like a top (Figure 6.A and 6.F), lanceolate (Figure 6.E), intermediate (Figure 6.B), and ovoid (Figure 6.D). The shape of the male bud also affects the shape of the bract base (medium and large shoulders) and bract apex (pointed, slightly pointed, intermediate, and obtuse). The analysis of morphological characteristics using NTSYs shows that the varieties of bananas in Keerom can be grouped into four clusters. The first cluster shows the closeness between *goroho* and *jarum* bananas. The second cluster shows a kinship between *ambon* bananas, *kepok abu-abu*, and *barangan*. The third cluster shows a kinship between *tanduk*, *raja*, *susu*, *and kepok asam*. The fourth cluster shows a kinship between *raja nangka*, *nona*, *merah*, and *hutan* (Figure 7).

The PCA results show that three main components can be used as the basis for grouping banana diversity in Keerom. The morphological diversity of bananas in the PCA1, PCA2, and PCA3 components reached values of 14.27, 13.05, and 11.45%, respectively. The PCA2 score of the main component shows that bananas from Arso are divided into four groups (Figure 8). Group I consists of three varieties of bananas, namely, *ambon*, *kepok abu-abu*, and *barangan*. Group II consists of two varieties of bananas, namely *goroho* and *jarum*. Group III consists of four varieties of bananas, namely *tanduk*, *raja*, *susu*, and *kepok asam*. Group IV consists of four varieties of bananas, namely *raja nangka*, *merah*, *nona*, and *hutan*.

Table 2. Results of soil fertility analysis in the Keerom lowland area, Papua, Indonesia

Physio-chemical parameters	Unit	Location (Sample)		
		Tuwi (AR-12)	PTPN2 Tami (AR-T.1)	Arso II, Track 5 (AR-7)
pH (H_2O) (1:1)	-	6.99	7.79	7.41
pH ($CaCl_2$)	-	6.28	6.63	6.33
C-organic	% w/w	2.99	7.05	2.10
Total nitrogen	% w/w	0.36	0.46	0.34
C/N Ratio	-	8.31	15.33	6.18
P Bray as P_2O_5	mg/kg	<9.88	135.73	<9.88
Cation exchange capacity (dry base)	cmol/kg	26.31	25.16	39.14
Cation exchangeable (dry base)	cmol/kg	7.36	3.27	0.78
Base saturation	%	27.98	13.00	1.98
Potassium (K)	cmol/kg	<0.05	2.06	<0.05
Sodium (Na)	cmol/kg	<0.09	<0.09	<0.09
Calcium (Ca)	cmol/kg	1.67	<36.00	0.78
Magnesium (Mg)	cmol/kg	5.69	1.21	<0.08
Aluminum exchangeable (dry base)	me/100g	<0.02	<0.02	<0.02
Acid exchangeable (dry base)	me/100g	0.44	0.45	0.27

Note: Sample analysis was conducted at the Integrated Laboratory Unit of IPB, Bogor

Table 3. Banana diversity in the Arso lowland area in Keerom, Papua, Indonesia

Banana's local name	Observation location							
	Young	Tami	Tuwi	Arso II	Yowong	Sanggaria	Warbo	Poros Arso
Kepok boy	+++	+++	+++	+++	+++	+++	+++	+++
Kepok abu-abu	++	++	++	++	+++	++	++	++
Raja	++	+	++	++	++	++	++	++
Raja nangka	-	-	+	-	-	-	-	-
Barangan	++	-	+	++	++	++	+	+
Nona	+	+	-	-	++	++	+	+
Susu	-	-	-	+	-	-	-	-
Ambon	-	-	-	+	-	-	-	-
Merah	-	-	-	-	-	+	-	-
Hutan	+	-	-	-	+	-	-	-
Tanduk	+	+	+	+	-	+	-	-
Jarum	-	+	-	-	-	-	-	-
Goroho	+	-	-	-	-	-	-	-

Note: - not found; + found in limited quantities; ++ many; +++ abundant

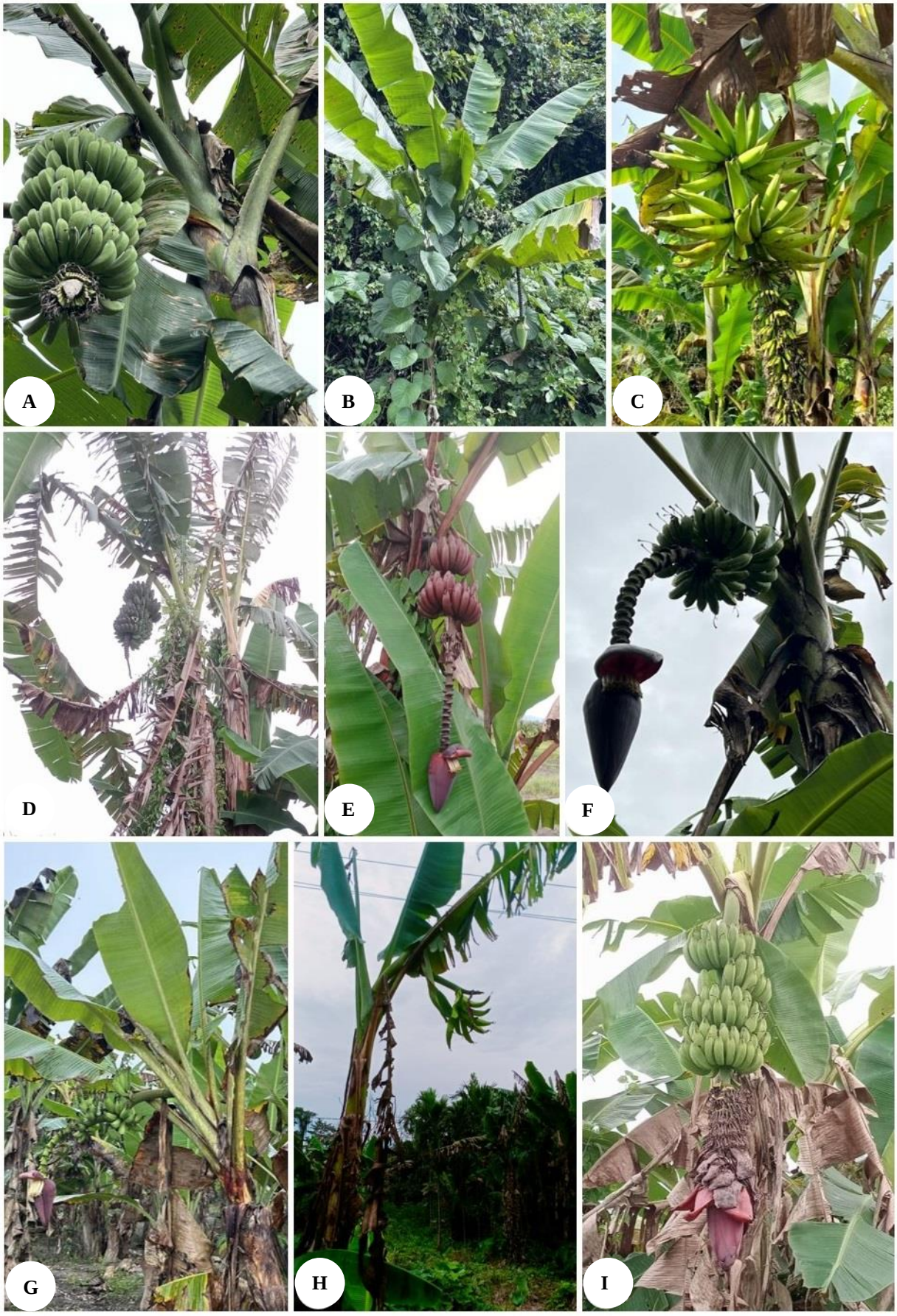

Figure 2. Diversity of banana habitus in the Arso lowland, Keerom, Papua, Indonesia: A. *Barangan*; B. *Hutan*; C. *Jarum*; D. *Kepok boy*; E. *Merah*; F. *Nona*; G. *Susu*; H. *Tanduk*; I. *Raja*

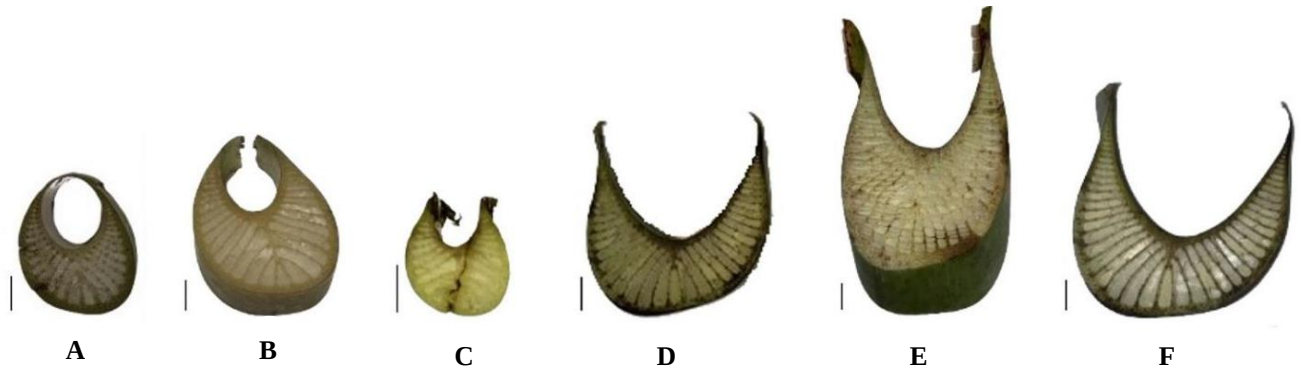

Figure 3. Diversity in cross-sectional morphology of leaf stalks (petioles) in several banana varieties found in Keerom, Papua, Indonesia: A. *Tanduk*; B. *Kepok asam*; C. *Nona*; D. *Barangan*; E. *Jarum*; F. *Kepok abu-abu* (scale bar: 1 cm)

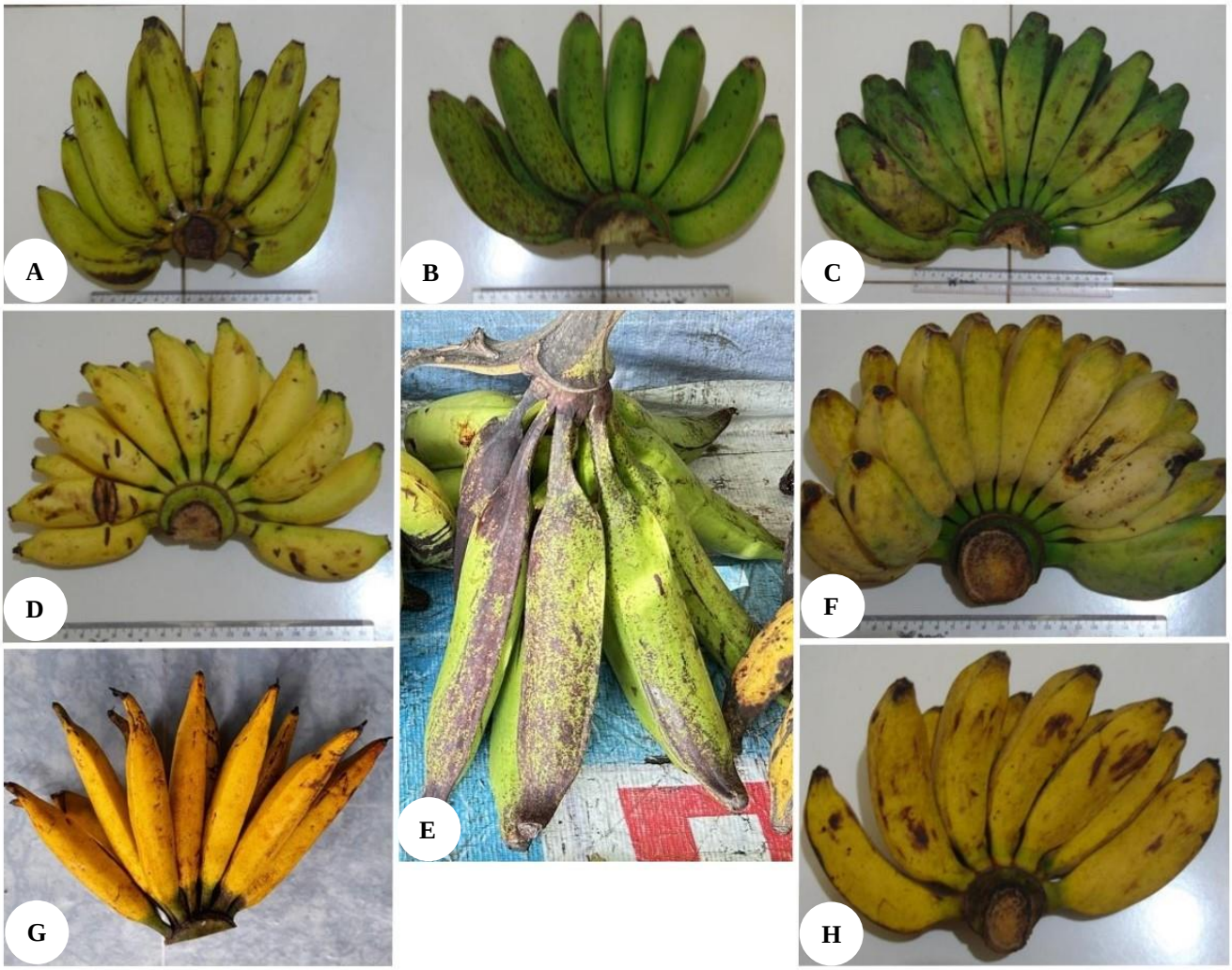

Figure 4. Banana varieties found in the lowland area of Keerom, Papua, Indonesia: A. *Ambon*; B. *Barangan*; C. *Kepok boy*; D. *Nona*; E. *Tanduk*; F. *Kepok abu-abu*; G. *Jarum*; and H. *Raja*

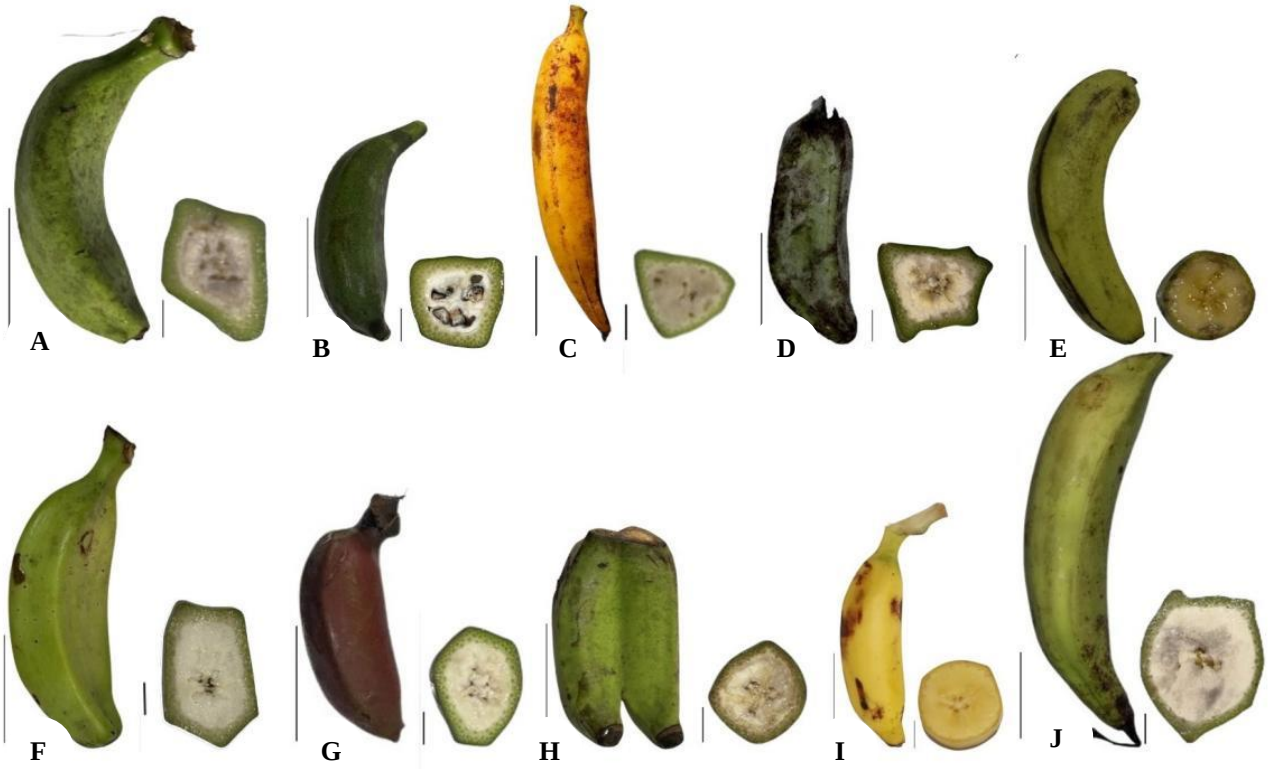

Figure 5. Varieties of banana fruit (scale bar: 5 cm) and cross-section of the fruit with various ovule positions (scale bar: 1 cm): A. *Barangan*; B. *Hutan*; C. *Jarum*; D. *Kepok abu-abu*; E. *Ambon*; F. *Kepok boy*; G. *Merah*; H. *Susu*; I. *Nona*; J. *Tanduk*

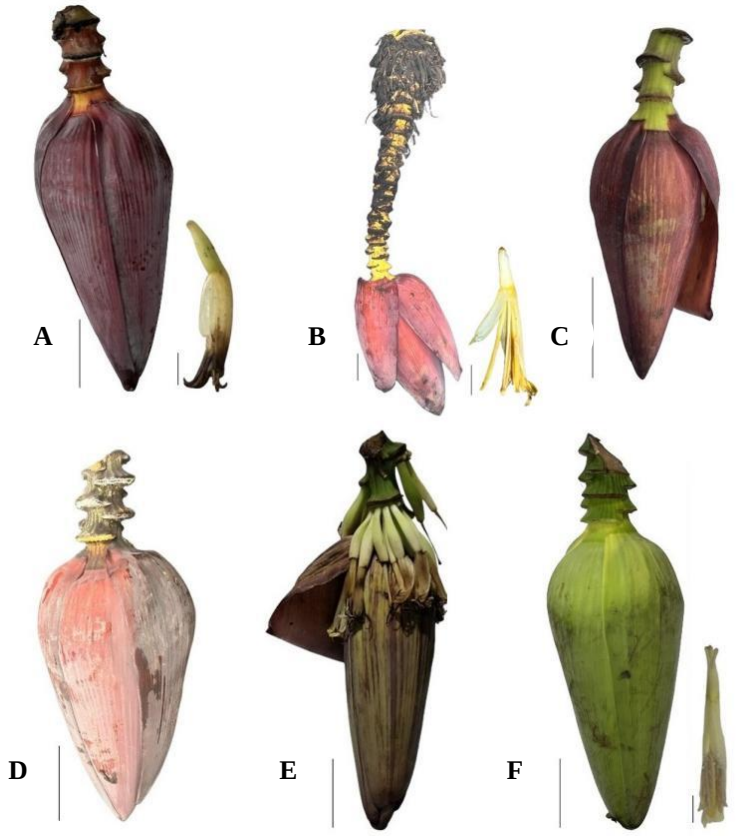

Figure 6. Varieties of banana blossom (male bud): A. *Susu*; B. *Raja*; C. *Nona*; D. *Merah*; E. *Jarum*; and F. *Hutan* (scale bar: 5 cm) and banana flowers (scale bar: 1 cm)

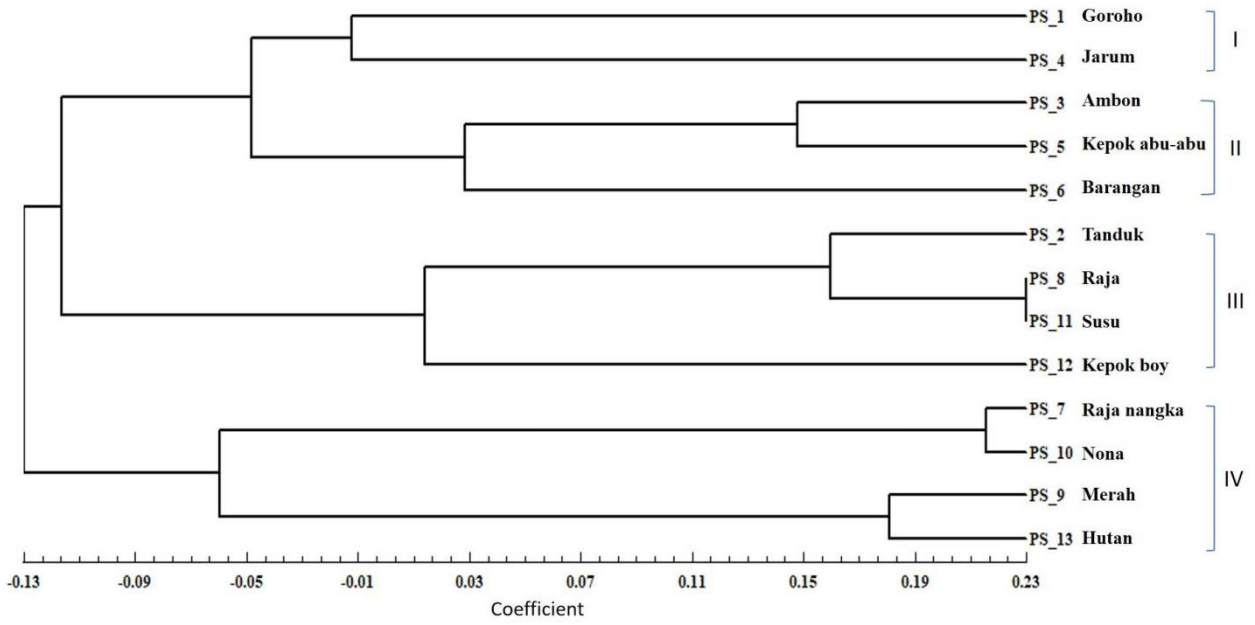

Figure 7. Banana kinship relationships are based on morphological characters, as observed in Keerom, Papua, Indonesia

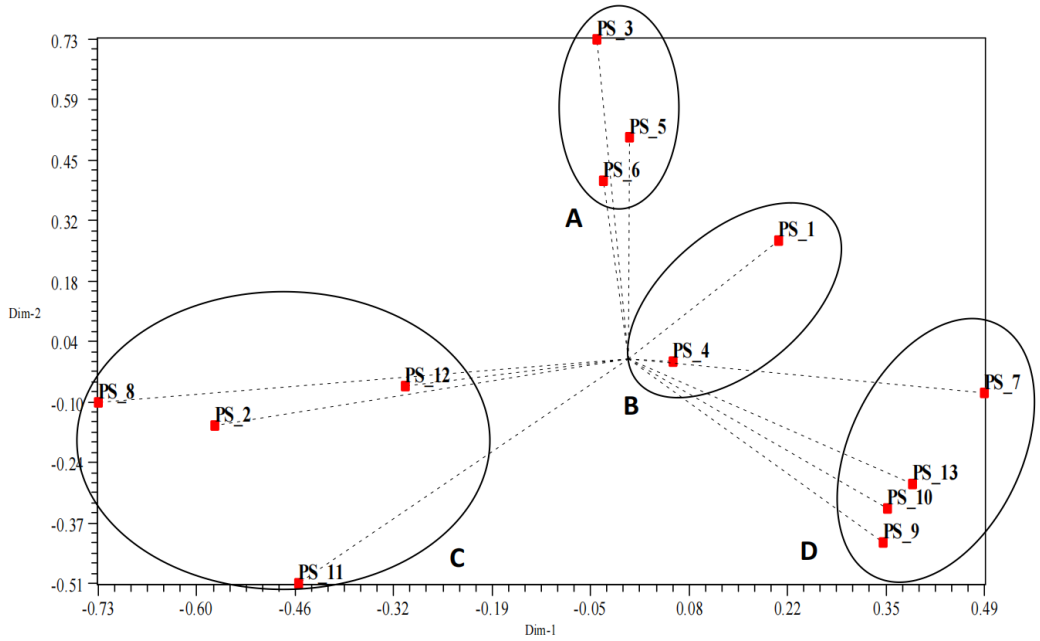

Figure 8. Plot score of two main banana components based on the 67 morphological characters of banana varieties in Keerom, Papua, Indonesia: PS_1. *Goroho*; PS_2. *Tanduk*; PS_3. *Ambon*; PS_4. *Jarum*; PS_5. *Kepok abu-abu*; PS_6. *Barangan*; PS_7. *Raja nangka*; PS_8. *Raja*; PS_9. *Merah*; PS_10. *Nona*; PS_11. *Susu*; PS_12. *Kepok boy*, and PS_13. *Hutan*

The three PCAs contribute to the principal component analysis based on the morphological characters. The results show that principal component 1 (PCA1) contributed 58.20% of the variation, PCA2 47.76%, and PCA3 38.80%. The results of the Eigenvalue test showed that nine main banana characters contributed most substantially to the grouping, namely: 1) leaf blade length (K22), 2) leaf vein lines (K33), 3) the color of cigar leaf dorsal surface (K36), 4) rachis appearance (50), 5) male bud type (K51), 6) ripe fruit flesh color (K60), 7) heart color (K65), 8) length (K66), and 9) heart diameter (K67). Based on their morphological characteristics, the fruit and banana blossom exhibit significant differences among the varieties of bananas observed.

Understanding the diversity of bananas involves studying native wild species, their relatives, and both primitive diploid forms and more advanced triploid varieties (Perrier et al. 2009). Therefore, molecular techniques are essential for accurately uncovering the diversity of banana varieties (Sardos et al. 2016; Rahmah et al. 2023).

Ethnobotany of banana plants: The utilization by the community

Observations reveal that the community widely utilizes banana plants as a local food source (Table 4). Most banana varieties are primarily used as a fruit source and sold to generate income for the local community. Other parts of the banana plant are also utilized: the leaves are used as wrapping materials for goods or food, and the banana blossom is consumed as a vegetable. A small portion of the community uses the stem as a component in plant fertilizers.

On various occasions, bananas are cultivated alongside other plants such as sugar cane, sweet potatoes, cassava, and various species of tubers in the agricultural system of indigenous people in Papua who still practice shifting cultivation. People in the mountains typically use sweet potatoes (batatas) and other species of tubers as their staple foods (Kogopa 2024). Meanwhile, in the lowlands, sago serves as a staple food source for the community (Kadir et al. 2022; Kadir et al. 2024).

Some Papuan people use bananas as part of traditional ceremonies and events (Zebua et al. 2023). In several other regions, bananas are used in a wide variety of ways, including as desserts such as fresh ripe bananas, boiled ripe bananas (*pisang rebus*), fried ripe bananas (*pisang goreng*), and unripe bananas made into *rujak bebek*, mixed with cassava or sweet potatoes and chili sauce. Other uses include *banana kolek* (bananas mixed with sugar and coconut flour), banana chips (*kripik pisang*), and offerings for traditional ceremonies (Iskandar et al. 2018). Several varieties of bananas can also be used as raw material for making "banana flour," which can be developed into a source for various types of food products (Keiluhu et al. 2024).

Banana-based food sources are highly important and offer significant nutritional value, making them beneficial for various forms of treatment (Ranjha et al. 2022). According to Palma et al. (2022), The potassium content, along with other elements such as calcium (Ca), iron (Fe), manganese (Mn), zinc (Zn), and rubidium (Rb), in the banana blossom samples studied was found to be higher than previously reported in the literature. This suggests that banana blossoms, as utilized by the community, are highly nutritious and serve as a valuable alternative for meeting the community's nutritional needs. Ferreira et al. (2023) also stated that banana stem flour is rich in phenolic compounds and exhibits strong antioxidant properties. In vivo studies indicate that supplementing a hypercaloric diet with banana stem flour helps prevent pathological damage by reducing total cholesterol and glucose levels, suggesting a potential hepatoprotective effect. Therefore, incorporating banana stem flour as a supplement can enhance the intake of fiber, antioxidants, and bioactive compounds.

The economic value of bananas

The observation results indicate that farmers sell bananas in bunches. When calculated, the selling price of the *tanduk* banana per hand is the highest, reaching IDR 8,000, followed by *ambon* bananas at IDR 3,750 and *raja* bananas at IDR 3,000 per hand. Other varieties of bananas are sold at various prices ranging from IDR 1,600 to IDR 2,500 per hand, with the lowest price being for *susu* bananas. Overall, at the farmer level, the average selling price of bananas is IDR 3,481.25 per hand (Table 5). Farmers can sell bananas directly to the market or through middlemen (collectors). At the collector level, the average selling price reaches IDR 5,125 (an increase of 47.22%). The selling price of bananas in the market (at the consumer level) reaches an average of IDR 8,500 per hand, which has increased by 144.16% compared to the selling price at the farmer level.

Based on the observation results, the *kepok boy* and *kepok abu-abu* varieties are commonly found in the market. This is understandable given their wide distribution and abundant availability (Table 3), which results in lower selling prices despite their popularity among consumers. Interview results revealed that the *tanduk* bananas command a higher price due to their popularity and durability (it does not spoil easily), similar to the *raja* bananas. On the other hand, several other banana varieties, such as the *nona* bananas, are often sold at lower prices, even though they are in demand by many consumers.

Table 4. Utilization of bananas by variety in the Keerom lowland, Papua, Indonesia

Variety	Utilization
Kepok boy	The fruit is consumed as food, while the leaves are used to wrap various food and beverage ingredients. Additionally, banana blossoms are utilized as vegetables
Kepok abu-abu	The fruit is consumed as food, while the leaves are used to wrap various food and beverage ingredients. Additionally, banana blossoms are utilized as vegetables
Raja	The fruit is consumed, and the leaves are used for wrapping
Raja nangka	The fruit is consumed, and the leaves are used for wrapping
Barangan	The fruit is consumed
Nona	The fruit is consumed
Susu	The fruit is consumed
Ambon	The fruit is consumed, and the leaves are used for wrapping
Merah	The fruit is eaten; however, this variety of banana is not widely known due to its limited population and the community's lack of awareness about it
Hutan	Birds primarily consume the fruit, and it remains unutilized by the community
Tanduk	The fruit is consumed
Jarum	The fruits are consumed, primarily prepared through baking
Goroho	The fruit is consumed, typically fried

Table 5. Banana price values in Keerom, Papua, Indonesia and surrounding areas

Variety	Price at the farmer level (per bunch) (IDR)	Selling price (per hand) (IDR)		
		Farmer	Middlemen/collectors	Market (consumer)
Kepok boy	15,000-20,000/bunch (7-8 hands)	2,500	3,000	5,000
Goroho	15,000-20,000/bunch (7-8 hands)	2,500	3,000	5,000
Kepok abu-abu	15,000-20,000/bunch (7-8 hands)	2,500	3,500	5,000
Raja	20,000-25,000/bunch (8-10 hands)	3,000	5,000	10,000
Raja nangka	For self-consumption	-	-	-
Barangan	20,000/bunch (8-9 hands)	2,200	3,500	5,000
Nona	10,000-15,000/bunch (6-8 hands)	1,800	5,000	8,000
Susu	10,000-12,000/bunch (6-8 hands)	1,600	3,000	5,000
Ambon	25,000-30,000/bunch (7-8 hands)	3,750	5,000	10,000
Merah	-	-	-	-
Hutan	-	-	-	-
Tanduk	20,000-25,000/bunch (2-3 hands)	8,000	10,000	15,000
Jarum	-	-	-	-
Average		3,094.44	4,555.56	7,555.56
Price difference at the farm level		0	1,461.12	4,461.12
Price increase		0	47.22%	144.17%

Note: -: not yet known/not yet economically valuable. Price increases are calculated based on prices from farmers. 1 USD = 17,000 IDR

The identification results also indicate that not all varieties of bananas are sold in Keerom. Certain varieties, such as *kepok abu-abu*, *kepok boy*, *raja*, and *barangan* bananas, are frequently sent to other cities, such as Jayapura City, due to the high demand for bananas there. Most bananas are sold in local markets, with none being marketed in supermarkets. This suggests that post-harvest management for farmers in Keerom has not been fully optimized. According to Saha et al. (2021) and Sah et al. (2023), post-harvest handling of bananas directly impacts the quality of the fruit, which in turn can increase its selling price and, consequently, the income of the community. Fettig et al. (2023) and Wijayanto (2024) added that this handling includes the availability of planting materials, development of post-harvest and processing technology, marketing, investment, and consumer education.

Although banana cultivation in Keerom is not yet intensively managed by the community, it is still sufficient to contribute to the income of local farmers. However, farmer assistance is essential to improve the management system and increase their income. Additionally, underutilized banana varieties can be optimized through ongoing, sustainable support. According to Eyland et al. (2020), the diversity of bananas in New Guinea (including Indonesia) is exceptionally high, warranting more in-depth research to understand and utilize their potential fully. Castañeda-Álvarez et al. (2016) and Mertens et al. (2020) emphasize the importance of conducting further studies on the diversity of plant species, including bananas and their relatives, to prevent extinction. This is crucial in light of the growing abiotic and biotic pressures associated with climate change, particularly those driven by anthropogenic factors such as the increasing global population, habitat loss and fragmentation, improper land use, and inadequate conservation strategies.

In general, it can be concluded that 13 banana species were found based on local knowledge, grouped into four clusters. The *kepok boy* and *kepok abu* bananas have a wider population and distribution, while *merah*, *jarum*, *raja nangka*, and *goroho* bananas are very limited. Banana parts that are commonly utilized by the community are the fruit, leaves, and heart of the banana. The selling price of bananas at the farm level averaged IDR 3,094.44 (USD 0.2) and IDR 7,555.56 (USD 0.45) per hand at the consumer level, an increase of 144.17%. Increasing the value-added utilization of banana plants in Keerom requires the assistance of farmers and the utilization of appropriate technology.

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