

# Plant diversity and its use in Javanese urban home garden: An ethnobotanical study in Central Java, Indonesia

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**Abstract.** Darmastuti SA, Nazar IA, Setyawan AD. 2024. *Plant diversity and its use in Javanese urban home garden: An ethnobotanical study in Central Java, Indonesia. Asian J Ethnobiol 7: 32-42.* Urbanization makes the spread of botanical knowledge increasingly widespread. Ethnobotanical knowledge brought by village communities can be applied in urban areas. The implementation of ProKlim (Climate Village Program) by the Indonesian Government strengthens the development of environmentally friendly cities that are able to adapt and overcome climate change and are sustainable by paying attention to the balance of social, economic, and environmental aspects. Currently, communities and home gardens have responded to various driving factors, such as the environmental movement and urban sustainability, and are more focused on providing healthy local food and community development. The objectives of this study were to find out the medicinal and food plants found in the home gardens and community gardens of ProKlim RW 16 Banjarsari Village, Banjarsari Sub-district, Surakarta City, Central Java, Indonesia and the influence felt by the community and knowing the existence of ProKlim RW 16 to support the 13<sup>th</sup> Sustainable Development Goals (SDGs), climate action. The method used is descriptive quantitative, which is conducted through observation, interviews, and questionnaires. Data from observations and interviews were calculated using the formula of Use Value, Relative Frequency of Citation, Informant Consensus Factor, and Fidelity Level. Meanwhile, questionnaire data is calculated using the Likert Scale calculations. The research results show 56 species that residents often use for medicinal and food plants. The most widely used medicinal plant is lemongrass (*Cymbopogon citratus* (DC.) Stapf), and the most widely used food plant is chili (*Capsicum frutescens* L.). Based on Likert Scale calculations, the adaptation indicator states that 90.25% of respondents agree that food plants grown by themselves are fresher and healthier. Meanwhile, on the mitigation indicator, 93.39% of respondents agreed that the more plants planted could reduce air pollution and lower the earth's temperature.

**Keywords:** Ethnobotany, plants, sustainable development, urban home garden, women farming groups

## INTRODUCTION

Humans need nature to survive through water, land, and air components. Excessive use of the environment to meet human needs negatively impacts the environment and disrupts its ecosystem. Global warming is characterized by increasingly hot temperatures and erratic weather conditions. According to Leontinus (2022), climate change is an implication of global warming, which is caused by an increase in greenhouse gases, especially carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>). The increase in the earth's temperature not only has an impact on increasing the earth's temperature but also changes the climate system, which influences changes in various aspects of nature and human life, such as the quality and quantity of water, habitat, forests, health, agricultural land and ecosystems. The Indonesian Ministry of Environment and Forestry is adapting to climate change through the ProKlim (Climate Village Program) implemented throughout Indonesia. The program aims to increase community involvement and other stakeholders to strengthen adaptation capacity to the impacts of climate change and provide recognition for adaptation and mitigation efforts on climate change that have been carried out to improve welfare at the local level according to regional conditions.

Home gardens in Javanese villages often contain a wealth of flora that can be divided into ornamental gardens,

vegetable gardens, fruit gardens, and border fences that demarcate the home garden or land ownership. Indonesian home gardens are ideal for growing a variety of flora as ingredients for spices, vegetables, medicinal, aromatic ingredients, or for other purposes. Moreover, various plants in gardens (*kebun*) or home gardens (*pekarangan*) are considered part of the farming culture in the environment around the house in urban communities (Hakim 2014). According to Shackleton et al. (2017), urban green spaces and home gardens encourage diversity and food security, enable adaptation to climate change, improve life quality and well-being, and increase connectivity between urban landscapes and remaining forest areas.

Ethnobotany is the science of the relationship between humans and plants. The terminology of ethnobotany was introduced by the North American plant expert John Harshberger in 1895 to describe the scientific discipline that pays special attention to matters related to plants used by primitive and aboriginal people. In the early days of ethnobotany, most surveys focused on collecting information on plant species, local names, and their benefits. There are several reasons why the study of urban ethnobotany should be prioritized, i.e.: (i) its potential for biodiversity and germplasm conservation; (ii) the high number of exotic and potentially invasive plant species; therefore, including of great economic and ecological importance; (iii) urban home gardens can provide food in

an environmentally friendly manner, preserving biodiversity and ecological and socio-economic sustainabilities; (iv) accelerating urbanization around the world will lead to gardens size reduction and potentially affect wealth; and (v) its contribute to the social networks maintenance.

Moreover, a home garden around the house with clear boundaries and ownership, has the potential to produce valuable crops. In addition to the garden aesthetic and production benefits, vegetable and medicinal plants support the health and wellness of family members. These gardens also have many additional benefits: follow a green lifestyle by planting gardens, starting from home, to cope with global warming trends (Igustita et al. 2023). RW 16 Banjarsari Village, Banjarsari Sub-district, Surakarta City, Central Java, Indonesia, is one of the ProKlim program implementation areas. One of the programs is to support the previously existing Bon Surgo Women Farmers Group. This group is developing urban agriculture and managing a community garden (*kebon/kebun bersama*) called Asmatoga (medicinal plant garden) and other community gardens which were previously bare land, as well as supports the planting of useful plants in members' home gardens (house yards, *pekarangan*), especially food and medicinal plants. This research examined the plant diversity found in the community and home gardens of ProKlim RW 16 Banjarsari Village, knowing the existence to support the 13<sup>th</sup> Sustainable Development Goals (SDGs), i.e., climate action.

## MATERIALS AND METHODS

### Study area

This research was conducted from July to August 2023 at the Climate Village Program (ProKlim) in RW 16, Banjarsari Village, Banjarsari Sub-district, Surakarta City, Central Java, Indonesia (Figure 1). Banjarsari has an area of approximately 2.33 km<sup>2</sup>. According to data from the

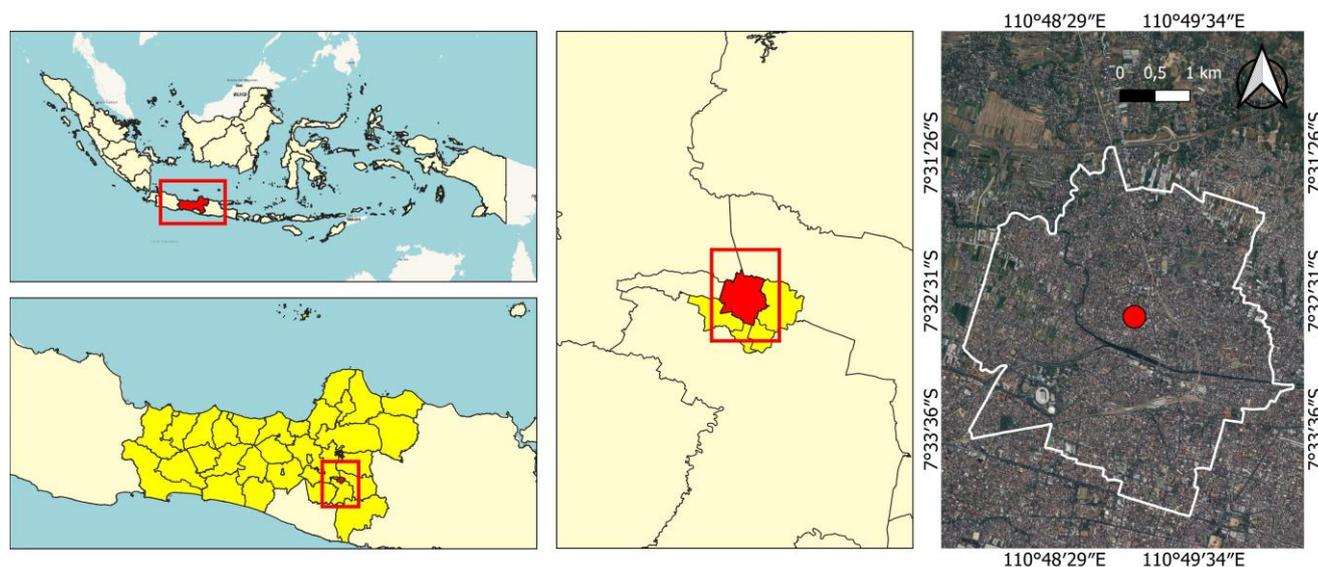
Surakarta City Population and Civil Registration Service (2022), the 2022 population was 20,056 people.

### Procedures

The research uses observation, as well as interview and questionnaire sheets for respondents who have met the criteria, i.e. home gardener, know plants, and are over 17 years old. The Slovin formula calculation, with a population of 174 people of ProKlim RW 16 Banjarsari Village (also member of Bon Surgo Women's Farmers Group) and a degree of accuracy of 5%, therefore, the sample size of 121 is sufficient. Meanwhile, interview with two key respondents, namely management from ProKlim RW 16 Banjarsari Village (i.e., Tri Sumardi) and Bon Surgo Women Farmers Group (i.e., Christian Hari), was used to provide a broad overview of socio-economic and environmental problems in the research location, to select initial respondents, and to support discussion.

The sampling technique used is non-probability sampling, namely purposive or non-random sampling, carried out with certain considerations and objectives. Respondents were appointed based on the direction of ProKlim RW 16 Banjarsari Village and Bon Surgo Women Farmers Group management and continued with a snowball sampling technique based on suggestions from previous respondents.

The data collection techniques used in this research were interviews, observation, and questionnaires. Data collected through field observations include the diversity of plant species, names, numbers, parts used, processing methods, and home garden development with the Bon Surgo Women Farmers Group. Plant diversity was carried out through direct house-to-house surveys to observe the presence of medicinal plants in home gardens (*pekarangan*). While, plants in community gardens (*kebon/kebun bersama*) of Asmatoga and others were recorded and documented for each species growing for further identification using POWO (Plants of the World Online, <https://powo.science.kew.org/>), as well as plants from home gardens.



**Figure 1.** Map of research location in Banjarsari Village, Banjarsari Sub-district, Surakarta City, Central Java Province, Indonesia

Interviews were conducted to observe the management of the Bon Surgo Women Farmers Group and the perceived impact of the Climate Village Program (ProKlim). The questionnaire method was used to obtain respondents' opinions regarding the existence of ProKlim, which can support the Sustainable Development Goals, and to find out the plant diversity used, processing methods, parts used, and the plant's properties. The questionnaire, in the form of a statement, will be evaluated using a rating scale, i.e., Likert scale (Likert 1932). The data analysis technique uses quantitative descriptive methods.

### Data analysis

The data analysis used in this research is an interactive analysis proposed by Miles and Huberman (1994) to assess the relative importance of locally known species using the Use Value (UV) formula.

$$UV = \frac{\sum U}{n}$$

Where:

UV : Use Value;

U : Number of citations per species;

n : Total number of informants.

Relative Frequency of Citations (RFC) is useful for indicating the local importance of each species. RFC was initiated by Tardío and Pardo-de-Santayana (2008). RFC has a value of 0 to 1.

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

Where:

RFC : Relative Frequency of Citation;

F<sub>c</sub> : Number of informants who mentioned using the species;

N : Total number of informants.

Many medicinal plant variables influencing the environment include local and scientific species names, number of medicinal plants, most reported medicinal uses, most frequently treated diseases, processing methods, and perceived efficacy. The homogeneity of local knowledge use was determined using the Informant Consensus Factor formula by Trotter and Logan (2019). The ICF value varies from 0 to 1. The ICF value is calculated using the equation (Silalahi et al. 2018; Cornara et al. 2014):

$$ICF = \left( \frac{Nur - Nt}{Nur - 1} \right)$$

Where:

ICF : Informant Consensus Factor;

Nur : Several usability reports for each category;

Nt : Several plant species used for a particular category by all informants.

Fidelity or fidelity levels are used to calculate the percentage of medicinal plants used most frequently in each disease or particular use category. The Fidelity level value can be calculated using the following formula:

$$FL = \frac{N_p}{N} \times 100\%$$

Where:

FL : Fidelity Level;

N<sub>p</sub> : Informant who mentioned medicinal plants for certain disease categories;

N : Total number of informants.

Meanwhile, the questionnaire is analyzed using the Likert Scale formula. The Likert scale measures attitudes, opinions, and perceptions of a person or group of people about social phenomena using interval data (Likert 1932).

$$Likert\ Scale = T \times P_n$$

Where:

T : Total number of respondents who voted;

P<sub>n</sub> : Choice of Likert Score Numbers

## RESULTS AND DISCUSSION

### Diversity and benefits of plants

Linda and Nurlaila (2014) revealed that home garden areas are generally planted with various plants that benefit residents and the surrounding environment. The food and medicinal plant species in ProKlim RW 16 Banjarsari Village consist of various species that provide ecological benefits. According to Azra et al. (2014), other factors supporting this home garden's potential are the tropical climate conditions and the high biodiversity in Indonesia, which should be able to fulfill people's food needs throughout the year.

Besides, people deliberately plant to extract their benefits; the wider the home garden, the more plant species people plant (Tobondo et al. 2021). The UV, RFC, ICF, and FL calculations are important in ethnobotanical studies of each species of food and medicinal plant use in ProKlim RW 16, Banjarsari Village. Therefore, Table 1 shows the plants used by residents of RW 16 Banjarsari Village.

Based on Table 1, the results of observations of plant use by the community in the ProKlim RW 16 Banjarsari Village area showed that 56 species of plants were obtained. This research only focuses on the species of medicinal plants and food plants that are used. As a result, 31 medicinal plants and 27 food plants were found, where two species are used either as medicinal or food plants, namely *Carica papaya* L. and *Psidium guajava* L. The leaves are for medicine, while the fruits are for food.

**Table 1.** Diversity of plants used by residents of RW 16 Banjarsari Village, Surakarta, Central Java, Indonesia

Scientific name	Local name	Name	Type	Parts used	Processing method	Perceived benefits	Source for cultivation	Amount of plants
<i>Allium cepa</i> L.	<i>Bawang merah</i>	Onion	Food	Leaf	Boiled	Reduces the risk of cancer	Tubers	2
<i>Aloe vera</i> (L.) Burm.f.	<i>Lidah buaya</i>	Aloe vera	Medicine	Stem	Polished	Treating skin diseases	Bud	6
<i>Alpinia galanga</i> (L.) Willd.	<i>Laos</i>	Galangal	Medicine	Bulbs	Cooked	Food flavoring	Tubers	7
<i>Alternanthera sissoo</i> Velde	<i>Bayam brazil</i>	Brazilian spinach	Medicine	Leaf	Boiled	Improves immunity and bone health	Seeds	2
<i>Amaranthus viridis</i> L.	<i>Bayam</i>	Spinach	Food	Leaf	Boiled	Vitamin A adds iron, prevents anemia	Seeds	7
<i>Annona muricata</i> L.	<i>Sirsak</i>	Soursop	Food	Fruit	Blended	Increasing the body's endurance reduces the risk of hemorrhoids	Seeds	2
<i>Annona squamosa</i> L.	<i>Srikaya</i>	Sugar apple	Food	Fruit	Eaten raw	Vitamin	Seeds	2
<i>Anredera cordifolia</i> (Ten.) Steenis	<i>Binahong</i>	Heartleaf maderavine	Medicine	Leaf, seed	Eaten raw, boiled	Medicine for fatigue, herpes	Planted seeds, cuttings	2
<i>Apium graveolens</i> L.	<i>Seledri</i>	Celery	Medicine	Leaf	Boiled	Lowers high blood pressure	Seeds	8
<i>Averrhoa bilimbi</i> L.	<i>Belimbing sayur</i>	Star fruit	Medicine	Fruit	Boiled	Cough medicine	Seeds	3
<i>Averrhoa carambola</i> L.	<i>Belimbing</i>	Star fruit	Food	Fruit	Eaten raw	Lowers high blood pressure	Seeds, stem cuttings	2
<i>Brassica chinensis</i> L.	<i>Sawi sendok / pakcoy</i>	Pak choi	Food	Leaf	Cooked	Facilitates digestion	Seeds	9
<i>Brassica oleracea</i> L.	<i>Kubis</i>	Cabbage	Food	Fruit	Eaten raw	Protects the body from radiation	Seeds	2
<i>Brassica oleracea</i> var. <i>botrytis</i> L.	<i>Kembang kol</i>	Cauliflower	Food	Fruit	Boiled	Rich in antioxidants, it reduces the risk of heart attack	Seeds	4
<i>Capsicum frutescens</i> L.	<i>Cabai</i>	Chili	Food	Fruit	Boiled, fried	Cooking ingredients, preventing sprue, vitamin C	Seeds	44
<i>Carica papaya</i> L.	<i>Daun pepaya</i>	Papaya leaf	Medicine	Leaf	Cooked	Increase appetite	Seeds	8
<i>Carica papaya</i> L.	<i>Pepaya</i>	Papaya	Food	Fruit	Eaten raw	Facilitates digestion	Seeds	8
<i>Centella asiatica</i> (L.) Urb.	<i>Pegagan</i>	Asiatic pennywort	Medicine	Leaf	Boiled	Immune	Bud	2
<i>Citrus aurantiifolia</i> (Christm.) Swingle	<i>Jeruk nipis</i>	Lime	Medicine	Fruit	Squeezed	Relieves cough	Seeds	5
<i>Citrus hystrix</i> DC.	<i>Jeruk purut</i>	Kaffir lime	Medicine	Leaf, fruit	Squeezed	Oral health, food flavoring	Graft	6
<i>Citrus limon</i> (L.) Osbeck	<i>Lemon</i>	Lemons	Medicine	Fruit	Squeezed	Relieves cough	Graft	3
<i>Citrus reticulata</i> Blanco	<i>Jeruk</i>	Orange	Food	Fruit	Eaten raw	Vitamin C	Planted seeds, cuttings	5
<i>Clitoria ternatea</i> L.	<i>Bunga telang</i>	Butterfly pea	Medicine	Flower	Brewed	Bone strengthener	Seeds	4
<i>Cucumis sativus</i> L.	<i>Timun</i>	Cucumber	Food	Fruit	Eaten raw	Lowers high blood pressure	Seeds	2
<i>Curcuma longa</i> L.	<i>Kunyit</i>	Turmeric	Medicine	Bulbs	Boiled	Treats stomach acid, relieves stomach ulcers	Tubers	33
<i>Curcuma zanthorrhiza</i> Roxb.	<i>Temulawak</i>	Curcuma	Medicine	Bulbs	Boiled	Digestive medicine	Tubers	6
<i>Cymbopogon citratus</i> (DC.) Stapf	<i>Serai dapur</i>	Lemongrass	Medicine	Stem	Boiled	Repels mosquitoes, relieves fever, cough medicine, warms the body	Stem cuttings	40
<i>Daucus carota</i> L.	<i>Wortel</i>	Carrot	Food	Bulbs	Juice	Maintain eye health, control blood sugar levels	Tubers	5
<i>Dimocarpus longan</i> Lour.	<i>Kelengkeng</i>	Longan	Food	Fruit	Eaten raw	Prevents aging	Seeds	2
<i>Fragaria ×ananassa</i> (Weston) Rozier	<i>Strawberry</i>	Strawberries	Food	Fruit	Eaten raw	For heart health and preventing cancer, a source of vitamin C	Seeds, stolen	7

<i>Ipomoea reptans</i> Poir	<i>Kangkung</i>	Kangkung	Medicine	Leaf	Cooked	Prevent diabetes, increase iron, prevent anemia	Seeds	17
<i>Kaempferia galanga</i> L.	<i>Kencur</i>	Kencur	Medicine	Bulbs	Boiled	Treats bruises, relieves coughs and sore throats	Tubers	20
<i>Limonium arboreum</i> (Willd.) H.Arnaud	<i>Lavender</i>	Lavender	Medicine	Flower	Dried	Mosquito repellent	Stem/root cuttings	2
<i>Luffa acutangula</i> (L.) Roxb	<i>Gambas / oyong</i>	Loofah	Food	Fruit	Cooked	Reduces diabetes, cleans the blood, reduces weight, overcomes inflammation, and improves bowel movements	Seeds	5
<i>Mangifera indica</i> L.	<i>Mangga</i>	Mango	Food	Fruit	Eaten raw	Contains vitamin C	Seeds, stem cuttings	4
<i>Manihot esculenta</i> Crantz	<i>Singkong</i>	Cassava	Food	Bulbs	Boiled	Source of carbohydrates	Stem	8
<i>Momordica charantia</i> L.	<i>Pare</i>	Bitter melon	Food	Fruit	Cooked	Lowers high blood pressure	Seeds	4
<i>Moringa oleifera</i> Lam.	<i>Kelor</i>	Moringa	Medicine	Leaf	Boiled	Lowers high blood pressure and cholesterol, uric acid	Stem	4
<i>Musa acuminata</i> Colla	<i>Pisang / gedang</i>	Banana	Food	Fruit	Eaten raw	Strengthens leg bones	Stem	4
<i>Pandanus amaryllifolius</i> Roxb. ex Lindl.	<i>Pandan</i>	Pandan	Medicine	Leaf	Blended	Lowers high blood pressure, makes cooking smell good	Roots	20
<i>Persea americana</i> Mill.	<i>Alpukat</i>	Avocado	Food	Fruit	In juice	Maintains heart health, lowers cholesterol	Seeds	3
<i>Phaleria macrocarpa</i> (Scheff.) Boerl.	<i>Mahkota dewa</i>	God's crown	Medicine	Flower	Boiled	Lowers high blood pressure	Seeds	2
<i>Phyllanthus buxifolius</i> (Blume) Müll.Arg.	<i>Seligi</i>	Seligi	Medicine	Leaf	Pounded	Treating sprains	Stem cuttings	2
<i>Piper ornatum</i> N.E.Br.	<i>Sirih merah</i>	Celebes pepper	Medicine	Leaf	Boiled	Reproduction health	Leaf cuttings	2
<i>Piper retrofractum</i> Vahl	<i>Cabe puyang</i>	Balinese long pepper	Medicine	Fruit	Boiled	Body endurance	Stem cuttings	2
<i>Pometia pinnata</i> J.R.Forst. & G.Forst.	<i>Matoa</i>	Matoa	Food	Fruit	Eaten raw	Vitamins increase body endurance	Seeds, graft them	2
<i>Psidium guajava</i> L.	<i>Daun jambu</i>	Guava	Medicine	Leaf	Boiled	Cure diarrhea	Seeds	4
<i>Psidium guajava</i> L.	<i>Jambu biji</i>	Guava	Food	Fruit	In juice	Maintain body endurance	Seeds, stem cuttings	10
<i>Sauropus androgynus</i> (L.) Merr.	<i>Katuk</i>	Star gooseberry	Medicine	Leaf	Boiled	Facilitates breast milk	Stem cuttings	4
<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	<i>Johar</i>	Siamese cassia	Medicine	Leaf	Boiled	Overcoming itching	Stem cuttings	2
<i>Solanum lycopersicum</i> L.	<i>Tomat</i>	Tomato	Food	Fruit	Eaten raw	Maintain eye health, vitamin C	Seeds	18
<i>Solanum melongena</i> L.	<i>Terong</i>	Eggplant	Food	Fruit	Boiled, fried	Prevents chronic diseases, source of vitamins	Seeds	18
<i>Syzygium aqueum</i> (Burm.f.) Alston	<i>Jambu air</i>	Water rose apple	Food	Fruit	Eaten raw	Contains vitamins	Seeds	5
<i>Syzygium polyanthum</i> (Wight) Walp.	<i>Daun salam</i>	Bay leaf	Medicine	Leaf	Boiled	Treating high blood pressure, kitchen spices, gout	Stem	19
<i>Vigna sesquipedalis</i> (L.) Fruwirth	<i>Kacang panjang</i>	Long beans	Food	Fruit	Boiled	Vitamin	Seeds	6
<i>Vitis vinifera</i> L.	<i>Anggur</i>	Grape	Food	Fruit	Eaten raw	Reduces the risk of heart attack	Seeds	3
<i>Zingiber officinale</i> Roscoe	<i>Jahe</i>	Ginger	Medicine	Bulbs	Boiled	Relieves sore throat	Tubers	20
<i>Ziziphus mauritiana</i> Lamk.	<i>Daun bidara</i>	Bidara leaves	Medicine	Leaf	Boiled, juice	Antioxidant	Stem	2

The medicinal plant species most often used by the community is the lemongrass (*Cymbopogon citratus* (DC.) Stapf). As many as 40 respondents mentioned lemongrass as a plant that has properties for repelling mosquitoes, reducing fever, cough medicine, and warming the body. The part of the lemongrass (*C. citratus*) that is used is the stem, and then the method of processing is boiling. The food crop that respondents most widely use is the chili plant as a food crop. A total of 44 respondents mentioned chili (*C. frutescens*). Chili is useful as a cooking ingredient, preventing sprue and vitamin C. The use of parts of the chili plant is in the fruit, and then the method of processing is by boiling or frying.

Use value determines plant species that have high utility in society. The greater the value obtained, the more the plant species is useful in society (Anggreini et al. 2021). The results of the highest use value calculation with a value of 1 are found in 4 food plant species, including Brazilian spinach (*Alternanthera sissoo* Velde), *Matoa* (*Pometia pinnata* J.R.Forst. & G.Forst), soursop (*Annona muricata* L.) and *gambas* (*Luffa acutangular* (L.) Roxb). Brazilian spinach is useful for improving immunity and bone health. Based on research by Elidar and Purwati (2022), *Matoa* trees have many potential benefits so that they can be developed. *Matoa* seeds can be used as local food, wood can be used for light construction materials, and bark and leaves can be used to treat fever and increase stamina. The bark is used to treat festering wounds because it contains antibacterials.

The soursop plant also increases the body's endurance and reduces the risk of hemorrhoids. Soursop leaves are also effective in preventing cancer. The *gambas* plant is a plant that has benefits for reducing diabetes, cleansing the blood, reducing weight, overcoming inflammation, and improving bowel movements. Ginger is the plant with the lowest use value (*Zingiber officinale* Roscoe). This plant has a use value of 0.05. People in RW 16 only said that the ginger plant has one benefit: relieving sore throats. The mention of the value of a species regarding the benefits felt by society influences the use value.

The Relative Frequency of Citation (RFC) of plants used by the community in the ProKlim RW 16 Banjarsari Village area is 0.02-0.36. Chili plants have the highest RFC value, 0.36. The chili plant (*C. frutescens*) is often used by 44 respondents as a cooking ingredient to prevent sprue. It contains vitamin C. Plants with high RFC values are the species most often used to cure diseases by the community because they are easy to find and cultivate in the environment.

Moreover, 24 plant species have the lowest RFC value of 0.02. These species include: starfruit (*Averrhoa bilimbi* L.), lemon (*Citrus limon* (L. Osbeck)), avocado (*Persea americana* Mill.), grape (*Vitis vinifera* L.), lavender (*Limonium arboreum* (Willd.) H.Arnaud), *pegagan* (*Centella asiatica* (L.) Urb.), *seligi* (*Phyllanthus buxifolius* (Blume) Müll.Arg.), *srikaya* (*Annona squamosa* L.), *cabe puyang* (*Piper retrofractum* Vahl), *bidara* leaves (*Ziziphus mauritiana* Lamk.), *binahong* (*Anredera cordifolia* (Ten.) Steenis), *mahkota dewa* (*Phaleria macrocarpa* (Scheff.) Boerl.), *johar* (*Senna siamea* (Lam.) H.S.Irwin &

Barneby), star fruit (*Averrhoa carambola* L.), onion (*Allium cepa* L.), longan (*Dimocarpus longan* Lour), cabbage (*Brassica oleracea* L.), cucumber (*Cucumis sativus* L.), *sirih merah* (*Piper ornatum* N.E.Br.), Brazilian spinach (*A. sissoo*), *Matoa* (*P. pinnata*) and soursop (*A. muricata*). These plants have low RFC values because they are rarely used by most people in everyday life.

ICF values range from 0.43 to 1. In calculating ICF, need Nur and Nt. Nur is the number of usability reports for each category. Meanwhile, Nt is the number of plant species used for a particular category. A value of 1 was found in 10 species in fever, diarrhea, reproduction health, sprains, breast milk booster, bruises, increased appetite, prevention anemia, warm the body and fatigue. The plant that can treat sprains is the *seligi* (*P. buxifolius*); the *seligi* plant is used by pounding it. Furthermore, plants for breast milk boosters are found in the *katuk* (*Sauropus androgynus* (L.) Merr.) when boiled.

Guava leaves (*Psidium guajava* L.) boiled enriched can treat diarrhea. To boost breastmilk, you can use the *katuk* leaf (*S. androgynus*), whose leaves are boiled. Papaya leaves (*Carica papaya* L.) can increase appetite. Boiled turmeric (*Kaempferia galanga* L.) can treat bruises. Apart from warming the body, the lemongrass (*C. citratus*) can also reduce fever. Maintaining reproductive health can use *sirih merah* (*P. ornatum*) and *kangkung* (*Ipomoea reptana* Poir) to prevent anemia. Boiled *binahong* (*A. cordifolia*) can treat fatigue. The lowest ICF value is 0.43, which is efficacious in increasing body endurance. Based on the Nt column, there are 5 species of immune-boosting plants, namely gotu kola (*C. asiatica*), Brazilian spinach (*A. sissoo*), *cabe puyang* (*P. retrofractum*), *bidara* (*Z. mauritiana*) and soursop (*A. muricata*).

Fidelity Level values range from a high of 19% to a low of 0.42%. A value of 19% was found in the cough category. The 6 species of plants that can treat coughs include starfruit (*A. carambola*), lemon (*C. limon*), lime (*Citrus aurantiifolia* (Christm.) Swingle), ginger (*Z. officinale*), kencur (*K. galanga*) and lemongrass (*C. citratus*). Meanwhile, the lowest value of 0.42% was found in the sprains, fatigue medicine, and reproductive health categories. *Seligi* (*P. buxifolius*) is the plant used to treat sprains. The plant used to treat fatigue is *binahong* (*A. cordifolia*). Then, to maintain reproductive health, respondents use the *sirih merah* (*P. ornatum*). Based on research by Silalahi et al. (2018), it can be said that a high RFC value does not always accompany a high ICF value because the community mentions no plant restrictions, so they cannot focus on certain plants.

### Response to climate program

Twenty (20) statements were given to 121 respondents to discover their perceptions regarding ProKlim activities with SDGs goal 13, i.e., climate action, and the data were calculated using a Likert scale. The Likert scale values were calculated by calculating the score for each statement with a value of 4 (agree) and 5 (strongly agree) to find a positive value for the hypothesis, which states that ethnobotanical studies support the SDGs. Table 2 represents the questionnaire calculations using a Likert scale.

**Table 2.** Results of questionnaire calculations using a Likert Scale

Statement no.	Dimensions	Indicator	Results (%)
1a	Plants planted in the home garden can achieve sustainable consumption and production patterns	Adaptation	84.96
1b	The plant products grown in the Women Farmers Group have economic and ecological value	Mitigation	85.45
2	I like growing food plant	Adaptation	83.64
3	The presence of green open space can be useful in supporting sustainable cities and settlements	Mitigation	89.59
4	I support the presence of green open spaces as an environmental movement and city sustainability	Mitigation	90.58
5	I have felt the impacts of climate change, such as rising temperatures and weather changes	Mitigation	84.96
6	I believe that the more plants planted can reduce air pollution and lower the earth's temperature	Mitigation	93.39
7	I am aware of the importance of environmental management and maintenance in achieving sustainable development	Mitigation	85.12
8	Women Farmers Group activities can support adaptation and mitigation measures for climate change	Adaptation	84.3
9	I use organic fertilizer (compost) to reduce greenhouse gas emissions	Mitigation	80
10	Planting trees can reduce global warming	Mitigation	91.9
11	I plant food crops with varieties that are rain-resistant and drought-resistant	Adaptation	68.1
12	The number of trees can reduce temperature and light intensity and can increase oxygen, soil fertility, and water availability.	Mitigation	89.59
14	Limited land in urban areas is not an obstacle in creating climate change adaptation actions	Adaptation	77.36
15	The harvest of food crops grown by yourself is fresher and healthier	Adaptation	90.25
16	I feel the benefits of the Women Farmers Group	Adaptation	81.65
17	I am sure that the existence of the Women Farmers Group can increase food security	Adaptation	84.3
18	The presence of the Women Farmers Group helps create a beautiful and clean environment	Mitigation	88.1
19	The existence of the Women Farmers Group can strengthen the quality of life, welfare, and connectivity between residents.	Adaptation	83.64
20	The presence of Women Farmers Group can increase green open space in urban areas	Mitigation	82.81

**Table 3.** Calculation of Informant Consensus Factor and Fidelity Level

Disease Category	Nt	Nur	ICF	FL (%)
Cough	6	91	0.94	19
Herbs	4	52	0.94	10.86
Body endurance	5	8	0.43	1.67
Fever	1	40	1	8.35
Diabetes	2	19	0.94	3.97
Diarrhea	1	4	1	0.84
Reproduction health	1	2	1	0.42
Sprains	1	2	1	0.42
Cholesterol & uric acid	2	24	0.96	5.01
Indigestion	2	33	0.97	6.89
Breast milk booster	1	4	1	0.84
Bruises	1	20	1	4.18
Increase appetite	1	8	1	1.67
Prevent anemia	1	17	1	3.55
Warm the body	1	40	1	8.35
Reduces the risk of cancer	2	4	0.67	0.84
Fatigue	1	2	1	0.42
Bone strengthener	2	4	0.67	0.84
Mosquito repellent	2	42	0.98	8.77
Skin disease	3	10	0.78	2.09
High blood pressure	4	53	0.94	11.06

Table 3 revealed the calculation of 20 statements from the questionnaire were obtained. The highest score was obtained in statement number 7 at 93.39%, about the

importance of environmental management and maintenance. The lowest value was obtained in statement number 12 at 68.01%, about the role of trees in reducing temperature and light intensity, as well as increasing oxygen, soil fertility, and water availability.

(1) As many as 84.96% of respondents agreed that plants planted in the home garden could achieve sustainable consumption and production patterns, which aligns with the Sustainable Development Goals. The results of interviews with Christian Hari, the Bon Surgo Women Farmers Group administrator and formerly manager, showed that the community garden (*kebon/kebun bersama*) used in RW 16 Banjarsari Village for Asmatoga medicinal garden and home garden (*pekarangan*) of the Bon Surgo Women Farmers Group achieved sustainable production and consumption patterns. All plants in the home garden and community garden use a sustainable planting system, and the community often needs the plants to be grown. The community also carries out 3R activities (reduce, reuse, recycle) channeled through the "Katon Semilak" Waste Bank to achieve sustainable consumption and production patterns.

(2) As many as 85.45% of respondents agreed that the plant products grown by the Bon Surgo Women Farmers Group had economic and ecological value. Plants grown in community gardens or residents' home gardens with various plant species can increase the ecological area's value. Through an interview with Tri Sumardi, the chairman of ProKlim RW 16 Banjarsari Village, the

Women Farmers Group aims to meet the residents' needs, but if the harvest is abundant, it will be sold to improve the residents' economy. Currently, respondents largely consume the harvested crops.

(3) As many as 83.64% of respondents agreed they preferred growing food plants in line with the aim of the ProKlim RW 16 Banjarsari Village adaptation activities, namely increasing food security. Even though people are used to consuming rice as a staple food, they also use other food plants as a substitute for rice, such as cassava, sweet potatoes, and taro. Apart from non-rice food crops, people also plant food crops in the form of vegetables and fruit in their home gardens.

(4) The presence of green open spaces is useful in supporting sustainable cities and settlements, as 89.59% of respondents agreed. Green open space plays a role in supporting sustainable cities and settlements, and the government has regulated the presence of green open space in cities by 30% of its area. Following research by Anisa (2023), Indonesia is implementing various strategies to realize sustainable cities and community goals by creating cities that are safe and comfortable for them, including: (i) Providing policies regarding air quality and waste management to reduce the negative impact on the urban environment. (ii) Providing policies regarding Public Spaces and Green Open Spaces which are considered to help create a safe, inclusive and easily accessible environment.

(5) The presence of green open spaces as an environmental and city sustainability movement is supported by 90.58% of respondents. Green open spaces in urban areas are an environmental movement that creates a beautiful environment for urban sustainability. One of the mitigation activities is increasing and maintaining vegetation cover in the ProKlim RW 16 Banjarsari Village area; this statement supports the environmental principle of biodiversity. The species planted are also diverse, so they can increase biodiversity and ecological value.

(6) As many as 84.96% of respondents are impacted by climate change, such as rising temperatures and weather changes; people felt the impact of global warming alone. According to research conducted by Nuraisah and Kusumo (2019), extreme climate events will cause (i) harvest and planting failures, which will lead to a decrease in productivity; (ii) damage to agricultural land resources; (iii) an increase in flood/drought intensity; (iv) increased humidity leading to increased nuisance organism intensities.

(7) The respondents agreed that planting more could reduce air pollution and lower the earth's temperature by 93.39%, and this statement has the greatest value compared to other statements. Residents of RW 16 planted various species along the road in residences as a mitigation effort, and bare land is also used as open space for farming. Plants are believed to reduce air pollution and lower the earth's temperature.

(8) Various parties' assistance is important in achieving sustainable development goals to increase public awareness of their environment. As many as 85.12% of respondents agreed with the importance of environmental management and maintenance in achieving sustainable development. Therefore, sustainable development is the effort to maintain

environmental resilience to be able to answer environmental problems. This statement also supports environmental principle number two, namely the principle of preservation and continuity. Sustainable development policies are directly related and aim to safeguard human life, balance natural resources, and promote environmental sustainability (Khairina et al. 2020).

(9) Bon Surgo Women Farmers Group activities support adaptation and mitigation measures to climate change by 84.3%. Adaptation to climate change has the potential to reduce the impacts of climate change. The Women Farmers Group adaptation to climate change is increasing food security by planting plants in the home garden using pots or vertical gardens. This supports establishing the Climate Village Program, namely strengthening global efforts to cope with climate change through food security. The food crops planted diversity affects climate change because the existence of various plants aims to anticipate crop failure due to the impact of climate change. With the diversity of species planted, the food plants that grow in a particular location become increasingly varied so that other plants can still be harvested if one species fails in a particular season.

Several plants resistant to climate change include chilies, tomatoes, eggplant, spinach, sorghum, corn, taro, cassava, pumpkin, long beans, and cucumber. Chili plants are popular with the community and have high economic value. The community has adopted chili plants as an anticipatory measure when the price of chilies increases. Climate changes, due to changes in rainfall, temperature, and humidity, also affect the yield of cayenne pepper (Ridho and Suminarti 2020).

Mitigation efforts are carried out by increasing and maintaining vegetation cover along roads in the RW 16 Banjarsari Village area and reducing greenhouse gas emissions with organic fertilizer. Ethnobotanical studies at ProKlim RW 16 Banjarsari Village have supported mitigation actions against climate change through reforestation. Reforestation is an activity that restores, maintains, and improves the condition of land so that it can produce and function optimally. Reforestation is carried out by maximizing unused land by planting various food crops, and these activities increase economic and environmental profits (increased green open space).

(10) Reducing greenhouse gas emissions is carried out to support climate change mitigation measures. As many as 80% of respondents agreed that using organic fertilizer (compost) could reduce greenhouse gas emissions. In line with research, using organic products is a mitigation technology to bind carbon by slowing the conversion of carbon into CO<sub>2</sub> gas, which will be released into the atmosphere (Munandar et al. 2014; He et al. 2023). Organic fertilizer is fertilizer composed of living creature material, such as weathered remains of plants, animals, and humans (Arifien et al. 2023).

(11) The statement that planting trees can reduce global warming was agreed upon by 91.9% of respondents. This means that respondents are aware that planting plants provides life benefits. Plants are useful for producing oxygen, which is necessary for living organisms, and

making the environment cool and comfortable. More plants planted will reduce air pollution, which can cause global warming (Rini et al. 2018). Home gardens contribute to climate mitigation due to the presence of plants that sequester and store carbon for a long time (Wiryo et al., 2023).

(12) Based on calculations, statement number 12 has a value of 68.1%. The statement "I grow food crops with rain-resistant and drought-resistant varieties" has the lowest value compared to other statements. Even though this statement has the lowest score compared to other statements, according to Table 3, this statement is still in the strongly agree/good category, which can still support the positive value of ethnobotanical studies in supporting the SDGs. Erratic weather changes mean that what is planted can change and even threaten crop failure. Following research by Servina (2019), the impact of climate change on fruit and vegetables in tropical Indonesia includes a decrease in production, both quantity and quality, the emergence of new pests, an increase in pest and disease attacks, and crop failure due to extreme climate. Climate change triggers environmental changes that cause changes in plant responses.

(13) 89.59% of respondents agreed that the number of trees can reduce temperature and light intensity, increasing oxygen, soil fertility, and water availability. Excessive light intensity and temperature can limit plant productivity. Light intensity is when the sun shines in one day (Putra and Faiza 2021), and excessive sunlight increases temperature and reduces air humidity, damaging plants (Friadi and Junadhi 2019).

(14) Limited land in urban areas is not an obstacle in creating climate change adaptation actions at 77.36%. The adaptation activity to this matter is using home gardens and bare land for planting plants. Following research by Rekavianti (2019), other activities that can be carried out to utilize the home garden are cultivating various species of plants, raising fish, and other activities carried out around the house to continuously diversify food ingredients and improve family nutrition.

(15) Moreover, 90.25% of respondents agreed that food crops grown themselves are fresher and healthier. Food grown in the home garden and community garden uses organic fertilizers and pesticides. Providing organic materials can increase productivity and obtain optimal harvest results that are fresher and healthier. According to Pathak et al. (2023) and Kaur et al. (2024), there has been an increase in public awareness of the use of inorganic chemical fertilizers, synthetic pesticides, and growth hormones in agricultural production, which can have a negative impact on human health and the environment.

(16) Therefore, 81.65% of respondents agreed that they felt the benefits of the existence of the Women Farmers Group. They provide benefits related to the environment, including contributing to environmental sustainability, reducing air pollution, and creating beauty and coolness in residential environments (Rinurwati et al. 2021). Similar research was also carried out by Ardy (2022) through the Women Farmers Group to support women in becoming

more productive and independent and improving their socio-economic abilities.

(17) The Women Farmers Group was formed to increase food security in ProKlim RW 16, Banjarsari Village. As many as 84.3% of respondents agreed that the existence of Bon Surgo Women Farmer Groups could increase food security. There needs to be more land in urban areas to grow rice, but the community adapted by planting non-rice foods that function as carbohydrates, such as sweet potatoes, taro, and cassava. Apart from that, the community also grows vegetables, fruit, and medicinal plants, which can be used to fulfill the family's nutrition and health. Based on the results of the author's interview with Christian Hari, the Bon Surgo Women Farmers Group administrator and formerly manager, the aim of establishing ProKlim in RW 16 Banjarsari Village is to raise community awareness to manage their environment and to harvest own crops that reduce vegetable costs of each household. Currently, the harvest is consumed by itself; in the future, it will be sold if the land owned is larger to meet the customer demands.

(18) The presence of the Women Farmers Group helps create a beautiful and clean environment, approved by 88.1% of respondents. Women Farmers Group in urban areas contributes to green open spaces to make the environment beautiful and clean. According to Rini et al. (2018), green open space is necessary to heal the damage to the urban environment, decreasing the oxygen supply. The imbalance of green open space with high air pollutants will cause many problems and disrupt life and human health comfort.

(19) The respondents agreed that the Women Farmers Group could strengthen the quality of life, welfare, and connectivity between respondents by 83.64%. The majority of respondents' jobs are housewives, so the existence of the Bon Surgo Women Farmers Group is very helpful in improving their life and welfare quality and connectivity between residents. Following Isma's research (2023), the Women Farmers Group is a forum for women farmers to process agricultural products that benefit their families and the surrounding community. Statement number 19 supports environmental principles in the form of local wisdom. This principle emphasizes that environmental protection and management efforts must consider the noble values in the community's life system. According to Irwan et al. (2018) and Suwartapradja et al. (2023), the social function of the home garden includes being a place for activities and social interaction. Activities that can be done in the home garden include gathering with neighbors on various activities and setting up a place for social activities. So, it can be concluded that women farming groups can strengthen the quality of life, welfare, and communication between residents.

(20) Respondents agreed that the presence of Women Farmers Group could increase green open space in urban areas with a score of 82.81%. Urban agriculture has developed in many cities, involving community involvement that varies between countries and cities (Tornaghi 2014). Providing green open space as an icon of ecosystem balance is useful for providing clean air and

absorbing carbon dioxide (CO<sub>2</sub>) while reducing urban areas' greenhouse effect and warming (Saragi et al. 2022).

Based on the 20 statements discussed, we find that 17 statements scored above 80%, which means they strongly agree in supporting the SDGs. There are 2 statements with the lowest scores, namely statements 12 and 14, but the results are still above 60%, meaning they still agree to support the SDGs. All the statements submitted in the questionnaire conclude that the ethnobotanical study at ProKlim RW 16 Banjarsari Village can support the 13th Sustainable Development Goal, namely climate action. Following the goals, one of the targets is increasing education, awareness, and human and institutional capacity related to mitigation, adaptation, impact reduction, and early warning of climate change. The observations, interviews, and questionnaires have shown that the community in ProKlim RW 16 Banjarsari Village has awareness and knowledge of mitigation, adaptation, impact reduction, and early warning of climate change.

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