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## The ethnobotany of homegardens along rural corridors as a basis for ecotourism planning: a case study of Rajegwesi village, Banyuwangi, Indonesia

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**Key words:** Homegardens, tourism, plantation, ethnobotanical indexes, conservation.

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### Abstract

Promoting quality environment through home gardens management is crucial in order to enhance ecotourism planning and development in remote areas adjacent to national park. The aim of the research was to analyze the ethnobotanical aspect of home gardens in Rajegwesi Village, Banyuwangi. Data was collected through a floristic survey and in-depth interviews. The floristic survey was conducted on home gardens along the road corridors of the villages. Following the floristic survey, in-depth interviews were done to explore local people perception on structures and functions of home gardens vegetation. Data was analyzed descriptively. Result showed that there were 132 plant species composing home gardens. They were used as a source of food, of medical materials, of livestock food, of firewood, of ornamental plants, of construction materials, of toxic elements, of materials for cultural ceremony, as well as having economic value, and some other minor categories of uses. The diversities of plant in home gardens are principal resources for tourism destination management. It includes home gardens to provide comfortable place to visitor, home garden as harbor of consumable and non-consumable plants to support tourism needs, and home gardens as tourism attraction.

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## Introduction

Tourism in rural area is one of the fast growing businesses able to generate significant economic impact. It is particularly important in many areas in developing countries such as Indonesia where natural and cultural resources are abundance. The growth of tourism is parallel with the availability of resources to enhance tourism practices and programs. The growth of tourism also requires new attractions to invite visitors come to the destination (Baud-Bovi and Lowson, 2002).

Home garden is the habitat for numerous plant species, which act as crucial resources in tourism planning and management. The important role of home gardens in rural area in developing countries has been widely reported. Scholars point out that the role of home gardens may range from local food security to global warming reductions. Home gardens have also been widely reported to contribute to biodiversity conservation (Kumar and Nair, 2004; Arifin *et al.*, 2012). Among the benefit of home gardens, the issue to link home gardens and tourism development is rarely discussed.

Ethnobotanical investigation of home gardens is important for several reasons. Justin and Nancy (2011) explains that ethnobotany is able to generate historical and ecological interactions of people and plants. Ethnobotanical survey often provides basic information on local people participation in biodiversity management. Hakim and Nakagoshi (2007) point out that ethnobotanical data of home gardens is crucial in tourism planning and development strategy. It is particularly important to create destination authenticity. Threats to the ethnobotanical knowledge, however, come from the decrease of recent generation to understand the traditional practices to maintain home garden diversity (Signorini *et al.*, 2009).

In the perspective of local people, diverse plant species in home garden have their own unique value. They often range from medical to economic value, and quite often as sources of daily food.

Understanding the motives behind planting particular plant species is crucial. Such information will allow tourism planners to increase the vegetation quality of home gardens (Kumar and Nair, 2004; Hakim and Nakagoshi, 2007; Arifin *et al.*, 2012; Solossa *et al.*, 2013). It is particularly important in an area adjacent to protected areas such as national parks. Abundant exotic-invasive plant species in home gardens threat the biodiversity in national parks. Improving home gardens as a strategy to improve tourism destination quality, therefore, should be able to minimize exotic plant species in home gardens. So far, few studies have been conducted to describe the flora composition in home gardens in the villages adjacent to such protected areas. Surveys are considered important for those villages near the national parks, since they are potential to be developed as a tourism destination area. However, rural tourism development should be coexisting with the principles of national park's biodiversity conservation by reducing and eliminating potential exotic-invasive species. The aim of this study was then to analyze the ethnobotanical aspects of home gardens along the corridor of Rajegwesi Villages, Banyuwangi, Indonesia.

## Material and methods

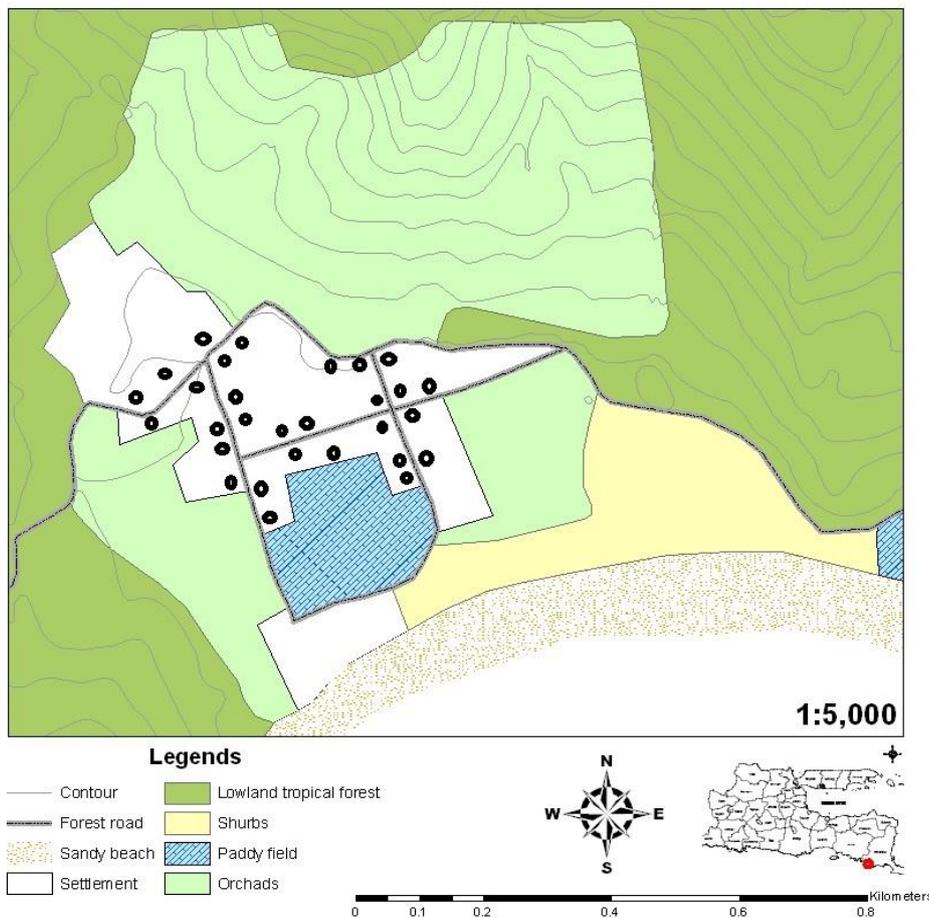
### *Description of the study area*

Rajegwesi is one of the villages which is located in northern coastal area of Banyuwangi, East Java, Indonesia. The village was firstly established as a refugee camp in Meru Betiri National Park area after the 1994 tsunami. Throughout times, the village then develops rapidly and administratively and becomes such a significant problem for Meru Betiri National Park. There have been some arguments to move out the angler families from Rajegwesi area. There are permanent and semi-permanent houses built in Rajegwesi. Generally, the topography ranges from flat (around the coastline) to very steep areas. The majority of the coastal dwellers are anglers (TN Meru Betiri, 2012).

Meru Betiri National Park or Taman Nasional Meru Betiri (TNMB) lies on the 8°20'48" - 8°33'48"S latitude and 113°38'48" - 113°58'30"E longitude.

Ecologically, Meru Betiri National Park is the home of numerous plants and animal species. Some plants are endemic to the national park including *Manggong bamboo (Gigantochloa manggong)*. In the past, Meru Betiri forest was the habitat of Javan tigers

before the tigers finally extinct. Recently, however, the park still contributes a significant role to wildlife conservation. Tourism has been flourished in Meru Betiri due to its spectacular landscapes and animal richness. Among them, sea turtle becomes the icon for special interest tourism in Meru Betiri. The community involvement in tourism practices in national park, however, is less developed (Whitten *et al.*, 1996; Hakim *et al.*, 2000).



**Fig. 1.** Study area at Rajegwesi, TNMB Banyuwangi Region. Dot indicates floristic sampling locations.

*Floristic survey*

Floristic survey was conducted at home gardens along the rural roads (Fig.1.). There were three main roads in Rajegwesi Village becoming the main corridor system of the village to access Meru Betiri National Park. From each road, ten home gardens were randomly selected through a random sampling technique. Totally, thirty (30) home gardens were involved for further floristic survey.

Prior to the floristic survey, ethno botanical observation form was constructed to support field data acquisition. In every selected home garden, floristic survey started with observation on the spatial structure of the home garden and its vegetation. All of the plants found in garden was recorded both its local name and individual number. In every visited home garden, the representative of family members was invited as an informant to complete question regarding to the ethno botanical aspect of the plants

inside the home garden. Informant was requested to state the species value inside the garden following several categories uses, namely plants species as food, medicin material, livestock food, ornamental plants, and source of income, construction materials, firewood, toxic materials for fishing, cultural plants used for ceremony and traditional ritual, and other categoris. Botanical expert staff from Purwodadai Botanical garden, East Java, assisted plants species identification. Voucher specimens that could not be identified in the field were deposited at the herbarium section of Purwodadi Botanical and Plant Taxonomy Laboratory of Brawijaya University for further analysis.

All the collected data was filled in a database and was analyzed using ethnobotanical indexes assisted by Ms. Excel 2010. The RFC and CI were calculated using the following formula:

Relative Frequency of Citation (RFC) (Pardo-de-Santayana, 2008)

$$RFCs = \frac{FCs}{N} = \frac{\sum_{i=1}^{iN} UR1}{N}$$

FCs = Frequency of Citation (the number of informants who mention the spesies)

N = Number of informants who participate in the survey

Cultural Importance Index (CI) (Pardo-de-Santayana, 2008)

$$CIs = \sum_{u=u1}^{UNC} \sum_{i=i1}^{iN} URui / N$$

u = use category

NC= total number of use category

UR= total number of use report

## Results

### *Species Diversity of Home Gardens in Rajegwesi Area*

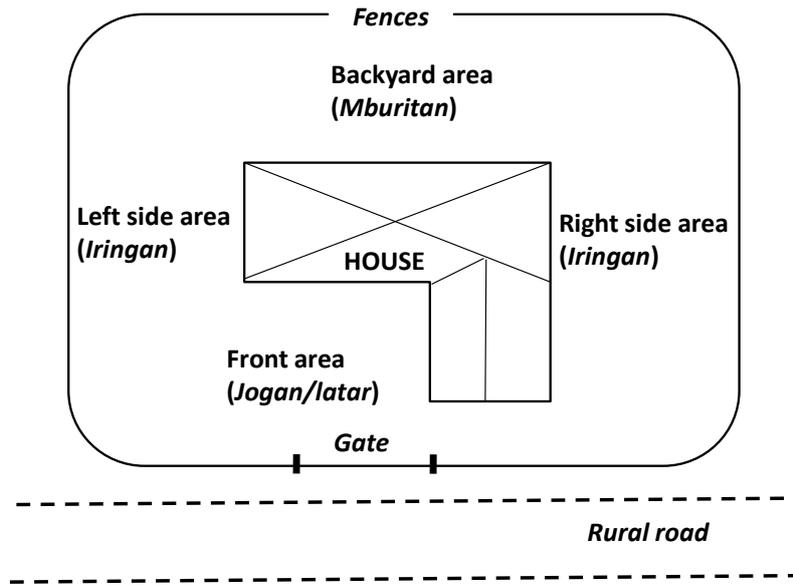
Home gardens in Rajegwesi commonly consist of three zones namely mburitan, iringan and jogan (Fig. 2.). Mburitan is an area that is located behind the home. It is usually used for keeping livestock and firewood. Iringan is an area that is located between or

beside home and it is usually used for planting vegetables, medicinal herbs, and others plantation that support the family daily needs. Jogan is an area that is located in front of the home and is used for planting ornamental and fruit plants. One family often has large land and builds their house in the centre of their land. Spatially, mburitan, iringan and jogan occupy similar percentage in size. Scholars point out that space organization and site naming are commonly found in traditional society (Sarmiento, 1995; Alderman, 2008).

Mburitan is the area where many plants grow in multi-cropping system. Tall and giant trees are often found in mburitan. Some plants even have huge canopy. Iringan is a place to cultivate bananas, spices, and medicinal plants. Jogan often becomes the home of numerous ornamental plant species. The ornamental plants are planted to improve scenic beauty of the home. Interestingly, the black taro or *Colocasia affinis* (locally called sente /lompong ireng) and black sugar cane or *Saccharum officinarum* are often planted in jogan area, particularly in the left and right side. Local people in Rajegwesi believe that those plants could help them avoid any negative power. The vegetation characteristic of jogan, iringan and mburitan in Rajegwesi is similar to many Javanese home gardens (Whitten *et al.*, 1996), but is different from Balinese and Papuan home gardens (Hakim *et al.*, 2009; Solossa *et al.*, 2013).

### *The diversity and important value of species*

Based on the field survey, there are 132 plants species grows in the home gardens. These species come from 54 families. All of the species cited by the local people were grouped into ten categories (Table 1). Some of them have more than one function.



**Fig. 2.** Spatial arrangement of home gardens in Rajegwesi.

**Table 1.** Diversity of plants species in home gardens.

| Category       | Number of plant species | Number of family | Number of Citation |
|----------------|-------------------------|------------------|--------------------|
| Food           | 63                      | 33               | 819                |
| Human medicine | 47                      | 25               | 426                |
| Livestock food | 8                       | 3                | 100                |
| Ornament       | 23                      | 15               | 245                |
| Economic value | 11                      | 8                | 109                |
| Construction   | 14                      | 9                | 120                |
| Firewood       | 23                      | 11               | 182                |
| Cultural       | 22                      | 14               | 213                |
| Toxic          | 4                       | 2                | 43                 |
| Others         | 15                      | 12               | 77                 |

The local people in Rajegwesi showed their basic strategy to live in a remote area by cultivating numerous plants in their home gardens. Food sources are crucial among community in remote areas and cultivating many plants becomes an important strategy to enhance community survival (Marsh, 1998). There were sixty-three species used as food sources mentioned by the informants. They consisted of starchy plant to meet carbohydrates needs, spices plants, and fruits plants. Species related with carbohydrate were mostly species with edible tuber, such as *Colocasia giganteum*, *Colocasia esculenta* and *Amorphophallus paeoniifolius*. The commonest starchy fruit plant found was *Musa paradisiaca*. Some

species were cultivated as vegetables. They consisted of *Amaranthus hybridus*, *Carica papaya*, *Amorphophallus paeoniifolius*, *Colocasia giganteum*, *Cucumis sativus*, *Artocarpus heterophyllus*, *Solanum torvum* and *Solanum melongena*. Flower part of *Musa paradisiaca* was also used as vegetable. Respondents also stated that the seeds of *Leucaena leucocephala* and *Parkia speciosa* were also important as vegetable species. The most common fruits in the home gardens were *Mangifera indica*, *Annona muricata*, *Musa paradisiaca*, *Syzygium aqueum*, *Carica papaya*, *Muntingia calabura* and *Chrysophyllum cainito*. *Cocos nucifera*, *Jatropha gossypifolia*, *Syzygium polyanthum*, *Pandanus*

*latifolius*, *Piper nigrum*, *Citrus hystrix*, *Capsicum annuum* and many species of *Zingiberaceae* were the common spices found in home gardens. Chadha and Oluoch (2003) point out those home gardens are important to countermeasure micronutrient malnutrition in developing countries. The diversity of species with micronutrient content in Rajegwesi, therefore, provides potential resources to support the basic needs of tourists on food in remote areas.

There were 44 plants species of home gardens that were used for medical treatment and healing therapy. Respondents stated that there were many kinds of diseases commonly attacked local population and the medical plants species were important in the absence of modern drugs. The common health problems found were fever and pain, respiratory problems, dermatological diseases, urogenital diseases, and blood pressure. Some plants are important as women's medicines and baby born treatments. The most cited medical plants were *Piper betle*, *Curcuma longa*, *Curcuma xanthorrhiza* and *Pluchea indica*. Leaves and the extract are the most common parts of traditional medical and medicinal materials. These sources can potentially be promoted as a local tonic (jamu) industry which might be involved and promoted as a health tourism program. Mueller and Kaufmann (2001) point out that traditional medicines, as well as traditional health treatment, has grown significantly, and they become such potential business to develop among traditional community to promote their traditional knowledge.

There were nine species used as main livestock food namely *Bischofia javanica*, *Leucaena leucocephala*, *Gliricidia sepium*, *Spondias pinnata*, *Ficus septica*, *Trema orientalis*, *Ficus callosa*, *Ficus variegata*, and *Ficus ampelos*. Such leaves were the common livestock food in tropical areas. Local people often use *Curcuma aeruginosa* and *Curcuma xanthorrhiza* as tonic for animals to increase livestock health and vitality. The leaves of *G. sepium* have high nutrition with crude protein of 20-30 % which is important to increase livestock weight and milk production. Leaves extract could be used as antimicrobial, nematicidal

and insecticidal (Nazli *et al.*, 2008). The availability of livestock food in Rajegwesi, therefore, provides opportunities to increase the quality and quantity of livestock. Farming can become one potential attraction of rural area tourism.

The ornamental plants were abundant in jogan area. The Euphorbiaceae, such as *Jatropha gossypifolia*, *J. multifida*, *Codiaeum megalanthum*, *C. variegatum* were planted in jogan area, and were used to improve visual quality of the house. Other common species are the members of Rubiaceae including *Mussaenda erythrophylla*, *Ixora grandiflora*, and *Ixora chinensis*. Ornamental plants are important to increase scenic beauty of environment (Hakim and Nakagoshi, 2007).

*Cocos nucifera* and *Musa paradisiaca* were the most common species in home gardens and cultivated to generate households income. About 14 species of woody trees were cultivated due to their function as building materials, community shelter, and furniture. Among them, *Gmelina asiatica* (Lamiaceae), *Terminalia catappa* (Combretaceae) were the common species for material construction. However, the woody trees were not sold since the regulation of the National Park regulation does not allow so. The conservation law protects the trees. According to Whitten *et al.* (1996), tropical forest in Java is the habitat for numerous woody tress species and therefore the remaining forest in Java must be protected.

Local people in Rajegwesi used firewood for cooking. Although there were 23 species used as the source of firewood, only some of them were commonly used. The quality of the wood to produce energy became the consideration of plant species selection as firewood sources. Plant species with highest citation (12 citations) for bioenergy were *Bischofia javanica* (Glintungan), *Leucaena leucocephala* (Lamtoro), *Gliricidia sepium* (Gamal/lisidi) and *Spondias pinnata* (kluncing). The cultivation of numerous woods in home gardens reduces the firewood

collection from Meru Betiri forest and therefore reduces threats to the national park.

Many plants in home garden have been used for performing cultural ceremony. They include *Cocos nucifera* and some varieties of *Musa paradisiaca*. There are also flowering plants such as *Mussaenda erythrophylla* (nusa indah), *Gardenia jasminoides* (ceplok piring), and *Michelia champaca* (cempaka putih). Six rituals have been identified in Rajegwesi, namely petik laut (throw offerings into the sea), baby born celebration (tingkepan, neloni, brokohan), wedding ceremony (siraman, midodareni, kacar kucur), harvesting and plantation ceremony (cok bakal) and baritan (ambengan). The plants are an important part for such ceremony.

Home gardens also become the habitat for poisonous plant species such as *Derris elliptica*, *Derris thyrsoiflora*, *Dioscorea hispida*, *Swietenia macrophylla* and *Jatropha podagrica*. Local people use the tuber of *D. hispida* and the seed of *S. macrophylla* and *J. podagrica* for poisonous material to catch fishes.

The importance of the species for the community as assessed using ethno botanical indices can be seen in Table 2. Plants with economic value seem to be important among the local people. In the situation where fishing activity is common, due to physical aspect of the sea, such plants become an important source to generate incomes.

**Table 2.** Ethno botanical indices species in Home gardens.

| No | Local Name                            | Species Name                        | Ethnobotanical Indices |      |
|----|---------------------------------------|-------------------------------------|------------------------|------|
|    |                                       |                                     | RFC                    | CI   |
| 1  | Kelapa (Coconut)                      | <i>Cocos nucifera</i>               | 0.97                   | 2.47 |
| 2  | Pisang kepok (Banana)                 | <i>Musa Paradisiaca</i> var.kepok   | 0.63                   | 1.50 |
| 3  | Sirih (Betel Pepper)                  | <i>Piper betle</i>                  | 0.63                   | 1.27 |
| 4  | Pisang raja nangka (Banana)           | <i>Musa paradisiaca</i>             | 0.60                   | 2.50 |
| 5  | Temulawak (Giant curcuma)             | <i>Curcuma xanthorrhiza</i>         | 0.43                   | 0.57 |
| 6  | Mbote (Taro)                          | <i>Colocasia esculenta</i>          | 0.40                   | 0.43 |
| 7  | Tebu ireng (Black sugarcane)          | <i>Saccharum officinarum</i>        | 0.50                   | 0.43 |
| 8  | Kencur (Galanga)                      | <i>Kaempferia galanga</i>           | 0.50                   | 0.29 |
| 9  | Gadung(Asiatic bitter yam)            | <i>Dioscorea hispida</i>            | 0.47                   | 0.29 |
| 10 | Sawi (cassava)                        | <i>Manihot esculenta</i>            | 0.47                   | 0.29 |
| 11 | Pete (Petai bean)                     | <i>Parkia speciosa</i>              | 0.47                   | 1.10 |
| 12 | Glintungan (Java cedar)               | <i>Bischofia javanica</i>           | 0.47                   | 0.29 |
| 13 | Kunyit (Turmeric)                     | <i>Curcuma longa</i>                | 0.47                   | 0.83 |
| 14 | Suweg (Elephant yam)                  | <i>Amorphophallus paeoniifolius</i> | 0.40                   | 1.10 |
| 15 | Lompong ireng (Black taro)            | <i>Colocasia affinis</i>            | 0.53                   | 1.63 |
| 16 | Luntas (Indian pluchea)               | <i>Pluchea indica</i>               | 0.40                   | 1.20 |
| 17 | Lamtoro (Horse tamarind)              | <i>Leucaena leucocephala</i>        | 0.37                   | 1.47 |
| 18 | Kluncing (Common hog plum)            | <i>Spondias pinnata</i>             | 0.37                   | 0.93 |
| 19 | Gamal/ lisidi (Nicaraguan cocoashade) | <i>Gliricidia sepium</i>            | 0.37                   | 0.90 |
| 20 | Pepaya (Papaya)                       | <i>Carica papaya</i>                | 0.30                   | 1.60 |

Both coconut and banana hold the most economic value among the local people of Rajegwesi. Coconut is the main material to produce sugar. Moreover, local people in Rajegwesi stated that coconut had numerous other uses such as for food, medicine, firewood, culture-related uses, handicraft, industry and others. Similarly, banana was considered as an important plant since it could be used for numerous purposes. The highest value of coconut and banana shows the degree of knowledge and dependency of the local people to such species (Tardio and Pardo-de-Santayana, 2008).

The plant species in home gardens consisted of shrubs (32%), herbs (44%) and trees (56%). Structurally, these groups grow and form multilayers. Herbs and shrubs often become the understory species. Most of the understories are species with special functions (i.e. plant with medical, ornamental, cultural and economic function). The upper-story plants consist of species with huge canopy such as *Cocos nucifera* and *Bischofia javanica*. These structures seem to be common for tropical home gardens (Nair and Kumar, 2004).

The implication of the home garden existence for tourism planning and development in Rajegwesi Area In the perspective of tourism planning and development, home gardens may contribute some basic roles. Firstly, the cultural management of space leads to the availability of significant open and green areas to provide relaxing environment for tourists. Baud-Bovi and Lowson (2002) point out that space is closely related to the tourism comfort. Tourists often avoid areas with dense infrastructure and busy human activities. Conversely, recent tourists seek remoteness with few buildings and infrastructure to enjoy natural setting. The traditional and local spatial arrangement of houses in the environment into *Mburitan*, *Iringan* and *Jogan* is part of the social and cultural aspect of the local people. This management model gives such wide areas for the comfort of the tourists.

Secondly, home gardens become a significant place to produce numerous goods to support tourism basic needs such as food. Tourism industry is often faced with the problems of resources scarcity, including edible plants to meet restaurant and hotel needs on food. It is presume to be the results of recent tourism increase, which is followed by increasing food demand (Cohen and Avieli, 2004). The originality of destination culinary is also stated as one of the crucial aspects to attract tourists. In line with such needs, the contribution of home gardens is crucial since such place is the home of numerous edible plant species for food, fruit, and spices.

Thirdly, home gardens with numerous plant species can be viewed as a potential attraction. The richness and complexity of plant species in home gardens could be managed and promoted as a tourism attraction. In developing countries, home gardens reflect local culture to manage their environment surrounding their house. The diverse human culture and physical environmental background, therefore, provides diverse potential tourism attraction in rural areas. In the context of destination authenticity construction, such aspect is also important. Home garden is one of the cultural landscapes, which can be promoted as a tourism attraction (Hakim *et al.*, 2009).

The basic role of home gardens is compatible with tourism destination development, particularly in remote areas. In the limitation of many infrastructure and facility for tourism development, remote areas have their special resources, which can be promoted as basic and potential resources for attraction. The involvement of home gardens into tourism industry should be promoted intensively.

### Conclusion

Home gardens along the rural roads are the habitat for numerous biodiversity, ranging from herbs to giant trees. Local people in Rajegwesi divided home garden into three categories, namely *Mburitan*, *Iringan* and *Jogan*. There were 132 plant species

belonging into 54 family found in these home gardens. They were used as a source of food, of medical materials, of livestock food, of firewood, of ornamental plants, of construction materials, of toxic elements, of materials for cultural ceremony, as well as having economic value, and some other minor categories of uses. The diversity of plants in home gardens can potentially contribute to support tourism development. Plant resources inside home gardens could be used for providing basic resources for tourist consumption, for managing local environment to meet cool air, enhancing environmental quality and flora in home gardens as a tourism attraction.

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