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The diversity of beneficial plants in the home-owned gardens of the Lingga Village, The Karo District, North Sumatra, Indonesia

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Abstract. The Batak Karo sub-ethnic group uses home gardens as resources for medicinal, edible, and ornamental plants. However, baseline information still lacks on the species diversity. The objective of this study was mainly to assess plant biodiversity in home gardens. Data were collected using ethnobotanical surveys and interviews. The surveys were conducted in 9 home gardens located at Lingga Village, Karo District, North Sumatra. Ninety species were recorded belonging to 45 families and 77 genera as useful plants in home gardens. The Araceae, Liliaceae and Solanaceae were the common family that were found each comprising 8, 7, and 6 species, respectively. The species used as edible plants (53 species), ornamental plants (35 species) and medicinal plants (23 species). *Begonia* sp., and *Secchium edule* were the most species found in the home gardens.

1. Introduction

The growth of human population implies to the increase of food demand and other needs. On the other hand, the productive lands are declining due mainly to land use changes. To meet the necessities of the human life, home gardens as traditional practices could be optimally utilised. Home gardens are known as small scale agroforestry practices in Indonesia [1,2]. Various types of plants are found in the home gardens that are used by humans as food, medicine and ornament [1,2,3,4]. Worldwide, home gardens are communities' most adaptable and accessible land resources and important components in reducing vulnerability and ensuring food security [5].

Home gardens have been documented as an important supplemental source contributing to food and nutritional security and livelihoods [1,6,7]. The factors lead to the optimal use of the home gardens are: the ease to access or to manage, and aesthetic values. The tropical home gardens can be identified as an alternative, which could provide economic and socio-cultural benefits to subsistence farmers [6]. The home-owned gardens were recorded to provide 2.0% of daily calorie intake and provides an income of up to 12.9% for the owner [1]. Factors related to developing productive home-owned gardens for the poor are: lack of land, lack of water, lack of capital, cultural barriers, lack of information on nutritional benefits of home-gardening, lack of agricultural extension advice, lack of appropriate plants and livestock, and lack of available labour [8]. Home-gardens are believed to provide a number of benefits to families, ranging from improving nutrition and providing a source for



additional household income, to improve the status of women in the household [8]. Potential environmental benefits of home-owned gardens may be important not only for home-gardening households, but for the broader society as well.

The home-owned gardens have different structures, depending on the culture, ethnicity [2], and topography. Those diversities include both horizontal and vertical spaces. The vertical structure of home-owned gardens in Bali is due mainly to the presence of a large number of trees (33.33 % of all recorded plant species), especially trees that produce fruits [2]. In tropical rural villages like Indonesia there is a tendency to cultivate various species of plants with different functions, habitus, and time. It is also done by the Karo ethnic group in Merdeka District [9,10], but the composition has not been revealed.

The Lingga Village is one type of village of the Batak Karo sub-ethnic group adjacent to Mount Sinabung, which is administratively located in the Simpang Empat District. The eruption of Mount Sinabung resulted in some agricultural activities, especially around the fields whose position are close to Mount Sinabung and cannot be managed optimally. The objective of this study was to assess the composition of plants in the home gardens of Lingga Village, Karo regency.

2. Research methods

2.1. Area study

This research was conducted in August 2016 in the Lingga Village, Simpang Empat Sub-District, Karo Regency, North Sumatera (figure 1). The Lingga Village is located at the foot of Mount Sinabung with 900-1,200 meters above sea level. Most of the inhabitants are sub-ethnic group of Batak Karo, working as horticultural farmers such as: chili (*Capsicum annum*), corn (*Zea mays*), egg plant (*Solanum melogena*), and tomato (*Solanum lycopersicum*). The eruption of Mount Sinabung caused local inhabitants to utilize the home-owned gardens for cultivating various food crops.

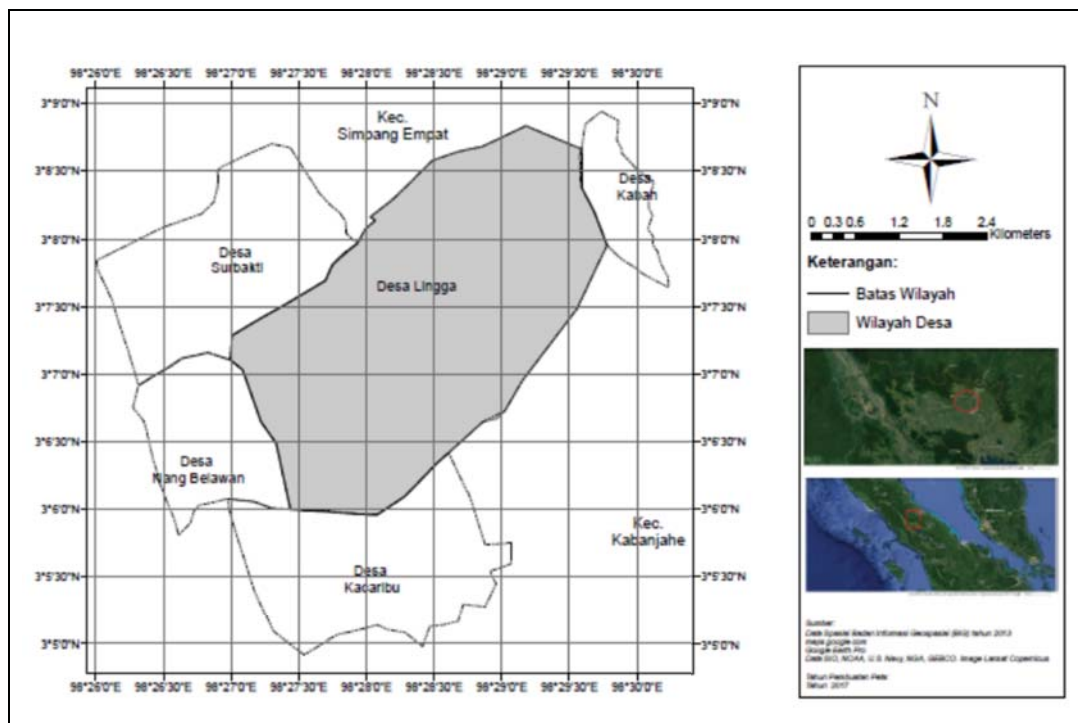


Figure 1. Study sites of The Lingga Village in The Karo District, North Sumatra, Indonesia.

2.2. Data collection

The data were collected through (semi-structured, in-depth and participatory observation) interview. The interviews were conducted based on limited samples of nine owners of the home-owned gardens. The plants on the home-owned gardens were recorded with respect to local names, habitus and uses, while vouchers specimens have been prepared. The local name, number of plants were calculated and the size of the home gardens have been measured. The specimens vouchers have been identified by botanists at the University of Indonesia, and some had been identified at the Indonesian Institute of Sciences Herbarium (LIPI), Cibinong, Bogor, Indonesia. The scientific names of the investigated plants were then verified using the on-line source [11].

2.3. Data analysis

The data acquired in this study were analyzed from a qualitative approach including the uses of plants, and plant parts, while sources and habitus were analyzed through descriptive statistics.

3. Result and discussion

The Batak Karo sub-ethnic home gardens in the village of Lingga were cultivated with various types of plants that were used directly or indirectly by the owner. The useful plants in this study were plant species that were directly exploited by the owner used for food, traditional medicine, building materials, and ornamental plants. This research discovered that there were 90 species belonging to 44 families and 77 genera of the useful plant on home gardens of the Batak Karo sub-ethnic group in Lingga village, North Sumatera (table 1). Most of the species were families of Araceae (8 species), Liliaceae (7 species), dan Solanaceae (6 species) whose families belong to the highest number species (figure 2). A total of 33 families were represented only by 1-2 species.

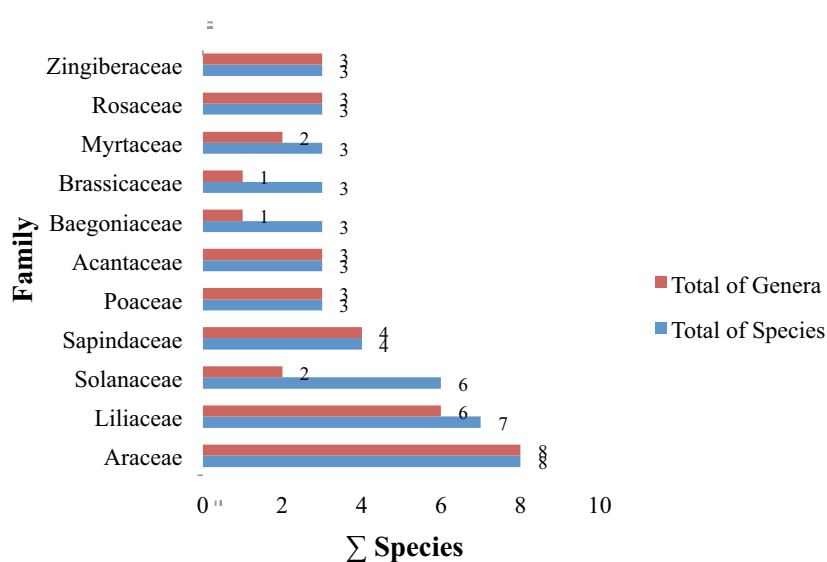


Figure 2. The families of useful plants in home-owned gardens belong to the highest number of species at the village of Lingga, Karo District, North Sumatera.

The useful plants which found in this research were different to the ethnic groups in Thailand [4] and Bali Aga [2]. The useful plants in the home gardens of the Thailand ethnic group was dominated by the Leguminosae, Cucurbitaceae, and Menispermaceae [4], while the Bali Aga ethnic group was

dominated by Zingiberaceae, Poaceae, Fabaceae [2]. The differences of plants found in the home gardens were influenced by the biodiversity status, culture, and profession of the owner [1,8].

Based on the life form, the useful plants in the Batak Karo sub-ethnic home gardens consisted of trees (22 species), shrubs (7 species), and herbs (61 species) (figure 2). The herbs included *Begonia* sp., *Sechium edule*, *Curcuma longa*, and *Etlingera elatior*. The herbs have short life, so they are easily replaced with other species. Their home gardens in West Java were dominated by ornamental plants by 47% less than 1 m in height (51.2%)[1]. Herbs were the dominant plants in the home gardens compared to shrubs and trees in the Zvishavane ethnic group [3,12].

□

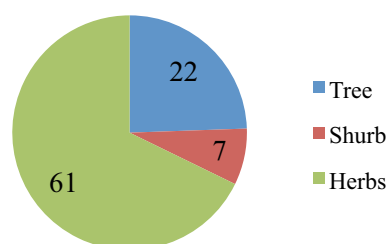


Figure 3. The number of species of the useful plants in the home gardens based of life form in the Village of Lingga, Karo District.

Mango (*Mangifera indica*), *mbasang* (*Mangifera foetida*), guava (*Psidium guajava*), rose apple (*Syzygium aqueum*), and *mbiwa* (*Eriobotrya japonica*) were sources of the fruit. The trees were planted in the corner or the back yard, or adjacent to the road. If the tree grew too high, it reduced the branch, which aims to wage the circulation in the environment and prevent the fallen trees. Sujarwo and Caneva [2]) stated trees also served as a support for climbing plants. The climbers were discovered in this study which included *Sechium edule*, *Phaseolus lunatus*, and *Piper betle*.

The plants in the Lingga Village's home garden were used as food (51 species), ornamental plants (35 species), medicine (23 species), and building materials (1 species) (figure 4). The front home gardens were cultivated by the ornamental plants as well as food and medicine, while the back yards were cultivated by the edible plants. *Hibiscus rosa-sinensis*, *Begonia* sp., *Justicia gendarussa*, and *Graptophyllum pictum* were the plants usually found in the front yard, while *Musa paradisiaca*, *Etlingera elatior*, *Manihot utilissima* were found in the backyard. The results of this study were different from that of Sundanese in West Java, in which the cultivation of the ornamental plants was more frequent than the edible plants in their home gardens [1], but not in Bali Aga ethnicity [2]. The management and utilization of the home garden were influenced by the owner [1,2].

Table 1. The useful plants in The Lingga Village, Sub District Simpang Empat, District Karo, North Sumatra Indonesia.

Family	Scientific name	Local name	Life form	Annual/perennial	Part of Uses	Uses
Acanthaceae	1. <i>Andrographis paniculata</i> (Burm.f.) Nees	<i>Sambiroto</i>	Herb	Perennial	Leaves	Medicine
	2. <i>Graptophyllum pictum</i> (L.) Griff.	<i>Daun ungu</i>	Shrub	Perennial	Leaves	Medicine and ornament
	3. <i>Justicia gendarussa</i> Burm.f.	<i>Sempilit</i>	Herb	Perennial	Leaves	Medicine and ornament
Agavaceae	<i>Polygonum tuberosa</i> L.	<i>Sedap malam</i>	Herb	Perennial	Flowers	Ornament
Anacardiaceae	1. <i>Mangifera foetida</i> Lour	<i>Mbacang</i>	Tree	Perennial	Fruits	Edible
	2. <i>Mangifera indica</i> L.	<i>Mangga</i>	Tree	Perennial	Fruits	Edible
Araceae	1. <i>Acorus calamus</i> L.	<i>Jerango</i>	Herb	Perennial	Rhizomes	Medicine
	2. <i>Alocasia macrorrhizos</i> (L.) G. Don.	<i>Langge merah</i>	Herb	Perennial	Tuber, Leaves	Edible
	3. <i>Anthurium crystallinum</i> Linden & Andre	<i>Kuping gajah bunga</i>	Herb	Perennial	Leaves	Ornament
	4. <i>Caladium bicolor</i> (Aiton) Vent.	<i>Keladi bicolor</i>	Herb	Perennial	Leaves	Ornament
	5. <i>Colocasia esculenta</i> (L.) Schott.	<i>Talas hijau, hitam</i>	Herb	Perennial	Tuber	Edible
	6. <i>Philodendron selloum</i> K. Koch.	<i>Filodendron ungu</i>	Herb	Perennial	Leaves	Ornament
	7. <i>Zamioculcas zamifolia</i> (Lodd.) Engl.	<i>Daun dollar</i>	Herb	Perennial	Leaves	Ornament
	8. <i>Zantedeschia aethiopica</i> (L.) Spreng	<i>Kala lili</i>	Herb	Perennial	Leaves	Ornament
Areaceae	1. <i>Arenga pinnata</i> Merr.	<i>Poula</i>	Tree	Perennial	Fruits, Stems, Leaves	Edible
	2. <i>Salacca zalacca</i> (Gaertn.) Voss	<i>Salak</i>	Tree	Perennial	Fruits	Edible

Family	Scientific name	Local name	Life form	Annual/perennial	Part of Uses	Uses
	3. <i>Curcuma zanthorrhiza</i> Roxb.	<i>Temulawak</i>	Herb	Perennial	Leaves, rhizomes	Medicine

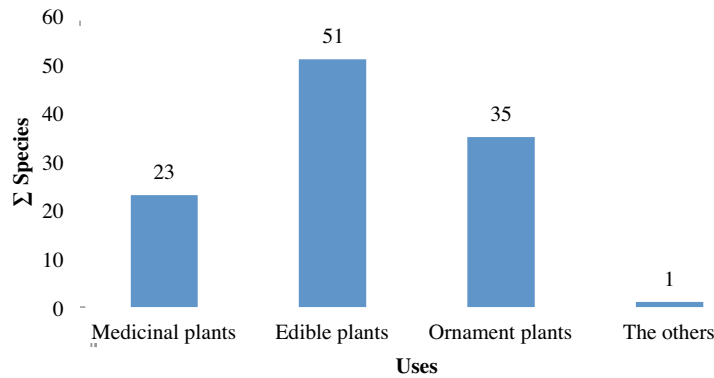


Figure 4. The number of species in the Village of Lingga home-owned garden based on its function.

The edible plants in the home garden of the Batak Karo sub-ethnic group were mostly the annual plants such as tomato (*Solanum lycopersicum*), mustard plants (*Brassica* sp.), celery (*Apium graveolens*), eggplant (*Solanum melogena*), and chilli (*Capsicum annum*). Every home garden was planted by various species but there were usually merely 2-3 individuals. These indicated that edible plants in the home gardens reserved as food stocks at home when it ran out. Most of the food came from fields or gardens managed as the main source of living from the owner. These different research results were found in Thailand [4] and Bali Aga [2], who planted the perennial in their home gardens. These differences were related to topography, local farming patterns, and the diversity of plants found in the surrounding environment. The Batak Karo sub-ethnic group inhabited the highlands of Karo with main livelihoods to grow horticulture and vegetables (*Solanum lycopersicum*, *Capsicum annum*, *Cabbage* sp.).

The utilization of the plants in the home gardens as food caused indirect impact to the owner's income. The *Sechium edule* (fruits), *Etilingera elatior* (fruits, flowers) could be sold to the neighbours or to the market or consumed by owner. The home-owned gardens were known to have a socio-economic role in the rural communities [12,13]. The plants in the home gardens of the Sundanese Region contributed up to 12% of the income 12.9% [1], while the plants used for medicine of the home-owned gardens or the other land contributed up to 12% to income in Vietnam [14]. The traditional healers maintained the medicinal plants for healing, while the farmer maintained approximately 90% of the medicinal plants in their home-owned gardens for commercialization and health care [15]. The local communities in South Africa, the plants in the home garden approximately 72% were consumed and 28% were sold [12]. The uses of plants especially the ones at the home were a cultural heritage of the local communities [16].

A total of 17 species of the useful plants in the home gardens of the Batak Karo sub-ethnic group were comprised of 10 species (food and medicine), 6 species (ornamental and medicine), and 1 species (ornamental and food). The plants used as food and medicine were: *Ananas comosus*, *Molinieria latifolia*, *Ocimum basilicum*, and *Cinnamomum burmannii*. The *Graptophyllum pictum*, *Justicia gendarussa*, *Isotoma longiflora*, *Cordyline terminalis*, and *Crynum asiaticum*, whilst *Etilingera elatior* was used as food, medicine, and ornament.

The part used of the plants were leaves (47 species), fruits (28 species), flowers (17 species), and tubers (7 species) (figure 5). The leaves mostly were used as vegetables such as: *Manihot utilissima*, *Brassica juncea*, *Brassica oleracea*, *Sechium edule*, and *Sauropus androgynus*. The tuber were used as carbohydrate source which belong to *Ipomoea batatas*, *Colocasia esculenta*, and *Caladium bicolor*.

Rhizomes were used as medicines, where among them were *Acorus calamus*, *Zingiber zerumbet*, and *Zingiber officinale*.

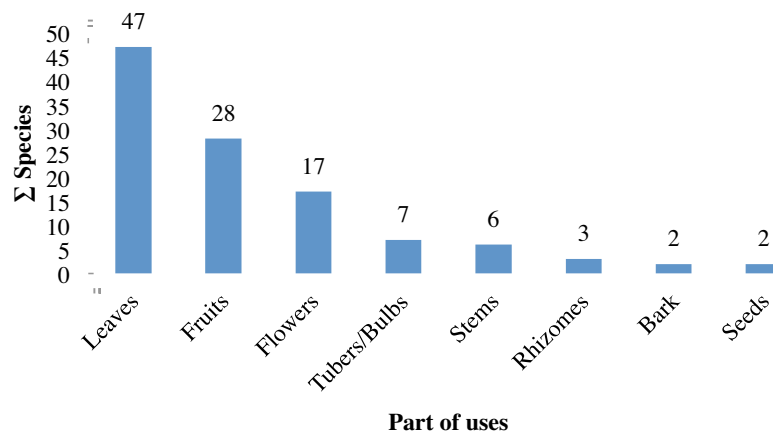


Figure 5. The number of species of useful plants in the home gardens of the village of Lingga, Karo Regency based of part of used.

Begonia sp. are species, which were mostly found in the home-owned gardens of the Lingga Village. The *Begonia* were used as the ornament and living fence. Only three species of *Begonia* were discovered in this study, but still at the genus level and the identification of further species is required. The Batak Karo sub-ethnic group, *Begonia* was called *riang-riang*. Although all species of *Begonia* are edible, but *Begonia* found in the home garden was used as an ornament because they have interesting leaf structure. The *Begonia laruei* was used as the main component for local cuisine *terites* but they were not been found in the home gardens except in the forests. *Terites* was the traditional cuisine of the Batak Karo sub-ethnic group in form of cooked soup from cow rumen [9,17]. The respondents mentioned that the *Begonia laruei* was difficult to be cultivated in the home-owned garden, due to differences of micro-climate in the forest and the home garden. The utilization *Begonia laruei* as ingredients of *terites* was expected to become a new source for the foodstuffs in the future.

4. Conclusion

There were 90 species recorded in this study which belonged to 45 families and 77 genera classified as useful plants in the home-owned gardens. The Araceae, Liliaceae, and Solanaceae were the common family that included the high number of plant species, namely 8, 7, and 6, respectively. The plants were used as edible plants (53 species), ornamental plants (35 species) and medicinal plants (23 species). *Begonia* sp., and *Sechium edule* were the most species found in the home gardens. In particular, *Begonia* was used as ornamental plants and as a living fence. A total of three species of *Begonia* were discovered in this study, but still at the genus level. The utilization of *Begonia laruei* as ingredients of local food such as *terites* was expected to become a new source for the foodstuffs in the future.

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The International Symposium on Arboriculture in the Tropics: Securing Ecosystem Functions in Urban Landscape

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THE INTERNATIONAL SYMPOSIUM ON ARBORICULTURE IN THE TROPICS (ISATrop2017)

“Securing ecosystem functions in urban landscape”

IPB International Convention Center, Bogor, Indonesia
21 November 2017



**Bogor, Indonesia
2017**



PREFACE

Trees have been considered for ages as ones of the key and substantial elements in urban landscape. Thus, the surrounding society's involvement in raising awareness to look after the trees as oxygen and nutrients provider is undoubtedly important, for the sake of welfare of mankind and the rest of creatures on Earth. Besides, the continuation of research related to trees in urban areas requires decent governance, which is associated to regulation, stakeholders' participations and arboriculture development aspect. By initiating The International Symposium on Arboriculture in the Tropics: Securing ecosystem functions in urban landscape (ISATrop2017), wishfully information can be collectively obtained whilst strengthening commitment of actors in regard of the importance of trees' role in urban ecosystem as well as a supportive conducts on actualizing environmental-friendly cities' establishment in tropical areas.

The *International Symposium on Arboriculture in the Tropics (ISATrop2017)* that was held on November 21st, 2017, was attended by 3 (three) keynote speakers i.e. Prof. Ahmad Ainuddin Nuruddin (Malaysian Society of Arborist, University Putra Malaysia, Malaysia), Prof. Emer. Ko Harada (Faculty of Agriculture, Ehime University, Japan), and Mr. Daniel C. Burham (Senior Arboriculture Researcher at Centre of Urban Greenery and Ecology (CUGE), National Park Board, Singapore). Moreover, two invited speakers i.e. Mr. Chew Guan Yu and Koh Eu Jin from CSK Landscape Services, Singapore were also presented in oral presentation session and 1 (one) instructor i.e. Mr. Goh Mia Chun (Principal Arborist/Tree Surgeon at CSK Landscape Services, Singapore) was presented in *Tree Climbing Demonstration and Tryout Station* session.

Topics of this symposium are classified into 2 (two), namely (1) *The Ecosystem Function in Urban Landscapes in Tropics*, with sub-topics concentrate on *Urban Biodiversity, Climate Regulation, Urban Socio-ecological System, ICT in Green City, Urban Pollution and Mitigation*, and *Nursery Industry*; and (2) *Evaluation/Technology of Ecosystem in Urban Landscapes in Tropics*, with sub-topics concentrate on *Urban Tree Health and Urban Tree Risk Assessment*. Total 82 participants took part in The ISATrop2017 that was comprised of 36 as oral presenters, 18 poster presenters and 28 non-presenters. Participants as well engaged in Symposium Tour to Bogor Agricultural University on November 22nd, 2017. Output of The ISATrop2017 is the partnership and networking reinforcement between both national and international arboriculturalists' stakeholders, with the aim for the research advancement for IPB and Indonesia Arboriculturalists Society (*Masyarakat Arborikultur Indonesia, MArI*).

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PHOTOGRAPHS





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CERTIFICATE

This is to certify that

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has attended as

Oral Presenter

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“Securing Ecosystem Functions in Urban Landscape”**

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Prof. Dr. Dodi Nandika

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