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Characterization, Cultivation, and Utilization of Cassava (Manihot Esculenta Crantz) on Kei Besar Island, Southeast Maluku Regency

Sirnawati Reniwuryaan[1*], Simon H. T. Raharjo[2], Meitty Louise Hehanusa[3]
Fakultas Pertanian, Universitas Pattimura
Corresponding Author: Sirnawati Reniwuryaan,
sirnawati.reniwuryaan@gmail.com

A R T I C L E I N F O

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A B S T R A C T

This study identified the characterization, cultivation practices, and utilization of cassava (Manihot esculenta Crantz) germplasm on Kei Besar Island, Southeast Maluku. Conducted from January to February 2025 in five villages, the research used surveys, observations, and interviews. Four local cassava accessions were identified—Kasbi/Enbal Merah, Kasbi/Enbal Pahit, Kasbi Putih, and Kasbi/Enbal Hafsa—distinguished by morphological traits. Seed exchange among villages resulted in the same accession having different local names. Cassava is traditionally cultivated and is an essential local food source, with farmer preferences influenced by taste, maturity, and environmental resilience. The findings support germplasm conservation and future variety development.

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INTRODUCTION

Cassava (*Manihot esculenta*) is one of the most important staple crops in tropical regions and serves as the third major source of carbohydrates after rice and maize. In Maluku, cassava is widely cultivated and plays a crucial role in local food security. A distinctive local product is the bitter cassava known as *enbal*, which contains cyanogenic compounds and requires fermentation to remove its toxicity. *Enbal* has long been part of the traditional diet of the Southeast Maluku community and has developed into various processed products with increasing economic value.

The diversity of cassava in the region, including sweet and bitter types, highlights the need for conservation and characterization of its germplasm. Such characterization is essential for identifying morphological traits and genetic variability that support breeding programs, conservation efforts, and the development of improved, locally adapted varieties. In Kei Besar Island, cassava has both nutritional and cultural significance; however, information on its morphological variability, cultivation practices, and utilization remains limited.

This study aims to characterize cassava germplasm on Kei Besar Island and to document local cultivation and utilization practices. The findings are expected to provide valuable data for genetic resource conservation and for developing superior cassava varieties suited to the agroecological conditions of Southeast Maluku.

THEORETICAL REVIEW

Cassava (*Manihot esculenta Crantz*) is an important food crop belonging to the Euphorbiaceae family and is widely cultivated in tropical regions. It has numerous local names and is classified under the genus *Manihot*, with *M. esculenta* and *M. utilissima* as its primary species. Cassava grows optimally in temperatures of 18–35°C, 65% humidity, and soil pH ranging from 4.5 to 8.0. It adapts well to various soil types, including ultisol, alfisol, and andosol. Morphologically, cassava is characterized by palmate leaves, cylindrical stems, storage roots that develop into tubers, and monoecious flowers with cross-pollination. Based on amylose content, cassava is categorized into floury types (>20% amylose) and waxy types (<20% amylose).

Cassava germplasm represents an essential genetic resource for plant breeding. Germplasm management includes conservation, utilization, and documentation of morphological and agronomic traits. Exploration and inventory activities are carried out to collect and identify genetic variability through both *in situ* and *ex situ* conservation methods. Morphological characterization using standardized descriptors is fundamental for distinguishing phenotypes, identifying local varieties, and determining economically valuable traits.

High genetic diversity is necessary for ecological adaptation and serves as the basis for developing superior cultivars. Cassava breeding involves germplasm collection, clonal selection, hybridization, and the application of biotechnology such as tissue culture and molecular markers. Major challenges include climate change, limited resources, and the need for varieties with improved tolerance to biotic and abiotic stresses. Continuous improvement of

cassava productivity and tuber quality is vital for strengthening food security and enhancing farmer livelihoods.

METHODOLOGY

This study was conducted from January to February 2025 in five villages of Kei Besar Island, Southeast Maluku Regency: Udar, Rahareng, Daftel, Lerohoilim, and Karkarit. The research materials consisted of cassava plants, supported by tools including questionnaires, a ruler, a camera, a computer, and cassava descriptor forms.

A survey method was employed using purposive sampling. Villages and respondents were selected based on key informants through a snowball sampling approach, targeting individuals knowledgeable about local cassava diversity. Each village involved 3–5 farmers who cultivated cassava. Data were collected through interviews using structured questionnaires and direct field observations.

Morphological characterization was carried out *in situ* using standardized descriptor forms to record traits of the canopy (shoots, leaves, stems) and tubers. Observed traits included young leaf apex color, central leaflet shape, leaf color, number of lobes, petiole color and length, vein color, petiole-scar prominence, stem cortex color, outer stem bark color, internode length, and tuber skin color. Each accession was documented with photographs of canopy and tuber parts.

The collected data were qualitative and obtained through field observation, presented in tables and images, and analyzed descriptively according to the descriptors used. Data processing was performed using Microsoft Excel.

RESULTS AND DISCUSSION

Cassava Accession in Kei Besar District

Kei Besar District, located in Southeast Maluku Regency, has rich local resource potential, including a diversity of food crops such as cassava (*Manihot esculenta* Crantz). Cassava is one of the main sources of carbohydrates that are widely cultivated by the local community, both for consumption and for sale in the local market.

Based on field observations and interviews with local farmers, it was found that there are several local cassava accessions that are differentiated based on traditional names, taste (sweet or bitter), shape and size of the tubers, and harvest age. Some names are "White Kasbi, Kasbi/Red Enbal, Kasbi/Bitter Enbal, Kasbi/Embal Hafsa". This diversity shows important potential in terms of genetic conservation and observation of local superior varieties.

These accessions are generally traditionally cultivated without high chemical inputs, with a pattern of intercropping with other crops such as corn and bananas. Adaptation to harsh local environments such as rocky soils and drought shows that local cassava has good resistance to environmental stress.

In the context of local food development and regional food security, the accession of cassava from Kei Besar has the potential to become the basis for breeding programs for drought or high-quality soil varieties.

Table 1. Cassava accessions were found in five sample villages in Kei Besar District.

No	Village Name	Name of the Variety Found	Accession Codes	Origin of Seeds
1.	Attack	Kasbi/Enbal Hafsa	KE. H.U	Previous Plants
		Kasbi/Enbal Pahit	KE. P.U	
2.	Rahareng	White Kasbi	KM. P.R	Farmers from other villages
		Kasbi/Enbal Pahit	TO. P.R	
		Kasbi/Enbal merah	KE. M.R	
3.	Daftel	Kasbi/Enbal Merah	KE. M.D	Farmers from other villages
		Kasbi/Enbal Hafsa	KE. H.D	
		White Kasbi	KM. P.D	
4.	Lerohoilim	White Kasbi	MILES. P.L	Previous Plants
		Kasbi/Enbal Merah	WED. M.L	
5.	Karkari	Kasbi/Enbal Pahit	TO. P.K	Originally from Rahareng Village
		White Kasbi	KM. P.K	

The results of the initial characterization in Kei Besar District of all cassava accessions were found to be 4 accessions. However, after these accessions were collected and reverified, it turned out that there were cassava accessions that had different names in one village from another but morphologically these cassava accessions had the same properties. Thus, from the actual verification results, 4 accessions were obtained. The 4 cassava accessions are Kasbi/Red Enbal, Kasbi/Bitter Enbal, White Kasbi, and Kasbi/Enbal Hafsa.

The same access is known based on the results of the characterization, a number of information provided from farmers, for example Kasbi/Enbal Hafsa. It is found in two villages, Udar and Daftel. Meanwhile, Kasbi/Enbal Bitter was found in four villages, Udar, Rahareng, Lerohoilim and Karkarit, Kei Besar District. This then happened due to the exchange of seeds between villages, so these two types of cassava were found in the sample village. This can happen even if the distance between the sample villages is quite far away, namely from one village to another. From Udar Village to Daftel Village. Another example, the white Kasbi from Karkarit Village has similar properties to the red Kasbi/Enbal from Lerohoilim Village, but there is a slight difference between the two accessions. The orientation of the stem stalk and the protrusion of the stalk of the leaves of the leaves in the white Kasbi have an irregular direction and the protrusion is not very prominent, while the red Kasbi/Enbal has a horizontal stalk orientation and the protrusion of the stalk of the leaves is very prominent.

Exploration of cassava plants, found several unique things found related to the characteristics possessed by some cassava plants. For example, in Karkarit village there is a white Kasbi/Enbal, the people there call it white Kasbi because of the color of this kasbi stem. and tastes good This accession has almost the same characteristics as the accession from Lerohoilim Village which is called Kasbi/Red Enbal, which according to the information obtained from farmers in the village has a uniqueness similar to white Kasbi, however, if observed using the description form, it turns out that there are differences between the two

cassava accessions. The red Kasbi/Enbal has an easy red bulb cortex, while the white Kasbi is white. In addition, there is also a difference in the color of the tops of the lower leaf bones in the red Kasbi/Enbal, the light brown shoots and brownish lower leaf bones, while the white Kasbi has a green shootout color and the color of the lower leaf bones is slightly reddish-green.

Karkarit and Rahareng villages were found to have bitter kasbi/enbal, the accession was called Kasbi/bitter enbal by farmers because starting from the old leaves and petioles were all purplish-green, From the results of interviews with farmers, it is known that most of the cassava seeds they cultivate come from neighboring villages, for example in Udar Village which on average take kasbi/enbal hafsa seeds, and Kasbi/Enbal Bitter, from a neighboring village, namely Rahareng Village. And it has been cultivated for a long time, so it may rarely get other varieties because certain accessions may be found in the villages. Farmers choose a type of cassava to be cultivated for their own reasons, such as the relatively fast harvest age and the taste of the tubers is delicious and sweet. Based on this reason, the accession of cassava was found which is a favorite because of its advantages. For example, in Karkarit Village, farmers prefer to plant white kasbi and bitter kasbi/enbal because generally these accessions have a delicious and sweet taste of tubers. In Rahareng Village, the community prefers red Kasbi/Enbal, white Kasbi, Bitter Kasbi/Enbal While in Daftel village there are Kasbi/Red Enbal, Kasbi/Hafsa Enbal and white Kasbi. For Udar Village, respondents prefer Kasbi/Enbal hafsa, and Kasbi/Enbal bitter. From the research conducted, the village that has a fairly high diversity is Daftel Village because more accessions are found in the village. This high diversity of access is due to the large supply of seeds from neighboring villages, namely Rahareng Village and Udar which are then cultivated until now by farmers in Daftel Village, thus enriching the types of cassava there.

From the results of this study, 4 cassava accessions were obtained. Carefully it can be known that there are cassava that can be consumed directly which includes 1 cassava accession; while the 3 accessions cannot be consumed directly because they contain high HCN (cyanide acid) and a bitter taste of tubers if consumed not through certain stages, for example, in Udar Village, Kasbi/Enbal hafsa, and Kasbi/Enbal Bitter are found.(Table 1), these two types of cassava must be processed in a certain way to be used as raw materials for food that can be consumed, for example in the form of local food called enbal husband, enbal bunga, enbal cheese, enbal milk, enbal fried and enbal pebbles. The bitter taste of cassava is caused by high HCN levels so it cannot be consumed directly. According to Suyamto and Wargiono (2006), cassava with high HCN content can be used as industrial raw materials. The accessions obtained from this study have a varied harvest lifespan, ranging from 4 months to 12 months (Table 2).

Table 2. Cassava Accession and Harvest Age in Kei Besar District.

Yes	Accession Name	Accession Codes	Harvest Age
1.	Kasbi/Enbal Hafsa	TO. K.U.	4-6 Months
2.	Kasbi/Enbal Pahit	TO. M.R	8-12 Months

3.	White Kasbi	MILES. P.R	6-8 Months
4.	Kasbi/Enbal Merah	TO. M.L	4-12 Months

Morphological Characteristics of Cassava Accession Stems in Kei Besar District

From the results of initial in *situ* characterization and morphological verification in the cassava stem collection land, it was found that 4 cassava accessions collected from the sample villages had morphological diversity, both from stems, leaves and tubers. Some types of cassava from Kei Besar sub-district have less prominent protrusions of leaf stalks on the stems and the orientation of the petiole on the stem in a horizontal or irregular direction. The color of the outer stem skin varies from golden, silver, light brown to blackish and yellowish brown. In general, all accessions have a straight bar shape.

The morphology of cassava stems varies greatly between accessions, depending on genetic factors and the growing environment. On Kei Besar Island, which is part of the Maluku Islands region, local variations of cassava accession show adaptation to local agroecological conditions. Here are some characteristics of cassava accession stems found in the area:

(KE.M.L)

(KE.P.R)

(KE.H.U)

(KM.P.R)

Figure 1. Diversity of Stem Morphology of Several Cassava Accessions in Kei Besar District (KE. M.L). Kasbi/Enbal Merah, (KE. P.R). Kasbi/White Enbal, (KE. K.U). Kasbi/Enbal Hafsa, (KM. P.R). Kasbi is bitter**.**

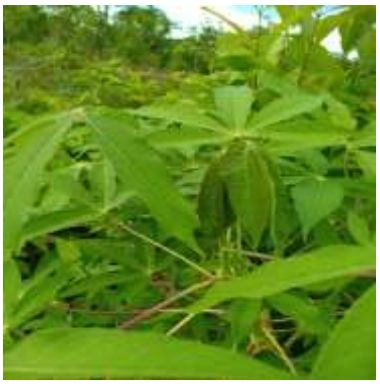
All cassava accessions based on observations turned out to have similarities in the distance of the trunk book, which is relatively short, and there are some accessions that have a distance of up to 3 cm. Less prominent petioles cause the distance between the stem books to be longer. For the type of stem growth, the initial characterization results are on average straight and most have branches, but in this result there is only one accession that has a branched crown

type, namely Kasbi Nasi. The branches owned by this accession are perpendicular, at a distance of 20 cm above the ground level, the trunk has been branched. This branching also occurs on young stems or almost close to the shoots of plants. This is because the age of the plant is genuine, so the accession of this cassava tends to branch faster than the accession of the other.

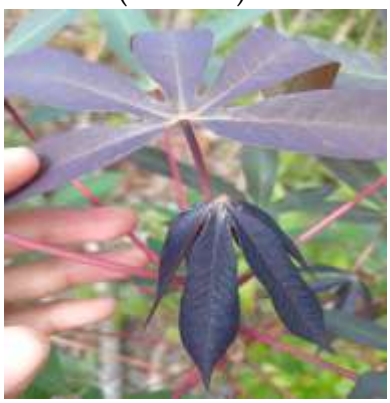
Morphology of Cassava Axesis Leaves from Kei Besar District

Cassava accessions in Kei Besar District have several shoot colors which include bright green, light brown, dark brown, and purplish. Accessions that have a light brown shoots color: kasbi/red enbal. Accessions that have a dark brown shoot-color: kasbi/enbal hafsa. Accessions that have a purplish color of Kasbi/Enbal bitter shoots. The leaves of the adult cassava plant in Kei Besar District have several shapes, which include lanceolate, elliptic, oval, and ovate leaf shapes. The accessions that have the form of laceolate leaves are: Kasbi/enba hafsa. Accessions that have the shape of elliptic leaves are Kasbi/Bitter Enbal and Kasbi/Enbal hafsa.

(KE.M.L)



(KM.P.R)



(KE.P.R)

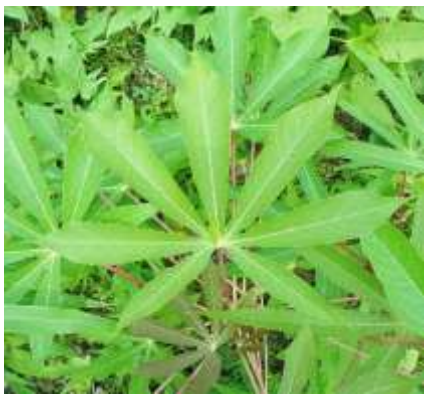
(KE.H.U)

Figure 2. Morphological Diversity of Shoot Color and Petiole Color of Several Cassava Accessions in Kei Besar District. (KE. M.L). Kasbi/Enbal Merah, (KM. P.R). Kasbi Putih, (KE. P.R). Kasbi/Enbal Bitter, (KE. K.U). Kasbi/Enbal Hafsa.

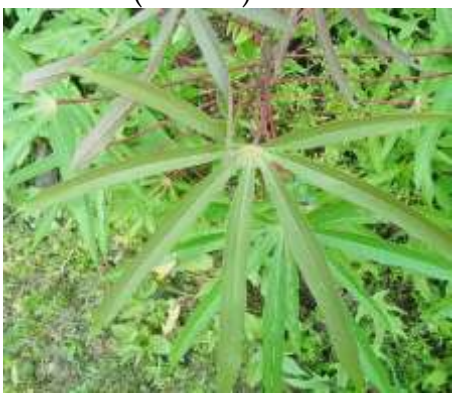
The color of cassava leaves found is green and dark green and has 5-7 leaf curves and has petiole colors ranging from yellowish green, reddish green,

reddish purple, yellowish red, red and purplish red with yellowish-green and slightly reddish leaf bone pigments.

(KE.P.R)



(KE.M.L)



(KE.H.U)

(KM.P.R)

Figure 3. Morphological Diversity of Leaf Color of Several Cassava Accessions in Kei Besar District. (KE. M.L). Kasbi/Enbal Merah, (KM. P.R). Kasbi Putih, (KE. P.R). Kasbi/Enbal Bitter, (KE. K.U). Kasbi/Enbal Hafsa.

The accession of Kasbi/Red Enbal found in Lerohoilim Village has differences in the stem, but on the other hand it has the characteristics of leaf shape that are similar to each other, namely the shape of the leaf elliptical, while Kasbi/Enabl hafsa has a lanceolate leaf shape and is slightly pointed at the tip of the leaf. While Kasbi/Enbal bitter from Rahareng Village has similarities and also has the same leaf shape, namely the Oblanceolate shape. Then the Kasbi that has leaves in the shape of an Ovate is a white Kasbi from Lerohoilim Village.

Morphological Characteristics of Cassava Accession Tubers from Kecematan Kei Besar

From the observation results, it was found that the shape of the bulbs varied which included cones, conical cylinders, cylinders and irregular. Characteristics of cassava bulbs found in the sample villages. Cassava accessions that have a conical tuber shape include white Kasbi (K.E-E1). There are also those that have a conical cylindrical shape, namely Kasbi/Bitter Enbal (K.E-O2). and Kasbi/Red Enbal. Meanwhile, Kasbi/Enbal hafsa has an irregular shape. There is also an outer tuber skin that is light brown and dark brown.

(KE.M.L) (KE.K.U)

(KM.P.R) (KE.P.R)

Figure 4. Morphological Diversity of Tubers of Several Cassava Accessions in Kei Besar District. (KE. M.L). Kasbi/Enbal Merah, (KM. P.R). Kasbi Putih, (KE. P.R). Kasbi/Enbal Bitter, (KE. K.U). Kasbi/Enbal Hafsa.

According to Soetanto (2008), cassava can be processed into processed food and non-food processing. In addition to being steamed, boiled or fried for consumption, the tubers can be used as raw materials for the food, chemical, pharmaceutical, and textile industries. In addition to tubers, cassava stems and leaves can also be used. The young leaves contain a lot of provitamin A, so they are good for vegetable dishes. The stems can be used for fuel or as cuttings for new plants and hedges. Farmers often plant cassava according to their desired tastes to support family consumption. However, there are some accessions that cassava has an unpleasant and bitter taste of tubers grown by farmers. Accessions like this include Kasbi Pahit, Kasbi Sangkola Daun Kecil and Kasbi Sangkola Daun Lebar. The bitter taste of these tubers is caused by the fact that they contain HCN.

However, cassava has been consumed in general without any significant poisoning effects. According to Astawan (2004), although cassava contains harmful toxins, because traditional processing methods are able to reduce the cyanide content of tubers to a limit that does not endanger health. Processing processes that are able to reduce the cyanide content in cassava are soaking, drying, boiling, fermentation, and a combination of these processes. Soaking followed by boiling can remove all free cyanide because the process of washing in running water and heating is powerful enough to prevent the formation of toxic HCN. From *the in situ characterization,* in general, the accession of cassava

from the two Kei Besar sub-districts did not show a morphological difference that was far from the results of observations in the collection land. However, the morphological properties of the stem are more found in the characterization of the land *in situ*. After looking back, most of them have not branched, this is because in *situ* the cassava accessions are not yet at the age of mature plants.

General Knowledge of Farmers in Kecematan Kei Besar About Aspects of Cassava Agronomy

Based on the results of interviews with farmers in each sample village regarding agronomic aspects, it turns out that there are many similarities about the cultivation method of cassava plants regarding planting patterns, planting materials, fertilizer use, maintenance and control of pests and diseases. The planting pattern carried out by farmers in the sample villages is a *mixed culture* which is generally irregular, meaning that in each cassava planting area there are other crops such as corn, beans, sweet potatoes and so on. Almost no farmers grow cassava monoculture. The village community still uses the hamlet system. Land preparation is carried out by means of light soil management such as hoeing to make mounds/guludan. But there are also those without tillage before planting cassava. According to farmers in Rahareng and Lerohoilim Villages, to plant cassava does not always have to be tilled but by means of cassava cuttings directly inserted into the ground. The planting material used by farmers is stem cuttings and is generally obtained from the plants themselves and only some of them come from neighboring villages or other farmers. From the results of interviews with the respondent farmers, it was found that cassava cultivation fertilizer had never been used. This is because the top *layer of soil* still contains a lot of organic matter on farmers' land. When harvesting cassava plants, farmers immediately replant them on the former guludan that has just been harvested. The maintenance of cassava plants is carried out casually, but there are also those that are carried out intensively. For example, almost all of the sample villages carry out weeding every month with the aim of reducing competition between plants and weeds. The main pests and diseases that attack cassava plants in each sample village according to farmers include wild boars and white caterpillars. For white caterpillars, the control method is carried out simply, namely at the time of weeding the plant if the pest is found to be caught and destroyed while wild boar is controlled by making traps or by hunting the wild boar pests, so that not a few farmers often spend the night around the garden area to hunt wild boar pests in the traditional way. Harvesting activities by farmers are not carried out simultaneously but according to needs, especially for their own family consumption. So it is very difficult to determine the production of tubers produced in a cassava planting area.

Utilization of Cassava as Local Food

Cassava (*Manihot esculenta* Crantz) is one of the local food crops that has great potential as an alternative source of carbohydrates besides rice and wheat. This plant thrives in various tropical regions, including Indonesia, because it is able to adapt to less fertile soil conditions and varied climates.

As a local food, cassava has a variety of benefits. The tubers can be processed into various food products such as: flower bals, peanut bals, banana bals, husband, papeda, spices, fried foods etc. In addition, young cassava leaves are also often used as a vegetable rich in vitamins and minerals.

The use of cassava is very important in maintaining local food security, especially in rural areas. In addition to being the main food source in the famine season, cassava can also be used as raw materials for the household industry.

The development of cassava as a local food also supports food diversification programs, reduces dependence on rice, and maintains local wisdom and culinary culture of the Indonesian people.

Table 4. Processed Results From Cassava From Kecematan Kei Besar

Yes	Sample villages	Types of cassava processing
1.	São Paulo	I am Kagang, I am Pump, I am Gorang.
2.	Rahareng	Pisang enbal, enbal goreng, suami
3.	Daftel	Flower Wrap, Husband, Peanut Wrap
4.	Karkari	Spiced Enbal, Fried Kasbi, Husband
5.	Lerohoilim	Lamet, enbal goreng, enbal bunga

Post-harvest management of cassava is carried out simply. The cassava is harvested, taken home and left in place for a few days. Cassava processing by the community is only limited to boiling, frying, making compote, and lamet. But there are also those that are made into papaeda kasbi, In addition to the use of edible tubers, there are also parts of the cassava plant that can be used, such as cassava leaves used as vegetables.

Local Food is food that is produced and developed in accordance with the potential of local regional and cultural resources. Local food is known, easy to obtain, various types, not imported and can be tried to meet your own needs or sold. Each region has different local food advantages according to production and consumption levels. Currently, local food is an important commodity to be developed with the aim of improving the quality and image, including the results of the process, both finished products and semi-finished products. The results of this development will later be able to produce a variety of quality local processed food products. Local foods of various types are used as basic ingredients for making food to combat malnutrition. In addition, the nutritional content in local food can also be used to overcome several nutritional problems in Indonesia. However, we need to understand that there is no single food that is able to provide nutritional content in the right amount and type. Therefore, food consumption needs to be diversified in order to cover each other's shortcomings in food ingredients (Muctadi and Sugiono, 1992). Local food becomes the mainstay of the region when it is taken more seriously. Because local food can be distributed to people other than raskin with a ratio of 40:60 (local food; Raskin). This comparison pattern needs to be done so that people's dependence on raskin will gradually decrease. Moreover, the diet of the people of Southeast Maluku highly upholds their rich food. The slogan circulating in the community that "not

eating the enbal is not yet full" is a trigger to continue to preserve local enbal food to support the food security of the local area.

Flower Wrap

Flower shells are a type of poisonous cassava (Manihot esculenta Crantz) typical of the Kei people, especially in Kei Besar and Kei Kecil, which are shaped to resemble flowers during the printing process, this type includes variations of ordinary shellfish, only different in the final shape.

Figure 5. Flower Wrap

Here are the basic ingredients and process of making flower shells:

1. Basic Ingredients
   a. Using bitter cassava which contains high cyanide, so it must go through a special process to remove the poison
   b. Usually use local varieties whose tubers are dense and white in color.
2. Manufacturing Process
   a. Stripping and washing
      The cassava is peeled off and washed thoroughly.
   b. Poison extortion (Detoxification)
      The sweet potato is grated and then squeezed using a traditional tool (squeeze machine or wese) to remove the contaminated liquid containing HCN.
   c. Dough drying
      The result of the squeeze is in the form of wet powder dried in the sun until slightly dry
   d. Flower shape printing
      Dry dough is formed using a metal or wooden mold that has a flower petal pattern.
   e. Roasting
      The flour-shaped dough is baked on a clay pan (met met) until dry and crispy.
3. Characteristics
   a. Its shape resembles a blooming flower with 5-6 petals
   b. The texture is red, the taste is savory-neutral (usually eaten with a side dish or as a snack).
   c. Usually thinner than round or plate envelopes

4. Cultural Functions and Values
   a. Become a long-lasting local food reserve
   b. Often served during traditional events or holidays
   c. The shape of the flower symbolizes the beauty and friendliness of the Kei people.

Banana Enbal

Enbal bananas are a type of local food that is widely cultivated in the Kei Islands, especially in Kei Besar, Southeast Maluku. This banana has a unique characteristic because the tubers are not eaten directly like ordinary bananas, but are processed into staple foods through traditional processes.

Figure 6. Banana Enbal

The manufacturing process is more or less like flower wrapping, but the basic ingredients are bananas and enbal, bananas that have been peeled and then defended in half and wrapped in enbal which has been processed into flour then ready to be fried into bananas, the processing of enbal bananas is a traditional heritage of the Kei people.

Suami

Husband is a traditional meal typical of Maluku, especially Southeast Maluku, which is made from grated cassava and coconut. This food is often used as a substitute for rice because it is rich in carbohydrates and filling.

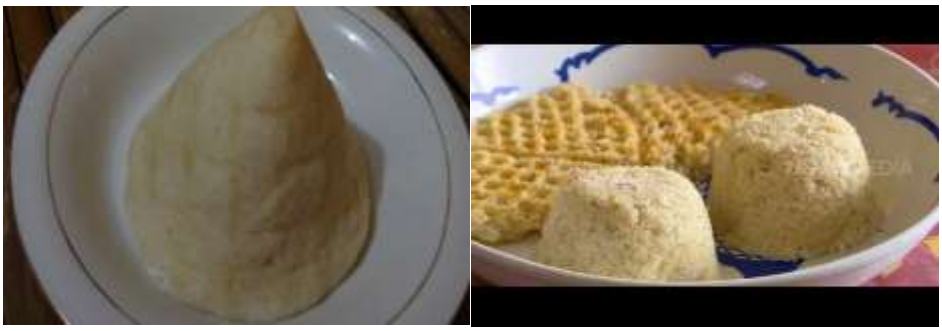


Figure 7. Suami

How to make your suami: Ingredients (1). Fresh cassava $\pm$ 1 kg, (2). Half-aged shredded coconut $\pm$ 1/2 grain, and (3). Salt $\pm$ 1 tsp.

Nuts

Enbal kacang is one of the variations of traditional food made from enbal flour which is processed from poisonous cassava or bitter cassava, which is added to peanuts as a mixture ingredient to give a savory taste and crunchy texture.

Figure 8. Nuts

This food comes from the Southeast Maluku Region, especially on Kei Island, and is usually used as a snack or complement to dishes. The basic ingredients for making peanut enbale are processed cassava that has gone through a process of deposition and repeated washing to remove cyanide poison, and peanuts that are roasted or fried, then mixed into the enbal dough until ready to be baked in a clay pan or baking pan until dry and cooked.

Fried Enbal

Fried enbal is one of the traditional preparations of the base ingredient of enbal (starch from bitter cassava/poisonous cassava) which is cooked by frying so as to remove the crunchy texture and savory taste.

Figure 9. Fried Enbal

This food originated in the Kei Islands, Southeast Maluku, and became a popular snack in the local community. The process of making fried enbals is almost the same as making flower enbals, but flower embals use molds while fried embals do not use molds.

Fried Kasbi

Fried kasbi is one of the traditional processed foods made from kasbi (cassava/cassava) which is processed by frying until cooked and has a crispy texture on the outside, soft on the inside.

Figure 10. Fried Kasbi

Sources of Genetic Diversity in Maintaining Local Food Security in Kei Besar Kecematan

The national food security program is still not running optimally, which is reflected in the high consumption and dependence of the community on rice, which still appears in various locations of cases of food insecurity and malnutrition. The continued occurrence of various cases of food insecurity and malnutrition shows that further efforts are needed to further optimize pagan crop management efforts, in this case food diversification, especially to reduce dependence on rice. People in the sample villages have long relied on garden products, including cassava as a source of food, in its development the consumption of cassava has decreased. From this study, in Kei Besar District, there are many various cassava accessions that are quite diverse. The diversity of types of cassava plant accessions needs to be maintained for generations so that it does not become extinct so that it can be used in the long term. If the community in this sub-district manages and cultivates cassava plants properly, the prospects for cassava development will be good. Good and regular management of cassava also plays an indirect role in preserving germplasm. Germplasm is a genetic source that is very useful for the assembly of superior clones. Cassava productivity in Maluku is still low, with an average of 11.87 tons/ha, while with the right cultivation technology, superior varieties of cassava can produce more than 35 tons/ha. One of the factors that causes low cassava production in Maluku is the use of inferior seeds because superior seeds are not available. (Balitkabi, 2005).

Cassava cultivation techniques in Maluku are mostly made simply and enough for consumption so that the development of cassava production is still low. As one of the solutions to realize food security in Maluku which is oriented towards the utilization of the potential of local resources, as well as finding solutions for the availability of superior cassava varieties and efforts to save germplasm from extinction. The variety of types and types of local food in Kei Kecil Timur District is very diverse. This is in accordance with the culture and

customs of the local community. The consumption of cassava, sweet potato, and papeda does not reflect the low socio-economic status of the community, but is the habit and wisdom of the local community in utilizing various food sources that are in harmony. One of the real efforts to increase the acceleration of the food consumption diversification movement in order to realize food security is to restore the pattern of food consumption diversification that has been rooted in the community as local wisdom. As a source of carbohydrates, people in rural areas usually consume corn, cassava, and sweet potatoes, by seeing this reality, the people in Kei Besar District all still adhere to appropriate food consumption patterns to support food security.

CONCLUSION

This study conducted in five villages of Kei Besar District identified four cassava accessions—*kasbi putih*, *kasbi/enbal merah*, *kasbi/enbal pahit*, and *kasbi/enbal hafsa*. These accessions exhibited distinct morphological variability in stems, leaves, and roots, including differences in stem color and cortex, leaf shape and lobes, apical leaf color, as well as root shape and cortex color. This diversity highlights the richness of cassava genetic resources in Kei Besar, which is valuable for germplasm conservation and future crop improvement initiatives.
Cassava cultivation practices across the villages are similar, typically grown in mixed cropping systems alongside maize and legumes. Cassava is used both as a staple food and in various traditional processed products such as *kolak*, *lamet*, *suami*, and *enbal goreng*, while the leaves serve as a vegetable. These findings indicate the central role of cassava in local food security and its potential for value-added development.

RECOMMENDATION

The study recommends:

1. Germplasm conservation through proper documentation and maintenance of local accessions;
2. Development of improved varieties based on local morphological traits;
3. Capacity building for farmers in cultivation and post-harvest processing;
4. Strengthening economic utilization of cassava-based products to enhance local livelihoods.

FURTHER STUDY

Future research should expand the characterization of cassava germplasm in Kei Besar by incorporating molecular marker analysis to complement morphological observations and provide clearer genetic differentiation among local accessions. Long-term studies are also needed to evaluate the adaptability and productivity of these accessions under varying environmental conditions, particularly in response to climate stress. Additionally, further investigation into post-harvest processing, nutrient composition, and the economic potential of traditional cassava-based products could support the development of value-added innovations. Strengthening socio-economic assessments related to farmers' preferences, cultivation practices, and market opportunities will also be

essential to guide sustainable cassava improvement and utilization programs in the region.

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