

## ***ETHNOBOTANY OF KEMANG (*Mangifera kemanga* Blume.) AS IDENTITY FLORA OF BOGOR REGENCY***

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### ABSTRACT

*Kemang (Mangifera kemanga Blume.) is a local fruit and has become the identity flora of Bogor Regency based on Decree of the Regent's Number 522/185/Kpts/1996. Currently, the existence of kemang is rare, and it is worried about becoming extinct. This study aimed to identify the ethnobotany of kemang in the community of Bogor Regency and to develop a conservation strategy for kemang as the identity flora of Bogor Regency. The research was carried out from April-July 2021 in Kemang District, Sukaraja District, and Leuwiliang District. Based on criteria, the research was conducted through deeply personal interviews with the local community. The characteristic of the respondent was individual who has kemang and gardeners whose gardens contain kemang. The data obtained were analyzed descriptively. Based on interviews with 30 respondents, kemang was identified by looking at leaf color, leaf shape, stem, flower, and fruit compared to mango (*Mangifera indica*). Kemang mainly was found growing in gardens (74%). Kemang propagation was done by seed. The most used parts were fruit (43%) and shoots (39%). Both parts were consumed directly in a fresh form. Besides having a role as a food ingredient, kemang has potential as an antioxidant, anticancer, and anti-degenerative. The reason people still maintain kemang because the existence of kemang is getting rare, and the selling price of kemang fruit is relatively high compared to other types of mango. In addition, kemang can also prevent soil erosion. The conservation strategies of kemang are optimizing the socialization and publication of kemang benefit, developing kemang cultivation, and developing kemang as a local fruit commodity.*

Key words: conservation strategy, ethnobotany, kemang, local fruit, rare

### INTRODUCTION

Humans cannot be separated from plants in fulfilling their daily needs. The information about the plant's use is usually obtained from generation to generation until now. Humans use plants to survive. Today's problem is the lack of attention and documentation of several important species as regional markers. Documentation of a species, both its ecology and the form of its use by the community, is important to avoid species extinction (Rai and Lalramnghinglova 2010). Pimm *et al.* (2014) state that species on earth were declared extinct before the study was carried out. The ethnobotanical study is one solution to prevent it. An ethnobotanical study is a study about the interaction between humans and plants. This study is essential for species conservation (Minnis 2000; Pei 2013).

*Kemang (Mangifera kemanga Blume.) is a mango family belonging to the Anacardiaceae family. Fitmawati et al.* (2013) stated that kemang is a mango type that grows wild with natural distribution in Sumatra, Kalimantan, and Java. *Kemang* can be found along rivers in Central Sumatra (Riau and Jambi) and Southern Sumatra (Lampung, Bengkulu and South Sumatra). *Kemang* is rarely found outside Sumatra. *Kemang* can be found on Java, especially in West Java (Kostermans and Boompard 1993). *Kemang* was even designated as the identity flora of Bogor Regency according to the Regent's Decree No. 522/185/Kpts/1996. The

determination of kemang as an identity flora is intended to maintain the sustainability and uniqueness of plants and characterize the region.

Deryanti (2014) stated that the kemang existence started to be rare. According to the Regent's Decree No. 522/185/Kpts/1996 kemang highly distributed in 17 area such as Citereup, Cimanggis, Cileungsi, Jonggol, Cariu, Caringin, Cijeruk, Ciomas, Ciampea, Cibungbulang, Leuwiliang, Nanggung, Cigudeg, Jasinga, Semplak, Gunung Sindur, dan Bojong Gede. Resida *et al.* (2017) stated that the scarcity of kemang is due to the reduction of the natural habitat of kemang on the Sumatra Island for oil palm plantations. *Kemang* fruit is categorized as a minor fruit because its economic value is not as good as mango (*Mangifera indica*). *Kemang* becomes less attractive for community cultivation. Meanwhile, kemang that is included in the indigenous fruit has benefits, including maintaining local ecological balance (garden scale) (Pratama *et al.* 2019) and nutritional sources (FAO 2014).

The scarcity of kemang that can lead to extinction will cause the loss of the benefits. Therefore, this study aimed to identify the ethnobotany of kemang in the community of Bogor Regency and to develop a conservation strategy for kemang as the identity flora of Bogor Regency.

## RESEARCH METHOD

The research was conducted in three sub-districts in Bogor Regency, namely Leuwiliang (Cibeber I Village, Karehkel Village, Karacak Village), and Sukaraja (Sukaraja Village, Nagrak Village, Cikeas Village), and Kemang (Kemang Village, Village Pabuaran, and Pondok Udik Village) (Figure 1). Leuwiliang and Sukaraja were selected based on information from fruit traders at Pasar Anyar and the 2019 Nusantara Flower and Fruit Festival, while Kemang Subdistrict was selected due to its historical elements (name of region).

The research was conducted from April to July 2021. The tools used were cameras and an interview guide. Respondents were selected by purposive sampling with specific criteria. The criteria were individual who has *kemang* or gardeners whose gardens contain *kemang*. The data collected consisted of respondents' characteristics and ethnobotanical data. Data on respondent characteristics consist of sex, age, level of formal education, and occupation (Susiarti *et al.* 2020),

while the ethnobotanical data includes the identification of *kemang*, habitat types, way of obtaining *kemang*, cultivation methods, utilization, and community stories related to *kemang* (Desti *et al.* 2019). All data collected were analyzed descriptively and presented in tables or diagrams (Tallei *et al.* 2019).

## RESULT AND DISCUSSION

### 1. Characteristics of Respondents

The results of interviews with 30 respondents consisting of nine villages showed that respondents were male (76.67%) and female (23.33%) (Table 1). Setiawan (2017) states that in the agricultural sector, the role of men is more significant than women. Based on age, respondents were dominated by 41-50 years old and 51-60 years old. Those ages are considered productive ages to work to fulfill household needs (Ministry of Health of the Republic of Indonesia 2020).

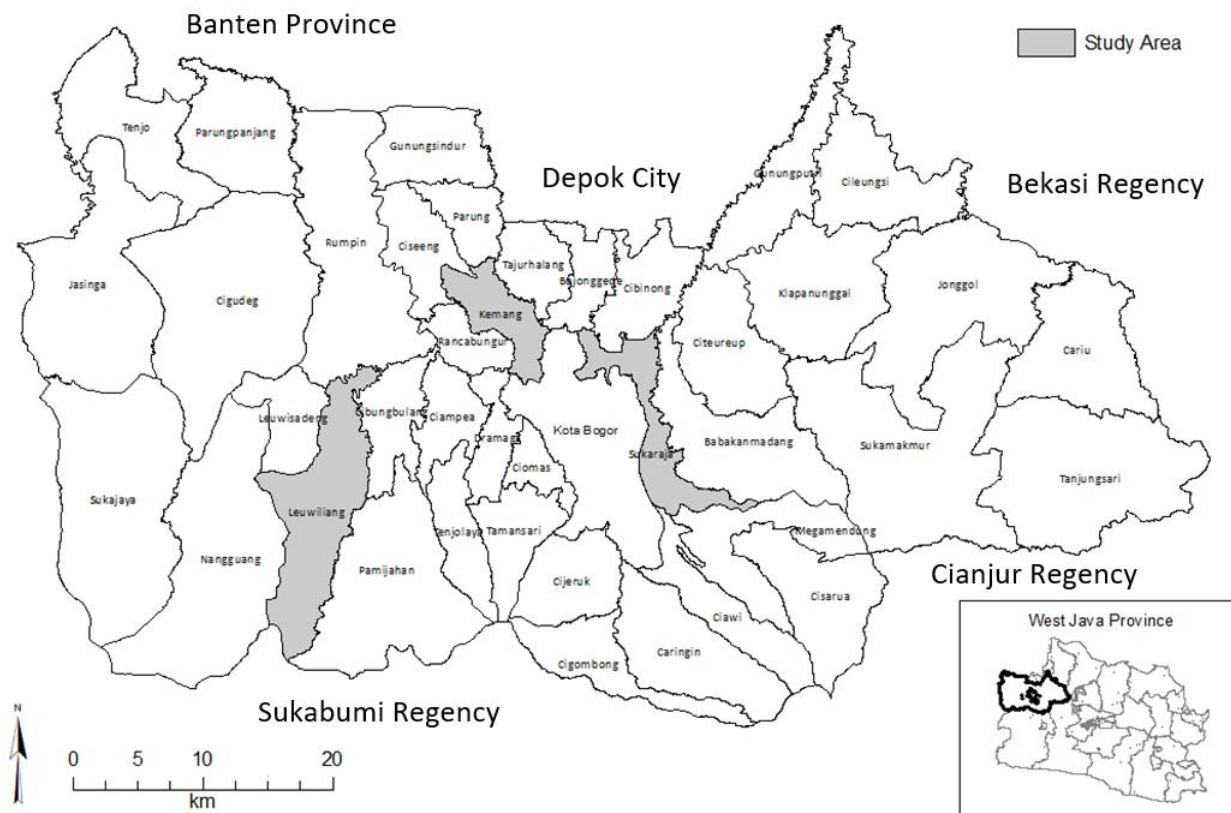


Figure 1 Map of research location

Table 1 Characteristics of respondent

Characteristics	Data	Total	Percentage (%)
Sex	Male	23	76.67
	Female	7	23.33
Age	20-30	2	6.67
	31-40	6	20.00
	41-50	8	26.67
	51-60	8	26.67
	>60	6	20.00
Formal education	No education	11	36.67
	Elementary school	7	23.33
	Junior High school	7	23.33
	Senior high school	5	16.67
Occupation	Farmer	8	26.67
	Trader	9	30.00
	Laborer	3	10.00
	Employee	3	10.00
	Housewife	6	20.00
	Unemployed	1	3.33

The respondents had a low level of formal education. A total of 36.67% did not finish elementary school. The difficulties in accessing formal education and choosing to work instead of school were the reasons. People with an elementary education level or below interact more with their environment to learn more about the benefit of these plants (Ramdhoni *et al.* 2015). Most respondents worked as traders (30%) and farmers (26.67%).

## 2. Ethnobotany of Kemang (*Mangifera kemanga* Blume.)

### a. Morphology

Respondents recognized the kemang tree based on leaf color, shape, stem, flower, and fruit. Kemang is closely related to mango (Fitmawati *et al.* 2013), so in describing the characteristics of kemang, people compare it with mango (*Mangifera indica*). Kemang has leaf shape and color the same as mango, but kemang leaf is longer and harder. Kemang stem is straight and reaches 20-25 m high. Kemang flower is purple. Some people said that the flower is pink. In line with Gunawan *et al.* (2019), kemang has a tree habitus height of 30-45 meters with light purple flowers and is panicle-shaped. Kemang fruit is yellowish-brown or light brown. The flesh is white with a large seed in the middle. The taste of the flesh is sour and astringent.

Respondents stated that the kemang fruit differs based on the size of the fruits and the color of the fruit skin. There are three types of kemang mentioned by respondents, namely kemang binglu, kemang sabuk, and

kemang burik. The skin of kemang binglu is yellowish-brown with a reddish tinge. The fruit is large and tastes sweeter than others. Kemang sabuk' skin is speckled and whitish. Kemang burik has the same features as kemang sabuk. Mulyaningsih *et al.* (2022) stated that there are four Bogor kemang cultivars in the Germplasm Garden, Cibinong Science Center Botanical Garden (CSC-BG), namely, lokal, sabu, binglu, gula pasir.

### b. Habitat

*Kemang* is usually found in yards, gardens, and graveyards (Figure 2). *Kemang* was mainly found in gardens (74.19%). People prefer to plant *kemang* in the garden rather than in the yard because the height of the *kemang* tree reaches 35 meters, has a wide canopy, and has strong roots. People tend to cut down a large *kemang* trees because they fear falling on their houses.

The community garden is located 200-1000 m from the house. Besides *kemang*, most people also grow other local fruits such as *gandaria* (*Bouea macrophylla*), *rambutan* (*Nephelium lappaceum*), and mangosteen (*Garcinia mangostana*), *melinjo* (*Gnetum gnemon*), mango (*Mangifera indica*), jackfruit (*Artocarpus heterophyllus*) and cloves (*Syzygium aromaticum*). Based on observations, most of the *kemang* are found in gardens close to water sources such as rivers or irrigation canals. It is similar to Fahrozi's (2014) research that *Mangifera casturi* (*Kasturi*) is more commonly found near rivers and creeks. Family graves are usually located adjacent to community gardens. The wide canopy of the *kemang* makes this plant suitable for the tomb.

The *kemang* owned by the respondent was obtained by planting, growing wild, inheritance, and buying *kemang* trees. Most respondents obtained the *kemang* tree by inheritance (Figure 3). *Kemang* was acquired along with the garden passed down from parents to their children. The existence of the *kemang* was maintained because the tree still produced fruits. Most of the respondents sold the fruits to buyer in wholesales. Buyer will climb the trees, harvest the fruits, and transport *kemang* fruits to the local market or the other collectors. Other than inheritance, *kemang* was growing wild. People consume the fruit, then the seeds are thrown into the garden and then grow well (Fakhrozi 2013).

**c. Kemang propagation**

Based on the interview, all respondents answered that the propagation of *kemang* is by seed. Dodo *et al.* (2016) stated the propagation of *kemang* by seeds and grafts. *Kemang* seeds planted by the community usually

come from the mother tree. The seeds are sown, and when they grow into seedlings, their height about 30-45 cm, the seeds are transferred to the other place. Two respondents planted *kemang* by transplanting seedlings. *Kemang* seedlings that grew wild around the mother tree were transferred to the garden. The respondent realized that the existence of *kemang* started to be rare, so it is necessary to plant *kemang* so that their children and grandchildren can see the *kemang* tree in the future.

**d. Used part**

Generally, the community uses four parts: fruit, shoots, stems, and bark. The parts used were fruit (43%) and shoots (39%) (Figure 4). *Kemang* fruit has white color and a refreshingly sour taste. *Kemang* is very distinctive. People said that the smell of *kemang* is the main attraction of this fruit. *Kemang* fruit can be consumed directly without processing

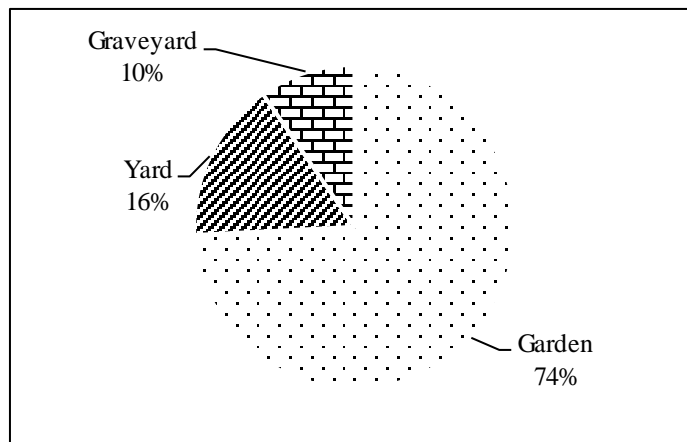


Figure 2 Percentage of kemang's habitat

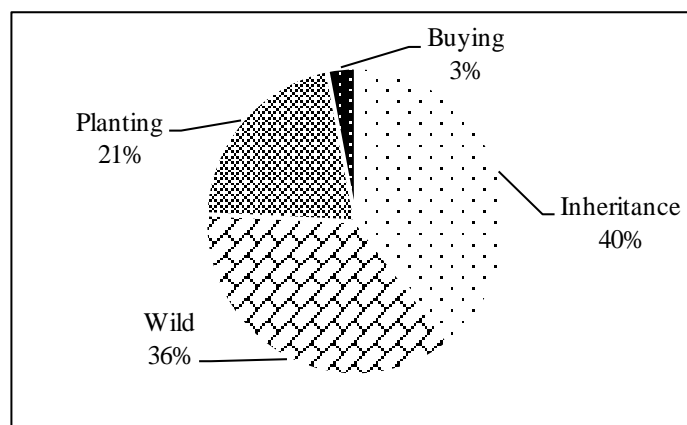


Figure 3 Way to get kemang

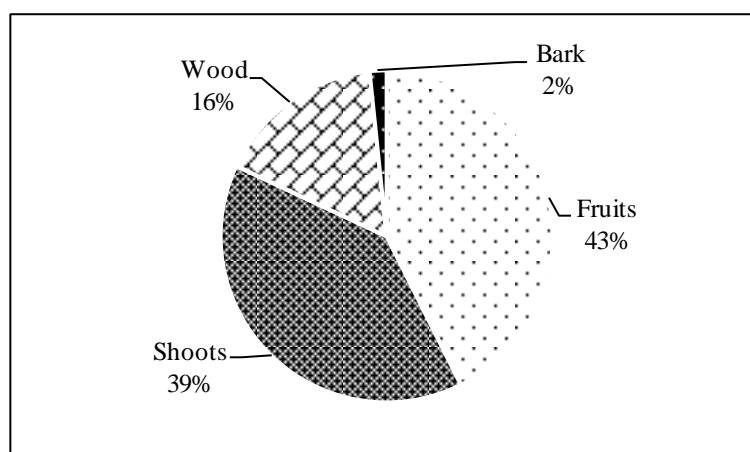


Figure 4 Percentage part used of kemang

Besides being consumed directly, *kemang* fruit can be processed into chili sauce, salad, and pickles. The *kemang* fruit used for processing is a little raw. Most respondents preferred that condition because the ripe *kemang* has a soft flesh texture. Every 100 grams of fruit contains 86.5 grams of water, 1 gram of protein, 0.2 grams of fat, 11.9 grams of carbohydrates, 0.005 milligrams of beta carotene, 58 milligrams of vitamin C and 200kJ of energy (Konstermans and Boompard 1993).

Another part that is used by the community is the plant shoot. *Kemang* shoots or young *kemang* leaves have a reddish color. Bogor people consume *kemang* shoots in their fresh form as a salad. Al Tapsi (2013) research states that some people do not like *kemang* shoots because of allergies. *Kemang* shoots cannot be taken all the time. According to respondents, the shoots can be harvested 2-3 times a year. *Kemang* shoots are sold wholesale. The buyer will directly climb the *kemang* tree and take the shoots. Besides climbing directly, people usually take *kemang* shoots with a small pole. *Kemang* shoots can be found in markets in Bogor in the form of small bundles for IDR 2500.00 – IDR 3500.00.

The next part used by the community is the stem (wood). *Kemang* wood is used as building material and containers. According to respondents, the quality of *kemang* wood was not excellent for building materials because it is soft, so it quickly rots. According to Sandri *et al.* (2013), *kemang* wood was classified in III-IV of strength. The wood is suitable for plywood, wallboard, sculpture, carving, handicrafts, and molding. The twigs and bark of *kemang* are used as firewood. The use of twigs and bark as firewood needs to be noticed. The smoke that is produced from burning can cause itching for some people. This incident is known as "balas kemang". According to the respondent, the healing

method is by burning a straw mat, then the smoke is directed to the itchy and swollen body part.

Some people think that the *kemang* tree is a haunted tree because of its large size. One of the *kemang* trees that is sacred and haunted is located in Kemang Village. There were many *kemang* trees in Kemang Village a long time ago, so the area was named "Kemang". There are *kemang* trees and Kiara trees near Kemang Village Office. Sedekah Bumi event is held every year at the place where Kemang Kiara grows, although today, there is no *kemang* tree there. The community of Kemang Village considers the *kemang* tree as the tree of their village identity, so its existence is maintained as possible.

Along with science and technology development, the benefits of *kemang* are not only limited to that. Several studies state that *kemang* has potential as an antioxidant and anticancer derived from several parts of the *kemang* that improve its use value (Table 2).

### 3. Conservation Strategies of Kemang (*Mangifera kemanga*)

Respondents maintain *kemang* existence because of the economic and ecological benefits of *kemang*. The economic benefit comes from the sale of *kemang* fruit and shoots. The price of *kemang* fruit in Nagrak Village and Karehkel Village is higher than local mango (bembem). The price of *kemang* shoots is almost the same as other vegetables, such as spinach and kale. One of the respondents stated that maintaining the *kemang* is that the *kemang* tree can hold the soil to prevent landslides. This reason underlies the respondents to plant *kemang* on the edge of steep soil. The price of *kemang* fruit and the ecological benefits felt by the community should be motivation so that it can add to the positive value of *kemang*.

Table 2 Content and potential of kemang part

Part	Content	Potency
Shoot	Phenols, fatty acids, steroids, terpenoids, alkaloids, alcohols, benzene, amines, hydrocarbons	Antioxidant <sup>1</sup>
Fruit	Flavonoids, tannins, triterpenoids, alkaloids	Anticancer (cervical cancer) <sup>2</sup>
Fruit skin	Tannins, triterpenoids, flavonoids, alkaloids	Anti-cancer (breast cancer) <sup>3</sup>
Leaf	Alkaloids, flavonoids, phenylpropanoids, amino acids	Antioxidant <sup>4</sup>
Bark	Antioxidant compounds, phenols, flavonoids, quercetin, gallic acid	Antioxidant, anti degenerative <sup>5</sup>
Seed	Flavonoids, triterpenoids, tannins, alkaloids	Anti-cancer (colorectal cancer) <sup>6</sup>

<sup>1</sup> Tapsi (2013), <sup>2</sup> Catrawardhana (2020) <sup>3</sup> Muslih (2020) <sup>4</sup> Fitmawati *et al.* (2021) <sup>5</sup> Fitmawati *et al.* (2020) <sup>6</sup> Saharso (2020)

Based on the interview result with the community in several villages in Bogor Regency, the existence of kemang started to be rare. Respondents said that kemang was still easy to find in the past, such as on roadsides, yards, and community gardens. The scarcity of kemang is characterized by the limitations of kemang fruit and shoots on the market (Deryati 2014). The scarcity is due to illegal logging and land conversion (Resida *et al.* 2017). Kiloes *et al.* (2014) stated that the kasturi mango is less able to develop into regional fruit. The flesh was small compared to the large seed size, the age of the plant to produce was long, and the harvest period was short were the reasons. Kasturi mango is not available all year round. The state of the underdeveloped kasturi mango is the same as the kemang. Due to several reasons, it is difficult for the community to maintain kemang existence. Kemang tree with a large trunk diameter is cut down to sell the wood. The existence of other fruit plants that are more economically valuable also threatens the existence of kemang. The community prefers to maintain the existence of the commercial fruit and cut down the kemang.

Furthermore, respondents mentioned that the length of time to bear fruit and limited land become the reasons for community reluctance to cultivate and plant kemang. Kemang propagation is done by seed, so it takes decades for the kemang to produce fruit. Kemang is an annual fruit crop that requires a large area of land. It becomes an obstacle for the community because not every community member has a garden or even owns the land, and there is no space for planting kemang. The constraints above can be circumvented by applying appropriate cultivation technology and conservation efforts.

Based on the description above, it needs a conservation strategy to protect species from extinction, among others:

1. Optimizing the socialization and publication of the benefits value of kemang

They were strengthening the benefits of kemang as food, building materials, firewood, and medicine.

Socialization by agricultural extension workers or related agencies will increase the knowledge or information about kemang that is still minimal. Most people do not know that kemang is designated as the identity flora of Bogor Regency. One of the solutions is adding this information to learning media, for example, environmental education. The research related to kemang also needs to be developed, especially the research related to the cultivation techniques and appropriate technology. On-farm conservation activities for local conservation in South Kalimantan for kasturi can be adopted. On-farm conservation activities are systems for cultivating and managing sustainable crops from a diverse population maintained by farmers.

2. Development of kemang cultivation

Kemang propagation still relies on seeds. The seeds come from the mother tree. Several respondents selected the mother tree. The mother tree has superior properties, including the sweet, large, and has many fruits. The seeds from the mother tree are then planted. The weakness of this propagation is the length of fruiting time, even decades.

The solution is artificial vegetative, although not all artificial vegetative can be performed on kemang. Pradnyawati *et al.* (2020) develop the local Balinese wani (*Mangifera caesia*) by grafting. Rootstock forms come from healthy and have more than six months old. The scion is derived from healthy high, yielding (seedless) wani shoots. The two rods (top and bottom) are then spliced. The joint is covered and placed in the nursery.

3. Development of kemang as one of the local fruit commodities

Until today, kemang fruit is still consumed directly in the form of fresh fruit. Kemang fruit can be developed into other processed products such as fresh drinks made by UPT Kemang District and marketed at the 2019 Nusantara Fruit and Flower Festival. Another kemang fruit product is velva kemang. Hadistiani *et al.* (2015) stated that processing kemang fruit into velva will improve the quality of kemang fruit. Furthermore, the

velva of the kemang fruit can be used as an alternative to meet the community's vitamin C needs.

The conservation strategy can work if there is the involvement of several parties such as the community, universities, state-owned enterprises, private companies, and related agencies, local governments. The role of these parties will influence the success of kemang conservation as the identity flora of Bogor Regency.

## CONCLUSION

The existence of *kemang* has begun to be rare in the research area. People tend to leave *kemang* and do not plant it because the fruit is considered to have no economic value compared to other local fruit commodities. *Kemang* is found growing in gardens, yards, and graveyards. Communities in the study area utilize the fruit, shoots, bark, and wood of *kemang*. *Kemang* fruit and shoots are consumed directly in fresh form. Bark and small twigs are used as firewood. *Kemang* stems (wood) are used as building materials. The community recognizes that the existence of *kemang* is rare. Conservation strategies that can be carried out are developing kemang cultivation, optimizing the socialization and publication of the benefits of *kemang*, and developing kemang as a local fruit commodity.

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