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Local knowledge of plant-based nutrition sources from forgotten foods in Datengan Village, East Java, Indonesia

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Abstract. *Afrianto WF, Tamnge F, Hidayatullah T, Hasanah LN. 2021. Local knowledge of plant-based nutrition sources from forgotten foods in Datengan Village, East Java, Indonesia. Asian J Ethnobiol 4: 53-64.* Plant-based food has benefits for health and the environment. Finding adequate plant-based nutrition sources can be found by exploring local knowledge. Here, forgotten foods mean two definitions that (i) those foods were consumed by the community before, but over time it is forgotten in the daily diet, and (ii) unusually consumed by the community outside, but it still is or over-consumed by the community. This study aimed to identify the plant-based nutrition sources in Datengan Village. The study was conducted in the Datengan Village, Grogol Sub-district, Kediri District, East Java Province, Indonesia. Ethnobotany approach through qualitative research (i.e., observation, semi-structured interview, and participant observation) were used to explore the plant-based nutrient sources from forgotten foods in Datengan Village. The results showed forgotten foods in Datengan Village, i.e., fermented foods, mushrooms, by-products, and plant rich-nutrition. There were 26 plant-rich-nutrition, two mushrooms, two fermented foods, and six by-product foods. This investigation is still a preliminary study. 14 handling, processing, and serving methods were used based on the interview. This plant-based nutrition source diversity can be an alternative to fulfill nutrient requirements for the community of Datengan Village and the community of outside areas.

Keywords: Forgotten foods, local knowledge, nutrition sources, plant-based foods

INTRODUCTION

That fast-growing population has several challenges. For example, Indonesia has serious hunger issues and ranks 70 out of 119 countries (von Grebmer et al. 2019). World Food Program (WFP) data revealed that 19.4 million of Indonesia's population suffer from malnutrition (World Food Programmes 2017). Besides, Indonesia's stunting cases are equal to 63% of children's stunting issues in Southeast Asia (FAO 2018).

In the early 1970s, Indonesia applied the green revolution to increase rice production. The program is known as The Five-Farming Efforts *(Panca Usaha Tani)*, i.e., the high-yielding rice varieties, chemical fertilizer and pesticides, irrigation, and intensive rice planting method (Partasasmita et al. 2019; Hidayat et al. 2020). The green revolution's impact is shifting the daily consumption of communities that focus only on rice. By exploring, forgotten foods can be alternative solutions to several challenges from five essential aspects: environmental, agronomic, economic, social, and political elements (Cheng 2018). Thus, food diversity, primarily plant-based foods, can improve the security of food production and as future functional foods (Mayes et al. 2012; Cooper 2015; Baldermann et al. 2016; Massawe et al. 2016; Cheng 2018).

A plant-based diet benefits health and the environment (Lynch et al., 2018). For health, several studies have reported that a plant-based diet can reduce the risk of chronic diseases such as cancer (Catsburg et al. 2015; Orlich et al. 2015; Tantamango-Bartley et al. 2016), mortality and morbidity caused by ischemic heart disease (Szeto et al. 2004; Kwok et al. 2014; Dinu et al. 2017), Diabetes type 2 (Tonstad et al. 2013; Satija et al. 2016), Metabolic syndrome (MetS) (Burkert et al. 2014; Turner-McGrievy et al. 2016). Also, the impact for the human body makes lower glucose (Dinu et al. 2017), body mass index (BMI) (Burkert et al. 2014), diastolic and systolic blood pressure (Pettersen et al. 2012; Yokoyama et al. 2014), triglycerides (De Biase et al. 2007), and lipoprotein cholesterol (Ferdowsian and Barnard 2009; Wang et al. 2015). For the environment, plant protein can reduce water, energy, and land, as well as reduce the GHGEs impact when it is compared with animal protein (Carlsson-Kanyama et al. 2003; Leitzmann 2003; Pimentel and Pimentel 2003; Reijnders and Soret 2003; Baroni et al. 2007; Marlow et al. 2009; Masset et al. 2014: Sabate et al. 2014; Soret et al. 2014; Springmann et al. 2016).

In this study, forgotten foods here mean two definitions: (i) those foods are consumed by the community before, but it is overlooked in the community's daily diet over time; (ii) Forgotten foods are unusually consumed by the community

outside, but it is still or over-consumed by the community (Palupi et al. 2020). This study aims to identify the plant-based nutrition sources in Datengan Village, Kediri, Indonesia. The nutrition source diversity can be an alternative to fulfill nutrition requirements for the community of Datengan Village and outside of the areas.

MATERIALS AND METHODS

Study area

The study was conducted in the Datengan Village, Kediri District, East Java Province, Indonesia. Datengan Village has three hamlets, i.e., Sumbersari, Datengan, and Semen. The village is located in latitude -7.73921 S7º 44'21.5826" and longitude 111.99176 E 111º59'30.30918". The majority of the community's livelihoods are farmers. To reach the city of Kediri, it needs approximately 30 minutes by car with a distance of about 15 km. Topographically, Datengan Village is low-land and has an altitude between 66 to 80 m asl.

Data collection

Ethnobotanical data were documented through the qualitative approach (i.e., observation, semi-structured interview, and participant observation). It was used to explore the nutrition sources from forgotten foods in Datengan Village. An in-depth interview with local experts was conducted using a semi-structured interview. Informants were purposively selected using snowball sampling, including village staff, family welfare education (PKK) members, elders, and households. The in-depth discussion followed prepared interview guidance based on a list of questions related to the topic of study. The observation was carried out to identify community-based socio-environmental aspects by foraging in home gardens, mixed gardens, and farms.

Data analysis

The data was analyzed by cross-checking, synthesizing, and summarizing based on observation, semi-structured interviews, secondary data, and participant observation. Also, the literature review was applied to support the study. The data was divided into four categories, i.e., (i) plant-rich nutrition, (ii) by-product, (iii) fermented food, and (iv) mushroom. The description of each category is provided in Table 1.

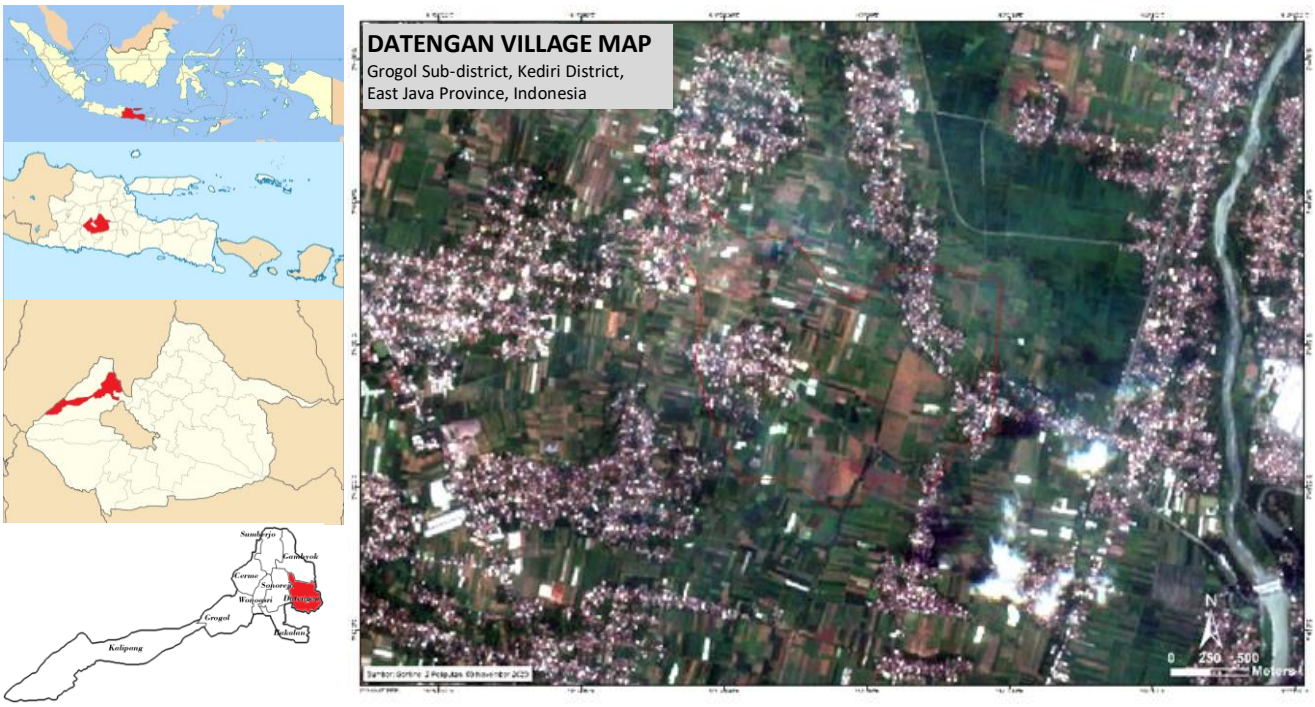

Figure 1. Map of Datengan Village, Grogol Sub-district, Kediri District, East Java Province, Indonesia

Table 1. Definition of each plant-based protein category

Category	Definition
Plant rich-nutrition	Raw materials (leaf, flower, fruit, tuber, seed, and stem) from plants
By product	A secondary product that is processed using the traditional method
Fermented food	Food is processed by using microorganisms
Mushroom	Mushroom taxonomically is not a plant, but mushroom is usually used as an ingredient in plant-based dead. Besides, following the Indonesia Ministry of Health, a mushroom is categorized as a vegetable (*sayuran*) in Indonesian Food Composition Data (Indonesia Ministry of Health 2018)

RESULTS AND DISCUSSION

Usually, traditional foods need plants as essential ingredients. The different regions also have other sources, processes, and components. This study documented 26 plant-rich proteins, two mushrooms, four fermented foods, and six by-product foods. All results found in this study are provided in Table 2-5. The plant-based nutrition sources in Datengan Village consisted of 18 families, and it was dominated by the Fabaceae (8 species) (Figure 2a). The plant part was dominated by the leaf (26%) (Figure 2b). Datengan's community collected the foods from their home gardens (*pekarangan*) and fields. In this village, the community has quite a space to grow several shrubs, trees, herbs, and ornamental plants in their home gardens. Food plants have a significant role in Datengan's Community. The local people consume plant-based foods more often than animal-based foods, and based on economic consideration, plant-based foods are cheaper than animal-based foods.

Leaf

In this study, the community consumed the leaves of nine plants. Commonly, the people of Datengan use the plants like shade, hedgerows, and crops. Even though several plants were wild and weed, such as *Marsilea crenata*, *Sauropus androgynus*, and *Portulaca oleracea*. The dried leaf extract of *M. crenata* showed the significant inhibitory activity of the HMG-CoA reductase enzyme and contained flavonoids, phenolic phytochemicals, and steroids (Hardoko et al., 2019). The ethyl acetate fraction of *Carica papaya* leaf has flavonoids, phenolics, alkaloids, and terpenoids compounds. Moreover, the ethanolic extract of *C. papaya* leaf revealed no potential cytotoxicity on T47D cells, causing high IC50 values (Yuliani and Syahdeni 2020), and accelerated the healing of oral ulcers on the buccal mucosa in the Wistar rat experiment (Femilian et al. 2019). *C. papaya* leaf also is utilized to increase platelets in a patient with dengue hemorrhagic fever and *Aedes aegypti* larvacide (Swastika 2015; Adnyani and Sudarmaja 2016; Ramayanti and Febriani 2016; Agustina 2019; Rahayu and Satmoko 2019: Mustika et al. 2020; Sari and Khaira 2020; Sudarwati et al. 2020). *Moringa oleifera* is also known as a superfood since the protein quality of *M. oleifera* leaf is higher than milk and eggs (Fahey 2005). The extract of *M. oleifera* leaf is used to cure malnutrition and augment breast milk in lactating mothers (Gopalakrishnan et al., 2016). *Sauropus androgynus* also is known to have superior nutrition and vitamin content (Bunawan et al., 2015). It has approximately 7.4 g of protein per 100g of fresh leaves (Padmavathi and Rao 1990). The antioxidant activity of ethanol extract of *Ipomoea batatas* is higher than α-tocopherol (Sulastri et al., 2013). According to Terangpi et al. (2013), the leaf of *Gnetum gnemon* contains high fiber content that has many benefits for health. *Cosmos caudatus* leaf extract shows impacting SGPT levels in the blood of Wistar rats-induced paracetamol (Maulida et al. 2020). *C. caudatus* leaf extract at a 600 µg/ml concentration increased the proliferation of human gingival fibroblasts culture and is non-toxic activity (Shabrina et al. 2018). Susanto et al. (2020) stated that *C. caudatus* at a maximum dose of 7.5 kGy could be preserved using gamma irradiation to avoid changing its anti-cancer properties. The young leaf of *C. caudatus* can be used as herbal tea to increase maturity because it has antioxidant activity (Dian-Nashiela et al., 2015). *C. caudatus* has the potential of antidiabetic activity, anti-hypertensive, bone-protective, anti-inflammatory, antimicrobial, and anti-fungal activity (Javadi et al. 2014; Cheng et al. 2015). Based on analysis from Palupi et al. (2020) showed that *C. caudatus* has a higher protein (19.45%) than *M. olifera* (18.45%) and *Pluchea. indica* (17.36%). *P. indica* leaf extract can be used as therapy in counteracting free radicals and improves histopathology in the liver, jejunum, and kidney (Aulanni'am et al., 2019). The leaf extract of *P. indica* has anti antibacterial activities such as *Enterococcus faecalis* and *Fusobacterium nucleatum* (Pargaputri et al. 2016; Pargaputri et al. 2017), *Propionibacterium acnes* (Hafsari et al. 2015), *Bacillus cereus*, *Pseudomonas fluorescent*, and *Salmonella typhimurium*, as well as also as an antioxidant (Srimoon and Ngiewthaisong 2015; Widyawati et al. 2018). *P. oleracea* has been reported to contain several pharmacological properties such as neuroprotective, antidiabetic, antimicrobial, antiulcerogenic, antioxidant, anticancer activities, and anti-inflammatory (Okafor and Ezejindu 2014; Uddin et al. 2014; Zhou et al. 2015). The crude extracts of *M. crenata* leaf have 6 bioactive compounds, such as steroid, alkaloid, carbohydrate, flavonoid, and decreasing free amino acid and sugar (Nurjanah et al., 2012).

Seed

The seed plants are commonly from legumes because most legumes have a protein that contains about 17-30% and are considered a high-quality source (Reddy et al. 1984). There were six plants consumed based on their seed part. The protein of *Canavalia gladiata* contains a high lysine level (6.49%) (Bressani et al., 1987; Rajaram and Janardhanan 1992). Even though *C. gladiata* and *C. ensiformi*s have high proteins, but they are still underutilized plants (Rajaram and Janardhanan 1992; Ekanayake et al. 2000). Black and red of *C. gladiata* are excellent antioxidant phenolic sources (Gan et al. 2016). In a rat experiment, using seed extract of *C. gladiata* with doses of 100 and 200 mg/kg can decrease AZP-induced hepatotoxicity (Kumar and Reddy 2014). *C. ensiformis* has been tested containing the neutral lipids of 2.21% of whole seeds, as well as the fatty acid, i.e., palmitic (15%), oleic (54%), linolenic (8%), and linoleic (7%) (Gaydou et al. 1992). *Vigna unguiculata* contains %moisture content, crude fat, fiber, protein, carbohydrate of 7.40±0.70, 1.77±0.03, 0.72±0.01, 14.95±0.14, 70.05±0.14, respectively (Musah et al. 2020). The mature seed of *Leucaena leucocephala* has been reported to contain a high of protein (30.81%) rather than dry and fresh leaves (Ekpenyong 1986; Sethi and Kulkarni 1995). Phytochemical investigation of various extracts of *Sesbania*

grandiflora showed steroid, flavonoid, saponin, phenolic, and tannins compounds (Semwal et al., 2018). *G. gnemon* has two protein fractions and antioxidant activities against free radicals (i.e., ABTS, DPPH, and superoxide anion) (Siswoyo et al., 2011). The doses of 600 mg/kg BW of ethanol extract of *G. gnemon* seed showed a significant antidiarrheal effect (Kardela et al., 2018).

Tuber

There were five plants consumed as a food alternative based on their tuber. Local accessions of *Dioscorea alata* from East Java showed that it has macronutrients such as protein (1.29-3.00%), carbohydrate (17.10-29.37%), moisture (65.47-82.46%), fiber (6.70-11.62%), fat (0.00-0.29%), and ash (0.85-1.44%) (Fauziah et al. 2020). The ethanolic extract of *Maranta arundinacea* arrowroot in a rat experiment revealed that it could decrease the concentration of MDA, SGPT, and SGOT (Ramadhani et al., 2017). According to Wijaya et al. (2014), *C. edulis* has scopoletin content (coumarin compound). *Xanthosoma sagittifolium* has an appreciable source of energy, protein, and vitamins that can be used to solve malnutrition challenges (Boakye et al. 2018; Wada et al. 2019). *Dioscorea hispida* is underutilized due to cyanide (HCN) compounds poisoning. To reduce the HCN in *D. hispida*, it can use ash during soaking with boiling (Pramitha and Wulan 2017), as well as repeat washing up to three times (Saleha et al. 2018). *D. hispida* with 630 mg/BW and 1260 mg/BW have been reported reducing glucose concentration with insulin effect in the rat experiment (Sunarsih et al. 2007). Nowadays, these tuber plants are rarely consumed by Datengan's Community. These tuber plants were the source of energy, protein, and carbohydrate as a staple food. They usually consume these tuber plants by steaming, making chips, and boiling.

Fruit

Based on the interview, four plants were consumed by Datengan's Community. The use of *Psophocarpus tetragonolobus* is the fruit or just seed. In the village of Datengan, the community consumed pods of *P. tetragonolobus* as *jangan asem* and *urap* (Table 2). A rat experiment extract using *P. tetragonolobus* with a 500 mg/kg BW dose showed a potential anti-osteoporosis activity (Nurmala et al., 2018). *P. tetragonolobus* is a legume that has beneficial nutritional characteristics. According to Kantha and Erdman (1984), protein contents in the ripe seed of *P. tetragonolobus* are around 29.3-39.0%. As an underutilized legume with rich protein content, the species will be a potential source to alleviate the protein malnutrition problem (Adegboyega et al., 2019). The cooking method with prolonged soaking time will provide the flavor, develop the weight of cooked beans, tenderness, and increase the protein of *P. tetragonolobus* (Ekpenyong and Borchers 1980). Fruit of *Artocarpus heterophyllus*, *A. camansi*, and *A. altilis* have a similar shape. *A. heterophyllus* is consumed both young and ripe. For young fruit, the people of Datengan Village cook for *jangan lodeh* and *bobor*. Immature fruits of *A. heterophyllu*s have protein contains higher than ripe fruits (Ranasinghe et al., 2019). The fruit extract of *A. camansi* has an optimum percentage antioxidant activity to inhibit free radicals at 50.65% (Arif et al., 2018). Moreover, a rat experiment using the extract of *A. altilis* showed that it has a significant anti-atherogenic effect and provides favorable lipid parameters to improve the antioxidant system of hypercholesterolemic (Adaramoye and Akanni 2014).

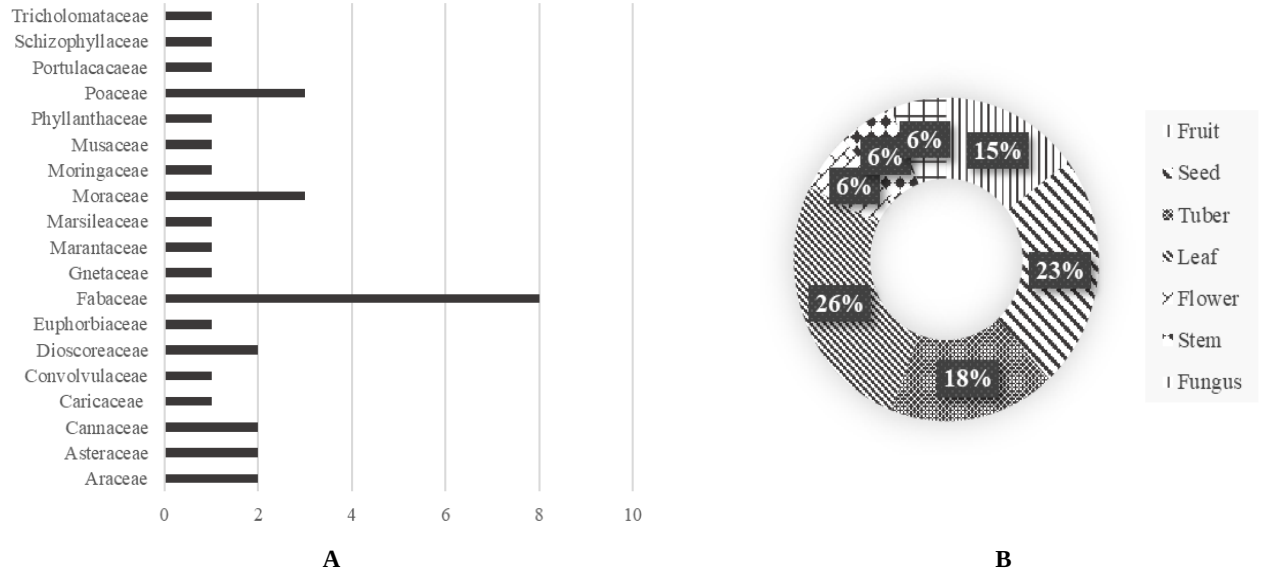

Figure 2. A. Plant family of protein sources in Datengan Village, East Java, Indonesia. B**.** Part used of protein sources in Datengan Village, East Java, Indonesia

Figure 3. Several forgotten foods in Datengan Village, Indonesia A. *Sesbania grandiflora (*flowers), B. *Musa paradisiaca* (flowers), C. *Moringa oleifera* (leaves), D. *Sauropus androgynous* (leaves), E. *Colocasia esculenta* (stems), F. *Vigna unguiculata* (seeds), G. *Artocarpus camansi* (fruits), H. *Carica papaya* (leaves), I. *Xanthosoma sagitifolium* (tubers), J. *tempe gembus* (a by-product from *Glycine max*), K. Cassava *tape* (fermented food from *Manihot esculenta*), L. *Gaplek* (a product from *Manihot esculenta*)

Stem

Two plants were consumed with their stem by Datengan's Community. The young stem of taro (*Colocasia esculenta*) and young shoot of bamboo (*Bambusa* sp.) were sold in 15 traditional markets in Kediri District (Yurlisa et al. 2017). The young node of bamboo's physical characteristic is soft and crunchy (Ainezzahira et al., 2017). Nutrients of the young bamboo shoot are carbohydrates, proteins, vitamins, minerals, and bioactive compounds (Nirmala et al. 2014; Felisbertoa et al. 2017). The young shoot of bamboo also has been reported to reduce blood pressure and blood cholesterol levels (Makatita 2020). The bamboo young shoot's different processing techniques (i.e., fermentation, boiyoung bamboozling) impact the nutrient contents (Satya et al., 2010). The study about the young stem of *C. esculenta* is still limited rather than other parts of *C. esculenta*. Extraction of the young branch of *C. esculenta* through the maceration method at 96% ethanol shows it has the highest antioxidant activity with an IC50 value (74.75 ppm), a total flavonoid of 97.38 mg QE/g extract, and complete phenolic content of 78.98 mg GAE/g extract (Pramiastuti et al. 2019). Both of them are cooked as *jangan bobor* and *lodeh.*

Flower

We also found that Datengan's Community consumed edible flowers such as *Musa paradisiaca* and *Sesbania grandiflora*. Genus Sesbania, around 60 species, is used as a medicinal and therapeutic plant commonly found in Asia, Australia, and Africa (Mohiuddin 2019). Not only *S. Grandiflora* flower but also all parts can be used for medicinal purposes (Kashyap and Mishra 2012; Alahakoon and Gagegoda et al. 2019). With ethanol extracts, S. Grandiflora flower and leaf showed anticancer activity at 100 and 200 mg/kg (Sreelatha et al., 2011). Also, in experiments in mice, methanolic extract (200 and 400 mg/kg) of *S. Grandiflora* flower can increase the provider of circulating antibodies (Arunabha and Satish 2014). The

comparison of flavonoid content between white and red flowers are 12.58-21.35 mg.100 g-1 and 17.32-30.05 mg.100 g-1 (Setiawan 2018), and alkaloid content 17.8% and 18.93%, respectively (Wiranawati et al. 2017). On the other hand, the blossom of banana (*M. paradisiaca*) or jantung pisang in the local language has been reported to contain antioxidant activity (Krishnan and Sinija 2016; Ferdinan and Prasetya 2018), and flavonoid (Walida et al. 2016). Consuming banana blossoms also can raise maternal breast milk output (Rilyani and Wulandasari et al., 2019). Both of them are cooked as *jangan bobor*.

Mushroom

We found two mushroom species consumed by Datengan's Community, i.e., *S. commune* and *C. nebularis*. Datengan's Community does not usually consume mushrooms in their daily consumption because they are rarely found (bloom in transitional season). Besides, they also need special treatment in cooking because people are afraid that the mushrooms are poisonous. Another region of East Java is Wonojati Village, Pasuruan District; they also have been reported to consume these mushrooms (Anwar el at. 2014). Usually, people consume these mushrooms as *bothok*, steamed with spices and grated coconut, and wrapped with banana leaves.

Fermented foods

This study recorded two fermented foods as *tape ketan* (black glutinous rice) and *singkong* (cassava). The black glutinous rice (*ketan*) makes a white and black tape. The starch in cassava and glutinous rice is essential for fermentation products. Fermentation is conducted by using *Saccharomyces cerevisiae* yeast that converts starch to alcohol. *Tape* is served in special moments such as Eid Al Fitr, weddings, meetings, recitations, or other special events. The cooking method of steam or boil is not relatively different from making *tape based* on color, pH, organoleptic properties, ethanol content, and sugar reduction (Marniza et al. 2020).

Black glutinous rice (*ketan hitam*) contains a high anthocyanin compound called pelargonidin 3-glucoside (Adrianta 2016). To serve *tape ketan*, it is steamed or boiled for around 30-40 minutes, then wrapped with banana leaves, and put in a closed or darkroom can produce the best quality *tape ketan* (Kanino 2019). The fermented process does not affect the anthocyanin content of black glutinous rice (Suhartatik et al., 2013). The white glutinous rice (ketan putih) protein is 6.81% (Suriani 2015). The yeast has an essential impact on producing alcohol in cassava and *tape ketan* (Berlian 2016). According to Fathnur (2019), the yeast doses of 1% resulted in the highest alcohol in cassava and the white glutinous rice. On the other hand, cassava is not correlated with ethanol levels (Dirayati et al., 2017).

The alcohol concentration in the *tape* is not affected by fermentation (Sari and Fajar 2019). The alcohol-contained *tape* needs consideration in the halal aspect because MUI Fatwa Number 4 in 2003 stated that containing ethanol (C_2H_5OH) >1% is categorized as *haram* foods (forbidden foods in Islam).

By-products

Datengan's Community also consume *tempe busuk* and *tempe gembus*. *Tempe busuk* or *tempe* overripe or *tempe* over fermented is cooked to make *sambal tumpang*. In Kediri, *sambal tumpeng* is eaten with *sambal pecel* and *rempeyek*. *Tempe busuk* dried at 60ºC is preferred by the consumers because it is not too stingy, has a good texture, is dry, and has a brown color (Andriani et al. 2013). *Tempe busuk* even has been reported to contain a higher protein of 33.22% than *tempe gembus* of 29.42% (Palupi et al. 2020). *Tempe gembus* is a fermented byproduct of tofu (soybeans). Adding 15% *bekatul* in *tempe gembus* provides a smoother texture, 57.24% protein dissolved, and 57.65% protein digested (Murdiati et al. 2000). *Bekatul* has protein as energy of 8.57% (Palupi et al. 2020). *Tempe gembus* variation has been reported to reduce the Hcy and MDA levels (Kurniasari et al., 2017). *Tempe gembus* with bromelain enzyme for 28 days also can decrease fibrinogen and the serum levels of hsCRP in rats (Dewi et al. 2018).

Gatot and *tiwul* are a local food from Gunung Kidul. In Gunung Kidul, dry land makes rice are not suitable to grow. Thus, people consume cassava (the main ingredient) as their food. These foods are consumed with grated coconut and wrapped with banana leaves. Datengan's Community has also consumed these foods, but now people rarely consume *Gatot* and *tiwul*. They currently consume these foods only as a traditional snack (jajanan pasar), so the portion is only tiny and not a staple food anymore. These foods are an alternative to functional foods. For example, *tiwul* has been reported to have a low glycemic index (34.21-37.50) (Hidayat et al., 2016).

In Datengan Village, *nasi jagung* (corn rice) is consumed with *urap*, *sambel tumpang*, and *rempeyek*, or it is also mixed with rice as a staple food. The corn with 12 hours' storage has the highest glucose level of 32.250 ppm (Novianti et al., 2017). According to Novianingtyas et al. (2020), there is no correlation between the consumption habits of nasi jagung and blood glucose in women 31-45 years old. *Nasi jagung* needs more processing corn that it makes people prefer to consume rice than *nasi jagung*. Even though, Maligan et al. (2019) stated that consumers prefer to consume *nasi jagung* rather than rice.

In conclusion, there were 27 plant-rich protein sources, two mushrooms, two fermented foods, and six by-product foods. This investigation is still a preliminary study. Reintroducing nutrition sources from forgotten food needs integration between ethnobotany, bioprospecting, conservation efforts, and market access (Afrianto et al. 2020). The knowledge of cultivating and the creativity of handling, processing, and cooking are needed to empower the community to utilize them. Collaboration with related stakeholders is also required, especially training, funding, and building a sustainable chain food system.

Table 2. Fresh produce of plant-based nutrition sources in Datengan Village, East Java, Indonesia

Local name	Latin name	Family	Parts of plant	Processed product	How to cook and serve
Lamtoro	*Leucaena leucocephala*	Fabaceae	Seed	*Bothok*	*Bothok*: Steamed with spices and grated coconut, wrapped with banana leaves
Kacang tholo	*Vigna unguiculata*	Fabaceae	Seed	*Lodeh*	*Lodeh*: Boiled with spicy, long bean, and coconut milk
Kecipir	*Psophocarpus tetragonolobus*	Fabaceae	Fruit (pod)	*Urap* and *sautéed*	*Urap*: Mixed with other leaves, spices, and grated coconut; Sauteed: sautéed with spices
Koro	*Canavalia ensiformis*	Fabaceae	Seed	*Lodeh*	
Koro pedang	*Canavalia gladiata*	Fabaceae	Seed	*Lodeh*	
Turi	*Sesbania grandiflora*	Fabaceae	Seed, Flower	*Jangan asem, pecel*, and *sambal tumpeng*	*Jangan asem:* Boiled with spicy, long bean, other leaves, and tamarind; *Sambal tumpang:* Boiled leaf and young fruit with tempe busuk
Beluntas	*Pluchea indica*	Asteraceae	Leaf	*Bothok*	
Kenikir	*Cosmos caudatus*	Asteraceae	Leaf	*Urap*	
Ubi jalar	*Ipomoea batatas*	Convolvulaceae	Leaf	*Lodeh*	
Krokot	*Portulaca oleracea*	Portulacaceae	Leaf	*Jangan bening*	*Jangan bening:* Boiled with spicy luffa, other leaves, and tamarind
Katuk	*Sauropus androgynus*	Phyllanthaceae	Leaf	*Jangan bening*	
Kelor	*Moringa oleifera*	Moringaceae	Leaf	*Jangan bening*	
Mlinjo	*Gnetum gnemon*	Gnetaceae	Leaf, seed	*Jangan asem*	
Pepaya	*Carica papaya*	Caricaceae	Leaf	*Pecel* and *sambal tumpeng*	*Pecel*: Cooked salad with peanut sauce
Pisang	*Musa paradisiaca*	Musaceae	Flower	*Lodeh, fried,* and *sautéed*	
Lompong	*Colocasia esculenta*	Araceae	Stem	*Lodeh*	
Bambu	*Bambusa* sp.	Poaceae	Stem	*Lodeh (young shoot of bamboo)*	
Nangka	*Artocarpus heterophyllus*	Moraceae	Fruit	*Bobor*	*Bobor*: Boiled spices with milky coconut
Kluwih	*Artocarpus camansi*	Moraceae	Fruit	*Bobor*	
Sukun	*Artocarpus altilis*	Moraceae	Fruit	*Bobor*	
Uwi	*Dioscorea alata*	Dioscoreaceae	Tuber	Boiled	
Garut	*Maranta arundinacea*	Marantaceae	Tuber	Boiled	
Ganyong	*Canna edulis*	Cannaceae	Tuber	Boiled	
Entik	*Xanthosoma sagittifolium*	Araceae	Tuber	Boiled	
Gadung	*Dioscorea hispida*	Dioscoreaceae	Tuber	Chip	
Semanggi	*Marsilea crenata*	Marsileaceae	Leaf	*Pecel*	

Table 3. Mushroom of plant-based nutrition sources in Datengan Village, East Java, Indonesia

Local name	Latin name	Family	Parts of plant	Processed product	How to cook and serve
Jamur grigit	*Schizophyllum commune*	Schizophyllaceae	Fungus	*Bothok*	*Bothok:* Steamed with spices and grated coconut, wrapped with banana leaves
Jamur barat	*Clitocybe nebularis*	Tricholomataceae	Fungus	*Bothok*	

Table 4. Fermented food of plant-based nutrition sources in Datengan Village, East Java, Indonesia

Fermented food	Source plant	Family	Parts of plant	Processed product	How to cook and serve
Tape ketan	*Oryza sativa* var. *glutinosa*	Poaceae	Seed	Steam	Steam and wrapped with banana leaves
Tape singkong	*Manihot esculenta*	Euphorbiaceae	Tuber	Steam	

Table 5. By product of plant-based nutrition sources in Datengan Village, East Java, Indonesia

By-products	Source plant	Family	Parts of plant	Processed product	How to cook and serve
Tempe gembus	*Glycine max*	Fabaceae	Seed	Fried	
Tempe busuk	*Glycine max*	Fabaceae	Seed	*Sambal tumpang*	*Sambal tumpang:* Boiled leaf and young fruit with tempe busuk
Bekatul	*Oryza sativa*	Poaceae	Seed	*Jenang*	*Jenang*: boiled with coconut milk and palm sugar baked
Gaplek	*Manihot esculenta*	Euphorbiaceae	Tuber	Steam	
Tiwul	*Manihot esculenta*	Euphorbiaceae	Seed	Steam	
Nasi jagung	*Zea mays*	Poaceae	Seed	Steam	

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