

Journal of **INDONESIAN TOURISM AND DEVELOPMENT STUDIES**



Published by

Postgraduate School, University of Brawijaya

Collaboration with

East Java Ecotourism Forum & Center of Tourism Study Brawijaya University

<http://jitode.ub.ac.id>

January, 2018

Journal of Indonesian Tourism and Development Studies

EDITORIAL BOARD

Chief Editor

Luchman Hakim

Ecotourism – Faculty of Mathematics and Natural Sciences, University of Brawijaya,
Indonesia

Team Editor

- Akira Kikuchi
Department of Environmental
University of Teknologi Malaysia, Malaysia
- Soemarno Soemarno
Department of Soil Science
Faculty of Agriculture
University of Brawijaya, Indonesia
- Iwan Nugroho
Widyagama University – Indonesia
- Devi Roza K. Kausar
Faculty of Tourism
Pancasila University, Indonesia
- Yusri Abdillah
Faculty of Administrative Sciences
University of Brawijaya, Indonesia
- Rukavina Baks
Faculty of Agriculture
University of Tadulako, Indonesia
- Regina Rosita Butarbutar
University of Sam Ratulangi, Indonesia
- Hasan Zayadi
Department of Biology
Faculty of Mathematics and Natural
Sciences
Islamic University of Malang, Indonesia

Managing Editor

Muhammad Qomaruddin, Jehan Ramdani Haryati
Aditya Dedy Purwito

Editorial Address

1st floor Building B of Postgraduate School, University of Brawijaya
Mayor Jenderal Haryono street No. 169, Malang 65145, Indonesia
Phone: +62341-571260 / Fax: +62341-580801
Email: jitode@ub.ac.id
Website: jitode.ub.ac.id



TABLE OF CONTENT

Vol. 6 No. 1, January 2018

Exploration of Herpetofauna Habitat as Tourism Attraction: Ecology, Preferences, and Potentials

Nia Kurniawan, Alif Aulia Ananda, Fatiha Kamila, Ari Ardiantoro, Satria Wira Bagaskara,
Agung Sih Kurnianto 1-8
DOI: 10.21776/ub.jitode.2018.006.01.01

Factors and Strategy for Sustainable Tourism in Boti Village, East Nusa Tenggara

Simon Suddin 9-16
DOI: 10.21776/ub.jitode.2018.006.01.02

Interpretation of Sustainability Factor in Wonorejo Mangrove Ecotourism, Surabaya, Indonesia

Rita Parmawati, Anita Qur'ania, Arief Kurnia Riarmanto, Arham Yakub, Agung Sih Kurnianto 17-22
DOI: 10.21776/ub.jitode.2018.006.01.03

The Effect of Merchant Characteristics and Religious Tour Visits as a Moderating Variable to Merchant Revenues (Study in Sunan Ampel Religious Tourism Area, Surabaya)

Alfi Muflikhah Lestari, Multifiah Multifiah, Arif Hoetoro 23-32
DOI: 10.21776/ub.jitode.2018.006.01.04

The Study of Development of Urban Farming Agrotourism Subak-Irrigation-Based in Sanur Tourism Area, Denpasar City, Bali

I Ketut Sardiana 33-40
DOI: 10.21776/ub.jitode.2018.006.01.05

Knowledge, Action, Perception and Attitude of Management of Talangagung Landfill toward Edu-Tourism Program: A Community Perspective

Koderi Koderi, Suyadi Suyadi, Abdullah Said, Abdul Wahib Muhaimin 41-48
DOI: 10.21776/ub.jitode.2018.006.01.06

The Utilization of Burungnesia to Detect Citizen Scientist Participation Preference in Birding Sites Observation in Java Island

Swiss Winnasis, Luchman Hakim, M. Ali Imron 49-54
DOI: 10.21776/ub.jitode.2018.006.01.07

The Invasive Plants Species along the Hiking Track of Mount Panderman Nature Tourism, Batu, East Java

Luhur Septiadi, Didik Wahyudi, Rhesma Sylvia Rachman, Syafrudin Syafrudin,
Nuri Thobibatus Shofia Alfaruqi 55-62
DOI: 10.21776/ub.jitode.2018.006.01.08

Exploration of Herpetofauna Habitat as Tourism Attraction: Ecology, Preferences, and Potentials

Nia Kurniawan^{1*}, Alif Aulia Ananda², Fatiha Kamilah¹, Ari Ardiantoro¹, Satria Wira Bagaskara¹,
Agung Sih Kurnianto³

¹Department of Biology, Faculty of Mathematics and Natural Sciences, University of Brawijaya, Malang, Indonesia

²Meru Betiri National Park, East Java, Indonesia

³Graduate School, University of Brawijaya, Malang, Indonesia

Abstract

Herpetofauna (Class: Reptilia, Amphibia) has potential value as tourist attraction and its sustainability could be preserved by ecotourism program. We propose a new fauna-based tourism attraction by conducting herpetofauna survey in a few locations inside Sukamade, Meru Betiri National Park (MBNP), and using their habitat as spots for ecotourism potential sites. Visual Encounter Survey method was conducted in 6 locations (200 m transect pathway). We found 166 individuals, belonging to 32 species in 15 families. *Leptobrachium hasselti* has the biggest Important Value Index (16.55%), making this species potentially become one of the potential herpetofauna as a tourist attraction. *Chelonia mydas*, an endangered species, is one of the interesting species to be observed in Sukamade. This species is full migrant and does long migration in its feeding ground in Borneo, Australia, and Pacific, then back to Sukamade to lay eggs. Sumber Sari and Glintungan forest became a habitat for amphibians that need clean water, such as *L. Hasselti* and *Leptophryne borbonica*, and potentially become the location of herpetofauna observation. *Occidozyga lima*, *Fejervarya limnocharis*, and *Limnonectes microdiscus* were found in four survey sites (Sumber Langsep, Glintungan, Estuary, and Jungle Track).

Keywords: Herpetofauna, Sukamade, Tourism.

INTRODUCTION

Herpetofauna (Class: Reptilia, Amphibia) is one of the animal group which able to illustrate the quality of local habitat [1]. This role is associated with its limitation on mobility and its dependency toward certain vegetation, also toward water body [2]. Herpetofauna has been developed for a choice of tourist attraction in Cambodia [3], and South Africa [4]. The endangered frogs also attracted ecotourism business, and this activity has been shown to help preserve its sustainability [5]. Ecotourism is the most relevant and progressive options with huge revenue potential [6].

Meru Betiri National Park (MBNP) is the largest lowland forest protection area in Java. Geographically, this area located at 80° 20' 48"-80° 33' 48" S and 113° 38' 48"-113° 58' 30" E. The presence of society in surrounding and inside the national park, as seen in Sukamade, MBNP, became one of the potential causes of conservation conflict, which related to economic needs [7]. This also threatens herpetofauna and

other fauna's diversity which became more isolated inside the Sukamade. On the other hand, Sukamade has a very high international tourist visit. In 2015, there are 2671 foreign tourists and 60,672 domestic tourists visit Meru Betiri National Park. This figure increased 90% from 2014 (MBNP unpublished data). This is a great tourism potential that should be developed. As far, turtle landing and nesting site on Sukamade beach became the only main object for Sukamade. It is important that other forms of exploration of the object as an alternative and diversification of products from the tour.

We propose a new fauna-based tourism object by conducting herpetofauna survey in a few locations inside Sukamade, MBNP, and using their habitat as spots for tourism potential [8]. Through a few analysis of biodiversity, we propose the areas which has potential and should became a priority in terms of tourism.

MATERIALS AND METHOD

Study sites

Survey was done for 6 days (December 14-19th 2016) and was focused on 6 main locations: Sumber Langsep, Glintungan, Sumber Sari, Coastal, Jungle Track, and Estuary (Fig. 1). All of these locations were located within Sukamade Resort, Meru Betiri National Park, Banyuwangi,

*Correspondence address:

Nia Kurniawan

Email : wawan@ub.ac.id

Address : Dept. Biology, Faculty of Mathematics and
Natural Sciences, University of Brawijaya, Veteran
Malang, Malang 65145.

East Java, Indonesia. These locations were chosen because it was able to illustrate different habitat for herpetofauna.

Sumber Langsep and Glintungan

These two blocks were located on the Eastern part of Sukamade Resort. Glintungan is the highest (202 m asl), and is a Dipterocarp forest with two rapid flowing river in it. Sumber Langsep (189 m asl) is a mix of Dipterocarp forest and *Lansium domesticum* plants. There was a river (2-4 m width) and cliffs with 2-3 m height around.

Sumbersari

This location is an open vegetation area, and utilized for agriculture, plantation, and settlement. There was a river, called Sukamade River (6-8 m wide) which quietly flows towards the estuary and the southern sea. These locations become the crossing access for grazing animals and transportation.

Beach, Estuary, and Jungle Track

These three locations were located on one block, i.e. the beach, but it shows different habitat for fauna. Beach consist of vegetation, such as bushes, shrubs, and sea sands. Estuary is the latest region of Sukamade River which

flooded in dry season, but it flows to the sea in rainy season. Dominant vegetation in this area are Nipah (*Nypa fruticans*), and Mangrove (*Rhizophora sp.*). Jungle track is an open part of lowland primary forest which consist of typical rainforest plants: Dipterocarp and *Ficus*, as well as more open area near the coast, such as Ketapang (*Terminalia catappa*) and Sage Plant (*Lantana camara*).

Survey

Visual Encounter Survey method was conducted in each location (200 m transect pathway) to assess the diversity of herpetofauna. This method was started from 7 pm until 11 pm. Time Constrained Studies (TCS) were not used in this study, while survey was used time variation, and depends on species discovery. Periodically, sample observed between the rocks, litter, foliage, shrubs, and fallen branches, without any disturbed microhabitat [9]. Herpetofauna were counted and collected with barehands, hook, or grabstick, then documented with Canon DSLR 1100D camera. All specimen then released on the same microhabitat. Then, the images were compared with the reference [10,11,12].

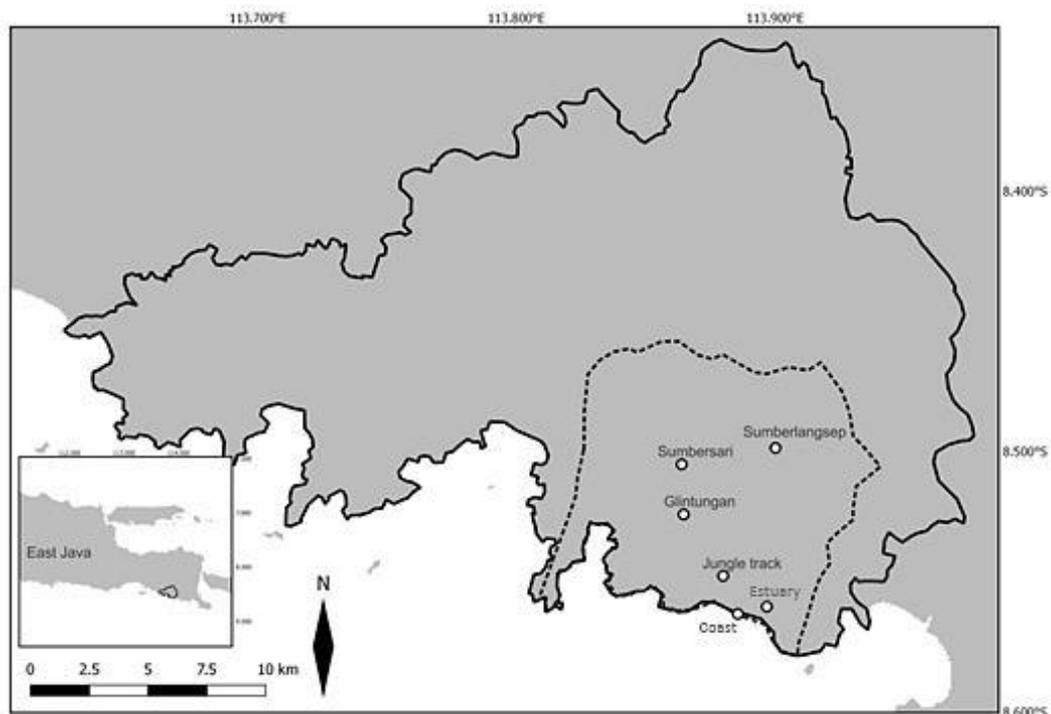


Figure 1. Research map

Description: black line = Meru Betiri National Park Area, dot line = Sukamade Area, survey point: study sites

Data Analysis

Important Value Index (IVI) and Shannon Index (H) were used to estimate herpetofauna diversity in MBNP. Ratio between species and agroforestry habitat were estimated using principal components based on Bi plot analysis. Past software version 3.0.0 was used for data analysis. We used Principal Component Analysis (PCA) to determine the preference of herpetofauna habitat among the studied locality. Status of threatened species was known from IUCN Red List (<http://iucnredlist.org>).

RESULT AND DISCUSSION

We found 166 individuals, belonging to 32 species in 15 family (Table 1). The most common species found are *Leptobrachium hasselti* (Anura: Megophryidae, n:21), *Cyrtodactylus marmoratus* (Squamata: Gekkonidae, n:15), *Hylarana chalconota* (Anura: Ranidae, n:14), *Occidozyga lyma* (Anura: Dicroglossidae, n:13), *Leptophryne* sp. (Anura: Bufonidae, n:13), *Microhyla* sp. (Anura: Microhylidae, n:12), *Polypedates leucomystax* (Anura: Rhacophoridae, n:11), *Takydromus sexlineatus* (Squamata: Lacertidae, n:8) and *Phrynoidis asper* (Anura: Bufonidae, n:8). Two species are categorized into IUCN Red List, those are *Chelonia mydas* (Endangered) and *Leptophryne cruentata* (Critically Endangered). Species which categorized into Appendix II CITES: *Varanus salvator* and *Chelonia mydas*. Shannon-Wiener index value shows a medium diversity (0.394).

Leptobrachium hasselti

Leptobrachium hasselti has the biggest IVI value (16.55%). *Leptobrachium* habitats was in the forest floor and its tadpole commonly found in river stream or creek around the forest. This species will come to the river when they are about to lay their eggs. It tadpoles has ability to maintain water quality by eating algae, prevent it from Algae blooming [13]. That was much portrayed with it's existence at lush forests, such as Glintungan. This frog was found among the rapids covered by tight canopy.

Leptobrachium hasselti has distinct body character: large head that is wider than its body, and; eyes tend to be large and glared. Tips of digits round, webbed at the base. Smooth skin, supratimpanic folds up to the base of the hindlimbs. Male are smaller (60 mm) than females (70 mm). It has scarlet coloured iris, dorsal with black plattern circles (darker circles), white ventral surfaces with black blotches. Juveniles is bluish in color [14]. Skin patterns

variation in *Leptobrachium hasselti* provides remarkable camouflage in tropical rain forest. Open lowland forest were not provide any habitat which fraught of leaf litter, as seen that this frog were not found in other habitat.

Table 1. Complete Checklist of Herpetofauna in Sukamade

Species	IVI	Location					
		SL	G	SS	M	P	JT
<i>Hylarana chalconota</i>	16.13	√	√	√			√
<i>Cyrtodactylus marmoratus</i>	14.81		√	√	√		
<i>Polypedates leucomystax</i>	12.40	√	√				
<i>Microhyla</i> sp.	11.08		√				√
<i>Takydromus sexlineatus</i>	10.59	√		√			√
<i>Phrynoidis asper</i>	10.59		√		√		√
<i>Occidozyga lima</i>	9.75		√				
<i>Hemidactylus</i> sp.	7.58		√		√		√
<i>Fejervarya limnocharis</i>	7.46	√			√		
<i>Kaloula baleata</i>	5.65				√		√
<i>Gekko gekko</i>	5.05	√			√		
<i>Eutropis multifasciata</i>	5.05		√				√
<i>Microhyla achatina</i>	4.94				√		
<i>Limnonectes microdiscus</i>	4.94						√
<i>Cheloniamydas* En</i>	3.73						√
<i>Odorrana hosii</i>	3,73						√
<i>Ramphotyphlops braminus</i>	3,73						√
<i>Leptobrachium hasseltii</i>	17.93		√	√			
<i>Boiga cynodon</i>	3.13				√		
<i>Leptophryne borbonica</i>	3.13		√	√			√
<i>Dandrelaphis pictus</i>	2.53				√		
<i>Varanus salvator*</i>	2.53				√		
<i>Xenochrophis piscator</i>	2.53						√
<i>Xenochropis trianguligerus</i>	2.53						√
<i>Bungarus fasciatus</i>	2.53						√
<i>Ahaetulla prasina</i>	2.53						√
<i>Dasia olivacea</i>	2.53						√
<i>Eutropis rudis</i>	2.53						√
<i>Lygosoma bowringii</i>	2.53						√
<i>Draco volans</i>	2.53						√

Notes: SL=Sumber Langsep, G=Glintungan, SS=Sumber Sari, M=Muala, P=Pantai, JT=Jungle Track.
En=Endangered, *=Appendix II CITES

Limnonectes microdiscus and *Microhyla*

Microhabitat conditions in Sumber Langsep and Glintungan also provide environmental composition which is appropriate with the needs of other species, such as *Limnonectes microdiscus* and *Microhyla*. Both live on the forest floor. Furthermore, *Odorrana hosii* was one species that commonly found on the rapids at Glintungan. We've also found this frog above the rocks or behind the rapid flows of Sumber Langsep Waterfall.

Hylarana chalconota

Hylarana chalconota commonly found at puddles, pool, or along small lowland forests stream [15]. Striking color of this species (green, yellow or cream colored) shows that this species is not camouflaged well on its surrounding vegetation. *Hylarana chalconota* are common

species that commonly found at secondary forest or highly disturbed area. Artificial pond, bushes, and paddy fields becomes the habitat of this species, especially at settlements or residential area [16].

Cyrtodactylus marmoratus

The presence of *C. marmoratus* also used as an indicator of conserved tropical rain forest [17]. This species are commonly found at the high or big tree in the forest, but sometimes it climbs down to the ground and rocks, so it is better known as forest geckos or stone geckos. An attractive and varietifely patterns make this species as cryptic species and continously studied in genetic relationship, ecology, distribution, and its behaviour. *Cyrtodactylus marmoratus*, as one of member of the most widespread genus, commonly found at tropical rain forestand open land areawhich contiguous with tropical rain forest [17]. In Indonesia, *C. marmoratus* can be found on the Island of Nias, Sumatra, Lombok, Borneo, Sulawesi, and Aru Archipelago. Its stable population may soon be threatened by the transition of land functions [8].

Chelonia mydas

Chelonia mydas (Green turtle) is one of the interesting species to be found in Sukamade. This species is full migrant and does long migration in its feeding ground in Borneo, Australia and Pacific, then back to Sukamade to lay eggs [18]. Green turtles became very common to find in Sukamade, and its management included in MBNP conservation program [19]. Local officers also revealed that this species becomes the most famous tourist attraction in Sukamade beach. However, its populatian will be threatened by eggs and adult overexploitation in the nesting sites all over the world [20]. Decreased population of this species also derived from climate change that affect hatchery temperature naturally [21].

Ecology, Preferences, and Potentials

Sukamade herpetofaunas consisting of many types of amphibians that depend on lowland rainforest. Rapids, waterfall, and closed rivers located far beneath the Summersari and Glintungan forest became a habitat for amphibians that needs clean water, such as *Leptobrachium* and *Leptophryne*. Herpetofauna becomes a potential in the development of economy, such as ecotourism [22]. Ecotourism is the only meeting point of conservation and

economic needs, where the people of Sukamade are no longer perceived as a threat but as potential conservationist, having seen the benefits of such biodiversity [23].

The herpetofauna observation results show that the spatial distribution of all species found in the six locations is illustrated by a dot (Fig.2). These results illustrate a particular habitat selection trend. The Dicroglossidae family is one of 14 other families that prefer habitat all across the survey sites. Three members of this family: *Occidozyga lima*, *Fejervarya limnocharis*, and *Limnonectes microdiscus* were found in four survey sites (Sumber Langsep, Glintungan, Estuary, and Jungle Track) with varying amounts. Glintungan is an ideal habitat for *Occidozyga lima*, since it has the highest elevation among other sites (202 m asl), as well as the existence of puddles and rapids that make it possible for this species to breed. The species is able to survive at a maximum elevation of 750 m above sea level, and has the capability to adapt to different habitats (grasses, dry forests, and lowlands that have aquatic vegetation)[15].

The species also habits open forest areas, as well as forest edges with temporary water accumulation (puddles and moats)[24]. Unlike the *Occidozyga lima*, almost all individuals of *Fejervarya limnocharis* are found in the estuaries. Estuaries in Meru Betiri National Park area is full of Mangrove plants (*Rhizophora* sp.), where this plant lives well in the brackish waters. This is consistent with Iskandars statement [14], in which *Fejervarya limnocharis* is a species that tends to choose habitats in areas with low elevation, and has a high tolerance to salinity (up to 2.8%). The abundance of *F. limnocharis* in the estuaries is also influenced by the availability of its food in large quantities, such as crabs or other small invertebrates [25]. Another member of the Dicroglossidae family, *Limnonectes microdiscus*, is a species that tends to choose habitat in undisturbed forest. Tadpoles of this species can be found in the region of the river with a clear flow of water [26]. The abundance of *L. microdiscus* found indicates that this species has a wide range of home range, in which adult species can be found in leaf litter and forest floor of enclosed primary forest, but not found in more open coastal forests. Meanwhile, tadpole or juvenile from *L. microdiscus* is distributed along the rim of the jungle track area.

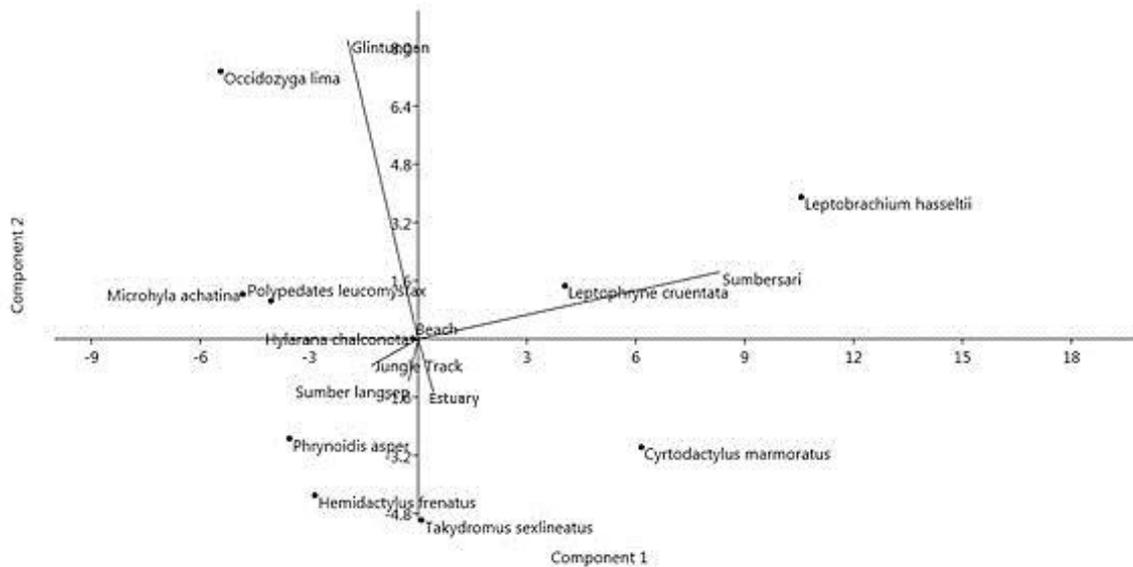


Figure 2. The Distribution of the Ten-Highest IVI of Herpetofauna in Sukamade

Different habitat preferences are also shared by species from the Microhylidae family, where all species found from this family tend to select habitat with a balanced terrestrial and aquatic composition. Sopyan [27] said that frogs of the genus *Microhylya* have ecological spreads vertically or horizontally. Glintungan and jungle tracks are two sites where two species of *Microhylya* genus (*Microhylya achatina* and *Microhylya* sp.) was found, both of which have small pools along the edge of the rapids (vertical pattern), and litter composition in the terrestrial area (horizontal pattern).

The pools around the rapid stream is an ideal place for *Microhylya* to breed, due to the presence of organisms or organic matter above the surface of the pond water, which is the main food source for the juvenile *Microhylya* [26]. Adult species prefer terrestrial habitat that tend to be moist, between litter and shrub bushes, where the whole component is present on Glintungan and jungle track. Other genera with two different habitat preferences is *Leptobrachium* sp. (Glintungan dan Summersari). Both of these locations are closed primary forest areas.

However, some areas in Summersari have been relocated to human activities (settlements, agriculture, and plantations). Both Glintungan and Summersari both have rapids with pool ponds along with a quiet stream of water. The condition is very potential to the growth of *Leptobrachium* tadpole in large quantities to grow and develop. The flow of rafting water and calm ponds facilitates the movement of juvenile frog to other habitat. As adult, *Leptobrachium*

tends to choose the habitat on both forest and lowland rainforest and bushland forests [28]. In addition, primary forest areas that have never experienced logging (Glintungan and Summersari), both have abundant *Leptobrachium* (threats to this species are agricultural land and large exploited populations).

In other side, economic value of amphibians and reptiles induce over-exploitation of its population (poaching), which can lead to extinction. More detail, Whitten explains that the preservation of species richness in Indonesia is threatened by commercial exploitation and habitat loss [29]. This condition is gradually worsen by the effect of climate change. Beyond these findings, Green Turtle (*C. mydas*) is a uniqueness of Sukamade. Nesting site beach on Meru Betiri National Park belongs to the government under the auspices of the Ministry of Environment and Forestry and is appointed as one of the specific Green Turtle conservation sites. This is because of the turtle lands every day. Sukamade beach is the largest nesting site for Green Turtle in Indonesia. There are four species of Sea Turtles which uses this nesting site, Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*), Olive Ridley (*Lepidochelys olivacea*), and Leatherback Sea Turtle (*Dermochelys coriacea*) [30].

The beginning of conservation management of sea turtles in Banyuwangi dates back to 1983, which back then consist Marengan Beach, Pancur, Paranglreng, Bantenan, and Pondok Waru. Meanwhile back then the other nesting site have not yet managed [31].



Figure 3. Some of herpetofauna of Sukamade. a. *Cyrtodactylus marmoratus*, b. *Leptobrachium hasseltii*, c. *Polypedates leucomsytax*, d. *Chelonia mydas*

Management in the area of Bantenan and Pondok waru in the form of semi-natural hatching only runs for one year of budget (1983/1984). Management in Bantenan and Pondok Waru areas is not long lasting due to: remote location, difficulty of transportation (land vehicle cannot be used), lack of adequate facilities, difficulty in finding fresh water source, lack of fund, and the nesting season often arrives at the same time as wet season, giving rise to malaria [32]. The capacity of these captive breeding site is limited and its facilities isn't adequate or has been damaged, which gave rise to predator entering the site.

The management carried out at Ngagelan post at this time in the form of transporting eggs from natural nest to semi-natural hatcheries, enlarging hatchlings hatching in tubs, releasing hatchlings, and safeguarding habitat of turtle nesting along the coast. Semi-natural hatching sites were made with 3x4 m size and 2x3.5 meters, bordered by 60 cm bamboo fence. Meanwhile the development tub (porcelain tub) was made with 6x3 meters in size and was separated into 5 small tubes, each containing up to 300 hatchlings [33]. Sukamade visitor is showing an increasing trends in the past 5 years (2012-2016) (Table 2). Sea turtle and its hatching

process observation became the main attraction. The observation of the turtle and its hatchling process is of particular interest to the tourism activities. The high interest from the visitor becomes an excellent base for tourism development.

Table 2. Annual Visits in Sukamade, MBNP

Year	International	Domestic
2012	584	2,758
2013	1,118	7,937
2014	2,152	57,940
2015	2,410	86,661
2016	2,671	60,672

Source: MBNP Unpublished Data

Sukamade tourist preferences for turtle observation tours are very high, compared to other tourist objects, such as bird watching, mammals, or nature explorations (MBNP unpublished data). This adversely affects the sustainability of the tourism business, where the product diversification becomes one of its supporters [34]. This study shows that Sukamade has potential locations in the development of nature exploration. MBNP as tourism stakeholders can make a selection of interest, preferences, and build a tourist location to continue to develop this tour and at the same time maintain its sustainability [5,35,36].

Herpetofauna habitat locations became an important spot for the basis of alternative tourism development. However, the access toward these locations is important for observation and research. Subsequent research is expected to make approaches on classifying the access and tourist preferences toward herpetofauna and its habitat observation-based tourism.

CONCLUSION

Sumbersari and Glintungan provide a suitable habitat for some interest herpetofauna: *Leptobranchium hasselti*, *Leptophryne borbonica*, and *Cyrtodactylus marmoratus*. Beach and Jungle track provide suitable habitat for almost all herpetofauna, and an endangered species: *Chelonia mydas*.

ACKNOWLEDGEMENTS

Authors acknowledges the support of PEER-USAID for herpetofauna studies in Java and Sumatra (2016). Authors acknowledge the work of NK research team: A.M. Kadafi, M. Alif Fauzi, A.S. Firdaus, and B. Priambodo. We thank also to Mr.Rohman and Mr Reindra for their assistance in field, and for valuable information. We thank to A.E. Wardana and Junaidi for their assistance on field planning. We also thank to senior officers in Sukamade : Mr. Puji Firmansyah, Mr Hasyim Fikri, Mr. Bc. Hartono and Mr.Pratono Puroso for providing valuable permission, photos, and feedback on our questions about herpetofauna.

REFERENCES

- [1] Stebbins, R. C. and N. W. Cohen. 1997. A natural history of amphibians. Princeton University Press. New Jersey.
- [2] Iskandar, D.T. and W.R. Erdelen. 2006. Conservation of amphibians and reptiles in Indonesia: issues and problems. *Amphibian and Reptile Conservation* 4(1), 60-87.
- [3] Neth, B. 2008. Ecotourism as a tool for sustainable rural community development and natural resources management in the Tonle Sap Biosphere Reserve. Uniderckei, University of Kassel. Germany.
- [4] Moor, R. 2012. Volunteers and ecotourism find their way to South Africa. *Tourism review online magazine* 3/2012. Available at: <http://www.tourism-review.com/travel-tourism-magazine-ecotourism-in-south-africa-volunteer-projects-and-frog-safari-article1777>.
- [5] Morrison, C., C. Simpkins, J. G. Castley and R. C. Buckley. 2012. Tourism and the conservation of critically endangered frogs. *PLoS ONE* 7(9), e43757.
- [6] Isaacs, J. C. 2000. The limited potential of ecotourism to contribute to wildlife conservation. *Wildlife Society Bulletin* 28(1), 61-69.
- [7] Irandu, E.M. 2003. Wildlife tourism and local communities in Kenya. ATLAS-Africa Conference. Arusha, Tanzania.
- [8] Subarudi. 2001. Upaya penyelamatan Taman Nasional Kutai. *Info Sosial Ekonomi* 2(1), 29-35.
- [9] Pradhan, S., D. Mishra, and K. R. Sahu. 2014. An inventory and assessment of snake diversity of Gandhamardan hills range of Western Oriissa, India. *International Journal of Pure and Applied Zoology* 2(3), 241-245.
- [10] Whitaker, R. and A. Captain. 2008. Snakes of India: the field guide, 1stEd. Draco Books. Chengalpet.
- [11] Dutta, S.K., M. V. Nair, P.P. Mohaptra and A. K. Mohaptra. 2009. Amphibians and Reptiles of Similipal Biosphere Reserve. Regional Plant Resource Center. Bhubaneswar.
- [12] Das, I. 2015. A field guide to the reptiles of South-East Asia. Bloomsbury Publishing Plc. London.
- [13] Ranvestel, A. W., K. R. Lips, C. M. Pringle, M. R. Whiles and R. J. Bixby. 2004. Neotropical tadpoles influence stream benthos: evidence for the ecological consequences of decline in amphibian populations. *Freshwater Biology* 49, 274-285.
- [14] Iskandar, D. T. 1998. Amfibi Jawa dan Bali – seri panduan lapangan. Research and Development Center, Indonesian Institute of Sciences. Bogor.
- [15] Van Dijk, P., D.T. Iskandar, M. W. N. Lau, Z. Ermi, G. Baorong, S. Haitao, S. Dutta, S. Sengupta and S. U. Sarker. 2004. *Occidozyga lima*. The IUCN Red List of Threatened Species. e.T58411A86626569.
- [16] Inger, R. F., B. L. Stuart, and D. T. Iskandar. 2009. Systematics of a widespread Southeast Asian frog, *Rana chalconota* (Amphibia: Anura: Ranidae). *Zoological Journal of the Linnean Society* 155, 123-147.
- [17] Kurniati, H. 2003. Amphibians and reptiles of Gunung Halimun National Park West Java Indonesia. Research Center for Biology, Indonesian Institute of Sciences. Bogor.

- [18] Moritz, C., D. Broderick, K.E.M. Dethmers, N. N. FitzSion, and C.J. Limpus. 2002. Population genetics of Southeast Asian and Western Pasific green turtles, *Chelonia mydas*. Australian Government, Department of the Environment and Water Resources. 1-42.
- [19] Godfrey, M. H., and N. Mrosovsky. 2006. Pivotal temperature for green sea turtle, *Chelonia mydas*, nesting in Suriname. *Herpetological Journal* 16(1), 55-61.
- [20] Seminoff, J., A. Resendiz and W. Nichols. 2002. Home range of green turtles *Chelonia mydas* at a coastal for aging area in the Gulf of California, Mexico. *Marine Ecology Progress Series* 242, 253-265.
- [21] Klom-In, W. 2002. Nesting location of the green sea turtle (*Chelonia mydas*) at the Huyong Island: Biology and Conservation. Naval War College, Institute of Advanced Naval Studies. Nakhon Pathom.
- [22] Darusman, D. and Widada. 2004. Konservasi dalam perspektif ekonomi pembangunan. Directorate General of Forest Protection and Nature Conservation Collaborate with Japan International Cooperation Agency (JICA) and Laboratory of Politic, Social and Economy of Forestry, Bogor Agricultural University. Bogor.
- [23] Basuni, S. and N. Kosmaryandi. 2008. Pengembangan ekowisata pada kawasan hutan konservasi. CV Tamita Perdana Nias. Nias.
- [24] Khan, M. A. R. 2001. A report on the puddle (bleating) frog *Occidozyga lima* (gravenhorst) from the Teknaf Peninsula, Bangladesh, with notes on the presence of other vertebrates. *Journal of Zoology* 16(9), 583-587.
- [25] Kurniati, H. 1998. Kebiasaan makan empat jenis katak *Rana* asal Kelila, Kabupaten Jayawijaya, Irian Jaya. *Biota* 3(2), 58-62.
- [26] Iskandar, D.T. and Mumpuni. 2004. *Microhyla achatina*. The IUCN Red List of Threatened Species: e.T57873A11696337.
- [27] Sopyan, M. H., Moerfiah and I. D. Rouland. 2006. Karakteristik dan kepadatan populasi genus *Microhyla* di wilayah Cagar Alam dan Taman Wisata Alam (CA-TWA) Telaga Warna. *Jurnal Zoologi*, 1-8.
- [28] Diesmos, A., A. Alcalá, R. Brown, L. Afuang, G. Gee, J. Sukumaran, N. Yaakob, L.T. Ming, Y. Chuaynkern, K. Thirakhupt, I. Das, D. Iskandar, Mumpuni, R. Inger, R. Stuebing, P. Yambun, M. Lakim and M. Kusriani. 2009. *Leptobrachium hasseltii*. The IUCN Red List of Threatened Species. e.T57554A11657884
- [29] Whitten, A. J., M. Mustafa and G. S. Henderson. 1987. *Ekologi Sulawesi*. Gadjah Mada University Press. Yogyakarta.
- [30] Putera, A. A. R., L. Sulmartiwi, and W. Tjahjaningsih. 2015. Effect of nesting site depth of green turtle (*Chelonia mydas*) on the incubation period and hatching success percentage in Sukamade beach, Meru Betiri Nasional Park, Banyuwangi in East Java. *Jurnal Ilmiah Perikanan dan Kelautan* 7(2), 195-198.
- [31] Limpus, C. J. 1995. Marine turtle biology. Briefing Book CAMP and PHVA Workshop for Marine turtle in Indonesia. Bogor.
- [32] Priyono, A. 1985. Studi reproduksi penyu daging, *Chelonia mydas* L., di Pantai Sukamade, Kabupaten Banyuwangi. Paper. Faculty of Fisheries, Bogor Agricultural University. Bogor.
- [33] Nuitja, I. N. S. 1992 *Biologi dan pelestarian penyu laut*. Bogor Agricultural University Press. Bogor.
- [34] Putri, S. D., Soemarno and L. Hakim. 2015. Strategic management of nature-based tourism in Ijen Crater in the context of sustainable tourism development. *Journal of Indonesian Tourism and Development Studies* 3(3), 123-129.
- [35] Krúger, O. 2005. The role of ecotourism in conservation: panacea or Pandora's Box? *Biodiversity and Conservation* 14, 579-600.
- [36] Haryati, J. R., J. F. Putri, N. Chairiyah, A. Harris, H. A. Putri and R. N. Pamungkas. 2016. Action plan in developing sea turtle conservation as ecotourism attraction in Sukamade, Meru Betiri National Park. *Journal of Indonesian Tourism and Development Studies* 4(2), 67-74.

Factors and Strategy for Sustainable Tourism in Boti Village, East Nusa Tenggara

Simon Suddin

Department of Architecture, Faculty of Science and Technology, Nusa Cendana University, Kupang, Indonesia

Abstract

The potentiality and limitation of tourism development in Boti Village of Timor Island lead to the needs of a comprehensive strategy to enhance the sustainability of tourism. The aims of the research are to describes the variable influence the sustainability of tourism and drawn the design for sustainable tourism in Boti Village. This research identifies 13 variables as crucial factors to determine the sustainable tourism in Boti Village. It is including strengthening local law in Boti, implementation of tourism regulation, formalizing regulation related to tourism zonation, strengthening conservation program, infrastructure development, accessibility improvement, fundraising and generating public support for funding, strengthening community development program and implementation, promoting research for tourism development, strengthening role of local institution (or locally called *Lembaga Adat/Masyarakat*), strengthening role of government in tourism infrastructure and accessibility development, strengthening the role of private sector, and developing and improving proper marketing strategy..

Keywords: conservation, responsible tourism, sustainable tourism.

INTRODUCTION

Boti village in East Nusa Tenggara (Indonesia) is one of the remotes villages but it has been visited by international tourist to enjoy the natural and cultural attraction of the village. Boti Villages inhabited by animism community under traditional leadership system with *Usif* as a kings and creator representative in Boti. Boti community live in sustainable live, with local wisdom and traditional knowledge as an important instrument in daily life. There is social structure that organized Boti community into single traditional community with its traditional life. It can be said that Boti is the last Kingdom in Timor Island with its traditional community live system and traditional ways of life to manage their environment [1,2].

Recently, Boti is one of the target for tourism development in East Nusa Tenggara Province. Fact that this village has been visited by international visitor from Europe and Australia lead local government develop specific planning for tourism development in Boti. The development of tourism in Boti is especially relevant to the national policy of tourism development and significantly important to support local economic development and environmental conservation [3,4]. The development also important to

enhance the socio-cultural aspect of local community in Boti.

Numerous internal and external aspect influence the success and future sustainability of tourism in Boti. Sustainability recently is important issues in the global life, including in tourism sector. Scholar point out that there are numerous aspect influence the sustainability of tourism, ranging from social, economic and environmental aspect. In many case, these factors is not independent, but each factor will have correlation with other factors [5,6]. Therefore, planning to meets sustainable tourism need comprehensive approach. As far, few studies were available to provide comprehensive perspective on tourism basic planning in Boti. The aims of the research is to describes the variable influence the sustainability of tourism and drawn the design for sustainable tourism in Boti Village.

MATERIALS AND METHOD

Participatory Prospective Analysis

Strategy development for sustainable tourism development in Boti was firstly done by developing sustainability scenario using Participatory Prospective Analysis (PPA). The PPA as an instrument analysis which is designed to identify and anticipate changes with expert involvement in analysis process, including the policy holders which are related to the tourism destination development [7].

PPA is an adaptation of numerous comprehensive methods in the rapid and comprehensive

* Correspondence address:

Simon Suddin

Email : simonsuddin57@gmail.com

Address : Dept. Architecture, Nusa Cendana University, Jl. Adisucipto, Penfui-Kupang.

framework of operational work. The cognitive aspect of the methods is related to its typology. It focus on interactions and consensus building, that are able to produce a particular concencuss among the inter stakeholder interaction. It is useful in the perspective of planning. This methods based on some principles, including participation, transparation, consistency, efectivity, relevancy, arguable, and able to increase stakeholders capacity [7].

Generally, there are steps in the process of planning that are conceptualized following the objectivity and rationality, including (a) data collection, (b) data analisys, (c) policy making, (d) implementation and (e) monitoring. The first and second steps is important and influce the success of the next steps.

Participatory Prospective Analysis was done by following these steps: (a) system identification, (b) system variable identification, (c) key variable identification, (d) the impact of inter variable analysis, (e) interpretation of all impact and inter variable dependency, (f) states - of future variable, (g) scenario development, and (h) establishing implication strategic and anticipation actions [7]. System identification was done as first stage in expert meeting, and it was done with discussion methods among expert. This steps is important for the future phase.

Data Collection

Identification of system variable was done using questionnaire, interviews and brainstorming. It is started from variable that have impact to system arrangement and evolution. To ensure the equal participation, the visual techniques using colour charts. Respondent was requested to freely state the important variable, at least one variable in one chart. Charts were collected and attached to the board. The similar

statement (redundant), was deleted and changes with other charts. In this steps, there are concencuss from all respondents to delete and add the charts. In this steps, the discussion related to the relevancy of variables was done, and it is follow up by development of partici- pant’s opinion and concencuss.

Key variable definition was done using structured discussion that discuss the relevancy of each agreed variable. There are simple roles in developing participant opinions to defines variable or not variable, including (1) not question sentence; (2) not negative statement; and (3) not physical expression. Variabel that cannot be stated in different situation was classified as irrelevant variable. From this step, the final definitf system variable was defined and analysed.

Data Analysis

The analysis on the impact of inter-variable was done using structural analys and work group. Respondent answers analysis was focused on the influence/dependence of each variable to other variable using consensual valuations approach. The direct conception valuation of each variable to other variable was illustrated in Table 1.

The valuation of variable impact to other variable was scored from 0 as no impact to 3 as strong impact. These value was discussed among respondent and after get concessus was fill up at influence/dependence (I/D) matrix. Number of valuation depend on the number of identified variable. If there are n variable, there are $n^2 - n$ relationship among variables which should discussed and evaluated. Interpretation of influence/dependence was analized using Microsoft Excel softwere, with table and figure as output analysis. The direct and indirect graph shows the streght level of variable.

Table 1. The Valuation of Direct Conception on Each Variable to Other Variable

From ↓	Factors									
To →	A	B	C	D	E	F	G	H	I	J
A	■									
B		■								
C			■							
D				■						
E					■					
F						■				
G							■			
H								■		
I									■	
J										■

Notes: A-J = important aspects in system

The determination of key factor or dominant factor shows level of influence and links between attributes in the sustainable system. In this situation, each quadrant in diagram has specific and different characters [7]. Each quadrant has characteristics as explained below:

- 1) Quadrant I (*driving variables*) contains factors that has strong impact but has low dependent. This quadrant is called driving variables and considered as a strongest factor in system.
- 2) Quadrant II (*leverage variables*) contains factors that has strong influence but also has strong leverage variables, in which each factors in this quadrant was viewed as strong variable.
- 3) Quadrant III (*output variables*) represents the output factor, in which its influence was less but has high dependency.
- 4) Quadrant IV (*marginal variables*) is the factor with low influence and low dependency. Factors in this quadrant can be ignored in the system.

Morphology Analysis

The next step after Participatory Prospective Analysis is the morphology analysis or steps to define the condition of variable in the future. This analysis aims to estimates future domain and propose alternatives. This analysis was done

by defining future key variable following Bourgeois and Jesus [7]. Respondent was asked to identify some conditions of future variable and focus to the free alternatives. The defined variable and its condition was set up into table that shows the future scenario combination.

RESULT AND DISCUSSION

Keys Variable Factor for Sustainable Tourism Development in Boti

The keys variable as leverages factor for sustainable tourism development in Boti was given in Table 2. Result of the study found that many aspet related to sustainable tourism development in Boti can be classified into four quadrant. This classification can be described below.

- Quadrant I (*driving variables*) consist of 2 factors namely (1) tourism infrastructure and (2) local law (*hukum adat*).
- Quadrant II (*leverage variable*) contains 11 factors: (1) government regulation, (2) tourism zonation, (3) transportation access, (4) cultural heritages preservation, (5) private sectors role, (6) culture conservation, (7) historical sites, (8) role of local institution (*lembaga adat*), (9) application of science and technology, (10) cultural tourism attraction, and (11) tourism education and training.

Table 2. Global Influence and Dependency of Leverages Factors in Sustainable Tourism Development in Boti

Codes	Factors	Global influence	Global dependency	Global strength	Global strength shared
A	Tourism area zonation	136	136	0.026	1.323
B	Water spring	86	48	0.021	1.074
C	climates	95	69	0.021	1.065
D	humidity	87	77	0.018	0.903
E	Fauna diversity	75	102	0.012	0.614
F	Rainfall	91	11	0.031	1.574
G	Jobs opportunity	28	115	0.002	0.104
H	Tourism service development	87	118	0.014	0.718
I	Service diversification	93	117	0.016	0.806
J	Tourism training and education	105	110	0.020	1.002
K	Application of science and technology	117	113	0.023	1.153
L	Cultural heritage protection	122	119	0.024	1.201
M	History sites	112	119	0.021	1.056
N	Cultural conservation	119	108	0.024	1.214
O	Education content	76	108	0.012	0.606
P	Cultural attraction	103	113	0.019	0.955
Q	Transportation access	132	117	0.027	1.366
R	Tourism infrastructure	129	94	0.029	1.457
S	Health facility	80	95	0.014	0.711
T	Accommodation	86	98	0.016	0.782
U	Health water	66	81	0.012	0.581
V	Role of local institutions	110	102	0.022	1.115
W	Local law	106	95	0.022	1.087
X	NGOs	93	103	0.017	0.863
Y	Privates role	120	102	0.025	1.262
Z	Governmental regulation	136	121	0.028	1.405

- Quadrant III (*Output variables*) contains 6 factors, includes (1) non governmental organization (NGOs), (2) business diversification, (3) development of other tourism services, (4) education content, (5) flora-fauna diversity, and (6) jobs opportunities.
- Quadrant IV (*Marginal variables*) contains 7 factors, namely (1) climates, (2) rainfall, (3) air humidity, (4) water spring, (5) tourism accommodation, (6) health facility, and (7) healthy water.

Keys Variable which are Needed by Stakeholders in the Development of Sustainable Tourism in Boti

Keys variable and the variable dependency was shown in Table 3. Quadrant I (*driving variables*) contains 2 factors, including: (1) tourism facility and (2) local law (*hukum adat*).

Quadrant II (*leverage variables*) contain 11 factors: (1) governmental regulation, (2) tourism zonation, (3) transport access, (4) protection of cultural heritage, (5) private sector, (6) cultural conservation, (7) historical sites, (8) role of local institution (*lembaga adat*), (9) science and technology application, (10) attraction to cultural tourism, and (11) education and tourism training.

Quadrant III (*output variables*) contain 6 factor, including : (1) NGOs, (2) tourism business diversification, (3) development of tourism ser-

vice, (4) education content, (5) fauna diversity, and (6) jobs opportunities. Quadrant IV (*marginal variables*) contains 7 factors, including: (1) climates, (2) rainfall intensity, (3) air humidity, (4) fresh water, (5) accommodation, (6) health facility, and (7) fresh water.

Basically, these variable has been identified important among scholar, especially to create sustainable tourism in developing countries with huge biodiversity and local culture tradition. Among the important drive variable in sustainability was infrastructure. In which this aspect contribute significantly in sustainable tourism development [8,9].

Keys Variable Related to Leverages Factors and Stakeholders Needs

Variable keys related to leverages factors and stakeholders needs towards sustainable tourism in Boti was given in Table 4. There are various key variables identified, indicates that the development of sustainable tourism cannot be implemented into single perspectives. Therefore, developing consensus among tourism stakeholder in Boti is important towards sustainable tourism development. Tosun [10] point out that negotiating among stakeholder and establishing consensus is important, especially in the situation where community participation is the crucial issues in tourism development.

Table 3. Global Impact and Dependency of Factors Related to Stakeholder Needs in the Development of Sustainable Tourism

Codes	Stakeholders needs	Global influence	Global dependency	Global strength	Global strength shared
A	Natural attraction	132	132	0.021	1.071
B	Cultural attraction	118	132	0.017	0.903
C	Man-made tourism potentials	113	129	0.017	0.856
D	Tourism area management	120	134	0.018	0.920
E	Conservation	144	131	0.024	1.223
F	Education	99	136	0.013	0.677
G	Nature condition	104	88	0.018	0.914
H	Integrated management	118	128	0.018	0.918
I	Local product commodity	94	116	0.013	0.683
J	Tourism service development	108	134	0.015	0.782
K	Prosperity improvement	124	145	0.018	0.927
L	Infrastructure	139	113	0.024	1.244
M	Accessibility	124	111	0.021	1.061
N	Utility	129	116	0.021	1.102
O	Funding	137	121	0.023	1.180
P	Retribution	98	115	0.014	0.731
Q	Promotion	127	134	0.019	1.002
R	Marketing	133	135	0.021	1.071
S	Investors collaboration	133	126	0.021	1.108
T	Research for development program	133	118	0.022	1.143
U	Implementation	130	100	0.023	1.192
V	Community development	130	124	0.021	1.079
W	Local norm (<i>Norma adat</i>)	108	90	0.018	0.956
X	Regulation	129	96	0.023	1.200
Y	Monitoring and assistance	115	135	0.017	0.858
Z	Regular evaluation	148	148	0.023	1.200

Table 4. Identification of Keys Variable Combination of Leverages Factors and Stakeholders Needs in the Development of Sustainable Tourism in Boti

No.	Keys variable of leverages factors	Keys variable of stakeholders needs	Combination key variable	code
1.	Tourism infrastructure (A)	Infrastructure (N)	Local law (<i>Hukum adat</i>) (B)	A
2.	Local law (<i>Hukum adat</i>) (B)	funding (O)	Tourism regulation (C+R)	B
3.	Government regulation (C)	Research for development (P)	Funding (O)	C
4.	Tourism area zonation (D)	program Implementation (Q)	Tourism area zonation (D)	D
5.	Transportation access (E)	Regulation (R)	Nature-based tourism attraction (Y)	E
6.	Cultural heritage protection (F)	Utility (S)	Cultural attraction (L)	F
7.	Role of private sector (G)	Accessibility (T)	Conservation (V)	G
8.	Cultural conservation (H)	Regular evaluation (U)	Cultural conservation (F+H)	H
9.	Historical sites (I)	Conservation (V)	Infrastructure (A+N)	I
10.	Role of local institution (J)	Investors collaboration (W)	Accessibility (E+T)	J
11.	Application of science and technology (K)	Marketing (X)	Utility (A+S)	K
12.	Cultural attraction (L)	Natural attraction (Y)	Community development (M+Z)	L
13.	Education and training in tourism (M)	Community development (Z)	Integrated management (U)	M
14.		Promotion (AA)	Application of science and technology (K)	N
15.		Increasing prosperity (AB)	Research for development (P)	O
16.			Promotion (AA)	P
17.			Marketing (X)	Q
18.			Role of local institution (J)	R
19.			Role of government (Q)	S
20.			Role of private sectors (G+W)	T
21.			Increase of prosperity (AB)	U

From the systematic synthesis, the consensus of stakeholder on the possible state for sustainable tourism development in Boti was given in Table 5. From the analysis, the possible and better scenario towards sustainable tourism in Boti was given in Table 6.

The scenario with highest score 633 and average 3.25 will occurs sustainably within 2-5 years located at the combination of 1B; 2C; 3B; 4C; 5B; 6C; 7B; 8B; 9B; 10C; 11C; 12B; 13B. This scenario seems to be ideal for the implementation of sustainable tourism development in Boti. In the perspectives of stakeholders, the significant strategy was summarized in Table 7.

From these results, it clear that there are some basic principles to support sustainable tourism development. More principally, it is seems that promoting and strengthening local law becomes the fundamental aspect and spirit for any tourism development program. Result of the analysis indicates that sustaining sustainable live of community in Boti is the main issues in Boti development, and tourism is should be complemented and able to support local culture

live and traditions. Scholar point out that it's become fundamental aspect for tourism development [11].

Strengthening local culture and tradition with local law guideline has been contributes significantly in Bali. Local institution and local culture has been contribute in outstanding and sustainable landscape, in which it is important to attract tourist to enjoy Bali [12]. The local law can be complement with tourism regulation which area set up by central and local government to manage tourism development. Scholars point out that tourism regulation is important to ensure tourism contribute to social, economic and environmental aspects [13]. Tourism zonation and environmental conservation is attributes to the sustainable tourism development, and these aspect has been mentioned by authors as an important aspect in tourism destination development [14]. Another aspect, i.e. infrastructure development, accessibility and funding support has been identified as key for destination competitiveness [8].

Table 5. Respondent Consensus on the Possible State for Sustainable Tourism Development in Boti

Keys variable	Codes	Possible state in the future		
		A	B	C
Local law (<i>Hukum adat</i>)	1	(1A)	(1B)	
		Local law provides less support sustainable tourism	Local law strongly support sustainable tourism	
Tourism regulation	2	(2A)	(2B)	(2C)
		There are regulation but no socialization	There are regulation, socialization but not implemented	There are regulation, socialization and implemented
Tourism area zonation	3	(3A)	(3B)	
		There are no zonation	Tourism zonation exist	
Environmental Conservation	4	(4A)	(4B)	(4C)
		Conservation exist and implemented by local community	Conservation exist, implemented partially and implemented sustainably	Conservation exist, implemented integrally and sustainably
Infrastructure	5	(5A)	(5B)	
		Infrastructure degraded, insufficient to support tourism	Infrastructure support tourism development	
Accessibility	6	(6A)	(6B)	(6C)
		Limited access, insufficient to support tourism development	Access sufficient to support tourism development	Access excellent to support tourism development
Funding	7	(7A)	(7B)	(7C)
		No funding available for tourism development	Funding available but limited	Funding available in sufficient amount to support tourism development
Community development	8	(8A)	(8B)	(8C)
		No community development program	Community development exist	Community development well done
Research for development	9	(9A)	(9B)	
		No research for development	Research for development available	
Role of local institution	10	(10A)	(10B)	(10C)
		There are no role of local institution in tourism development	There are role of local institution in tourism development	Role of local institution very strong in tourism development
Role of government	11	(11A)	(11B)	(11C)
		There are no governmental role	Role of government limited	Role of government significant in tourism development
Role of private sector	12	(12A)	(12B)	
		There are no role of private sector in tourism development	There are role of private sector in tourism development	
Marketing	13	(13A)	(13B)	
		There are no marketing strategy	Marketing strategy exist and implemented	

Table 6. Summary of Possible and Better Scenario towards Sustainable Tourism in Boti

Scenario combination	Score		Category
	Total	Mean	
Local low support sustainable tourism development (1B)	52	3.47	Implemented sustainable in realistic status in this moment
There are regulation, socialized and implemented (2C)	53	3.53	Implemented sustainably more than 6 years
Tourism zonation available (3B)	48	3.20	Implemented sustainably in 2-5 years
Conservation programmed and implemented integrally and sustainably (4C)	39	2.60	Implemented sustainably in 2-5 years
Infrastructure support tourism development (5B)	38	2.53	Implemented sustainably in 2-5 years
Good access, support tourism development (6C)	50	3.33	Implemented sustainable in realistic status in this moment
Funding available, very limited (7B)	51	3.40	Implemented sustainable in realistic status in this moment
Community development available following needs (8B)			Implemented sustainable in realistic status in this moment
Research for development available (9B)	52	3.47	Implemented sustainable in realistic status in this moment
Local institution contribute significantly in tourism development (10C)	56	3.73	Implemented sustainable in realistic status in this moment
Government contribute significantly in sustainable tourism development (11C)	58	3.87	Implemented sustainable in realistic status in this moment
Private sector contribute sufficient in sustainable tourism development (12B)	40	2.67	Implemented sustainably in 2-5 years
Marketing strategy available and well implemented(13B)	38	2.53	Implemented sustainably in 2-5 years
	633	3.25	Implemented sustainably in 2-5 years

Table 7. Identification of Strategy for Sustainable Tourism Development in Boti

No.	Key variable	Scenario	Strategy
1.	Local law (<i>Hukum adat</i>)	Local law support sustainable tourism development	Strengthening local law
2.	Tourism regulation	Regulation available, socialized, and well implemented	Implementation of tourism regulation
3.	Tourism zonation	Tourism zonation exist	Formalizing regulation related to tourism zonation
4.	Environmental conservation	Conservation programmed and implemented integrally and sustainably	Strengthening conservation program
5.	Infrastructure	Infrastructure support tourism development	Infrastructure development
6.	Accessibility	Good access, support tourism development	Accessibility improvement
7.	Funding	Funding available but limited	Fundraising and generating public support for funding
8.	Community development	Community development available following needs	Strengthening community development program and implementation
9.	Research for development	Research for development available (9B)	Promoting research for tourism development
10.	Role of local institution	Local institution contribute significantly in tourism development	Strengthening role of local institution (<i>Lembaga Adat/Masyarakat</i>)
11.	Role of government	Government contribute significantly in sustainable tourism development	Strengthening role of government in tourism infrastructure and accessibility development
12.	Role of private sector	Private sector contribute sufficient in sustainable tourism development	Strengthening role of private sector
13.	Marketing	Marketing strategy available and well implemented	Developing and improving proper marketing strategy

CONCLUSION

There are 13 variable identified as factors that contributes to the sustainable tourism in Boti Village, Timor Island. It includes strengthening local law, Implementation of tourism regulation, Formalizing regulation related to tourism zonation, Strengthening conservation program, Infrastructure development, Accessibility improvement, Fundraising and generating public support for funding, Strengthening community development program and implementation, Promoting research for tourism development, Strengthening role of local institution (*Lembaga Adat/Masyarakat*), Strengthening role of government in tourism infrastructure and accessibility development, Strengthening role of private sector, Developing and improving proper marketing strategy.

REFERENCES

- [1] Situmeang, V. S. N. 2013. Ume kbbu: Household granary and food security in Timor Tengah Selatan. PhD Thesis. University of Oregon.
- [2] Suddin, S. 2017. Resources of Boti Village (Timor Island) for the ecotourism development. *Journal of Indonesian Tourism and Development Studies* 5(2), 107-112.
- [3] Cukier, J. 2002. Tourism employment issues in developing countries: examples from Indonesia. *Tourism and development: Concepts and Issues*, 165-201.
- [4] Hakim, L., M. Soemarno, S. K. Hong. 2012. Challenges for conserving biodiversity and developing sustainable island tourism in North Sulawesi Province, Indonesia. *Journal of Ecology and Environment* 35(2), 61-71.
- [5] McMinn, S. 1997. The challenge of sustainable tourism. *The Environmentalist* 17(2), 135-141.
- [6] Weaver, D. B. 2006. *Sustainable tourism: Theory and practice*. Routledge.
- [7] Bourgeois, R., F. Jesus. 2004. *Participatory prospective analysis: exploring and anticipating challenges with stakeholders*. Monographs.
- [8] Inskeep, E. 1991. *Tourism planning: an integrated and sustainable development approach*. Van Nostrand Reinhold.
- [9] Dwyer, L. 2007. *International handbook on the economics of tourism*. Edward Elgar Publishing.
- [10] Tosun, C. 2000. Limits to community participation in the tourism development process in developing countries. *Tourism Management* 21(6), 613-633.
- [11] Hughes, H. L. 2002. Culture and tourism: a framework for further analysis. *Managing Leisure* 7(3), 164-175.
- [12] Hakim, L., J. E. Kim and S. K. Hong. 2009. Cultural landscape and ecotourism in Bali Island, Indonesia. *Journal of Ecology and Environment* 32(1), 1-8.
- [13] Costa, N. and G. Martinotti. 2003. Sociological theories of tourism and regulation theory. *Cities and Visitors: Regulating People, Markets, and City Space*, 53-71.
- [14] Newman, C. M., A. J. Knudby and E. LeDrew. 2007. Assessing the effect of management zonation on live coral cover using multi-date IKONOS satellite imagery. *Journal of Applied Remote Sensing* 1(1), 011504.

Interpretation of Sustainability Factor in Wonorejo Mangrove Ecotourism, Surabaya, Indonesia

Rita Parmawati^{1*}, Anita Qur'ania², Arief Kurnia Riarmanto², Arham Yakub², and Agung Sih
Kurnianto³

¹Postgraduate, University of Brawijaya, Malang, Indonesia

²Graduate School of Environmental Sciences, University of Brawijaya, Malang, Indonesia

³Public Health Faculty, University of Bakti Indonesia, Banyuwangi, Indonesia

Abstract

Mangrove Ecotourism Wonorejo Forest (EHMW) is designed by the Surabaya City's government to have some aspects of nature and education to conservation that may help to save the environment and economy, especially through the tourism. Some ecologists revealed that the development of tourism in EHMW runs not balanced and not oriented to the principle of sustainability. This study aims to determine the level of sustainability of EHMW management in Surabaya based on analysis of three sustainability criteria. The study was conducted from September to October 2017. We conducted two methods of data collection: interviews and questionnaires. Assessment is grouped into four levels of sustainability status (%): 0.00-25.00 (unsustainable); 25.01-50.00 (less sustainability); 50.01-75.00 (sufficient sustainability); and 75.01-100.00 (continuous). EHMW management goes into sustainable criteria (77.18%). The value of the sustainability of all criteria is still below 50.1%, or less sustainable. Each criteria's value was ecology criteria of 29.38%, on the economic criteria of 28.17% and on the social criteria of 19.63%.

Keywords: Environment, Mangrove, Social, Sustainable, Wonorejo.

INTRODUCTION

Indonesia has the largest mangrove area in the world, approximately 4,252,000 hectares, and most of this area are outside of Java Island [1]. Spalding [2] inform that 40% of Indonesia's mangrove forests have been converted to agriculture, fish ponds, and coal industries in South Sulawesi, South Kalimantan and Northern Java [3]. Mangrove is an important component of the coastal ecosystem balance [4]. Ecologically, mangrove serves as a coastal protection from tsunami [5], erosion barriers, sediment catchers [6], carbon sequestration [7], recycling the nutrients [8,9], maintaining fisheries process [10; 11], preserving biodiversity [12], and preserving coastal ecosystems [13]. In addition, mangroves also help reduce the risk of global warming [14, 15,16].

Mangrove Ecotourism Wonorejo Forest (EHMW) is designed by the Surabaya City's government to have some aspects of nature and education to conservation that may help to save the environmental and economical values [17,18], especially through the tourism [19-23].

However, some ecologists revealed that the development of tourism in EHMW runs not balanced and not oriented to the principle of sustainability [24]. Tourism development that generally runs rapidly and prioritizes economic interests, will reduce the value of its benefits to the overall context of sustainable tourism, such as justice, environment, economy and, in particular, its effects on the economic dimension, environmental resource management, and socio-cultural development [25,26]. Ecotourism cannot be separated by the conservation efforts, so ecotourism is called the effort of responsibility towards nature [27,28].

EHMW management requires the adoption of sustainable management concepts based on a sustainable development triangle framework. This framework illustrates that sustainable development is oriented towards three mutually supportive and related sustainability dimensions: the ecological, economic and social dimension [29,30]. This study aims to determine the level of sustainability of EHMW management in Surabaya based on analysis of three sustainability criteria.

MATERIALS AND METHOD

Study sites

The research was conducted at EHMW, Wonorejo Village, Rungkut subdistrict, Surabaya. This area covers 648,453 ha and located at ± 2 km

*Correspondence address:

Rita Parmawati

Email : rita_parmawati@ub.ac.id

Address : Postgraduate, University of Brawijaya, MT
Haryono street no. 169, 65145. Malang.

east from Surabaya city. Since 2007, the area was developed as a tourist and conservation area, both the ecosystem and the physical coast of abrasion. EHMW is established on municipal government land and its development is dependent on Surabaya Regional Budget and Expenditure (*Anggaran dan Pendapatan Belanja Daerah*). This area has good both of the main and supporting facilities, such as parking area, management office, nursery, track, canteen, mosque, public toilets, playground, pier, counters, jogging track, and rest area. Some private-owned boats can also be used to roam the mangrove area.

Data collection

The study was conducted from September to October 2017. We conducted two methods of data collection: interviews and questionnaires. Determination of the respondents was done randomly, sampling with a balanced amount based on the background, so it is considered that every respondent has the same opportunity. The object on this method is the community, visitors and managers (n=30). The topic of the questions consists of the perception and knowledge of the respondents about the sustainability of ecotourism on ecological, economic, and social sustainability.

Analysis

The data were processed and analyzed based on the total score of questions of the questionnaire using Likert scale (Table 1). The results were analyzed using Factor Analysis. Furthermore, to assess the sustainability of EHMW management, assessment is used based on modifications from Suwarno [31]. Assessment is grouped into four levels of sustainability status (%): 0.00-25.00 (unsustainable); 25.01-50.00 (less sustainability); 50.01-75.00 (sufficient sustainability); and 75.01-100.00 (continuous). We built 6 indicators of sustainability that will be explored, including 1. Ecology (mangrove area expansion, mangrove's benefits information, and community involvement on protecting the environment), 2. Economy (small community's business), and 3. Social (community involvement on management and maintaining sustainability).

Table 1. Likert scale score

Score	Keys
1	Strongly disagree
2	Disagree
3	Quite agree
4	Agree
5	Strongly agree

RESULT AND DISCUSSION

The EHMW sustainability indicators are shown in Table 2. Based on the analysis of these indicators, it is known that EHMW management goes into sustainable criteria (77.18%). However, through more specific observations the value on the sustainability at all criteria is still below 50.1%, or less sustainable. Each criteria's value was environmental criteria of 29.38%, on the economic criteria of 28.17% and on the social criteria of 19.63% (Fig. 1).

Environmental criteria have the highest value among the two other criteria measured. The expansion of mangrove forests contributes the greatest value in sustainability to environmental criteria (14.83%). Expansion is due to continuous planting activities by visitors and government. It is also revealed by the community that the conservation of mangrove forest in EHMW is considered getting better due to the expansion. In addition, information is also considered quite influential. Educative information regarding on the benefits of mangroves is present in the EHMW management section. The environmental component is the basic concept of building an ecotourism and is the most important part to be considered and protected on its management [32]. Attention to the environment, being one of the distinguishing features between ecotourism and mass tourism [33,30]. A well-grown ecotourism activity can be illustrated by the substantial contribution of these activities to local community life and environmental conservation [34], including higher reforestation activities as demonstrated by EHMW's management facts.

In addition to the expansion of mangrove areas, there are educational activities that become indicators of environmental criteria [35]. This activity is a sharing of information about the types of flora, fauna, and benefits of mangrove forests for humans. However, this activity was not considered to work properly. Most tourists and managers still consider EHMW has no different from mass tourism. In fact, education is one of the distinguishing features between ecotourism and mass tourism. There is a responsibility of the managers and tourists to understand the benefits of eco-tourism objects for the environment and people, so hopefully the principle of sustainability can be met each other [27]. Education on ecotourism is also a kind of learning and experience process, thus becoming something unique and even worth selling [36].

Table 2. Sustainability Determinants of EHMW Surabaya Composited Management

Criteria	Indicators	Value of sustainability (%)	Total
Environment	Expansion of mangrove forests	14.83	29.38
	Information on the use of mangrove plants	8.35	
	Community involvement in waste management	6.2	
Economics	Small business management policy in the ecotourism area of Wonorejo mangrove	28.17	28.17
Social	Community involvement in activities to maintain the condition of mangrove forests	12.14	19.63
	Community involvement in mangrove forest management	7.49	
TOTAL			77.18

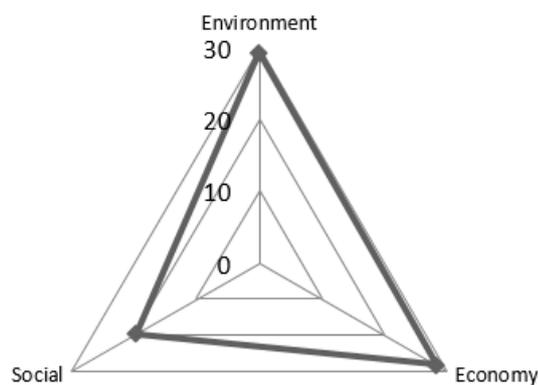


Figure 1. Preference of EHMW Surabaya Sustainability Criteria

Community involvement on waste management is still very low. Their participation can be seen from a small portion of society that less coordinated to collect and manage waste in the EHMW. Most of the waste management is done by the manager [37]. Nevertheless, the community should be included at the part of waste management so they can share their ideas and participate on the waste management activities, starting from the planning, implementation and evaluation of the program [38]. The participation of the community on managing the ecotourism area is not only aimed at benefiting and experiencing it, but also maintaining the tourist attraction in harmony with the objectives of environmental conservation, building awareness and respect for the environment and culture, and awakening the sensitivity of managers, communities and visitors to social, political, economic, ecosystem services and its environmental impacts [39,40].

The economic criteria is stated to be less continuous in this study (28.17%). The indicators that affect the economic criteria are small business management policies around EHMW. Although it was stated less continuous, but the existence of EHMW Surabaya revealed by the

respondents that have a great economic value for the community. However, the level of income is still feasible to be optimized again. The boundaries of the small business community space have not been agreed and socialized, so some parties still doubt the existence of these small business forms. The regulation of the business utilization space needs attention so that the EHMW area can become a source of income and improve the welfare and quality of life of the surrounding community [39,41,42,43].

Social criteria declared unsustainable (19.63%). The results reveal that the public has no desire to participate in managing EHMW in an organizational structure. Communities tend to be limitedly involved in planting projects undertaken or advised by the government. Motivation of this activity is the impact of the abrasion that once reached the home of the citizens. The emergence of ecotourism should be the solution of the effects of environmental damage, as well as improving the welfare of society [34]. People's motivation in mangrove ecosystem management, either aimed at achieving improved welfare or with conservation motivation, should emerge independently to support the development and sustainability of an ecotourism [30,44].

CONCLUSION

Mangrove Ecotourism Mangrove Wonorejo Surabaya is stated to be less sustainable on environmental and economic criteria (29.38% and 28.17%) and also unsustainable on social criteria (19.63%). The expansion of mangrove areas strongly supports environmental and economics criteria [45,46]. The small business management policy has not optimally supported the economic criteria. The management that has not been done by the community, has impact on the small community initiatives in social criteria [47].

REFERENCES

- [1] FWI/GFW. 2001. Potret keadaan hutan Indonesia. Forest Watch Indonesia. Bogor.
- [2] Spalding, M., F. Blasco and C. Field. 1997. World mangrove atlas. International Society for Mangrove Ecosystems. Okinawa.
- [3] Tantu, A. G., Soemarno, N. Harahab and A. Mustafa. 2012. The dynamic of landscape change at coast area, in Labakkang subdistrict, Pangkep regency, South Sulawesi. *Journal of Coastal Development* 15(2), 133-141.
- [4] Kapuangan, H. D., Maryunani, Soemarno, N. Harahap. 2016. The sustainability of mangrove ecosystem and its implication for mangrove-based rural tourism development in southern Malang Regency, East Java, Indonesia. *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)* 10(7), 27-34.
- [5] Alongi, D. M. 2008. Mangrove forests: resilience, protection from tsunamis, and responses to global climate change. *Estuarine, Coastal and Shelf Science* 76, 1-13.
- [6] Bird, E. C. F. 1971. Mangroves as land-builders. *The Victorian Naturalist* 88, 189-197.
- [7] Alongi, D.M. 2012. Carbon sequestration in mangrove forests. *Carbon Management* 3, 313-322.
- [8] Bosire, J. O., F. Dahdouh-Guebas, J. G. Kairo, J. Kazungu, F. Dehairs and N. Koedam. 2005. Litter degradation and CN dynamics in reforested mangrove plantations at Gazi Bay, Kenya. *Biological Conservation* 126, 287-295.
- [9] Kristensen, E., S. B ouillon, T. Dittmar and C. Marchand. 2008. Organic carbon dynamics in mangrove ecosystems: a review. *Aquatic Botany* 89, 201-219.
- [10] Lee, S. Y. 2004. Relationship between mangrove abundance and tropical prawn production: a re-evaluation. *Marine Biology* 145, 943-949.
- [11] Lee, S. Y. 2008. Mangrove macrobenthos: assemblages, services, and linkages. *Journal of Sea Research* 59, 16-29.
- [12] Bouillon, S., N. Koedam, A. V. Raman, and F. Dehairs. 2002. Primary producers sustaining macro-invertebrate communities in intertidal mangrove forests. *Oecologia* 130, 441-448.
- [13] Bird, E. C. F. 1986. Mangroves and intertidal morphology in Westernport Bay, Victoria, Australia. *Marine Geology* 69, 251-271.
- [14] Purnobasuki, H. 2005. Forest mangrove: Surabaya perspective overview. Airlangga University Press. Surabaya.
- [15] Dahdouh-Guebas, F., L. P. Jayatissa, D. Di Nitto, J. O. Bosire, D. Lo Seen and N. Koedam. 2005. How effective were mangroves as a defence against the recent tsunami? *Current Biology* 15, R443-R447.
- [16] Lee, S. Y., J. H. Primavera, F. Dahdouh-Guebas, K. McKee, J. O. Bosire, S. Cannicci, K. Diele, F. Fromard, N. Koedam, C. Marchand, I. Mendelssohn, N. Mukherjee and S. Record. 2014. Ecological role and services of tropical mangrove ecosystems: a reassessment. *Global Ecology and Biogeography* 23, 726-743.
- [17] Harahab, N. 2008. Analisis ekonomi ekologi perencanaan wilayah hutan mangrove. PhD Thesis. Study Program of Agriculture Sciences. Graduate School, University of Brawijaya. Malang.
- [18] Mangkay, S. D., N. Harahab, B. Polii and Soemarno. 2013. Economic valuation of mangrove forest ecosystem in Tatapaan, South Minahasa, Indonesia. *IOSR Journal of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT)* 5(6), 51-57.
- [19] Wahyuni, S., B. Sulardiono and B. Hendarto. 2015. Strategi pengembangan ekowisata Mangrove Wonorejo, Kecamatan Rungkut Surabaya. *Diponegoro Journal of Maquares* 4(4), 66-70.
- [20] Thomas, G. and T. V. Fernandez. 1994. Mangrove and tourism: management strategies. *Indian Forester* 120(5), 406-412.
- [21] Salam, M. A., G. R. Lindsay and M. C. M. Beveridge. 2000. Eco-tourism to protect the reserve mangrove forest the Sundarbans and its flora and fauna. *Anatolia* 11(1), 56-66.
- [22] Hakim, L., Soemarno and S.K Hong. 2012. Challenges for conserving biodiversity and developing sustainable island tourism in North Sulawesi Province, Indonesia. *Journal of Ecology and Environment* 35(2), 61-71.
- [23] Saifullah and N. Harahap. 2013. Strategi pengembangan wisata mangrove di Blok Bedul Taman Nasional Alas Purwo Kabupaten Banyuwangi Jawa Timur. *Indonesian Journal of Tourism and Development Studies* 1(2), 79-86.

- [24] Antaranews. 2011. Ekowisata Mangrove ancam ekosistem? Available at: <http://www.antaranews.com/berita/262121/ekowisata-mangrove-ancam-ekosistem> Accessed on 15 October 2017.
- [25] Pillay, M. and C. M. Rogerson. 2013. Agriculture-tourism linkages and pro-poor impacts: the accommodation sector of urban coastal KwaZulu-Natal, South Africa. *Applied Geography*. 36, 49-58.
- [26] Wiharyanto, D. and A. Laga. 2010. Kajian pengelolaan hutan mangrove di kawasan konservasi Desa Mamburungan Kota Tarakan Kalimantan Timur. *Media Sains* 2(1), 10-17.
- [27] Datta, D., R. N. Chattopadhyay and P. Guha. 2012. Community based mangrove management: A review on status and sustainability. *Journal of Environmental Management* 107, 84-95.
- [28] Nouri, A. D., A. Danchkar and R. Sharifipour. 2008. Evaluation of ecotourism potential in the northern coastline of the Persian Gulf. *Environmental Geology*. 55, 681-686.
- [29] Primavera, J. H. 2000. Development and conservation of mangroves in the Philippines. *Ecological Economics* 35, 91-106.
- [30] Wang, L., L. Zhong, Y. Zhang and B. Zhou. 2014. Ecotourism environmental protection measures and their effects on protected areas in China. *Sustainability* 6, 6781-6798.
- [31] Suwarno, J., H. Kartodihardjo and B. Pramudya. 2011. Pengembangan kebijakan pengelolaan berkelanjutan DAS Ciliwung Hulu Kabupaten Bogor. *Jurnal Analisis Kebijakan Kehutanan* 8(2), 115-131.
- [32] Conway, D. 2004. Tourism, environmental conservation and management and local agriculture in the eastern Caribbean; is there an appropriate, sustainable future for them? In: Duval, D.T. (ed.) *Tourism in the Caribbean, trends, development, prospects*. Routledge. London and New York.
- [33] Weaver, D.B. 2004. Manifestations of ecotourism in the Caribbean. In: Duval, D.T. (coord.) *Tourism in the Caribbean, trends, development, prospects*. Routledge. New York.
- [34] Zambrano, A. M. A., E. N. Broadbent and W. H. Durham. 2010. Social and environmental effects of ecotourism in the Osa Peninsula of Costa Rica: the Lapa Rios case. *Journal of Ecotourism* 9(1), 62-83.
- [35] Tri, N. 2000. Valuation of the Mangrove Ecosystem in Can Gio Mangrove Biosphere Reserve, Vietnam. UNESCO, Vietnam MAB National Committee.
- [36] Blamey, R. K. 2001. Principles of ecotourism – the encyclopedia of ecotourism. CABI publishing. Australia.
- [37] Sinha, A.M. and I. Enayetullah. 2000. Community Based Solid Waste Management: The Asian Experience. Waste Concern. Dhaka.
- [38] Ahsan A., M. Alamgir, M.M. El-Sergany, S. Shams, M. K. Rowshon, and N. N. Nik Daud. 2014. Assessment of municipal solid waste management system in a developing country. *Chinese Journal of Engineering*, Article ID 561935.
- [39] Blaj, R. 2014. Ecotourism and nature tourism – components of a sustainable management of forests. *Journal of Horticulture, Forestry, and Biotechnology* 18(4), 51-54.
- [40] Uddin, M., E. van Steveninck, M. Stuij and M. Shah. 2013. Economic valuation of provisioning and cultural services of a protected mangrove ecosystem: a case study on Sundarbans Reserve Forest, Bangladesh. *Ecosystem Services* 5, e88–e93.
- [41] Stone, K., M. Bhat, R. Bhatta, and A. Mathews. 2008. Factors Influencing community participation in mangroves restoration: a contingent valuation analysis. *Ocean and Coastal Management* 51, 476-484.
- [42] Souza, F. and C. Silva. 2011. Ecological and economic valuation of the Potengi estuary mangrove wetlands (NE, Brazil) using ancillary spatial data. *Journal of Coastal Conservation* 15, 195-206.
- [43] Hunt, C. A., W. H. Durham, L. Driscoll and M. Honey. 2015. Can ecotourism deliver real economic, social, and environmental benefits? A Study of the Osa Peninsula, Costa Rica. *Journal of Sustainable Tourism* 23(3), 339-357.
- [44] Kiper, T., G. Özdemir and C. Sağlam. 2011. Environmental, socio-cultural and economical effects of ecotourism perceived by the local people in the northwestern Turkey: Kiyiköy case. *Scientific Research and Essays* 6(19), 4009-4020.
- [45] Salem, M. and D. Mercer. 2012. The economic value of mangroves: a meta-analysis. *Sustainability* 4, 359-383.

- [46] Hussain, S. A. and R. Badola. 2010. Valuing Mangrove benefits: contribution of mangrove forests to local livelihoods in Bhitarkanika Conservation Area, East Coast of India. *Wetlands Ecology and Management* 18(3), 321-331.
- [47] Ahmad, S. 2009. Recreational values of mangrove forest in Larut Matang, Perak. *Journal of Tropical Forest Science* 21(2), 81-87.

The Effect of Merchant Characteristics and Religious Tour Visits as a Moderating Variable to Merchant Revenues (Study in Sunan Ampel Religious Tourism Area, Surabaya)

Alfi Muflikhah Lestari^{1*}, Multifiah², Arif Hoetoro²

¹Master Program of Economics and Business, Faculty of Economics and Business, University of Brawijaya, Malang, Indonesia

²Faculty of Economics and Business, University of Brawijaya, Malang, Indonesia

Abstract

This study aims to determine the influence of merchant characteristics based on age, education, capital, years in business and labor to the income of merchants and to know the effect of religious tourism as moderating variable that influences the Sunan Ampel religious tourism area of Surabaya. This research used simple random sampling technique with 70 merchants as respondent. Data were analyzed using moderation regression with interaction method. The results showed age, capital and labor have a significant effect on the merchant's income while the years in business and education have no significant effect on the merchant's income. The result of research on religious tourism visit as moderating variable shows religious tourism visit has a moderating effect on the relationship of age, capital and business time to the merchant's income. On the other hand, this variable has no moderating effect on the relation of labor and education to the merchant's income.

Keywords: age, capital, education, labor, religious tourism, the income of merchants, years in business.

INTRODUCTION

The tourism sector is a sector that has an important role for the economic income of a country. By 2016, according to the United Nations World Tourism Organization (UNWTO) the tourism sector is able to contribute to world GDP by 10% [1]. The tourism sector is also one of the potential sectors that become the biggest economic engine or income generator in Indonesia. By 2015, the tourism sector is growing rapidly becoming one of the third foreign-exchange sectors after the oil and gas sector, as well as palm oil with a total revenue of 12.225 Trillion Rupiah [2]. Therefore, the potential of the tourism sector in Indonesia has a considerable impact on the economy of the country, thus it needs to be developed.

The tourism sector can be developed from various types of tourism in Indonesia. According to Law No. 9 of 1990 Article 16 on the type of tourism, there are various types of tourism in Indonesia, such as nature tourism, cultural tourism and artificial tourism. Indonesia is a country rich in culture. Among them, there are various ethnic, religious, racial, and customs that give birth to various activities and religious

ceremonies that can create local and foreign community interest to participate in it or just to watch the activity. It is then able to give birth to tourism potential, one of which is the type of cultural tourism associated with religion related historical tourism which commonly known as religious tourism. Religious tourism is a type of tourism that is associated with religious tourism, history, culture, and belief in a particular society which made some people continue to preserve it.

The potential of religious tourism in Indonesia is inseparable from the spreading of Islam in Indonesia which leaves historical evidence worthy to be preserved and nurtured. The development of the spread of Islam in Indonesia is known to have many figures who play a role in it and to this day is still highly respected. In this study, researchers set the focus of research in the Surabaya's religious tourism area of Sunan Ampel who is famous as one of the nine guardians (*Wali Songo*) that spread Islam in Java, especially in the area of Surabaya East Java. Sunan Ampel religious tourism area is known by many visitors. Visitors come from all regions of the archipelago and even some are from abroad. The impact caused by the high tourist visits is felt especially on the economic activities of local communities around the tourist area. Many of the local communities around the religious tourism area of Sunan Ampel Surabaya take advantage of this opportunity by working as a merchant. This certainly has an impact on the

*Correspondence address:

Alfi Muflikhah Lestari

Email : alfie.tary@gmail.com

Address : Faculty of Economics and Business, University of Brawijaya, Veteran Malang, Malang 65145.

creation of new jobs for communities around the religious tourism area of Sunan Ampel Surabaya, as well as to increase the income of the community.

The income of the community in area of Sunan Ampel Surabaya is from the business of working as a merchant. The merchant's income can be influenced by various factors from merchant characteristics such as age, capital, years in business, education, and labor. Merchants' income in the Sunan Ampel religious tourism area of Surabaya is interesting to be observed since the increase in an individual merchant's income significantly increases the income of the community. In addition, the increase in merchant income indicates that the religious tourism area of Sunan Ampel has been visited by many tourists. The high religious tourist visits are presumed to have a moderating effect on the relationship of merchant characteristics to the merchant's income in the religious tourism area of Sunan Ampel Surabaya. The income of merchants in the religious tourism area of Sunan Ampel Surabaya is interesting to be studied because the high tourist arrivals have increased the level of competition among merchants due to the large number of merchants and the similarity of business type among those merchants. Therefore, the formulation of the problem in this study is how the merchant characteristics (based on age, capital, years in business, education, and labor) affecting the income of merchants and how the religious tourist visits as moderating variables influence the relationship of merchant characteristic to merchant's income.

LITERATURE REVIEW

Tourism

Law of the Republic of Indonesia No. 10, year 2009 on tourism has stated that tourism is a travel activity undertaken by a person or group of people by visiting a certain place for recreational purposes, personal development, or studying the uniqueness of tourist attraction in a non-permanent visit. According to Law No. 9 of 1990 Article 16 on the type of tourism, there are various types of tourism in Indonesia, including the nature tourism which is a tour that utilizes natural resources as a tourist destination. The next type is a cultural tourism which is a tour that utilizes history, customs or culture of the nation to serve as a tourist destination. In addition to the aforementioned types, there is artificial or special interest tourism which is a tour that

utilizes natural resources and the potential of cultural arts that can generate special interest for travel.

The development of the tourism sector aims to improve the quality of life and the welfare of the community of tourist areas that will ultimately provide benefits to the fulfillment of community needs. The success of tourism development is determined by 3 factors namely, the availability of objects and attractions, the facilities and infrastructure that allows tourists to visit a region or tourist area and has a target tourism that can provide comfort or impact to society [3].

Tourism Economics

Tourism activities in the economic aspect cannot be separated from the demand and supply for goods and services in the tourist area. Demand is defined as a number of goods and services that can be purchased at a certain time and price [3]. Goods and services which are expected to be purchased in tourist area usually different from one to another area so that goods and services available must be tailored to the needs of tourist visitors. Yoeti [3] also explained that in the context of economics, supply is defined as a number of goods, services, products or commodities, which are available in markets ready for sale to consumers in need. In tourism, supply includes all products and services produced by a group of tourism industry companies as suppliers that offer to tourists who come directly or who buy through travel agents in which case the travel agents act as an intermediary.

Religious Tourism

Religious tourism is a kind of tourism related to religion. Pilgrimage or religious tourism is a kind of tourism that is somewhat associated with religion, history, customs and beliefs of people or groups in the community [5]. Pilgrimage or religious tourism mostly done by individuals or entourage to the holy places, the tombs of a great man or an exalted leader, to a hill or mountain considered sacred, the burial place of a character or a leader as a magical man full of legends. Pilgrimage tourism or often referred to as pilgrim tours, is a type of tourism where the purpose of the trip is to see or witness religious ceremonies [6].

In Islamic tradition, the grave pilgrimage is part of religious ritual and is one of the recommended worship. In the hadith of the Prophet SAW the command of the pilgrimage of

the grave states that "I (the Prophet) do not forbade you pilgrimage grave, so now pilgrimage your grave, because the grave pilgrimage can soften the heart, can make tears running and remember the existence of *ahirat*, and do not utter bad words "(HR Hakim). Thus, religious tourism in the form of grave pilgrimage is recommended to be done because it provides benefits in remembering death or the realm of *ahirat* (afterlife) and we can also pray for the ones who has passed away.

Theory of Production

Production is a way on how resources (inputs) can be used to produce a product (output). Production function is a function or equation that shows the relationship between the combination of input usage and output level per unit of time [7]. In this model, the relationship between input and output is arranged in a production function which can be formulated in general as follows:

$$Q = f(K, L, M)$$

Description:

Q = the number of outputs generated over a given period

K = amount of capital used

L = amount of labor used

M = another variable that is likely to affect production

Theory of Profit

In general, the main goal of a firm is to obtain profit. Profit is defined as a reward for the firm's efforts to produce goods and services [8]. Theoretically, profit is the value of total firm revenue minus the total cost incurred. Profit can be calculated by the formula below.

$$\pi = TR - TC$$

Profit (π) is derived from total income (TR) which represent the amount of output sold (Q) multiplied by the price per unit (P). While the total cost (TC) is the sum of fixed costs (FC) and variable costs (VC). The profit formula can be written as follows.

$$\begin{aligned} \pi &= TR - TC \\ &= (P \times Q) - (FC + VC) \end{aligned}$$

Thus, this study used the net income or often called profit.

Merchant Characteristic Factors

Age

It determine the ability of merchant to work productively. The age factor is based on the biological aspects of the age of the population grouped, among others, the yet to be productive

age (aged 0-14), the productive age (15-64 years) and the non-productive age population (65 years and above). Age is usually used as a benchmark or indicator of a person's maturity level. The more mature a person is the greater the responsibility, so that someone who is married have to work to meet the needs of his life and his family [9].

Capital

It can be used to perform the production process to meet the needs of the merchant's business. Capital is a factor of production which is very important in determining income level, but not the only factor that can increase income [10].

Years in business

It plays an important role in the process of doing a business. The number of years spent in doing a business will affect businessman productivity so that it can increase efficiency and reduce production costs to a point where it is smaller than the sales [10].

Education

The purpose of a person's education is to get a better job. The level of education undertaken by a person can determine his future, therefore education becomes a mandatory government program which is a process of continuing the transfer of language, skills, experience and knowledge from one generation to the next in order to live in the community [11]. In addition, education can bring changes in the business built or being run by business actors [12].

Labor

It usually influenced by wagherate or income received. Labor is associated with the wage rate, then a person's decision to work will be influenced by the person's income level [13].

Religious Tour Visits as a Moderating Variable

Religious tour visits are tourists who come to a religious tourism object. Tourist visits have an impact on the economic activities of the people around the tourism object. These activities are related to demand and supply theory. Request made by visitors who usually take the time to shop to get souvenirs at the tourist attractions. Offer made by the community who work as a merchant in offering goods needs of tourist visitors. A tourist attraction that is visited by many tourists can affect the increase in the merchant's revenue because there are many transactions of buying and selling goods or

services at tourist attractions. Therefore, a tourist visit may moderate a merchant's income which means tourist visits as a moderating variable. Moderating variables are used to strengthen or weaken the influence of one variable towards another [14]. Thus, religious tour visits are used as moderating variables because they are presumed to be able to moderate the influence of the merchant's characteristics to the merchant's income.

MATERIALS AND METHOD

Study Area

This research used quantitative approach. Quantitative approaches were used to examine the population and specific samples, data collection used research instruments and quantitative data analysis/statistics, with the aim to test the hypothesis that has been set [15]. This research was conducted at Sunan Ampel Religious Tourism Surabaya which is located at Street of KH Mansyur Ampel Urban Village, Semampir, Surabaya, East Java. The research was conducted in May-July 2017.

Data Collection

Sources of data used are primary data with questionnaires, interviews and documentation. In this research, the sampling method used is simple random sampling because the population from which the sample are taken tend to be homogeneous. The population were merchants who set up shop in the religious tourism area Sunan Ampel Surabaya. In this study based on Roscoe's opinion in Sugiono [15], the number of samples used in the multivariate analysis is calculated at least 10 times the number of research variables used. In this study, the variables used are 7 variables consisting of the dependent variable which is the merchant's income and independent variables which comprised of age, capital, years in business, education, and labor and tourist visits as moderating variables. Thus, the number of sample used in this study is in the amount of $7 \times 10 = 70$ respondent merchants in the religious tourism area Sunan Ampel Surabaya.

Data Analysis

The analytical method used was moderation analysis with interaction method. The interaction test is called Moderated Regression Analysis (MIRA). Interaction test was done by multiplying the variables hypothesized as moderating variables with independent variables. If the multiplication variable between the independent

variables and the hypothesized variables as significant moderation variables, it can be concluded that the variables hypothesized as moderating variables is really moderate the relationship between independent and dependent variables. The regression equation with the interaction method is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 D_1 + e \dots \dots \dots (1)$$

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 D_1 + \beta_6 Z + e (2)$$

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 D_1 + \beta_6 Z + \beta_7 X_1 Z + \beta_8 X_2 Z + \beta_9 X_3 Z + \beta_{10} X_4 Z + \beta_{11} D_1 Z + e \dots \dots \dots (3)$$

Description:

Y = Merchant Revenue	X ₄ = Labor
X ₁ = Age	D ₁ = Education
X ₂ = Capital	Z = Tourism Visit
X ₃ = Years in business	

The classical assumption test is performed to produce an accurate data analysis, in which a regression model must satisfy the assumptions of data normality, and be free of the elements of multicollinearity and heteroscedasticity. F test was used to determine the simultaneous effect of all independent variables on dependent variable. T test used to determine the partial effect of independent variables on the dependent variable. Coefficient of determination used to measure how far the model's variation of independent variables able to explain its dependent variable.

RESULT AND DISCUSSION

Data of Merchants Respondent

The data collected in this study (Table 1) shows that from 70 respondent merchants in the religious tourism area of Sunan Ampel Surabaya, the majority age group is 30-39 years by 43% followed by the age group of 40-49 years by 24%. The rest is the age group of 20-29 years with 20% and 50-59 years with 13%. Based on gender, the majority of respondents are male (56%), while female respondents were 44%. Based on education, the majority of merchants in the religious tourism area of Sunan Ampel Surabaya are high school, vocational, Islamic high school graduates (59%). Merchants who have undergraduate title are 20%. In addition, merchants whose education level is elementary school graduate were 13%, while merchants who have completed education up to junior high school are 9%.

Based on the workforce who was employed by merchants in the religious tourism area of Sunan Ampel Surabaya, most merchants only employed 1 person (39%). In the next data,

merchants who have no workforce are 30%. However, there are also merchants who employed more than 1 person, i.e. merchants who employed 2 persons (26%) and merchants who employed 3 persons (6%). Based on the years in business, data shows that the majority of merchants in the area of religious tourism Sunan Ampel Surabaya have done the business for 11-15 years (33%). Other groups related to this characteristic are 6-10 years (29%), 1-5 years (20%), 16-20 years (13%) and the merchants who have been in the business for more than 20 years amount to 4 respondents (6%).

Table 1. The Data of Respondent

Factors	Data of Respondent	Amount	%	
Age (years old)	20 – 29	14	20	
	30 – 39	30	43	
	40 – 49	17	24	
	50 – 59	9	13	
Gender	Man	39	56	
	Woman	31	44	
Education	Elementary School	9	13	
	Junior High School	6	9	
	Senior High School/Vocational High School/Islamic High School	41	59	
	Undergraduate (Diploma 1/ Diploma 2/ Diploma 3/Bachelor)	14	20	
	Labor (person)	0	21	30
		1	27	39
2		18	26	
3		4	6	
Years in Business (year)	1–5	14	20	
	6–10	20	29	
	11–15	23	33	
	16–20	9	13	
	>20	4	6	
Capital (million rupiah)	1 – 5	15	21	
	6 – 10	20	29	
	11 – 15	18	26	
	16 – 20	12	17	
	> 20	5	7	
Income (million rupiah) per month	< 1	15	21	
	1 – 2	28	40	
	3 – 4	20	29	
	> 4	7	10	

Based on the capital (in Rupiah), the data shows that the majority of merchants in the religious tourism area of Sunan Ampel start their business by using capital of 6-10 million (29%). Furthermore, the capital used by merchants in starting their business of 11-15 million amount to 26%. In addition, there are merchants who start their business by using capital of 1-5 million for 21%. Merchants who start their business using capital of 16-20 million are 17% and merchant

who started his business with capital of more than 20 million are 7%. Based on the income, the majority of merchants in the religious tourism area of Sunan Ampel Surabaya have an income of 1-2 million rupiah per month by 40%. Furthermore, merchants whose income are 3-4 million per month are 29%. Merchants in Sunan Ampel religious tourism area whose income is <1 million per month are 21% and merchants with income more than 4 million per month are only 10%. The afore mentioned respondents data can be presented as follows (Table 1).

In this study, tourist visit data in the religious tourism area of Sunan Ampel Surabaya in the period of May - July 2017 is used as the base data for the moderating variable to the merchant's income. The data shows that religious tour visits in the area of religious tourism Sunan Ampel Surabaya have increased in May - July 2017. In May the number of tourist visits amounted to 58,932 people then increased by 62,264 people or as much as 5%. However, in July tourist visits decreased by 60,586 or as much as 3%.

Moderating Analysis with Interaction Method

Based on Kolmogorov Smirnov Test value on the first, second, and third equation the Asymp value. Sig (2-tailed) is 0.200 > 0.05, the data used have normal distribution and fulfill the normality assumption. All the variables in each equation model do not have multicollinearity because all variables have VIF values smaller than 10, thus it can be said that there is no multicollinearity. In the Glejser test results which is done by regressing the absolute value of the residual to the independent variable, the significance of the variable in each model has no significant effect because the level of significance above 0.05. Therefore, it implied that every variable in the three equation models does not have heteroscedasticity. Regression equation based on result of moderating analysis with interaction method are as follows.

$$(Y) = 262,575.508(\alpha) + 23,470.433(X_1) + 0.101(X_2) - 10,234.668(X_3) + 705,618.106(X_4) - 88,059.889(D_1) + 389,143.406(e) \dots\dots\dots (1)$$

$$(Y) = 5,204,185.539(\alpha) + 23,810.622(X_1) + 0.099(X_2) - 13,584.792(X_3) + 723,528.341(X_4) - 98,869.517(D_1) + 84,863.747(Z) + 8,635,734.734(e) \dots\dots\dots (2)$$

$$(Y) = 35,198,865.809(\alpha) + 34,734.186(X_1) + 0.122(X_2) + 81,334.782(X_3) + 317,468.332(X_4) + 207,631.210(D_1) + 580.415(Z) + 0.359(U_Z) - 0.639(M_Z) - 1,541.485(LU_Z) + 1.775(TK_Z) + 1.169(P_Z) + 16,618,567.210(e) \dots\dots\dots (3)$$

table, i.e. $df_1 = k - 1 = 6 - 1 = 5$ and $df_2 = n - k = 70 - 6 = 64$. The calculated F value of 94.811 is greater than the value of F table 2.36 and the significance number is 0.000 smaller than the alpha 5% (0.05). It indicated that there are significant influence of age, capital, years in business, labor, and education to income. Coefficient of determination obtained a value of 0.872 which means that 87.2% of factors influencing the changes in income can be explain by age, capital, years in business, labor, and education. While the simultaneous test results of the second equation obtained calculated F value of 78.234 and the value of F table of 2.25, where F table, namely $df_1 = k - 1 = 7 - 1 = 6$ and $df_2 = n - k = 70 - 7 = 63$. The calculated F value of 78.234 is greater than the value of F table 2.25 and the significance number is 0.000 smaller than the alpha 5% (0.05). It showed that there is significant influence of age, capital, years in business, labor, education and tourist visit to income. Coefficient of determination obtained value of 0.870 which means that 87% of factors influencing the changes in income can be explain by age, capital, years in business, labor, and education.

The simultaneous test results of the third equation obtained the calculated F value of 45.933 and the value of F table of 1.96, where F table, namely $df_1 = k - 1 = 12 - 1 = 11$ and $df_2 = n - k = 70 - 12 = 58$. The calculated F value of 45.933 is greater than the value of F table 1.96 and the significance number is 0.000 smaller than the alpha 5% (0.05). It indicated that there is significant influence of age, capital, years in business, labor, education, tourist visit, interactions of age and tourist visits, capital interactions and tourist visits, years in business interactions and tourist visits, labor interactions and tourist visits, educational interactions and tourist visits to income. Coefficient of determination obtained a value of 0.877 which means that 87.7% factors influencing changes to income can be explain by age, capital, years in business, labor, education, tourist visits, age interaction and tourist visits, capital interaction and tourist visits, long interaction of business and tourist visits, labor interaction and tourist visits, educational interactions and tourist visits. In the result of t-test or partial test on the first equation, the following results are obtained in Table 2.

Statistical operation for the first equation is regressing independent variable towards its dependent variable. By using two-way test that is $\alpha = 0.05$ and $df = n - k = 70 - 6 = 64$, then t table

obtained for 1.99773. Based on the analysis, it is known that the variables of age, capital and labor have a significant effect on the merchant's income while the old variable of business and education have no significant effect to the merchant's income. In the result of t-test or partial test in the second equation, the following results are obtained (Table 3).

Table 2. t Test for Equation (1)

Variable	T count	T table	Sig	Exp
Age	2.158	1.99773	.035	Sig
Capital	8.606	1.99773	.000	Sig
Year in Business	-.543	1.99773	.589	Not sig
Labor	6.291	1.99773	.000	Sig
Education	-.474	1.99773	.637	Not Sig

Notes: Sig = Significant, Not Sig = Not Significant

Table 3. t Test for Equation (2)

Variable	T count	T table	Sig	Exp
Age	2.174	1.99834	.033	Sig
Capital	7.911	1.99834	.000	Sig
Year in Business	-.685	1.99834	.496	NotSig
Labor	6.183	1.99834	.000	Sig
Education	-.527	1.99834	.600	NotSig
Tourist Visits	.573	1.99834	.569	Sig

Notes: Sig = Significant, Not Sig = Not Significant

In the second equation, regression is applied to free variables and variables hypothesized as moderating variables to the dependent variables, by using two way test that is $\alpha = 0.05$ and $df = n - k = 70 - 7 = 63$, hence got t table equal to 1.99834. Based on the analysis, it is known that the variables of age, capital, and labor have a significant effect on the merchant's income, while the variable of years in business and education have no significant effect on the merchant's income. In addition, tourist visits hypothesized as moderating variables have no significant effect on merchant's income. In the result of t-test or partial test on the third equation, the following results are obtained (Table 4). In the third equation, regression is applied to free variable. The variable hypothesized as moderating variable and interaction variable (multiplication of free variable with variable which hypothesized as moderating) to dependent variable, by using 2-way test that is $\alpha = 0.05$ and $df = n - k = 70 - 12 = 58$. Hence, t table was equal to 2.00172. The analysis results shows that 4 variables (age, capital, years in business, and labor) has a significant effect on the merchant's income. While the variable of education do not have significant effect to the merchant's income.

Table 4. t Test for Equation (3)

Variable	T count	T table	Sig	Exp
Age	3.276	2.00172	.002	Sig
Capital	9.863	2.00172	.000	Sig
Year in Business	2.917	2.00172	.005	Sig
Labor	2.406	2.00172	.019	Sig
Education	1.588	2.00172	.118	Not Sig
Tourist Visits	2.070	2.00172	.043	Sig
Interaction: age and tourist visit	2.162	2.00172	.035	Sig
Interaction: capital and tourist visit	-2.986	2.00172	.004	Sig
Interaction: year in business and tourist visit	-3.399	2.00172	.001	Sig
Interaction: Labor and tourist visit	.662	2.00172	.511	Not Sig
Interaction: education and tourist visit	.348	2.00172	.729	Not Sig

Notes: Sig = Significant, Not Sig = Not Significant

In addition, the variable of tourist visit that hypothesized as moderating variable has significant effect to the merchant's income. In the analysis result of interaction variable, it is known that the interaction variable of age-tourist visit, capital-tourist visit variable, and business-tourist visit have significant effect to the merchant's income. While the interaction variable of labor-tourist visit and education-tourist visit have no significant effect to the merchant's income. The moderation test in this research consider the condition if:

- the second equation on the variable of tourist visit which hypothesized as moderating variable did not have a significant effect to the merchant's income
- the third equation has a significant effect to the merchant's income
- and there are interaction variables which have significant effect to the merchant's income

The tourist visit variable is categorized as the pure moderator variable between the merchant's characteristic variable (age, capital, years in business, labor, education) on the merchant's income. The conclusion of tourist visit as moderating variable which moderate the effect of merchant's characteristic (age, capital, years in business, labor, education) to merchant's income are tourist visit moderate the effect of age, capital and years in business to merchant income; while tourist visit did not moderate labor and education effect to the merchant's income.

The Effect of Age and Religious Tour Visits to The Merchant's Income

The regression analysis showed that age had significant effect on the merchant's income and the tourist visit moderated the effect of age to the merchant's income. This illustrates that age can be used as a benchmark of income levels of a person from the activities undertaken.

Activities of a person's age are usually distinguished between pre-productive, productive and non-productive ages. This study found that the majority of merchants age in the religious tourism area Sunan Ampel Surabaya are inside the group of productive age in the range of 30-39 years. At a productive age, a person has a strong physical and ability to think and act well which enable them to reach high productivity in their activities. Merchant productivity can be reflected from the level of sales made.

Productive age usually has a responsibility to meet the needs of his life and his family so that one needs to work hard to earn an income. This research found that majority of merchant in Sunan Ampel religious tourism area have 1-3 dependents (53%). Other number regarding this matter are merchants with 0 dependent (34%), with 4-6 dependent (10%) and with more than 6 dependents (3%). Thus, the age of merchants in the religious tourism area of Sunan Ampel affects the responsibility in fulfilling the needs of their dependents which motivate them to work hard to earn income.

This study also concluded that age affects income and tourist visits moderate this effect. The findings of this study are supported by previous research which showed that the factors influencing the performance of merchants is measured from net income. There is a significant relationship between the age factor of merchants to the level of net income of street vendors in Yogyakarta city [16]. Thus, the age of merchants in the religious tourism area of Sunan Ampel affect the productivity of merchants and subsequently affecting the level of sales which in turn will affect the income of merchants. In addition, tourist visits that moderate the age of the merchant's income are reflected in the number of items sold and the income generated during the peak season of tourist visits.

The Effect of Capital and Religious Tour Visits to The Merchant's Income

The regression analysis shows that capital has significant effect to the merchant's income and the tourist visit moderate this effect. This finding illustrates that capital is used as a factor of production which is included in the input in the form of business capital which then produces output in the form of goods sold so as to obtain income. Merchants' initial capital are primarily used to start the business. In the long run if the business develops well then the amount of capital can be increased which in turn can be used to increase the inventory of goods sold.

Merchant's capital usually affects the size of the established business. Large firms are reflected from the inventory of goods sold and the breadth of the place of trade, and vice versa. This study found that the majority of merchants in the area of Sunan Ampel religious tourism start its business by using capital of 6-10 million rupiah, thus these merchants can be categorized as small or medium firms. Another reasoning for categorizing them as small or medium firms are the similarity of goods sold e.g. souvenirs, clothing, food so that the inventory of goods sold are small and the relatively small business premises.

The results shows that capital is affecting income and tourist visits moderate this effect. The findings of this study are supported by previous research that explained capital factor have positive and significant effect to the earnings of small industry entrepreneurs in the Regency of Dairi [17]. The merchant's capital in the tourist area of Sunan Ampel were used to open a trading business by producing goods which in turn has a positive effect on their income and when tourist visits increase the income of merchants will increase as well.

The Effect of Year in Business and Religious Tour Visits to The Merchant's Income

The regression analysis results show that the years in business has no significant effect on the merchant's income. This illustrates that in the religious tourism area of Sunan Ampel has high competition among merchants that are usually influenced by the same type of business among merchants such as souvenirs merchants, food, clothing and pilgrimages. This research found that the majority type of merchant business in the religious tourism area of Sunan Ampel are souvenir and clothing amount to 29 merchants or 41%. Souvenirs merchants only 27%, food

merchants 19%, and clothing merchants 13%. Thus, the number of merchants with the same type of business makes the higher competition among merchants that cause years in business has no effect on income.

However, the results of moderating analysis indicate that religious tour visits moderate the effect of years in business to the merchant's income. This illustrates that the number of years the merchant's spent on the business usually affects the merchant's experience in running his business. The merchant's experience from the years in business may be related to the merchant's knowledge of the consumer's appetite for the goods offered as well as the merchant's ability to provide services to the consumers with the aim of establishing good relations and image.

The findings of this study are supported by previous research conducted which showed that the years in business does not affect the income of small-scale tile industry in Majalengka Regency [18]. Meanwhile, another study showed that the years in business has a significant effect on the income of merchants in Art Market of Sukawati in Gianyar regency [19].

The years in business does not affect the income of merchants in the religious tourism area of Sunan Ampel Surabaya because there is high competition among merchants. However, this study also found that tourist visits moderate the effect of years in business to the merchant's income in the religious tourism area of Sunan Ampel Surabaya because the merchant's experience of consumer tastes can increase their business.

The Effect of Labor and Religious Tour Visits to The Merchant's Income

The regression analysis results show that labor has a significant effect on the merchant's income. This illustrates that in the religious tourism area of Sunan Ampel, the workforce owned by merchants is very helpful in obtaining income. The findings of this study are supported by previous research which explained the workforce has a positive and significant effect on the income of street vendors in the District of West Denpasar [20].

Nevertheless, this study found that tourist visits did not moderate the effect of labor to merchant income. This illustrates the number of workforce owned by merchants do not affect the visitor preference in buying goods. It may be that the employed workforce were not too productive

in offering goods. Labor productivity is usually influenced by wages earned. This research found that the majority of salary or wage given by the merchant to his workforce in the religious tourism area of Sunan Ampel is 600 thousand - 1 million rupiah (37%). Other level of wages paid are 100 - 500 thousand rupiah (33%). There are 21 respondents (30%) who do not have a workforce so there is no need to provide wage. Thus, the productivity of labor is influenced by the level of wages provided so that when the wages provided by merchants are still less than appropriate, the productivity of labor will also be less than the maximum.

The results of data analysis in this study show that the workforce affects the income of merchants. This illustrates that the workforce owned by merchants can assist them in running their business. Meanwhile, the tourist visit does not moderate the effect of workforce to the merchant's income which may be due to the productivity of labor that is less than the maximum because the level of wages are less than appropriate.

The Effect of Education and Religious tour visits to The Merchant's Income

The regression analysis showed that education has no significant effect on the merchant's income. This illustrates that in the Sunan Ampel religious tourism area merchant who has higher level of education on average has no difference in obtained income compared to the merchants who have lower levels of education. This might happen because the high competition between merchants caused by the same type of business in the area may not be affected by the educational background of merchants. In turn, it has no effect on income. The type of business in the Sunan Ampel religious tourism area consisted of food, souvenirs and clothing which does not require any special skills of a certain level of education, thus when highly educated merchants can earn high revenues, merchants with low education (elementary or junior high school graduates) can earn the same.

This study also found that the visit of religious tourism does not moderate the effect of education to the merchant's income. Tourist visitors as buyers usually do not pay attention to the level of merchants' education. They only concerned with the quality of the goods or the services that the merchant provides. Therefore, the level of education does not have a relation-

ship with the tourist visitors as a buyer, thus not affect the merchant's income.

The findings of this study are supported by previous research in Banjarnegara. The study showed that the success of the business is measured from the income level of the ceramic crafts's business. The level of education does not affect the success rate of the ceramic handicraft business in Klampok, Banjarnegara [21]. Another study found that the level of education has a negative and insignificant effect on the success of the yellow rice stalls business in Jepara regency [22]. Thus, education does not affect the merchant's income because the high competition between merchants with the same type of business and does not require special skills to affect the merchant's income. In addition, religious tour visits do not moderate education towards merchant revenue because religious tourism visitors as buyers do not pay attention to education when buying goods sold by merchants.

CONCLUSION

The study showed that age, capital and labor significantly influence the merchant's income while the years in business and education have no significant effect on the merchant's income. Interaction of age-tourist visit, capital-tourist visit, and years in business-tourist visit have significant effect to the income of merchants. While the interaction of labor-tourist visits as well as education-tourist visits have no significant effect on the merchant's income. Therefore, religious tour visits moderate the relationship of age, capital and years in business to merchant income while religious tour visits do not moderate labor relations and education to merchant income.

Recommendation

1. Capital is a much needed factor to support business development in the religious tourism area of Sunan Ampel. Therefore, Surabaya city government needs to cooperate with banking institutions to provide ease in providing capital assistance so that business merchants are growing and their income is increasing. Furthermore, the Surabaya city government also needs to provide training on capital management so that the business run by the merchant can be sustainable.
2. Workforce employed by merchants in the religious tourism area of Sunan Ampel Surabaya has a high working hours so the merchants need to provide an appropriate wage in order to increase labor productivity.

3. Tourists in the religious tourism area of Sunan Ampel Surabaya has always been increasing especially in the Islamic holidays. Therefore, the Surabaya municipal government and the management of the Sunan Ampel Foundation need to give attention to the convenience of visitors by paying attention to public facilities and services such as parking lot, toilets and cleanliness of tourist attractions.
4. Department of Tourism in cooperation with the city government of Surabaya and the board of the Sunan Ampel foundation need to have a good record regarding the visitors who come to the religious tourism area of Sunan Ampel Surabaya with a systematic and accountable procedures

REFERENCES

- [1] UNWTO. 2017. 2017 is the international year of sustainable tourism for development. United Nations World Tourism Organization. Madrid.
- [2] Ministry of Tourism. 2017. Performance report of the Ministry of Tourism 2017. Available at: www.kemenpar.go.id.
- [3] Yoeti, A. O. 2008. Perencanaan dan pengembangan pariwisata, 2nd Ed. Pradya Paramita. Jakarta.
- [4] Sapta, N. 2011. Pembangunan sektor pariwisata di era otonomi daerah. www.kemenpar.go.id
- [5] Pendit, N. S. 2002. Ilmu pariwisata sebuah pengantar perdana. Pradya Paramita. Jakarta.
- [6] Yoeti, A. O. 1996. Pengantar ilmu pariwisata. Angkasa Publisher. Bandung.
- [7] Sukirno, S. 2013. Teori pengantar makroekonomi, 3rdEd. Raja GrafindoPustakaUtama. Jakarta.
- [8] Suwardjono. 2008. Teori akuntansi: perencanaan pelaporan keuangan. BPFE Yogyakarta. Yogyakarta.
- [9] Simanjuntak, P. 2001. Pengantar ekonomi sumber daya manusia. BPFE University of Indonesia. Jakarta.
- [10] Firdausa, R. A. and F. Arianti. 2013. Pengaruh modal awal, lama usaha dan jam kerjaterhadap pendapatan pedagang kiosdi Pasar Bintoro Demak. Diponegoro Journal of Economics 2(1), 1-6.
- [11] Poerbakawatja, S. 1980. Ensiklopedia pendidikan. Gunung Agung Publisher. Jakarta.
- [12] Tambunan, T. 2002. Usaha kecil dan menengah di Indonesia. Salemba Empat Publisher. Jakarta.
- [13] Sumarsono, S. 2003. Ekonomi manajemen sumber daya manusia dan ketenagakerjaan. Graha Ilmu Publisher. Yogyakarta.
- [14] Utama, S. 2012. Aplikasi analisis kuantitatif, 1st Ed. Faculty of Economics. Udayana University. Denpasar.
- [15] Sugiyono. 2012. Metode penelitian kuantitatif kualitatif dan R&D. Alfabeta Publisher. Bandung.
- [16] Hariningsih, E. and A. R. Simatupang. 2008. Faktor-faktor yang mempengaruhi kinerja usaha pedagang eceran, Studi kasus: pedagang kaki lima di Kota Yogyakarta. Jurnal Bisnis dan Manajemen 4(2), 25-40.
- [17] Lingga, I. 2009. Analysis of factors affecting small industry enterprises income inDairi Regency. Master Thesis. University of North Sumatera. Medan.
- [18] Wiyoso, Y. 2004. Policy analysis of local government against development of small tile industry in Majalengka Regency. Master Thesis. Master Program of Administrative in Regional Government, Institute Government of Home Affairs. Jatinangor.
- [19] Artaman, A. D. M. 2015. Analysis of factors affecting market income of Sukawati Art Market traders in Gianyar Regency. Master Thesis. Graduate School, Udayana University. Denpasar.
- [20] Antara, I K. A. and L. P. Aswitari. 2016. Beberapa factor yang mempengaruhi pendapatan pedagang kaki lima di Kecamatan Denpasar Barat. E-Jurnal Ekonomi Pembangunan Udayana University 5(1), 1265-1291
- [21] Sri Susilo, Y. and J. Ellyawati. 2011. Analisis Tingkat Keberhasilan Usah Industri Kecil. Jurnal Bisnis dan Ekonomi 5(1), 43-56.
- [22] Imron, M. and P. A. Wibowo. 2008. Analisis faktor-faktor yang mempengaruhi tingkat keberhasilan usaha (Studi pada Warung "Nasi Kucing" di Kabupaten Jepara). Jurnal Dinamika Ekonomi and Bisnis 5 (2), 111-132.

The Study of Development of Urban Farming Agrotourism Subak-Irrigation- Based in Sanur Tourism Area, Denpasar City, Bali

I Ketut Sardiana*

Department of Agroecotechnology, Faculty of Agriculture, University of Udayana, Bali, Indonesia

Abstract

This study aims to study the development of urban farming agrotourism planning in Sanur Tourism area. The approach used the Participatory Rural Appraisal (PRA), which is an approach that combines knowledge and opinions of rural communities in the planning and management of development programs. Data obtained through field observation, Focus Group Discussion (FGD) and in-depth interviews involving all stakeholders in the development of agro-tourism Sanur. The study shows that the development of agrotourism aimed at two central points of development, namely: Subak Sanur in Sanur Kaja, with wide appeal in the form of farmers markets, urban farming field schools, and layout biocircle farming; and Subak Intaran kauh and Intaran Kangin in Village of Sanur Kauh and Sanur Kaja, with wide appeal among others cycling in paddy fields, education agrarian culture and irrigation systems Subak, attractions farming, social-religion activities, recreational fishing and bird watching. Development of facilities including the construction of gates and parking areas, information service facilities, toilets and bicycle parking, and a viewing post/gazebo, as well as cycling paths. Accessibility and circulation path aimed at structuring the Subak as cycling paths and setting its utilization by residents of Subak. Institutional development is directed to revitalization and empowerment of existing traditional institutions, through improvement of managerial capacity, prepare *awig awig* (written rules), and increasing the knowledge and skills of people in the process of adding value agricultural commodities

Keywords: agrotourism, development, Subak-irrigation based, urban farming.

INTRODUCTION

Agricultural land, especially for rice fields, has its own attraction for the landscape of Sanur tourism area. Paddy fields and paddy-farming activities have given the identity of Sanur as a rural tourism area. The traditional institution of the farmers that still exists is a great potential of supporting capacity for the sustainability of farming in Sanur. The area of agricultural land in Sanur Tourism Area is 189 ha.

Land conversion and low interest of younger generation to work in agricultural sector due to the low income become serious problems for the conservation of Subakland in this area. The data showed that, in the last decade, the conversion of agricultural land into residential or other lands was increasing very rapidly to 23.74% in the period of 2002-2011 or by 401.5 ha from the rice field area in Sanur [1]. Considering the rate of land conversion, there will no longer paddy fields remain in the next five years in Sanur Tourism Area, if there is no significant effort was made.

One of the strategies that can be taken is through the integration between tourism businesses and agricultural activities [2]. In this regard, agriculture can be served as a tourist attraction (agrotourism), agricultural products can be oriented to meet the needs of hotels and restaurants, revitalize the traditional institutional function of farmers (*Subak*) as the managers of agrotourism attraction and the adoption of organic-based horticultural agriculture technology [3,4]. The development of organic-based urban farming is the answer to the efforts of agricultural conservation in Sanur area. For this purpose, there must be an understanding between the stakeholders, i.e. farmers as the agricultural entrepreneurs, custom village as waste management to be the source of fertilizer for agricultural products, and business actors that play a role in absorbing agricultural products and users of agrotourism package [5,6]. The local government may act as a facilitator and provider of development funds to support the partnership. The suitable agrotourism pattern to develop is the organic-based urban farming.

Urban agriculture means an agriculture activity which can be in the form of farming, raising, fishing, forestry, located within an urban or a rural area, by processing, producing and

* Correspondence address:

I Ketut Sardiana

Email : ksardiana@yahoo.co.id

Address : Faculty of Agriculture Udayana University, Jl PB Sudirman, Denpasar, 80225.

selling and distributing various food and non-food products using human and natural resources (soil, water, nutrients, air and sunlight) and aims to provide and meet the consumption of food products for people who live in the urban areas [7,8].

In addition, the characteristics of urban agriculture include its proximity to markets, high competition for land, very limited land, using city resources such as organic waste and wastewater, relying on biodegradable products, and having a high degree of specialization [9]. The development of urban farming agrotourism has already been pioneered in Sanur tourism area. People of Sanur Kauh Village has pioneered the bike path along the border of Subak Intaran and Subak Intaran Timur as an access for tourists who are interested in enjoying the scenery of paddy fields. Similarly, in Subak Sanur, precisely at *Matahari Terbit* beach, a field school of horticultural crops has been developed on the land area of 2 ha, a cooperation between the Government of Denpasar City and the owner of Santrian group as the land owner. Therefore, we aim to study the development of urban farming agrotourism planning in Sanur Tourism area.

MATERIALS AND METHOD

Study Area

The study was conducted in Sanur Tourism area covering three villages, namely Sanur Kaja Village, Sanur Kauh Village and Sanur Village, in August-December 2016. The research used participatory rural appraisal (PRA) approach, which involved the community in the study area throughout research stages, from potential and problem identification, needs analysis, as well as composing the concept of attraction development, circulation system, facility and infrastructure development.

Data Collection and Analysis

Data collection techniques consisted of field observation, in-depth interviews, and focus group discussions (FGDs). The respondents were the stakeholders of agrotourism development in Sanur area, namely *Pekaseh* (Head of paddy-field farmers group), farmers' representatives, Sanur Development Foundation, head of village, youth organization and tourism entrepreneurs in Sanur area. The data analysis used was descriptive-qualitative.

RESULT AND DISCUSSION

Condition and Potential of Tourist Attraction

Sanur Tourism Area consists of three villages, namely Sanur Kaja, Sanur and Sanur Kauh Villages, which are administratively included to the South Denpasar Sub-District, Denpasar City, with a total area of 1,057 ha. There are three subak irrigations found in Sanur area which are still preserved and maintained for their sustainability, and become one of the remaining rice fields in the middle of Denpasar City: Subak Intaran Barat, Subak Intaran Timur and Subak Sanur, as the data of subak are shown in the following table 1.

Table 1. Name of Subak, Village, Area and Number of Farmers in Sanur Area

Village	Subak	Area (ha)			Farmers
		1943	2002	2012	
Sanur kauh	Intaran Barat	195.68	120.80	120	102
	Intaran Timur	161.15	19.42	12	58
Sanur Kaja	Sanur	234.67	72.52	57	23
Sanur		0	0	0	0
Total		590.50	212.74	189	183

Sources: Statistic Center Denpasar [1]

In general, the cropping pattern and schedule systems applied to Subak Intaran are in the form of paddy-paddy-CGPRT (coarse grains, pulses, roots and tubers) croppings in the odd year and CGPRT-CGPRT-paddy croppings in the even year. It is due to the split of water supply with Subak Sanur Kauh in rotation, by using the reverse cropping pattern from Subak Intaran in which there are paddy-paddy-CGPRT in the even year, and CGPRT-CGPRT-paddy croppings in the odd year [10].

The yields sold along the village roads or along the Ngurah Rai bypass allow consumers to buy fresh and cheaper products directly from the farmers. The street trading activity is definitely against the regulation because it can cause traffic jams and endanger the sellers or buyers. The sellers should make decent and safe stalls for buyers. Any tourists who want to buy crops as souvenirs, can buy through the stalls without having to pick the crops in advance.

In Subak irrigations around Sanur Tourism Area, there are some subak infrastructures that have tourism potential, including Pura Subak and Balai Subak, *Jineng* (a place in which the farmers store their yields), *Bale Timbang* (a place in which the farmers hold discussion), *Bangun Bagi* (a building for water distribution per paddy field),

Kubu (a building in which the farmers can take a rest), and cattle pens. The potential development of Subak Intaran in order to support agrotourism can be conducted by utilizing the existing facilities and infrastructures, as follows:

- 1) To see the landscape view of paddy fields and also various conducted farming activities.
- 2) To see birds, cattles and other animals outside the paddy fields.
- 3) To see the rituals performed by Subak members.
- 4) Tourists can participate in farming activities, such as; plowing, paddy cropping, eel catching, and other activities.
- 5) Fruit picking for watermelon, melon, cucumber, tomato and other fruits and enjoying the fruits on site immediately
- 6) Conducting exercise by tracking the riverbank which has been developed to have jogging track on it.

The Problems and Needs of Agricultural Attractions Development

Based on the results of focus group discussions (FGD) which involved stakeholder representatives in the Sanur area, there were some issues found that became the concerns of the stakeholders related to the development of agrotourism, as follows:

- 1) The variety of agricultural attractiveness has not been developed and packed into agrotourism package yet.
- 2) There has not been horticultural crops market available yet on the location
- 3) Bicycle and trekking tracks in the middle of paddy fields of Subak Intaran Barat and Subak Intaran Timur have not been arranged and packed according to the standard
- 4) The agribusiness-related insight among the farmers is still very low.
- 5) The farmers have not adopted organic system cultivation technology yet.
- 6) Subak institutions do not have competence in agrotourism package management yet.

The development of tourist attraction in Sanur Tourism area can be summarized as follows:

- 1) The development of horticultural crops and organic system of urban farming

based on agrotourism are integrated with household waste management.

- 2) The development of farmers market.
- 3) The arrangement of trekking track in the middle of paddy fields (Subak).
- 4) The agricultural products processing into typical food (*brem*/traditional fermented food or beverages and wine).
- 5) The Subak-based institutional development of agrotourism management.

Meanwhile, based on the analysis of the problems obtained from the inventory, there was also another problem found that also required some treatment/management. It was the preservation of Subak land through the reduction of land conversion rate.

The Synthesis and Concepts of Development

Based on the conditions, potentials and problems that have been inventoried and analyzed above, there were various planned efforts needed to realize Sanur area as a high-quality tourist attraction. The efforts made were in order to maximize the existing potentials and to overcome a number of obstacles/problems to keep having a tourist attraction with a high competitiveness (Table 2).

There were various alternative actions taken to exploit the potentials and to overcome the problems/obstacles. Based on these alternatives, there were some best and most feasible actions obtained to be implemented.

The basic concept of planning in this study was an agricultural area as a high-quality tourism attraction. As a nature-based tourist attraction, the quality of agricultural tourist attraction was focused on creating the integrity of agricultural ecosystems concerning the preservation of the physical environment, biodiversity, social and cultural values, and awareness of the people in the conservation movement [11]. The components of accessibility, circulation system and supporting facilities for tourist attraction became a single entity in the planning. The concept of agricultural tourism attraction development in this planning consisted of the development of organic based urban farming, agricultural land zoning system, circulation system, facilities and infrastructures.

The Concept of Zoning

The spatial concept was developed based on the agricultural potentials of the region, by having principle on the method of a tourism

destination development [12]. It also considered the needs of tourism spaces as well as the supporting factors of tourism as a whole.

The agrotourism zone is divided into agrotourism attraction zone and agrotourism supporting zone. Attraction zone is the core area that becomes the center of agrotourism activities. There will be an intensive utilization of natural resources potentials, namely agriculture commodity and Bali traditional agrarian cultural activity (Subak). In addition, there will be an attraction zone developed in which the tourists can participate directly in agricultural activities. Agrotourism Supporting Zone includes Receiving zone, Service Community zone, Linkage Corridors, and Community zone.

The Concept of Circulation

Circulation system is the movement from one to another space. The developed concept of tourism path was basically intended to link the spaces on the site to facilitate the movement of visitors. The circulation concept in Sanur agrotourism area was planned by utilizing the existing path, however, there is a need of more portion for the visitors. Agrotourism has more emphasis on the sustainability of tourism without disturbing community activities, however, it does not mean negating the contact between the tourists and the community and their daily activities.

Table 2. The Analysis and Synthesis of the Tourist Attraction in Sanur Tourism Area

Elements of Agriculture	Analysis	Synthesis	
		The Utilization of Potentials and Solutions	Alternatives
Agricultural Landscape	Subak/paddy fields, which provide rural atmosphere, are threatened for the sustainability	Requires preservation and added-value increase for the agricultural fields	<ol style="list-style-type: none"> 1) Integrating the agriculture and tourism 2) Landscape zoning for agrotourism development
Attraction	The attraction of rural, endemic floral and animal nature, and Subak activities have not been packed into a tourism package as the paddy and CGPRT cropping do not provide satisfying results for the farmers	<ol style="list-style-type: none"> 1) Requires a package of natural-based tourism attraction of the tourism village and agricultural activities into an agrotourism package 2) Requires agricultural intensification by cropping the market-oriented commodities 	<ol style="list-style-type: none"> 1) Packaging the village tourism attraction and agricultural activities into an agrotourism package 2) Purchasing agricultural products for tourism industry needs 3) Converting to horticultural farming technology for lowlands
Accessibility and Circulation	The public access to the agrotourism location is adequate but not well-arranged, as the circulation is still limited using the Subak path	The arrangement of Subak path for the circulation of visitors	<ol style="list-style-type: none"> 1) Improving the access path quality and establishing parking areas 2) Arranging Subak path for circulation routes
Agrotourism activities	The attraction and agrotourism-supporting facilities are still inadequate	Requires addition on the agrotourism-supporting facilities	<ol style="list-style-type: none"> 1) Developing farmers market for product marketing, verticulture installation, pot farming exhibition layout etc. 2) Arranging the trekking tracks to enjoy the paddy fields scenery 3) Providing fields for paddy cropping attraction, horticultural cropping, and installation
Institution and Community	There is no management established and the low competence of the people in managing the agrotourism package	Requires the establishment of management institution and training of urban farming technology for the farmers	<ol style="list-style-type: none"> 1) Revitalizing Subak into agrotourism package management 2) Developing the managerial competence for agrotourism 3) Improving farmers' skills in applying the urban farming technology 4) Agricultural products processing into Bali-specific traditional snacks, such as <i>brem Bali</i>, and taro-made wine

The Concept of Activities and Facilities

Activity is separated based on the level of tourist participation in agricultural activities, namely active and passive agrotourism activities. Active agrotourism activities require an active tourist participation directly in agricultural activities or processes, or interpret agricultural activities with the help of interpreter(s) in order to gain knowledge and understanding through direct experience and delivery. Otherwise, passive agrotourism activities emphasize recreational activities, as the educational value is obtained through the understanding and self-observation conducted by the tourists [13].

Results of Zone Planning

The zone planning is considering the characteristics of potentials, conditions, problem analysis and alternative synthesis of agrotourism development. It also consider directing the development of facilities and infrastructures. Therefore, management of agrotourism was divided into two categories:

1) Attraction Complex/Zone

It is a description of the attraction zone in the model of the tourism destination zone and is the core area that becomes the center of agrotourism activities. The intensive utilization of natural resources, such as agriculture and traditional agrarian agriculture (Subak), which can be enjoyed by the tourists. In addition, it developed into space of attractions where tourists can participate directly to conduct agricultural activities (Fig. 1 and 2).



Figure 1.The Attraction: the Process of Making Biogas and Organic Fertilizer (source: personal documentations)



Figure 2. Plowing Attraction Plowing the Rice Field (source: personal documentations)

This attraction complex consists of two points of agricultural area in Sanur Tourism Area. One as the center or core of attraction by presenting the agribusiness outlets or terminals and the attraction of introduction to *urban farming* technology. While the other point presents cycling attraction to enjoy the view of paddy fields combined with Subak activities, such as land cultivation, paddy cropping, eel catching and other activities.

2) Agrotourism Supporting/Welcoming Zone

A space that is prepared as a *welcoming area* that marks the agrotourism area. The activity exists in this area is the introduction to the area. The main function of welcoming zone is to create the *image* and identity for visitors.

Service Community Zone

This zone contains the fulfilling needs activities for the tourists. This zone provides services to the tourists related to the fulfillment of the needs of comfort, convenience and completeness in enjoying the activities of agrotourism. It includes information service, public facilities and service providers, such as bike rent and local guides. The service community zone is in an accessible area for the tourists, and is an integrated service center within the area.

Community Zone

It is a community living space with all its activities and patterns. The community zone embodies the life of indigenous people and separates it from the attraction zone. This zone is composed by a series of the surrounding neighborhoods and environment, including courtyards and gardens [14].

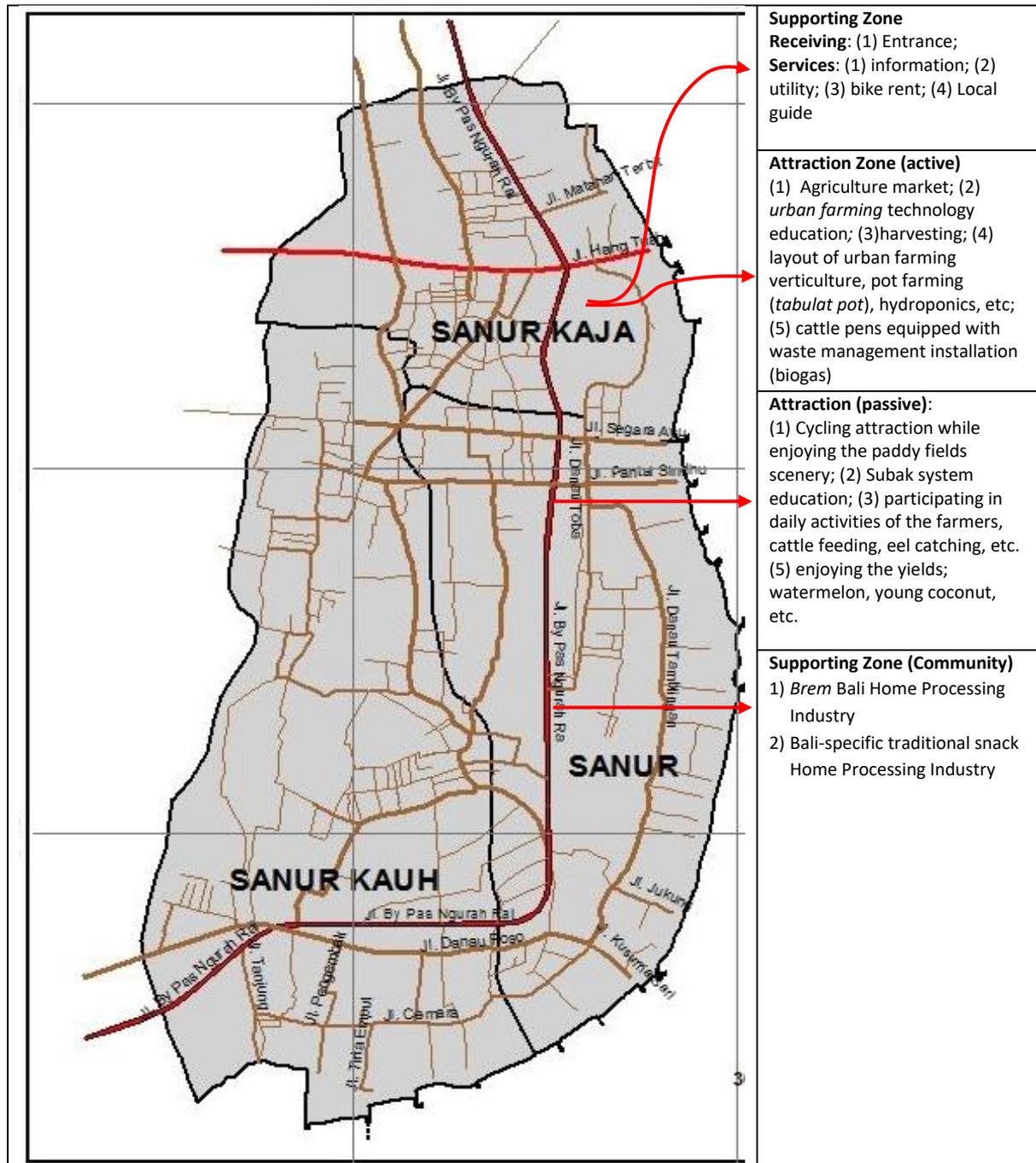


Figure 3. Agrotourism Zoning in Sanur Tourism Area (scale 1: 25.000)

There is a home industry in several houses of the local people in processing agricultural products. The products are *brem Bali*, the making and processing of *dodol* (sugar-palm based confection), and various Bali-typical traditional snacks [15].

The zone planning which consisted of attraction zone and supporting/welcoming zone, as previously mentioned, was described in following Figure 3. The developed concept of facilities was the concept of facilities suited to the needs of agrotourism activities. In general, the facilities to be developed are divide into active agrotourism facilities, passive agrotourism facilities, and supporting facilities.

CONCLUSION

The main attractions to be developed in Sanur agrotourism are the introduction to horticultural farming techniques and education of urban farming technology and enjoying the paddy fields scenery and livelihoods of farmers which organized in Subak. The development of agrotourism in Sanur is aimed at two centers of development, namely (1) SubakSanur in SanurKaja Village, with a variety of attractions developed in the form of farmers market, urban farming school, and biocircle farming layout; (2) Subak Intaran Barat and Subak Intaran Timur in Sanur Kauh and Sanur Kaja villages, with a variety of developed attractions, including cycling tours in rice fields, agrarian culture education (Subak) and Subak irrigation systems, cropping attraction, social-religious activities, fishing and bird watching.

The development of facilities including the construction of gates and parking areas, information service, public toilets and bicycle parking areas, installation and display of urban farming practices, cattle pens equipped with biogas processing installation, urban farming installation, gazebo/observation post, and bicycle track. The development of access/circulation is directed at Subak road arrangement as cycling path and the arrangement of its utilization with Subak community.

The Institutional Development and Community Empowerment is directed to the revitalization and empowerment of the existing traditional institutions, so that the program is designed to focus on capacity improvement, such as the development of managerial capability of agrotourism package, the preparation of *awig-awig* (written regulations), the preparation of various packages of activities in the agrotourism area, and agreement on the costs which have to be paid by the tourists. It also needs the improvement on knowledge and skills of the community in the process of increasing the added values of commodity, and in the management of agrotourism.

ACKNOWLEDGEMENTS

The author thanks to all parties who have helped in both of the research process and the completion of this article. The parties are Ministry of Tourism which have funded this research, Pembangunan Sanur Foundation and the members of Masterplan Arrangement Team for National Tourism of Sanur, Nusa Dua, Kuta, and surrounding areas.

REFERENCES

- [1] Statistic Center of Denpasar. 2015. Denpasar City in figures. Denpasar.
- [2] Sardiana, I K. and N. L. R. Purnawan. 2015. Community-based ecotourism in Tenganan Dauh Tukad: an indigenous conservation perspective. *Jurnal Kajian Bali* 5(2), 347-368.
- [3] Junaedi, I W. R. and I G. B. R. Utama. 2016. Agrotourism as the economics transformation of the tourism village in Bali (case study: Blimbingsari Village, Jembrana, Bali). *Journal of Business on Hospitality and Tourism* 2(1), 26-40.
- [4] Sucipta. 2008. *Agribisnis pembangunan setengah hati*. University of Udayana. Denpasar.
- [5] Pitana, I G. and P. G. Gayatri. 2005. *Sosiologi pariwisata*. Andi Offset Publisher. Yogyakarta.
- [6] Windia. 2006. *Transformasi system irigasi Subak yang berlandaskan konsep Tri Hita Karana*. Pustaka Bali Post. Denpasar.
- [7] Yang, Z., J. Cai and R. Sliuzas. 2010. Agrotourism enterprises as a form of multi-functional urban agriculture for peri-urban development in China. *Habitat International* 34(4), 374-385.
- [8] Butler, L. and D. M. Moronek (Eds.) 2002. *Urban and agriculture communities: opportunities for common ground*. Council for Agricultural Science and Technology. Ames, Iowa. Available at: http://bieb.ruaf.org/ruaf_bieb/upload/943.pdf.
- [9] Kingsley, J., M. Townsend and C. Henderson-Wilson. 2009. Cultivating health and wellbeing: members' perceptions of the health benefits of a port Melbourne community garden. *Leisure Studies* 29(2), 207-219.
- [10] Food Crop Agricultural Agency of Bali Province. 2013. *The recapitulation of farmer group federation/farmer group, organically certified by LeSOS (2009-2012)*. Bali-Indonesia.
- [11] Hakim, L., J. E. Kim, S. K. Hong. 2009. Cultural landscape and ecotourism in Bali Island, Indonesia. *Journal of Ecology and Environment* 32(1), 1-8.
- [12] Gunn, C. A. 1994. *Tourism planning*, 3rd Ed. Taylor and Francis. New York.
- [13] Budiasa, I W. and I G. A. A. Ambarawati. 2014. *Community based agro-tourism as an innovative integrated farming system*

- development model towards sustainable agriculture and tourism in Bali. *Journal of International Society for Southeast Asian Agricultural Sciences (ISSAAS)* 20(1), 29-40.
- [14] Puriandi, F. 2013. Proses perencanaan kegiatan pertanian kota yang dilakukan oleh Komunitas Berkebun di Kota Bandung sebagai masukan pengembangan pertanian kota di kawasan perkotaan. *Jurnal Perencanaan Wilayah dan Kota* 24(3), 227 – 240.
- [15] Sarjana, I M. 2016. Market and stakeholders analyses on ecotourism in Subak Sembung, Peguyangan Village, Denpasar City. *E-Journal of Tourism Udayana University* 3(1), 58-71.

Knowledge, Action, Perception and Attitude of Management of Talangagung Landfill toward Edu-Tourism Program: A Community Perspective

Koderi^{1,2*}, Suyadi^{1,3}, Abdullah Said^{1,4}, Abdul Wahib Muhaimin^{1,5}

¹Doctoral Program of Environmental Studies, Graduate Program, University of Brawijaya, Malang, Indonesia

²Environmental Department of Malang Regency, Indonesia

³Faculty of Animal Husbandry, University of Brawijaya, Malang, Indonesia

⁴Faculty of Administrative Science, University of Brawijaya, Malang, Indonesia

⁵Faculty of Agriculture, University of Brawijaya, Malang, Indonesia

Abstract

This study aimed to determine the knowledge, action, perception, and attitude of landfill managers and community to Talangagung landfill program as an edu-tourism destination in Malang. Talangagung landfill became one of the best examples of waste management in Indonesia. This study used a quantitative approach by conducting field observations and questionnaire survey for data collecting. Questionnaires were distributed to community around landfill to assessed waste management in Talangagung landfill as an edu-tourism attraction. The data obtained was analyzed descriptive quantitatively by using Likert scale. The results showed that landfill manager and community had good knowledge about waste management practices based on environmental conservation principles. This was in line with the action, perception, attitude of landfill managers and community that supported the government program. The average Likert score of observed indicators indicated that respondents' answers were in the 'high level' category with a score of 3.92. It means respondents had a positive response to the questions posed by the researcher based on conditions in the field. Synergy and cooperation between landfill managers and community were one of the keys to support the success and sustainability of edu-tourism program in Talangagung landfill.

Keywords: community, edu-tourism, landfill management, perspective.

INTRODUCTION

Waste is basically substances or objects that are not used anymore, either in the form of domestic waste (household) and disposal of the factory as the rest of the industrial process [1]. People in managing waste still rely on end-of-pipe approach, that is, garbage collected, transported, and disposed to final waste processing site or landfill. In fact, large volumes of waste at the site have the potential to release methane (CH₄) gas that can increase greenhouse gas emissions and contribute to global warming and bring bad impacts to society. If the waste is stacked in the absence of good waste management [2-7].

Waste processing is an effort to reduce the volume of waste or change the waste into something more useful. Waste that has been collected can be processed further, either in the location of waste sources or after arriving at the final waste processing site [8,9]. Waste manage-

ment that does not meet the principles of environmental conservation can cause conflicts between the landfill manager and surrounding community. For example, fire case at Bantar Gebang landfill at Bekasi, landslide case of garbage at Leuwigajah, Bandung and Kohse landfill in Ethiopia causing negative impact to environment and decreasing quality of life of society.

Waste management activities in the landfill have the potential to be utilized as a form of socialization and educational tourism on waste management and environmental conservation for visitors or the public. Landfill opportunities to become ecotourism products, such as educational tourism (edu-tourism), will be in line with sustainable tourism development programs. The essence of a sustainable tourism program is maintaining a balance between economic needs, socio-cultural relations and environmental conservation [10,11]. There are some characteristics of ecotourism such as (a) the existence of local management; (b) the existence of quality travel and tourism products; (c) appreciation of the culture; (d) the importance of training; (e) rely and relate to natural and cultural resources; (f) integration between development and conser-

*Correspondence address:

Koderi

Email : ri.kode@yahoo.co.id

Address : Office of Environmental Services, Malang
Regency, Jl. KH. Agus Salim No. 7, Malang.

vation [12]. Educational tour is a program who tourists visit a tourist destination with the main purpose to gain experience of learning or non-formal education directly in the tourist destination [13,14]. Educational tour contains elements of education that aims to change the perception of a person to have awareness, responsibility, commitment to environmental conservation and culture. Educational tourism was a new market opportunity in tourism services business [15]. The desire of tourists to gain more knowledge about tourist destinations has led to a shift in the trend of tourist preferences toward special interest activities with more intensive participation in tourist areas visited. Currently, more tourists want to get more learning experience in making tourist visits.

One example of landfill management as educational attractions is Talangagung landfill is located in the city of Kepanjen, Malang regency. Talangagung landfill is a final waste processing site that was initially managed by an open system (open dumping) then converted into controlled landfill (sanitary landfill) with a capacity of 140 m³.day⁻¹. The development of the Talangagung landfill began in September 2009, in 2010 the prototype model of the utilization of methane gas began to be developed, and in January 2011 the discussion was conducted with experts from universities for the preparation of future improvement programs. This landfill is used as educational tourism destination and laboratory application of appropriate technology for waste processing, and place of learning to improve student and community motivation in environmental conservation based waste management. In the development of educational tourism, community involvement is an important thing and must exist. In this case, society should be viewed as a subject and not as an object of tourism development. Community participation plays important role in achieving good waste management and a key factor attaining the goal of waste management [16,17,18].

The existence of people living around the landfill to be one factor for the successful landfill management. This community also play a role in maintaining the sustainability of the landfill edu-tourism program that has been proclaimed by the local government [19]. However, the information regarding public perception of waste management system in landfill and Talangagung landfill status as educational tourism object has not been widely available. This information is important as a material evaluation of landfill

management based on environmental conservation and community participation. Therefore, in this study, researchers assess the knowledge, action, perception, and attitude of landfill managers to the existence of Talangagung landfill as an educational tourism destination.

MATERIALS AND METHOD

This study used a quantitative approach by conducting field observations and questionnaire survey for data collecting. Data were analyzed statistically descriptive. This descriptive analysis was carried out with the aim of obtaining information about the knowledge, action, perception, and attitudes of the community around the landfill manager regarding the management and status of Talangagung landfill as an educational tourism object.

Area Study

This research was conducted in Talangagung landfill, Kepanjen Sub-district, Malang Regency, East Java Province. Geographically, Talangagung landfill was located at 8°07'14.81''S and 112°33'43.00''E with 339 m asl in elevation. This area study was determined intentionally, with the following considerations (1) Talangagung landfill was the main priority program of the Malang Local Government in order to follow up the Laws of the Republic of Indonesia number 18 of 2008 concerning Waste Management; (2) Talangagung landfill has been identified as Smart Practice 2016 by Knowledge Center, Ministry of National Development Planning of the Republic of Indonesia (BAPPENAS).

Data Collection

The research data was collected by using questionnaires survey and distributed to respondents (community) living around landfill. The number of respondents who participated in this study were 99 individuals with no considerations of gender, age, and occupation of the respondents. A structured questionnaire could be effectively used in order to investigate public participation in waste management practices, focusing on awareness, attitude, knowledge, and behavior [20]. Data collection was conducted by filling out a list of questions in writing addressed to the respondent. Basically, data collection using questionnaires was similar to interviews, the difference lies in questions and answers made in writing. Questionnaires were distributed to community members, but the researcher kept the questionnaire completely filled according to the circumstances.

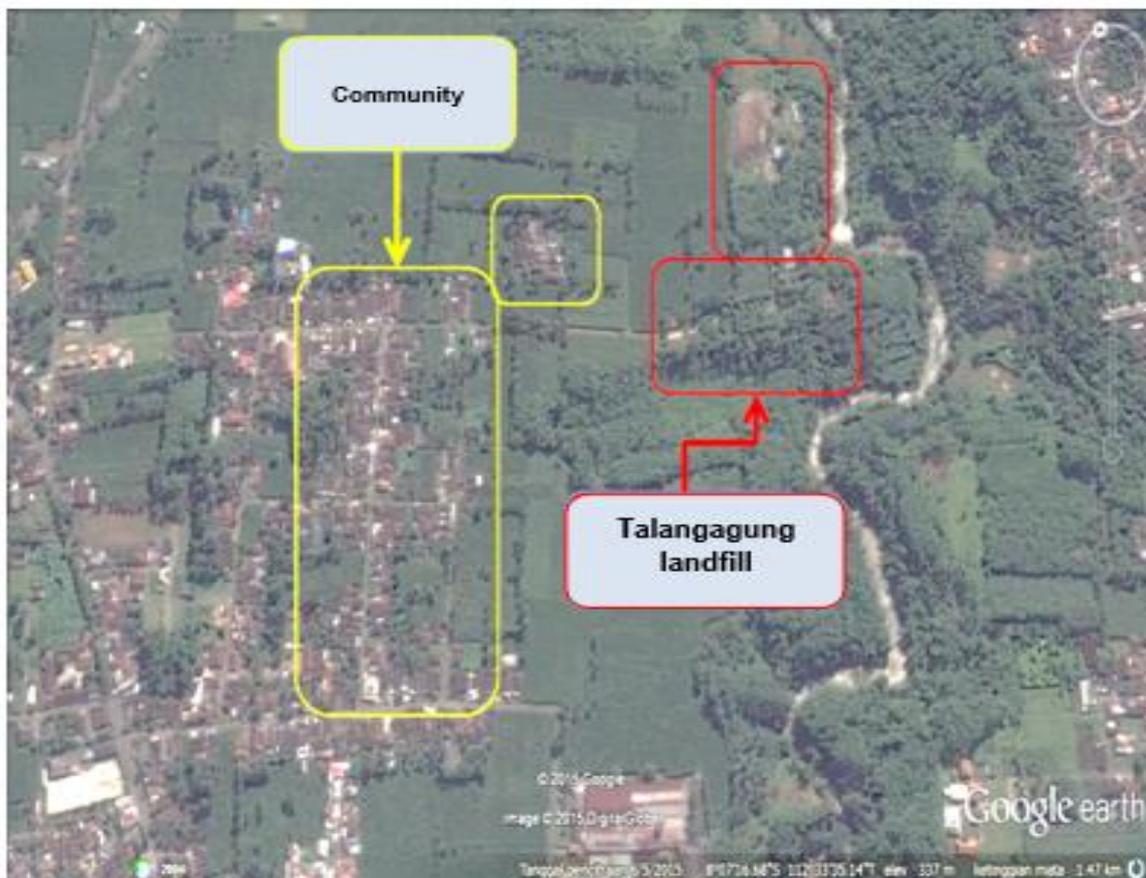


Figure 1. Location of Area Study at Talangagung Landfill, Kepanjen, Malang.

Data Analysis

This research used descriptively quantitative analysis. This descriptive analysis was to provide an overview of the field data by interpreting the primary data into tabulation. Thus, this descriptive analysis aimed to obtain a description of the condition of variables studied include knowledge, actions, perceptions, and attitudes of communities around the Talangagung landfill and also to identify the characteristics of each variable.

This study used Likert scale in data analysis to describe the category and level of each indicator on observed variables. Likert scale was a way of measurement by providing an opportunity to a respondent to answered questions with a predetermined answer score ranged 1 to 5 [21]. Questionnaires in this study using five answers that could be selected one by respondents. The answer given by respondent had the value according to the items compiled with answers that had a range positive to negative meaning. The data of this research using semantic differential scale yielded score of 1 to 5. Then to categorize the average of respondent's answer

was determined interval scale calculated from the highest score minus the lowest score then divided by five. From the calculation, the interval for the category of 0.80 was obtained, thus the categories of respondents' answers were determined based on the following scales lowest (1.00 - 1.80), low (1.81 - 2.60), moderate (2.61 - 3.40), high (3.41 - 4.20) and highest (4.21 - 5.00).

RESULTS AND DISCUSSION

In terms of knowledge about the existence of Talangagung landfill as an edu-tourism destination, in general, the community had good knowledge about it as evidenced by the average Likert's score of 3.72. This score informed that the level of respondent's knowledge to Talangagung landfill status as edu-tourism destination was high. There were several indicators that described the level of knowledge of respondents including knowing, understanding, applying, analyzing, synthesizing, and evaluating. Likert's scores on synthesizing and evaluating indicators were observed lower than the other indicators (3.04 and 3.08) and categorized into 'moderate'

level (Fig. 1). Community's knowledge about the suitability between landfill management with environmental conditions on Talangagung landfill was on still low level. This could be seen from the respondents' answers where as many as 32% of respondents answered was 'appropriate', 32% of respondents answered was 'not appropriate', and 31% of respondents did not answer.

Meanwhile, community knowledge about the evaluation of landfill management policy involving the local government and community itself was also observed at low level. With regard to the implementation of the evaluation activities, as many as 54.6% of respondents stated that the evaluation of landfill management policy was 'often' conducted but as many as 27.8% of respondents stated that evaluation was rare to do. This became a note for landfill manager and

local government to develop better and routine evaluation plan. Evaluation became important because it was a means to encourage improvement and development in the future.

According to the community, waste management practice in Talangagung landfill was well-managed by landfill manager. This was showed from Likert score more than 3.40 with an average of 4.02, this value belong to 'high' category level (Fig. 2). This high score illustrated that the respondents agree with the questions posed by researcher based on reality in the field. Questions posed to respondents were divided into several indicators including awareness, interest, evaluation, policy implementation, and acceptance from the landfill management for better edu-tourism practices.

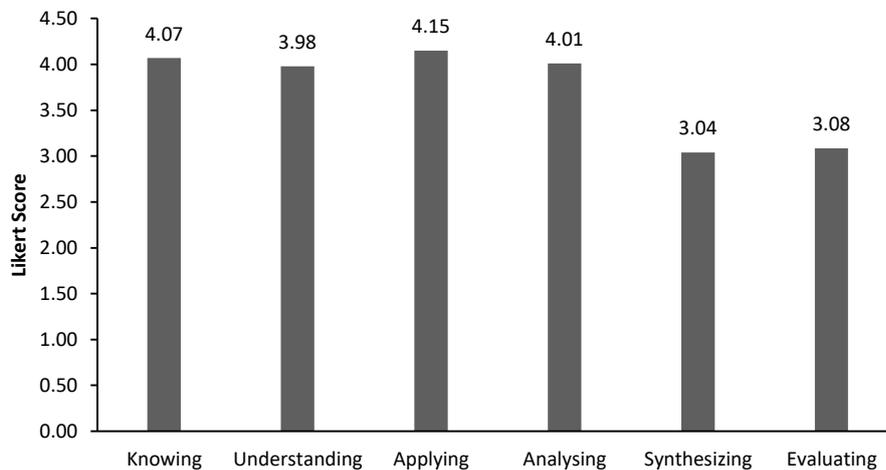


Figure 1. Knowledge of Community on Landfill Management as an Edu-tourism Object

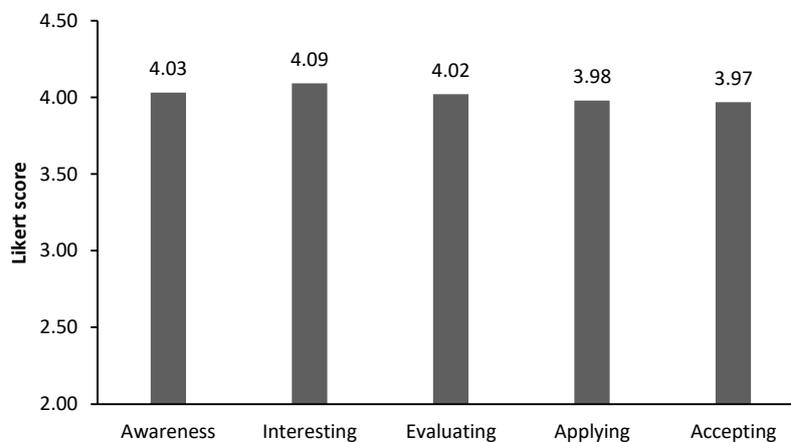


Figure 2. Actions of Landfill Manager on Waste Management based on Community's Answer

Based on field observations, activities of waste management to support Talangagung landfill as an edu-tourism destination were motivated by desire to achieve better environmental conditions. This was evident from the results of interview where more than 45% of respondents always stated environmental factors to be the main reason on each question points asked (indicator). Environmental knowledge was strongly correlated with environmental activity [16]. Additionally, environmental knowledge was connected to improving people's attitude toward the environment [16,22].

Beside environmental factors, economic and socio-economic factors were also be another reason factor for implementation of good waste processing practices. Good landfill management also provided good impact for community as well so that the landfill edu-tourism program could well develop. Thus, the number of visitors (tourists) would be increased and interested to visit. This was certainly good thing because it could give additional income for the surrounding community or landfill manager.

For community perception aspect, their responses were determined based on four question points as an indicator including the understanding of landfill manager about environmental rules on waste management practices (understanding), community interest in landfill program as an edu-tourism object (interesting), joint evaluation between landfill manager and community (evaluating), and concern about the negative impact of landfill (interpretation).

Understanding, interesting, and evaluating indicators showed high Likert's score, >3.41 with an average of 4.08 (Fig. 3). According to 90% of respondents, landfill managers had been processing waste in accordance with existing environmental rules. This was in line with the interest of respondents to management of landfill in Talangagung as a place to learn how to implement good waste processing practices for healthy environment. Almost all respondents stated that they interested or very interested, 87%, 27% respectively, on waste management system applied by Talangagung landfill manager. A good waste management process and fitted with environmental conservation rules became the main attraction for community to support the edu-tourism landfill program. However, this conditions need to be supported by regular evaluation on landfill management system. According to the respondents, evaluation activities should be conducted jointly between landfill

manager and community for improvement of edu-tourism landfills. Because the synergy between landfill managers and community was an important and interrelated factor to guarantee the landfill sustainability and success [23,24].

Although the landfill management regarding waste management practices had good appreciation, but 60% of respondents were still concerned about the negative impacts of landfill and only 28% of respondents stated that they were not worried about the negative impacts. Respondents had interpretation that the negative impacts of landfill might be emerged anytime. Based on Likert's score, the response was only 3.36 and this was categorized into 'moderate' level. This situation became a duty for landfill manager and local government to improved community understanding on safety aspects of current landfill management. Socialization of the benefits and safety of environmental based landfill management needed to be deeply and intensively conduct to the community. This was important thing because when community felt insecure about the existence of this landfill, the sustainability of edu-tourism landfill program would be threatened in the future. People would have awareness on waste management practices towards the environment when gaining a lot of knowledge about the consequences of waste management [25].

Policy of Malang government which established Talangagung landfill as an edu-tourism destination was supported by respondents. Over 90% of respondents agreed on each question point asked. The answers used to describe respondents attitude toward the policy. On each question indicator, the Likert score of the respondent's answer was more than 3.40 with an average of 4.03 categorized into high level (Fig. 4). Based on this information indicated that respondents did not refuse the policy. It also informed that respondents showed good environmental attitudes. Environmental attitudes were understood as favorable or unfavorable feelings towards some feature of the physical environment or a problem related to it. Environmental attitudes and behaviors were frequently linked to those personal values. Related to this, attitudes were favorable or unfavorable feelings inspired by an object or situation [26].

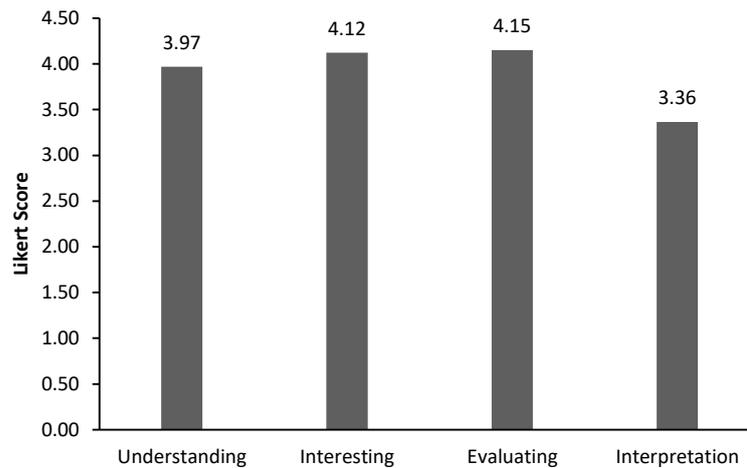


Figure 3. Community's Perception toward the Landfill Manager's Understanding on Waste Management

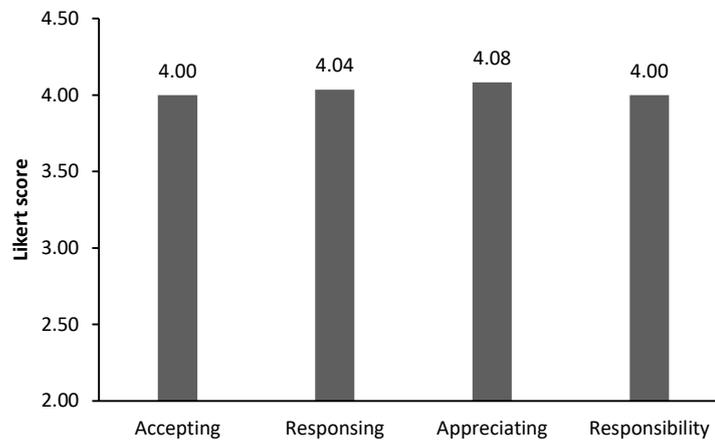


Figure 4. Landfill Managers and Community's Attitude toward Waste Management Policy as Edu-tourism Destination

Regarding to responsibility of landfill management, 93% of respondents stated that the landfill manager had carried out their responsibilities well. The process of waste management had been well conducted, so some problems could be minimized to be emerge. Talangagung landfill became one of examples on environmental based and integrated landfill management in Indonesia. Waste management process used as tourist attraction made this place to be a learning tool for every visitor such student and community. In the development of an edu-tourism object, there were five principles that should be considered [27]. This five basic principles included environmental conservation, education, tourism, economy, and community participation. These five principles interrelated to one another and it could not be separated.

The existence of Talangagung landfill provided benefits not only for landfill managers but also the surrounding community. People community got benefits from both environmental and economic aspects. From the environmental aspect, people got environmental benefits such as clean environmental, health, feeling comfort. Meanwhile, on the economic aspect, community got benefit in the form of utilization of methane gas (renewable energy) from the landfill management. The management of landfill had built a methane gas channel system, as a result of its waste management activities, which was well integrated into people's house around the landfill. This methane gas channel system had been integrated into 190 houses around the landfill with a radius of 1 km. This methane gas could be utilized by the community for daily activities such as cooking.

Thus, the local community could save their expenses per day. In addition, in this Talangagung landfill, there were also various supporting facilities for every visitor who came.

Transformation of Talangagung landfill from open dumping system to controlled landfill management had become the beginning of development of this edu-tourism program. An environmental based and integrated waste management system was the main attraction of this landfill. One of real effort on sustainable waste management development was the utilization of methane gas by community around the landfill with an integrated system. Utilization of methane gas as waste processing products was considered as one successful innovation in landfill management. Furthermore, this innovation becomes one of existing tourist attractions in Talangagung landfill. In addition, the development of green open space in the landfill area accompanied by various facilities also became one of the additional attractions for the visitors.

The development of conservation-based edu-tourism object at Talangagung landfill is deliberately conceptualized and carried out flexibly to optimize the use of available resource potential. Of course, it will or may also affect ecological considerations. Because the phenomenon of emerging ecological problems may also have an impact on the disruption of economic and social order. The alternative and effective way to avoid such problems is to integrate conservation education at every stage of the edu-tourism landfill development process. This must be set from the beginning through local policy products, so that the implementation process of development from the beginning to end of the landfill management will be consistent and integrated with environmental conservation education. This concept offers the implementation of anticipatory environmental policy and cross - sectoral conservation policy at the local district or municipal level.

The process of conservation education in the landfill is very necessary to do. It serves as a learning material for visitors related to the importance of environment sustainability for human life. Educational institutions have very important role in preparing professionals and technicians in the environment field, including waste management. Therefore, cooperation between educational institutions and landfill managers is very important to be established. Some developing countries that invest in environmental education and research have

enjoyed positive impacts from such investments as having clean cities and changing people's assumptions on environmental workers by putting them at a high level.

CONCLUSION

Respondents showed a good opinion on the knowledge, action, perception, and attitude of landfill managers toward landfill management programs as edu-tourism destination. It was indicated by the average Likert score of the observed indicator being in the 'high level' category. The establishment of Talangagung landfill as an edu-tourism destination also had been supported by community around the landfill. Synergy and cooperation between landfill managers and community was one of the key to support the success and sustainability of edu-tourism program in Talangagung landfill.

ACKNOWLEDGEMENTS

The author would like to thank the Malang Regency Government, community member in Talangagung, Talangagung landfill management, UB Rector, and Director of Graduate Program – University of Brawijaya.

REFERENCES

- [1] Kastaman, R. and A. M. Kramadibrata. 2007. Sistem pengelolaan reaktor sampah terpadu (Silarsatu). Institute for Research and Community Service Padjajaran University. Bandung.
- [2] Bogner, J., K. Spokas, E. Burton, R. Sweeney and V. Corona. 1995. Landfills as atmospheric methane sources and sinks. *Chemosphere* 31 (9), 4119-4130.
- [3] Mestre, S. Ana, C. Freire, J. Pires, N. P. Carvalho, M. L. Pinto. 2014. High performance microspherical activated carbons for methane storage and landfill gas or biogas upgrade. *Journal of Materials Chemistry A* 2, 15337-15344.
- [4] Medina, M. A. P. and R. R. C. Forten. 2015. Estimating methane gas emissions from solid waste generated by households in an urban village in Bukidnon, Phillippines. *American – Eurasian Journal of Agriculture and Environmental Sciences* 15(5), 837-842.
- [5] Tian, H., C. Lu, P. Ciais, A. M. Michalak, J. G. Canadell, E. Saikawa, D. N. Huntzinger, et.al. 2016. The terrestrial biosphere as a net source of greenhouse gases to the atmosphere. *Nature* 531(7593), 225-228.
- [6] Perkoulidis, G., A. Karagiannidis, St. Koutogianni, L. F. Diaz. 2011. Solid Waste

- management in developing countries: present problems and future perspectives. *Journal of Environmental Protection and Ecology* 12, 570-580.
- [7] Pin-Jing, H. 2012. Municipal solid waste in rural areas of developing country: do we need special treatment mode? *Waste Management* 32, 1289-1290.
- [8] Zubair, A. and Haeruddin. 2012. Studi potensi daur ulang sampah di TPA Tamangapa Kota Makassar. *Proceeding of Research Results Faculty of Engineering*, 6 Ed., TS2-1-10.
- [9] Rahmaddin, M. Y., T. Hidayat, B. Yanuwadi and Suyadi. 2015. Knowledge, attitude, and action of community towards waste management in river bank of Martapura. *International Journal of Applied Psychology* 5(4), 96-102.
- [10] Wearing, S. and J. Neil. 1999. *Ecotourism: impacts, potentials and possibilities*. Routledge. Oxford.
- [11] Purwanto and J. Damanik. 2013. Strategi pemasaran atraksi wisata Teater Calonarang Tetekan di Tabanan Bali. *Jurnal Nasional Pariwisata* 5(3), 154-171.
- [12] Hakim, L. 2004. *Dasar-dasar ekowisata*. Bayumedia Publishing. Malang.
- [13] Rodger, D. 1998. Leisure, learning and travel. *Journal of Physical Education, Research and Dance* 69(4), 28-31.
- [14] Ciptasari, R. 2011. Taman rekreasi pendidikan di Semarang. Available at: <http://eprints.undip.ac.id/33005/>.
- [15] Purnawan N.L.R. and I Putu Sudana. 2012. Wisata edukasi Budaya Bali. *Majalah Publikasi IPTEKS Ngayah* 3(4), 51-57.
- [16] Dhokhikah, Y. and Y. Trihadiningrum, 2012. Solid waste management in Asian developing countries: challenges and opportunities. *Journal of Applied Environmental and Biological Sciences* 2(7), 329-335.
- [17] Chung, S. S. and C. S. Poon. 2001. A comparison of waste-reduction practices and new environmental paradigm of rural and urban Chinese citizens. *Journal of Environmental Management* 62, 3-19.
- [18] Sukhor, F. S. A., A. H. Mohammed, S. I. A. Sani and M. Awang. 2011. A review on the success factors for community participation in solid waste management. *International Conference on Management (ICM) Proceeding*. Available at: <https://EconPapers.repec.org/RePEc:cms:1icm11:2011-070-260>.
- [19] Purba, H. D., C. Meidiana and D. W. Adrianto. 2014. Waste management scenario trough community based waste bank: a case study of Kepanjen District, Malang Regency, Indonesia. *International Journal of Environmental Science and Development* 5(2), 212-216.
- [20] De Feo, G. and S. De Gisi. 2010. Public opinion and awareness towards MSW and separate collection programmes: A sociological procedure for selecting areas and citizens with a low level of knowledge. *Waste Management* 30, 958-976.
- [21] Singarimbun, S. E. 1995. *Metode Penelitian Survei*, Revised Ed. PT. Pustaka LP3ES. Jakarta.
- [22] Barraza, L. and R. A. Walford. 2002. Environmental education: a comparison between English and Mexican School children. *Environmental Education Research* 8, 171-186.
- [23] Xu, D. Y., Z. Y. Lin, M. P. R. Gordon, N. K. L. Robinson and M. K. Harder. 2016. Perceived key elements of a successful residential food waste sorting program in urban apartments: stakeholder views. *Journal of Cleaner Production* 134, 362-370.
- [24] Upendra, D. B., S. Belbase and R. B. Lila. 2017. Public perceptions and practices of solid waste recycling in the City of Laramie in Wyoming, U.S.A. *Recycling* 2(11), 1-19.
- [25] Malik, N. K. A., S. H. Abdullah, L. A. Manaf. 2015. Community participation on solid waste segregation through recycling programmes in Putrajaya. *Procedia Environmental Sciences* 30, 10-14.
- [26] Buenrostro, O., L. Marquez and S. Ojeda. 2014. Environmental perception of solid waste management in the municipalities of Patzcuaro, Mexico. *Environmental Engineering and Management Journal* 13(12), 3097-3103.
- [27] Meyers, K. 2009. *Ekowisata: panduan dasar pelaksanaan*. UHJAK/2009/PI/H/9. Jakarta.

The Utilization of *Burungnesia* to Detect Citizen Scientist Participation Preference in Birding Sites Observation in Java Island

Swiss Winasis^{1*}, Luchman Hakim¹, M. Ali Imron²

¹Department of Biology, Faculty of Mathematics and Natural Sciences, University of Brawijaya, Malang, Indonesia

²Department of Forest Conservation, Faculty of Forestry, Gadjah Mada University, Yogyakarta, Indonesia

Abstract

The contribution of citizen scientist in conservation field has been recognized important, but it is few studied in Indonesia. Citizen Science especially important in bird conservation. The aims of the research is to assess the citizen scientist preference in site selection and its relationship to the success to complete observer's checklist in Java Island. This study confirmed that citizen sciences is effective in collecting field data of birds. It is especially useful to record common birds, birds with high population number, and general birds. Special birds and birds in small population seems to be rarely reported by citizen scientist. Lowest preferred location often has limitation of accessibility. Citizen scientist has more preference to select sites for bird observation in wild habitat.

Keywords: Birds conservation, conservation, public participation, *Burungnesia*.

INTRODUCTION

Recently, many people involve voluntarily in biodiversity and environmental monitoring and report as a citizen scientist [1]. Citizen scientist has been considered as an important instrument in conservation program. Many local people involve in investigation and make report which are important in science development, especially in ecology conservation and field biology [2].

The contribution of citizen scientist in collecting data and monitoring has been identified important. There are however, limitation of data quality which are collected by citizen scientist. Effort to improve the voluntary skill of citizen scientist has been implemented in many countries. Many citizen scientists has been trained to read instruments and protocol, use the equipment, and records data. There is also effort to provide actual data which are useful for scientist and government in order to make decision. The development of skill and ability of citizen scientist is important in providing basic data, evaluating and monitoring the status of biodiversity [3,4].

Java Island (Indonesia) has high bird's diversity levels in which many of them endemic to Java Island and its surrounding islands. Birds, ecologically and culturally is important animals in Java Island. Bird's diversity in Java Island has been documented and reported in numerous

book and scientific journals [5-8]. Birds inhabits various habitat ranging from big city in Jakarta to remotes islands. Many birds with high conservation status remain conserved in protected habitat, including national park, nature-strict reserve and other protected area category. Java Island, however, is densely populated island, in which many wild area converted into settlement and industrial area. It becomes threats to birds in Java Island [9].

Citizen scientist participation in a scientific survey has been reported from numerous countries, but only few reports comes from Indonesia. With the total forest estimated about 160 million km², the conservation of biodiversity in Indonesian forest and its surrounding area is important. These forest is important habitat for numerous birds' species. Decrease of forest and rapid land uses changes lead to the decrease of birds. Recently, birds has been pressured, and many species went extinct [10]. Bird's survey face numerous limitation, including number of skilled – semi skilled observer, techniques and equipment. Few researchers cannot be effective to record the super abundance of birds in Indonesian archipelago.

The available data that generated from citizen scientist will provide information on the distribution of bird in Java Island. There are, however, still limited empirical aspect on the advantage of citizen science involvement in birds monitoring to support conservation. While there are potential number of citizen scientist in Java, few studies has been conducted to evaluate the contribution of citizen scientist in birds to support conservation. The aims of the research is

*Correspondence address:

Swiss Winasis

Email : sikebogiraz@gmail.com

Address : Dept. Biology, Faculty of Mathematics and Natural Sciences, University of Brawijaya, Veteran Malang, Malang 65145.

to examine the utilization of Burungnesia and citizen scientist preference in site selection and its relationship to the success to complete bird observer's checklist in Java Island.

MATERIALS AND METHOD

Data Collection

Authors develop Burungnesia application which is freely downloaded in Google Playstore at <https://goo.gl/Q6lfPh>. Authors introduces the application to the birdwatcher community in Indonesia through social media and birdwatcher community network. Birdwatcher only able to use the application if they register to the system. The program was launched at 2016 and has been downloaded by 1,300 users. From these number, 760 user make registration and involve in voluntary birds observation in numerous sites in Java Island.

We collected geographic data of birds watcher site when they make observation from July 2016 to March 2017. The data was automatically saved at www.birdpacker.org, in which author act as the administrator of server.

We also distributes questionnaires to the registered user of Burungnesia through email and face book of *Pengamat Burung Indonesia* (Indonesian association of Birdwatcher). The distribution of questionnaire was aimed to generate complementary data which are important in spatial analysis. The collected questionnaire also essentially provides data related to the qualification of users based on the recorded and identified birds. The birds list was known as personal checklist. There is assumption that high number of reported checklist shows the ability of better identification on birds. From 194 distributed form by email, only 139 was send back to researcher.

Spatial Analysis

The observation point which is reported by observer was stored and overlay with environmental variable which influence the observer decision in observation site selection. The environmental variable are encompasses (a) distance from observer home, (b) distance from main road, in which observer able to reach by walking, (c) slope, and (d) lands coverage. The land coverage was derived from map produce by Ministry of Environmental and Forestry 2012. It can be downloaded from <https://goo.gl/70CBe8>. The map of land slope was downloaded from goo.gl/jeAsoj, using NASA SRTM3 SRTMGL3s. The

road was generated from BAKUSORTANAL through goo.gl/6Xo6FD.

Each variables are further classified based on the accessibility level. Slope class was classified following the Decree of Agricultural Ministry (SK Mentan Nomor 837/Kpts/Um/11/80) about criteria and methods of protection forest declaration. The variable of distance of observer home to observation sites, nearest road to observation sites and land uses category was evaluated using questionnaire.

For data analysis, spatial data was analyzed using ESRI ArcGIS 10.3 that run using Windows 10 OS. All of the environmental variable were processed in raster format with similar property: cell size (X,Y): 959.435617, 959.435617; upper extent: 9442137.44312, left: -155159.448956, right: 1085390.80388, lower: 9023823.51409; with spatial reference: WGS1984/UTM Zone 49S; datum: D_WGS_1984; Units of length in meter and unit of angle in degree (0.0174532925199433).

RESULT AND DISCUSSION

The application of Burungnesia lead to the rapid data input for the further data analysis. Within 8 months of the data generated from informant, about 13,036 lines, from 1,436 observation sites has been reported by 195 user. From Java Island area, there were about 7,338 lines, from 841 observation sites was reported by 143 user. The distribution of observation sites was given in Figure 1. There was possibility of the number on point of observation which was reported, but some point was disappear during the analysis as a technical problem. Most of the disappear point was distributes along the coast line. It is especially occur during the clipping process in coordinates sites analysis. Point beyond map border and low accurate in recording automatically affect point disappears during clipping stages in ArcGIS analysis.

This analysis shows that the distribution of birds observed was concentrated in Jakarta-Bogor-Bandung area (25.77%), Purwokerto (5.15%), Semarang (8.25%), Jogjakarta-Solo area (31.96), Malang area (12.37%), Surabaya (11.34%), and other sites in Java Island (5.14%). These cities has been deeply analyzed and used as reference sites in defining and analyzing observer's origins distance to the observation site. Distance were divided into 5, 10, 30, and 60 km.

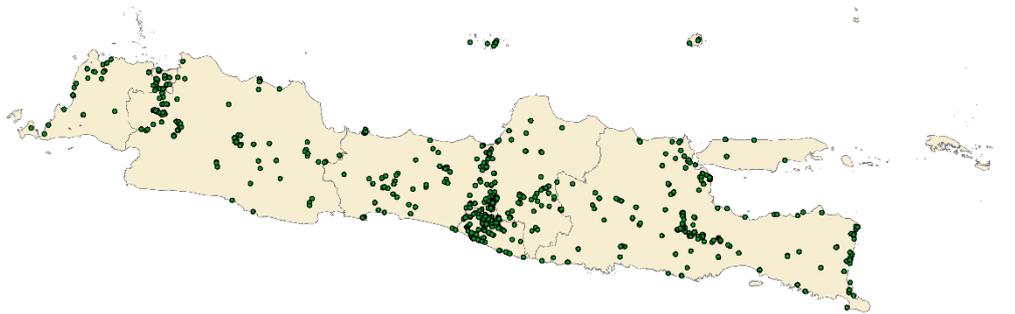


Figure 1. Distribution of Birdwatcher which are Recorded from Burungnesia between July 2016 to March 2017 in Java Island

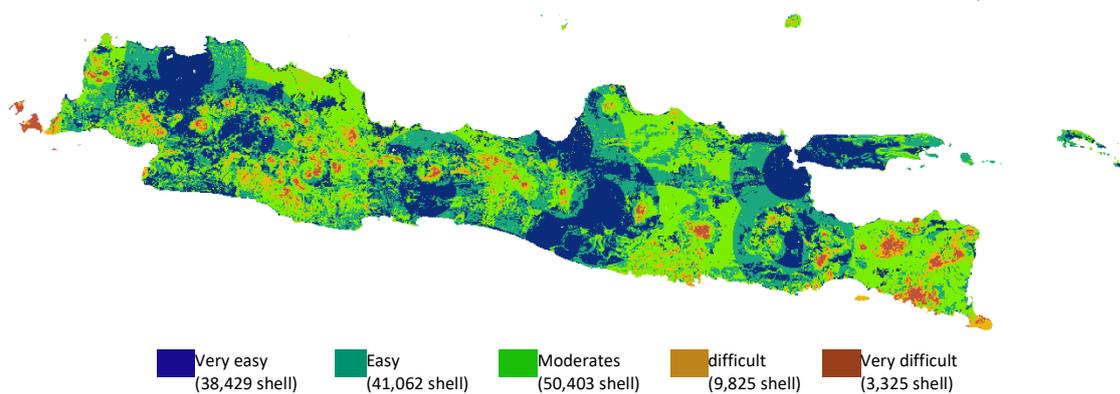


Figure 2. Accessibility Level of the Bird Watching Location. The accessibility level was derived from environmental variable, including distance from bird watcher originality, distance from main road, slope and vegetation coverage.

Table 1. Distribution of Observation following Each Environmental Variable

Category	Number of observation point			
	Distance from road	Vegetation cover	Slope	Distance from observer origins
NN	203	180	168	190
Very easy	590*	35	400*	17
Easy	1	76	110	56
Moderate	38	213	92	313*
Difficult	7	337*	58	149
Very difficult	2	-	13	116
Total of point observation	841	841	841	841

Notes: NN = area not includes in all category or because the point beyond the border of Java islands. These location includes area in small island (Kepulauan Seribu, Kepulauan Karimunjawa and small islands surrounding Kangean Island).

The nearest distance (5 km) mostly located at house yard, open green space, City Park, and campus. The far distance often includes forest, costal area, national park and production forest. Based on the observation, distance was not limitation factor for birdwatcher observation. The highest point observation category was found at medium category (10-30 km) with number of shell 313 (Table 1). This phenomena similar with the result of questionnaire, in which distance was not problem factor in observation (10.8 %). Scholar point out that people with specific hobby and interest to observe particular objet often ignored the distance. Distance is

sensitive aspect in selection of recreation sites. Among the ecotourism or nature-based tourism, object attractiveness is important [11,12]. Most of the respondent state that time was the crucial factor and became the important problem for an observation.

Similar evidence was found in the category of land cover. The highest number of observation point was found at difficult category with number of shell 337. Interestingly, the very easy category has lowest conservation point (Table 1). There were numerous ecosystem categories involved as difficult category, namely primary mangrove forest, primary peat, and wild shrubs.

The moderates accesses category includes primary and secondary dry land, secondary mangrove, forest plantation, dry land agriculture with shrubs, savanna, wild shrubs, fish pond and water body. The observer has less interest to make observation in settlement area, paddy field and open lands. There were no report to the very difficult land category.

Based on the questionnaire survey, the observer motivation to choose difficult land category was influenced by the motive to increase number of personal record (25.9 %) or find the specific birds taxa (20.9%). The bird species which area related to these reason includes birds with specific habitat. These birds naturally distribute in habitat category moderate and difficult. The highest reason were there were no preference or random in selection (33.8 %).

In the variable of observation distance from road and slope, there were similar respondent answers. Many respondents select habitat with very easy category. There were tendency among observer to found the easy access point for observation. With the assumption that bird is dynamic object, in which animals actively move, the selection of observation plot in wild area will be better that unpredictable sites. Based on the observe tendency to select sites (Table 1), the spatial preference of birds observed was mapped as shown in Figure 3.

From Figure 3, the location with sharp slope such as mountainous and karts area has less tendency to visit. Administratively, these area are conservation area under the management of conservation authority such as PERHUTANI (Indonesian Forest Enterprises), office of forestry, both provincial and regency, and

Ministry of Environment and Forestry. These area includes Halimun Salak National Park, Gunung Gede-Pangrango National Park, Gunung Ciremai National Park, Gn. Wilis-Kelud (KPH Kediri), R. Soeryo Grand Forest (under management of Provincial office of forestry), Mt. Kawi (PERHUTANI KPH Malang), Bromo-Tengger-Semeru National Park, mountainous area from Mt. Argopuro, Mt. Raung to Mt. Ijen (East Java Nature Conservation Office, BKSDA) and Baluran National Park. Some area with flat lands includes conservation area in Ujung Kulon National Park, Alas Purwo National Park, Meru Betiri National Park and Nusa Barung Island (Strict Nature Reserve, BKSDA). Empirically, these area has been reported as an important habitat for birds [8,10,13]. While the conservation area has diversity and abundance of birds, these sites had been less visited due to the accessibility limitation. The observer mostly select sites with accessibility with medium land contour.

There were report from nearest location to observer home (sites within <5 km), in which observer make observation in numerous place such as house yards, campus, city park, etc. In the context of citizen science, the observation surround observer home is still important. In developed countries, the backyard birds programs receive a lot of attention from public.

Respondent has specific perception in bird watching. About 52.5% stated that they like to observe birds in natural and wild habitat. There were also reason related to the birds conservation in natural habitat (24.5%). This also significant and important as educational tools to increase knowledge and skill (11.5%). About 10.1% state that it is part of the jobs.

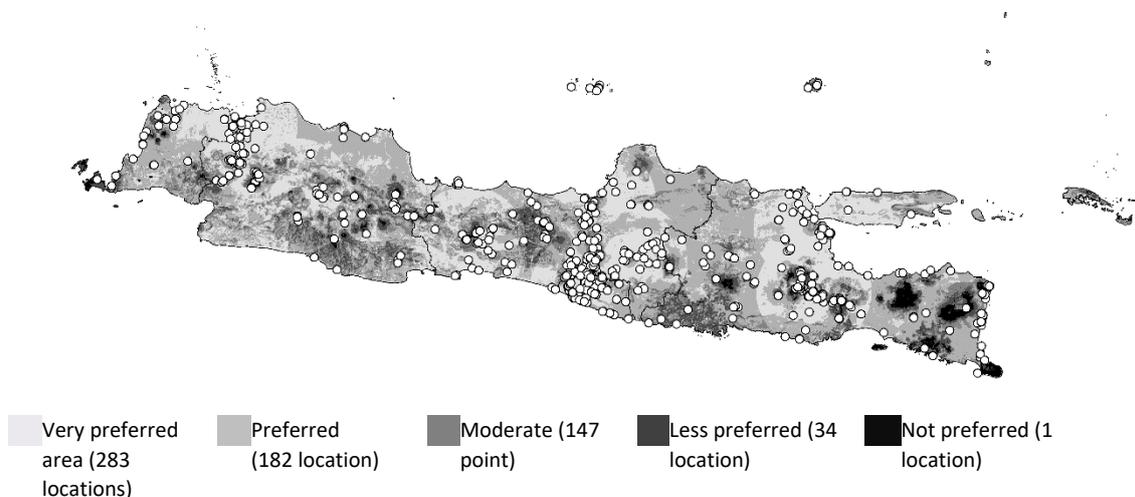


Figure 3. Preference Distribution of Observer in Java Island

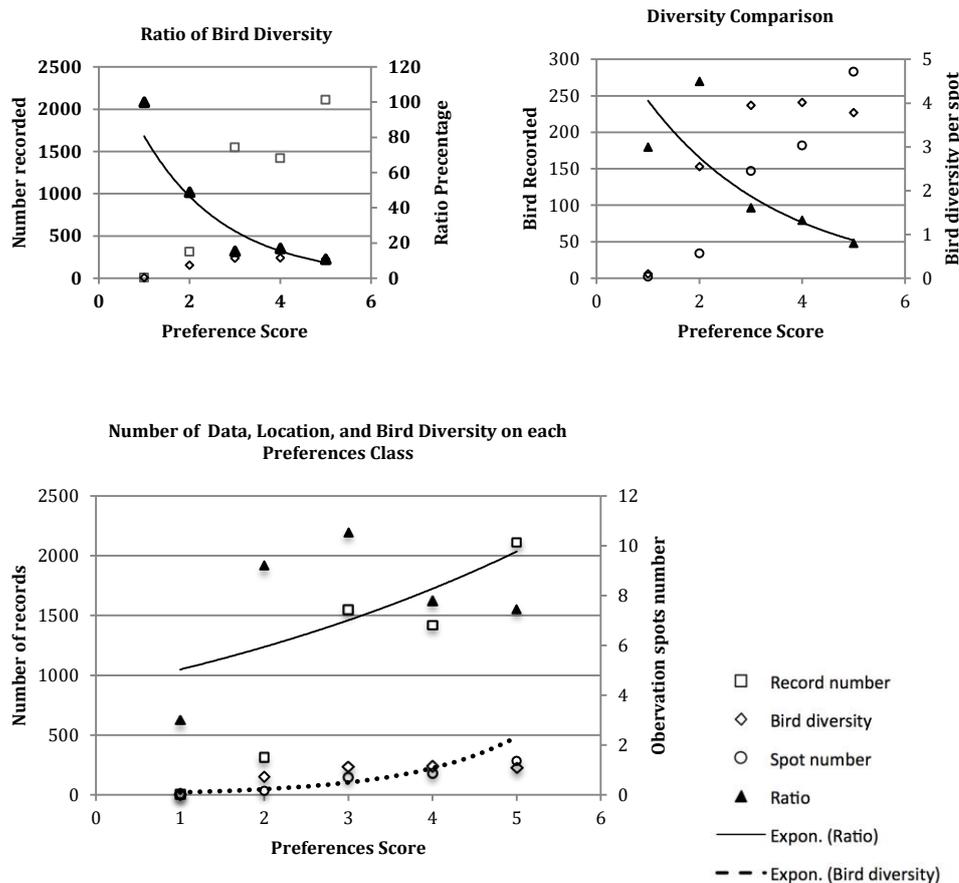


Figure 4. Relationship Pattern of Each Preference Class to the Number of Lines Data, Number of Observation Point and Birds Diversity

In the aspect of sites selection, about 33.8% respondent stated that the selection of sites was randomly picked or there were no preference in sites observation. About 25.9% select particular sites with the objective to increase checklist of the bird. About 15.1% stated that the selection is based on the reason that the place had never been visited before, or rarely monitored.

The main problem for bird watching activities includes limitation of available time (41.7%), inadequate birding instrument (29.5%) distance and accessibility (10.8%), and ability to identify birds species (9.4%). Only 8.6% respondent stated there were no problems in observation. Bird-watchers available time for birds observations became crucial limitation factor to explore bird in the field. Birdwatchers avoid place with difficult accessibility to save time and energy.

The Preference Sites Selection and Birds Species

There are interesting relationship between observer sites preference and birds encounter.

The relationship was drawn in Figure 4. The preferred sites of observation has significant relationship to the increase number of birds, as shown in dotted line. The ratio of number of lines and point of observation, and there are positive relationship between huge number of observation point with preferred sites. However, comparative ratio of bird's diversity and number of data and point of observations were decreased in the preferred location category.

This phenomena shows that location with high preference provides common list of birds in which population abundance and easily recognized. The endemic birds, special and birds in small population often inhabited in the place with less preferred by observers.

Based on the Figure 4 number and species diversity of birds are very low in not preferred sites, and increase gradually in moderate to very preferred sites. However, ratio between number of birds and endemic birds was highest in less preferred and tend to decrease in preferred area. In less preferred area, special, endemic and small

population birds often found easily. This area often become the target of bird watcher with the specific object observation. Observer in this category often includes professional and persons with specific interest, including researchers. Based on the questionnaire, bird observers has been successfully identified 177 species. The highest number of species which has been reported was 800 species. As a reference, number of birds in Java Island was estimated about 541 species.

CONCLUSION

From this study, it is clear that citizen sciences effective to collect field data of birds. It is especially useful to record common birds, birds with high population number, and general birds. Special birds and birds in small population seems to be rarely reported by citizen scientist. Lowest prepared location often has limitation accessibility. Citizen scientist has preference to select sites for birds observation in wild habitat. Observer select particular sites for bird observation following several aspect, including budget availability, accessibility and physical ability of observer to conduct observation. It is shown by the few number of observation conducted in sites with sharp slope and far from main road.

REFERENCES

- [1] Cohn, J. P. 2008. Citizen science: Can volunteers do real research?. *BioScience* 58(3), 192-197.
- [2] Dickinson, J. L., B. Zuckerberg and D. N. Bonter. 2010. Citizen science as an ecological research tool: challenges and benefits. *Annual Review of Ecology, Evolution, and Systematics* 41, 149-172.
- [3] Cooper, C., J. Dickinson, T. Phillips and R. Bonney. 2007. Citizen science as a tool for conservation in residential ecosystems. *Ecology and Society* 12(2), article 11.
- [4] Bonney, R., C. B. Cooper, J. Dickinson, S. Kelling, T. Phillips, K. V. Rosenberg and J. Shirk. 2009. Citizen science: a developing tool for expanding science knowledge and scientific literacy. *BioScience* 59(11), 977-984.
- [5] MacKinnon, J. R. 1988. *Field guide to the birds of Java and Bali*. Gadjah Mada University Press. Yogyakarta.
- [6] Holmes, D. A. and S. Nash. 1989. *The birds of Java and Bali*. Oxford University Press, USA.
- [7] Andrew, P. 2011. The birds of Indonesia. Kukila checklist no. 1. Additions, corrections and notes. *KUKILA* 6(2), 47-52.
- [8] Balen, B. V. and E. T. Margawati. 2012. A checklist of the birds of the Botanical Gardens of Bogor, West Java. *KUKILA* 3(3-4), 82-92.
- [9] Sodhi, N. S., M. C. Soh, D. M. Prawiladilaga and B. W. Brook. 2005. Persistence of lowland rainforest birds in a recently logged area in central Java. *Bird Conservation International* 15(2), 173-191.
- [10] Thiollay, J. M. and B. U. Meyburg. 1988. Forest fragmentation and the conservation of raptors: a survey on the island of Java. *Biological Conservation* 44(4), 229-250.
- [11] Nicolau, J. L. 2008. Characterizing tourist sensitivity to distance. *Journal of Travel Research* 47(1), 43-52.
- [12] Zhang, J., G. Wall, J. K. Du, M. Y. Gan and X. Nie. 1999. The travel patterns and travel distance of tourists to national parks in China. *Asia Pacific Journal of Tourism Research* 4(2), 27-34.
- [13] Rahayuningsih, M., A. Mardiasuti, L. B. Prasetyo and Y. A. Mulyani. 2007. Bird community in Burung Island, Karimunjawa National Park, Central Java. *Biodiversitas* 8(3), 183-187.

The Invasive Plants Species along the Hiking Track of Mount Panderman Nature Tourism, Batu, East Java

Luhur Septiadi*, Didik Wahyudi, Rhesma Sylvia Rachman, Syafrudin,
Nuri Thobibatus Shofia Alfaruqi

Department of Biology, State Islamic University Maulana Malik Ibrahim Malang, Malang, Indonesia

Abstract

Indonesia has the highest biodiversity that places ecotourism as a sustainable development sector. The negative impact of ecotourism is the vulnerability to invasive plant species growth. They invade the habitat of the native plants and potentially alter the biodiversity balance. This invasive plant introduction is predicted caused by tourist and hiker visits. Therefore, the inventory of invasive plant species is urgently needed. The field survey was conducted on March 11-12, 2017 to inventory invasive plant species along the Panderman Mountain hiking track that common travelers explored and then identified. Species of *Pinus Caribaea*, *Chromolaena odorata*, *Lantana camara*, *Leucaena leucocephala*, *Pennisetum purpureum* are categorized invasive plants. Four species of plants otherwise potentially invasive include *Calliandra calothyrsus*, *Ageratum conyzoides*, *Bidens pilosa*, and *Acacia deccurens*. The widespread access to protected environmental destinations leads to the spread of highly invasive species. The impact of invasive species depends on factors such as reproduction rate, vegetative phase, adaptability of seeds that can withstand adverse conditions and in particular human vectors as a way of spreading them.

Keywords: Batu, Ecotourism, Hiking track, Invasive plants, Panderman Mountain.

INTRODUCTION

Indonesia is an archipelago located between two continents (Asia and Australia) and two oceans (Pacific and India) possessing a wealth and very high diversity. With its geographical landscape, Indonesia has a vast territory of approximately 1.913 million km² of land, with 17,504 islands, 3.1 million km² of the territorial sea, and an area of 2.7 million km² [1] of ZEE (Exclusive Economic Zone). Based on the distribution of biodiversity in the world, Indonesia is not only rich in genetic and species diversity, but ecosystem diversity that places Indonesia as the country with the greatest biodiversity after Brazil. Therefore, conservation efforts in Indonesia are also very important, due to the potential of new species brought and grown by humans [2].

Types of the alien species in new strains and varieties can provide economic benefits as well as a direct contribution to the welfare of the people. The alien plants species that entering a new ecosystem have the potential to adapt and compete with the native species inhabited. However, there are species of the alien plants

that capable to spread and grow rapidly, and displace the existence of a living endemic species called the Invasive Alien Species (IAS) [3].

The introduction of new species has an effect on the balance of the world's ecosystems. Indonesia, which included in ten countries with the highest biodiversity in the world, has an important position in the biodiversity of the world [4]. Directly, invasive alien species can be a cause of reduced biodiversity and world diversity.

Invasive species are emerged in habitats that were often brought by humans, which did not previously exist in the habitat, then grew and spread on their own. Invasive species are one of the main threats to current conservation that cause many extinct species. The most dominant invasive species are species introduced from other habitats, although some endemic species have become invasive in their new habitat [5].

Tourists may be one of the distributors and vectors of indirect species distribution. In terms of Ecotourism, the opening of tourist access into protected areas causes the spread of alien species to be more vulnerable [6]. The opportunities for invasive species to spread by tourists as vectors are higher and lead to the spread of cross-country disease [7].

Further research revealed that nature tourism in Indonesia has been threatened by Invasive Plant Species. Unconsciously, tourists

*Correspondence address:

Luhur Septiadi

Email : luhur.septiadi@gmail.com

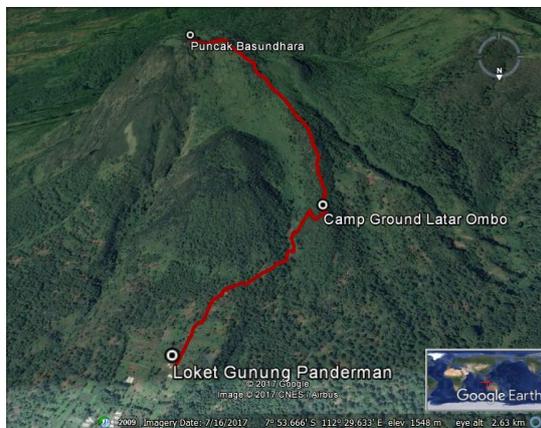
Address : Dept. Biology, State Islamic University Maulana
Malik Ibrahim Malang Jl. Gajayana No. 50 Malang,
65144.

can bring alien plants and have the potential to shift endemic plants from their habitat [8]. Mount Panderman is a popular natural hiking site in East Java which is thought to have many alien plant species. Therefore, there should be a study on diversity and invasive plants spreading. This study aimed to analyze the diversity of invasive plants and their distribution along the Mount Panderman Nature Hiking Track, Batu, East Java.

MATERIALS AND METHOD

Study Area

Panderman Mountain is one of the most active volcanoes in Indonesia located in Batu, East Java Indonesia (7 ° 54'03.7 "S 112 ° 29'51.0" E) with an elevation of 2045 m asl and is included in the Cluster of Putri Tidur Mountain of Mount Kawi, Butak and Panderman (Fig. 1). This mountain is well known as a popular hiking site with two hiking paths namely the hamlet of Toyomerto, Pesanggrahan village which is the common route and the Curah Banteng line [9]. The study was conducted on a common path through which hikers started at the payment counter (1344 m asl), Camp Ground Latar Ombo (1733 m asl), continued to the top of Basundhara (2045 m asl). The total distance traveled during the study is about ± 2.5 km.



Figures 1. Panderman Mountain Nature Tourism Hiking Track recorded using GPS

Sampling

The Field Survey was conducted on March 11-12, 2017 to find out the diversity and invasive plant distribution along the Panderman Mount trajectory that explorative hikers travel through. The exploratory lane is recorded using GPS and then the invasive alleged plant at the site is measured in height and marked its location using GPS.

Identification

Identification of plants is directly done by using literature, books, and articles, such as Flora of Java [11]. The determination of invasive plants was carried out by using literature [12], which was checked on the database of SEAMEO Biotrop and the State Ministry of the Environment [13], and several other databases such as ISSG - Invasive Species Specialist Group [14], ISC - Invasive Species Compendium [15], PIER - Pacific Island Ecosystem at Risk [16] and existing Forest Vegetation Analysis [17,18].

RESULT AND DISCUSSION

The results of Inventory indicate that 16 plants can be found along the Hiking track of Mount Panderman Nature Tourism. Based on the results of research that has been done, we found *Pinus caribaea*, *Chromolaena odorata*, *Lantana camara*, *Leucaena leucocephala*, *Pennisetum purpureum* and classified to 5 Invasive plant which is an alien plant. *Calliandra* sp., *Agaratum conyzoides*, *Bidens pilosa*, and *Acacia deccurens* belong to 4 potentially invasive plants that are alien plants, and 7 endemic plants are found including *Anaphalis javanica*, *Gigantochloa apus*, *Cycas rumphii*, *Musa* sp, *Eucalyptus alba*, *Urena lobata*, and *Adiantum capillus-veneris* along the Hiking Track of Panderman Mountain Nature Tourism.

Invasive Species Plant Diversity

Sixteen plants have been identified with 5 invasive alien species, 4 potentially invasive alien species, and 8 endemic species (Table 1). The species that categorized as invasive plant are species that disrupt the balance and biodiversity due to the nature of the allelopathy belonging to several species to prevent the growth of other species. Otherwise, species that are categorized potentially invasive is because of their ability to survive in harsh environments, and the most of the result are successions and cultivars.

Pinus caribaea belongs to the family of the *Diploxylon pinus*, there are three varieties of *P. caribaea* known as *P. caribaea* var. *Caribaea*, *P. caribaea* var. *Bahamensis* and *P. caribaea* var. *Hondurensis* (Fig. 2a) [13]. Caribbean Pine (*P. caribaea*) is a medium-sized pine tree with straight rods, cylinders, and round crowns. The needle-shaped leaf, cone seeds, and wing anatomy characterize the distinction between each variety. The lower branches are usually long, lean and sag, while the upper branches often lead upright.

Table 1. List of Plant Species Found along the Mount Panderman Nature Hiking Track

No	Species	Family	Habitus	Locality	Status
1	<i>Pinus caribaea</i>	Pinaceae	Tree	Alien	Invasive
2	<i>Chromolaena odorata</i>	Asteraceae	Shrub	Alien	Invasive
3	<i>Lantana camara</i>	Verbenaceae	Shrub	Alien	Invasive
4	<i>Leucaena leucocephala</i>	Mimosaceae	Shrub to small tree	Alien	Invasive
5	<i>Pennisetum purpureum</i>	Poaceae	Grass	Alien	Invasive
6	<i>Calliandra calothyrsus</i>	Fabaceae	Tree	Alien	Potentially Invasive
7	<i>Ageratum conyzoides</i>	Asteraceae	Herb	Alien	Potentially Invasive
8	<i>Bidens pilosa</i>	Asteraceae	Herb	Alien	Potentially Invasive
9	<i>Acacia deccurens</i>	Mimosaceae	Shrub to small tree	Alien	Potentially Invasive
10	<i>Anaphalis javanica</i>	Asteraceae	Shrub to small tree	Native	-
11	<i>Gigantochloa apus</i>	Poaceae	Grass	Native	-
12	<i>Cycas rumphii</i>	Cycadaceae	Tree Fern	Native	-
13	<i>Musa sp.</i>	Musaceae	Herb	Native	-
14	<i>Eucalyptus alba</i>	Myrtaceae	Tree	Native	-
15	<i>Urena lobata</i>	Malvaceae	Shrub	Native	-
16	<i>Adiantum capillus-veneris</i>	Adiantaceae	Rhizome fern	Native	-



Figures 2. Invasive plant documentation (a) *P. caribaea*, (b) *C. odorata* (c) *L. camara*, (d) *L. leucocephala*, (e) *P. purpureum*, (f) *Calliandra sp.*, (g) *A. conyzoides*, (h) *B. pilosa*, and (i) *A. deccurens*

Although it can grow as high as 45 meters the caribbean pine typically reaches a height of 20 to 35 meters and has a stem diameter of 50 to 100 centimeters. The skin of this plant is reddish-brown to grayish and is divided by rough and irregular cracks with leaves like needles [19]. Further research reveals that the pine leaves release an allelopathic substance that inhibits the growth of other plants around it. In a row of pine forests, clean floors can be seen and few plants survive pine allelopathy [20].

Chromolaena odorata (L.) King & Robinson (*Rumput Golkar*) comes from the Asteraceae or Compositae family (Fig. 2b). The other names of this species are *Eupatorium affine* Hook & Arn., *E. brachiatum* Wikstrom, *E. clematitis* DC., *E. conyzoides* M. Vahl [14,16]. This plant belongs to the perennial shrubs, grow upright, height about 1.5-2 m very rarely reaches the maximum height, is a climbing plant. The leaves are facing, reddish-brown when young, toothed leaves, young leaves have a distinctive (aromatic) smell. Flowering are terminal or axillary, homogamous, flowering up to 20-35, Comes with bridal cover involucre, imbricata, Comes with a large and short purple flowered head with a distinctive odor. The seeds are linear, elbows, brown or black, 5 mm long. Pappus white coarse fur, with a length of 5 mm [13]. These plants include as invasive species that are harmful to plantation crops such as coffee, oil palm plantations, and forests. *Chromolaena odorata* is bush that will prevent the growth of other species, due to competition factors and its allelopathic properties. In dry conditions, these plants become the cause of forest fires, and the causes of diseases such as skin diseases, asthma and allergies [13,14].

Lantana Camara L. (*tembelek-tembelean*) belongs to the Verbenaceae family (Fig. 2c). Another name for this plants is *Camara vulgaris* and *Lantana scabrida* [14,16]. These plants include as perennial bushes with a sharp smell, with a height of 1-3m. The stems grow upright and scattered, with stiff and small hair pointing down large. Both leaves are opposite, oval shaped, with toothed margins, 5-9 cm long, 2-7 cm wide, upper hairy coat and fluffy bottom. The length of the petiole reaches 1 cm. Flowers attached to leaf axils, with short rachis,

numerous inflorescences, 2-3.5 cm in diameter, with varied colors such as pink, red, yellow or orange, Fruit of two seeds, egg length drupe with diameter 4-6 mm [13]. In other habitats, the spread of these plants is so large that it is said to inhibit the regeneration of the rain forests for 3 decades. Allelopathic properties possessed by these plants can reduce the grow and productivity of the surrounding plants [14,15].

Leucaena leucocephala (Lam.) De wit (*Lamtoro*) is belongs to the Mimosaceae family (Fig. 2d). Other names for this species is *Acacia leucocephala* (Lamark) Link 1822, *L. glabrata* Rose 1897, and *L. glauca* (L.) Benth. 1842 [14, 16]. *Leucaena leucocephala* has a characteristic shrub or small tree up to 10 m high. Bipinnate leaves, alternate, with 3-10 pairs of pinnae, 20cm long, with orbicular glands under a pair of proximal from pinnae; leaves opposite, linear to oblong. Inflorescence attached to axillary / terminal panicles, white flowers, in the glomerules pedunculate there are 3 pieces. The fruit is pod, membranous, straight, brown and cracked seeds 15-30 per pod, ovoid, shrink [13]. *Leucaena leucocephala* has long existed in Indonesia due to the its various benefits, but eventually this plant became a species that invaded various tropical regions. They are difficult to remove after they grow and their habitat can not be exploited or traversed and threatens existing endemic plants [14,15].

Pennisetum purpureum Schumach (*Rumput Gajah*) comes from the family Poaceae or Graminaceae (Fig. 2e). Other names for this species is *Cenchrus purpureus* (Schumach.) Morrone., *Pennisetum benthamii* Steud., *P. benthamii* var. *nudum* Hack., *P. benthamii* var. *sambesiense* Hack., *P. benthamii* var. *ternatum* Hack., and *P. blepharideum* Gilli [14,16]. *Pennisetum purpureum* is a 4 m perennial grass, a branched stem at the top, grayish internodes. Build leaves are parallel to oval, flat, turquoise with a length of 1 m and 3 cm wide, rough leaf edge, sturdy leaf bone. The inflorescence of the rough terminals is purplish brown, with a length of 20 cm and 2 cm wide. Spikelets have a length of 4-6 mm, clustered to 2-6 on axes and hairy. [13]. This species is spread by its vegetative growth and is found in extensive habitats. If this species is invasive, it will form a thick grass with a length of about 3 m in humus-rich soil, replacing native vegetation and regeneration of endemic plant. This species has a deep root system, seeds are rarely produced, hard to burn, and when the trunk is cut, it will regenerate. *Pennisetum*

Purpureum is a grass that grows rapidly, and colonizes new areas and forms dense clumps. It can alter the balance of the ecosystem. *Pennisetum Purpureum* is adaptable to dry conditions and has the ability to grow from a basal piece of stem [14,15].

Calliandra calothyrsus (*Kaliandra*) belongs to the Fabaceae family (Fig. 2f). Species of *Kaliandra* in Indonesia include *C. calothyrsus* Meissn., *C. haematocephala* Hassk., and *C. surinamensis* Benth [16]. The habitus of this species is shrubs, woody stems, bushes, height reaches 45 meters and roots can reach a depth of 1.5-2 m. *Kaliandra* grows well in all soil types and has the ability to grow fast, resistant, deep root system and able to form root nodules as a result of symbiosis with *Rhizobium*. *Kaliandra* is grown for wood use as firewood, greening the land, and feeding cattle. Currently this type of species has been widely grown in many tropical countries, especially in Southeast Asia, for the benefit of agroforestry. This type of legume plant is easy to plant and its growth is fast, its seed productivity is big enough, and it is easy to adapt to new environment. This causes the spread of this plant to extend as a result of the human vector for its usefulness [16, 10].

Ageratum conyzoides L. (*Bandotan*) is from the Asteraceae or Compositae family (Fig. 2g). The other names of this species are *A. cordifolium* Roxb., *A. hirsutum* Lam., *A. hirtum* Lam., *A. humile* Salisb., *A. mexicanum* Sims., *A. nanum* Hort. Ex Sch. Beep [14,16]. This species belongs to seasonal herb, erect, with a height of 20-80cm. Long stems, hairy, with many branches that appear from the base of the branch. The lower leaves with long stems will be opposite to the upper leaves with short branches, rough surfaces and visible leaf bone, pointed tip, narrowed to the base of a hairy petiole with a length of 2-3cm. Inflorescent terminals with many branches, each branch of which there are flowers that are protected bractea amounted to 2-3 parallel [13]. Research shows that extracts from these plants can inhibit the germination of plants such as amaranthus, *Oryza*, and wheat. Therefore *A. conyzoides* belong to plants that have allelopathic properties [13,15].

Bidens pilosa (*Ketul*) this species is from the Asteraceae or Compositae family (Fig. 2h). Other names for this species are *B. Sundaica* Blume, *B. leucorrhiza* (Lour.) DC., *B. Pilosa* L. var. *minor* (Blume) Sherff [14,16]. *Bidens pilosa* is an annual herb, grows upright, smells typical (aromatic), with a height of about 15-100 cm. The trunk is

cylindrical and often branched. The leaves are facing, with 3-5 leaves, awakened leaves with jagged edges. Flower terminal/aksilar with red or yellowish flowers, has a flower crown of 5-7 [13, 14]. *Bidens pilosa* lives on moist soil, flowering all year long. Seeds will be stored for 3-5 years which then germinate which of course requires light and aeration. *Bidens pilosa* prevents regeneration from other plants or is allelopathic. Leaf and root content is known to suppress germination process and germination of other plants through decomposition process. *Bidens pilosa* grows three times faster than other similar plants [13,14].

Acacia deccurens (Akasia) comes from the Fabaceae Family (Fig. 2i). The other names of this species is *A. angulata* Desv., *Mimosa angulata* (Desv.) Poir., *M. decurrens* Wendl., and *Racosperma decurrens* (Willd.) Pedley [14,16]. *Acacia deccurens* grows upright with a height of 5-15m, with lateral branching. The rod is smooth, gray-black, bipinnate leaf is dark brown and shiny, contains 4-15 pinnulas. The child leaves parallel to almost oval. This plant is diurnal that opens when there is stimulation of sunlight, and closes at night. Flowering about 15-30 head flowers on aksilar raceme. Longitudinal seed with short aryl [13]. *A. deccurens* becomes a serious problem in various regions of Australia, Hawaii, and New Zealand due to its rapidly spreading and nutrient-depleting roots. Heavy stature has a negative impact on existing biodiversity [15,21].

Distribution of Invasive Plant Species

Distribution of plants found along the Mount Panderman Nature Tourism Hiking Track commences from the Counters checkpoint, Latar Ombo campground to Basundhara peak from the height of 1423 to 2046m asl. The distribution of plants found along Mount Panderman Nature Tourism Hiking Track is shown on Table 2.

Pinus caribaea is found at an altitude of 2016 m asl. It grows widely in tropical and subtropical Africa. In its natural habitat in Central America and in the Caribbean basin, these plants grow both in lowland (about 700 m asl) and in fertile soils with an average annual rainfall of 1200 mm per year and average annual temperatures ranging from 20°C up to 27°C. In Africa, these plants are reportedly adaptable to various climates and elevations. In Uganda, the plant is able to grow well in shallow soil in lowland locations and performs well in fairly dry places. Overall, *Pinus caribaea* is recommended for growth in the central, west, north, and southern

regions of the country [14,15,22]. This plant is able to adapt and grow in different climates and different elevations allegedly causing its spread to be found widespread and disrupt other endemic plants.

Chromolaena odorata is found at an altitude of 2021 m asl and is usually found in places that are dry, barren (arid). It originated from the tropical forests of Latin America and Central and spread to Asia as a Alien species [14,15]. *Chromolaena odorata* are considered invasive weeds in fast-growing fields. This plant originated in South America and Central America and has been introduced into the tropical regions of Asia, Africa and the Pacific [14,23]. *Chromolaena odorata* grows in various soil types and grows in different types of vegetation, eg forest vegetation (annual rainfall 1500 mm), grasslands and arid (annual rainfall less than 500 mm). This plant is usually found in the lowlands of about 50-1000 mbsl [13,23]. The spread of invasive plants at different elevations is thought to be caused by human vectors as intermediaries and their adaptability.

Lantana Camara is found at an altitude of 1680 m asl and is derived from an American tropical forest, and is the worst invasive plant species in the world. [13, 15]. *Lantana camara* now spread to nearly 60 countries, namely New Zealand, Mexico, Florida, Trinidad, Jamaica and Brazil. Reportedly in many African countries including Kenya, Uganda, Tanzania and South Africa. Currently *L. camara* is distributed throughout India [14,24]. Habitat is found in plantations (tea, rubber, oil palm, sugar cane), secondary forests, sometimes forming dense forests, and cultivated as fence plants. In Java has been naturalized and found at an altitude of ± 1-1700m asl [13].

Leucaena leucocephala is found at an altitude of 2021m asl. This species came from the Mexican jungle and spread to Asia America to Africa [13,14] in river bank, semi-natural, degraded soil, and secondary vegetation, tea and coffee plantations. This plant is able to survive in rainfall 500 - 3500 mm. This extraordinary ability causes *Leucaena leucocephala* as the most aggressive invasive plant [20]. *Leucaena leucocephala* lives at an altitude of more than 1400m a.s.l. The ability of these plants to adapt and compete in new habitats puts these plants as harmful invasive plants.

Table 2. Distribution of Plants Found along the Mount Panderman Nature Tourism Hiking Track

No	Species	Elevation (m above sea level)	Location
1	<i>Pinus caribaea</i>	2016	7° 54.181'S 112° 29.788'E
2	<i>Chromolaena odorata</i>	2021	7° 54.161'S 112° 29.735'E
3	<i>Lantana camara</i>	1680	7° 53.833'S 112° 29.534'E
4	<i>Leucaena leucocephala</i>	2021	7° 54.045'S 112° 29.626'E
5	<i>Pennisetum purpureum</i>	2017	7° 54.174'S 112° 29.794'E
6	<i>Calliandra calothyrsus</i>	2026	7° 54.155'S 112° 29.870'E
7	<i>Ageratum conyzoides</i>	1593	7° 53.709'S 112° 29.531'E
8	<i>Bidens pilosa</i>	2013	7° 54.155'S 112° 29.838'E
9	<i>Acacia deccurens</i>	2018	7° 54.155'S 112° 29.867'E
10	<i>Anaphalis javanica</i>	1825	7° 54.061'S 112° 29.638'E
11	<i>Gigantochloa apus</i>	1443	7° 53.512'S 112° 29.729'E
12	<i>Cycas rumphii</i>	1435	7° 53.544'S 112° 29.664'E
13	<i>Musa sp.</i>	1430	7° 53.509'S 112° 29.718'E
14	<i>Eucalyptus alba</i>	1837	7° 54.069'S 112° 29.645'E
15	<i>Urena lobata</i>	1810	7° 54.045'S 112° 29.625'E
16	<i>Adiantum capillus-veneris</i>	1429	7° 53.513'S 112° 29.706'E

Pennisetum purpureum is found at an altitude of 2017 m asl *Pennisetum purpureum* comes from tropical forests of Africa and sub-Saharan and has spread throughout the world and naturalized and become invasive species [14, 20]. It is a common weed in agricultural fields, pastures, and along the roadside. These plants also grow in waters, wetlands, floodplains, river banks, swamps, forest edges, disturbed places, and waste disposal sites especially in dry to wet areas [34]. *Pennisetum purpureum* can adapt well to drought conditions and can be found in arid lowlands to lush highlands [35]. The widespread deployment capability of the world by its vegetative and other plants to grow is a factor of this plant is classified as invasive.

Calliandra calothyrsus found at an altitude of 2026m asl *Kaliandra* is one of the leguminous trees that grows and originates in Mexico and Central America in various habitats up to 1860 m altitude from sea level if the phosphate and water requirements for nitrogen fixation are met. Live naturally along the banks of the river, but quickly occupy areas where land is disturbed. This species is especially present in areas where rainfall ranges between 1000 and 4000 mm per year. This species grows in areas with a minimum annual temperature of 18-22°C. In the original growing place, this species lives on various soil types and appears to be resistant to slightly acidic soils with a pH of about 4.5. The spread of invasive *Kaliandra* plant causes stunted growth of native or planted seeds and naturally grown. However its usefulness which is beneficial to society causes prevention of plant spread need to be reviewed again [3,16].

Ageratum conyzoides are found at an altitude of 1593 m asl This species derived from the tropical forests of Latin America and Central to spread to Asia to Africa [13,14,20]. This herbaceous plant is found in tropical and subtropical environments and lives on farmland and plantations, barren land, roads, and forests. *Ageratum Conyzoides* thrive in an environment of organic soil, minerals, with high humidity but difficult to live in less fertile soils [32]. These plants are from South and Central America, *A. conyzoides* include pantropic weed spread to subtropical and temperate regions where it grows in summer [20]. This plant has been recognized as an ornamental plant and cultivation in Europe. Now, however, this species is now found throughout the continent and its spread may be more extensive than is known today [33]. This plant can produce 40,000 seeds per plant and one half of these seeds can germinate shortly after they have broken with lightweight seeds and are easily scattered by wind or carried by water and germinate under various conditions of this environment and grow well up to 3000 m asl [13].

Bidens pilosa is found at an altitude of 2013 m asl This species derived from tropical forests of America and spread to Indonesia to Africa [13, 14,20]. *Bidens Pilosa* is native to tropical America but is now a pantropic weed [29]. Eastern Latin America and Africa have the worst weed infestation of this plant [30]. This plant can usually be seen in all seasons in the tropics but grows most active in the summer and warmer parts. This plant acts as a weed on crops, pastures, vacant lots, gardens, cultivation areas and roadside [31]. It's habitat is usually found

along the river, vegetable fields, rice fields, gardens, roadside, tea gardens, coffee gardens, and rubber plantations. *Bidens pilosa* spread throughout Indonesia except Kalimantan and Maluku [28]. These plants prefer to live wet soil to a height of 2500 m asl [13].

Acacia decurrens are found at an altitude of 2018 m asl *Acacia decurrens* plants are from Australia and can spread all over the world quickly because *A. decurrens* can live easily and have no difficult growing conditions [14,22]. *Acacia decurrens* grow naturally especially in eucalypt forests and Australian forests [26]. In their original distribution timeframe, *Acacia decurrens* is considered a rapidly growing pioneering species and often raises serious concerns because it is potentially invasive to their new habitat [25]. This plant extends about 100 km of depth and natural range of latitudes around 33-37°S [27].

CONCLUSION

Sixteen plants found along the hiking track of Mount Panderman as follows: 5 invasive alien species, 4 potentially invasive alien species, and 8 endemic species. The species of *P. caribaea*, *C. odorata*, *L. camara*, *L. leucocephala*, *P. purpureum* are categorized invasive plants that disrupt the balance and biodiversity due to the nature of the allelopathy belonging to several species to prevent the growth of other species. Four species of plants otherwise potentially invasive include *Calliandra* sp., *A. conyzoides*, *B. pilosa*, and *A. decurrens* because of their ability to survive in harsh environments, and most are the result of successions and cultivars. These invasive/potentially invasive species threaten the growth and distribution of endemic species in the area, i.e *A. javanica*, *G. apus*, *C. rumphii*, *Musa* sp, *E. alba*, *U. lobata*, and *A. capillus-veneris*.

REFERENCES

- [1] Statistic Center. Luas daerah dan jumlah pulau menurut provinsi 2002-2015. Available at: <https://www.bps.go.id/linkTabelStatis/view/id/1366>. Accessed August 2017.
- [2] Ministry of Environment. 2009. Fourth national report the convention on biological diversity. Ministry of Environment Republic of Indonesia. Available at: <http://www.cbd.int/doc/world/id/id-nr-04en.pdf>
- [3] Sunaryo. 2011. Komposisi jenis dan potensi ancaman tumbuhan asing invasif di Taman Nasional Gunung Halimun-Salak, Jawa Barat. *Berita Biologi* 11(2), 231-239.
- [4] Alaydrus, R. 2013. Spesies tumbuhan asing invasif (Invasive Alien Plant Species) dan peluang pengawasannya dalam penyelenggaraan perkarantinaan tumbuhan. Available at: <http://karantina.pertanian.go.id/>.
- [5] Simberloff, D. 2010. Conservation biology for all. University of Oxford Press. Oxford.
- [6] Charles, H. and J. S. Dukes. 2007. Impacts of invasive species on ecosystem services. *Ecology Study* 7(193), 217-237.
- [7] Zuhri, M. and Z. Mutaqien. 2013. The spread of non-native plant species collection of Cibodas Botanical Garden into Mt. Gede Pangrango National Park. *Journal of Tropical Life Science* 3(2), 74-82.
- [8] Global Invasive Species Programme. 2000. Global strategy on invasive alien species. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Available at: <http://www.cites.org/common/com/ac/16/E16-Inf-12.pdf>.
- [9] Batu Tourism. 2015. Mount Panderman. Available at: <http://www.eastjava.com/tourism/batu/mount-panderman.html>.
- [10] Herdiawan, I., A. Fanindi and A. Semali. 2014. Karakteristik dan pemanfaatan *Kaliandra (Calliandra Calothyrsus)*. Nasional Workshop on Animal Feed Plants. Research Center of Animal. 141-148.
- [11] Backer, C. A. and R. C. Bakhuizen. 1968. Flora of Java. N.V.P. Noordhoff. Groningen, Netherlands.
- [12] Tjitrosoedirdjo, S. S. 2005. Inventory of the invasive alien plant species in Indonesia. *Biotropia* 5(25), 60-73.
- [13] SEAMEO Biotrop. Knowledge management center on tropical biology. Available at: <http://kmtb.biotrop.org/collections/spias/>.
- [14] ISSG. The Invasive Species Specialist Group (ISSG). 2017. Available at: <http://www.issg.org/database/>.
- [15] ISC. 2017. Invasive Species Compendium (ISC). Available at: <http://www.cabi.org/isc/default.aspx?site=144&page=4066>.
- [16] PIER. 2017. Pacific Island Ecosystems at Risk (PIER). Available at: <http://www.hear.org/pier/>.
- [17] Kurniati, E. 2005. Analisa vegetasi tumbuhan pionir pada areal bekas kebakaran Gunung Panderman Batu. Master Thesis. Department of Forestry, Muhammadiyah University of Malang. Malang.
- [18] Ardyansah. Analisis vegetasi hutan Gunung Panderman (studi pada lahan bekas

- kebakaran hutan Petak 232 dan 233) Bkph Pujon Kph Malang. Master Thesis. Department of Forestry, Muhammadiyah University of Malang. Malang.
- [19] Wildscreen Arkive. 2012. Carribean pine. Available at: <http://www.arkive.org/cari/bbean-pine/pinus-caribaea/image-G102672.html>.
- [20] Cahyanti, L. D., T. Sumarni and E. Widaryanto. 2015. Potensi alelopati daun pinus (*Pinus Spp.*) sebagai bioherbisida pra tumbuh pada gulma krokot (*Portulaca oleracea*). Gontor AGROTECH Science Journal 1(2), 21-32.
- [21] Hidayan, Y., D. Suryawan, E. Sutyarto, R. Umayana and A. Kurnia. 2015. Sebaran spesies asing invasif *Acacia decurrens* di kawasan Taman Nasional Gunung Merapi. Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia 1(4), 738-742.
- [22] Kalanzi, F., S. Nansereko, P. Okullo, S. Gwali, I. Kiyingi and R. T. Guuroh. 2014. Growth performance of 5-year old *Pinus caribaea* var. *hondurensis* (Barr. and Golf.) in selected districts of Uganda. Uganda Journal of Agricultural Sciences 15(2), 127-135.
- [23] Chakraborty, A. K., S. Rambhade and U. K. Patil. 2011. *Chromolaena odorata* (L.): an overview. Journal of Pharmacy Research 4(3), 573-576.
- [24] Kalita, S., G. Kumar, L. Karthik and K. V. B. Rao. 2012. A review on medicinal properties of *Lantana camara* Linn. Research Journal Pharmacy and Technology 5(6), 711-715.
- [25] Sunardi, Sulistijorini and T. Setyawati. 2017. Invasion of *Acacia decurrens* Willd. after eruption Mount Merapi, Indonesia. Biotropia 1, 35-46.
- [26] Tame, T. 1992. Acacias of south eastern Australia. Kenthurst, Sydney. Kangaroo Press. Australia.
- [27] Boland, D. J. 1987. Genetic resources and utilisation of Australian bipinnate acacias (Botrycephalae). Proceedings of Australian Centre for International Agricultural Research 16, 29-37.
- [28] Baker, M. and R. Corringham. 1995. Native plants of the Blue Mountains. Three Sisters Publication. Winmale, N.S.W., Australia.
- [29] Wagner, W. L., D. R. Herbst and S. H. Sohmer. 1999. Manual of the flowering plants of Hawaii, Revised ed. University of Hawaii Press. Honolulu, USA.
- [30] Mitich, L. W. Beggarticks. 1994. Weed Technology 8(1), 172-175.
- [31] Holm, L. G., J. V. Pancho, J. P. Herberger and D. L. Plucknett. 1979. Ageographical atlas of world weeds [Internet]. John Wiley and Sons. New York, USA.
- [32] Greuter, W. 2016. Occurrence details for *Ageratum conyzoides*. Available at: <http://ww2.bgbm.org/EuroPlusMed/PTaxonDetailOccurrence.asp?NameId=117571&PTRefFk=7000000>.
- [33] Missouri Botanical Garden. 2016. Tropicos database. Missouri Botanical Garden. St. Louis, Missouri, USA.
- [34] Chandrasekar, K. 2012. Invasive alien plants of Indian Himalayan Region - diversity and implication. American Journal of Plant Sciences 3, 177-184.
- [35] Langeland, K. A., H. M. Cherry, C. M. McCormick and B. K. A. Craddock. 2008. Identification and biology of non-native plants in Florida's Natural Areas. University of Florida IFAS Extension. Gainesville Florida, USA.

MANUSCRIPT SUBMISSION

FOCUS AND SCOPE

Competitiveness of destinations, products and Indonesian tourism business; Diversification of tourism products; Incentive system of business and investment in tourism; Information, promotion and communication in tourism; Tourism supporting infrastructure; Security and convenience in tourism; Tourism policy; Unique tourism community life (living culture); Local knowledge, traditions, and cultural diversity; Diversity and attractions in ecotourism; Diversity of natural attractions in ecotourism; Pluralistic diversity of ecotourism society; Diversity of ecotourism activities; Hospitality of the local resident; The quality of tourism services; Quality of HR in tourism (Standard, accreditation and competence certification); The market share of tourism and integrated marketing system; Package of tourism attraction; Development of tourism regions; Community based Eco-Tourism.

PEER REVIEW PROCESS

Publication of articles by JITODE is dependent primarily on their validity and coherence, as judged by peer reviewers, who are also asked whether the writing is comprehensible and how interesting they consider the article to be. All submitted manuscripts are read by the editorial staff and only those articles that seem most likely to meet our editorial criteria are sent for formal review. All forms of published correction may also be peer-reviewed at the discretion of the editors. Reviewer selection is critical to the publication process, and we base our choice on many factors, including expertise, reputation, and specific recommendations. The editors then make a decision based on the reviewers' advice, from among several possibilities:

Accepted, with or without editorial revisions
Invite the authors to revise their manuscript to address specific concerns before a final decision

Rejected, but indicate to the authors that further work might justify a resubmission

Rejected outright, typically on grounds of specialist interest, lack of novelty, insufficient conceptual advance or major technical and/or interpretational problems

PUBLICATION FREQUENCY

JITODE publish 3 Issues per year.

OPEN ACCESS POLICY

This journal provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge.

COPYRIGHT NOTICE

Authors who publish with this journal agree to the following terms:

Authors retain copyright and grant the journal right of first publication with the work simultaneously licensed under a Creative Commons Attribution License that allows others to share the work with an acknowledgement of the work's authorship and initial publication in this journal.

Authors are able to enter into separate, additional contractual arrangements for the non-exclusive distribution of the journal's published version of the work (e.g., post it to an institutional repository or publish it in a book), with an acknowledgement of its initial publication in this journal.

Authors are permitted and encouraged to post their work online (e.g., in institutional repositories or on their website) prior to and during the submission process, as it can lead to productive exchanges, as well as earlier and greater citation of published work (The Effect of Open Access).

PRIVACY STATEMENT

The names and email addresses entered in this journal site will be used exclusively for the stated purposes of this journal and will not be made available for any other purpose or to any other party.

**Title Typed in Bold, Capitalize each First Letter of Each Word, Except
Conjunctive, *Scientific name* should not be Abbreviated
(Calibri 14 Bold Center, should not exceed 12 words, except conjunctive)**

First Author^{1*}, Second Author², Third Author³ (Calibri 12 Center, without title)

¹First Author Affiliation, Correspondence author should be indicated by * symbol (Calibri 9 Center)

²Department of Biology, Faculty of Mathematics and Natural Sciences, University of Brawijaya, Malang, Indonesia

³Laboratorium of Physiology, Faculty of Medicine, University of Brawijaya, Malang, Indonesia

Abstract (Calibri 9 Bold Center)

This article illustrates preparation of your paper using MS-WORD (.doc or .rtf). Manuscript was numbered consecutively. Main text typed in two columns (67 characters), except title and abstract in one column. The manuscript should be written in English. The length of manuscript should not exceed 10 pages including table and figure in this format using A4 paper single space. The text should be in the margin of 3 cm up, down and left side, 2.5 cm on right side. Abstract includes the research purposes, research method and research results in one paragraph of *essay*, not *enumerative*. No citation in abstract. Abstract should not exceed 200 words. Keywords typed after abstract. (Calibri 9 Justify).

Keywords: manuscript, English, format, 5 words maximum (Calibri 9 Left)

INTRODUCTION*(Calibri 10 Bold, Left, Capslock)

All submitted manuscripts should contain original research which not previously published and not under consideration for publication elsewhere. Articles must be written in ENGLISH and manuscripts may be submitted for consideration as research report articles, short reports or reviews.

The introduction explains the background of the problem, the study of literature and research purposes. Some initial introduction paragraphs explain the problem and background to these problems [1]. The next few paragraphs explain the study of literature that contains recent knowledge development which is directly related to the issues. The last paragraph of the introductory section contains a description of the purposes of the study. (Calibri 10 Justify)

MATERIAL AND METHOD(Calibri 10 Bold, Left, Capslock)

This section describes the types of methods (qualitative, quantitative or mixed-method) with details of methods of data collection and data analysis [2]. This section also describes the perspective that underlying the selection of a particular method. (Calibri 10 Justify)

Data Collection (Calibri 10 Bold, Left)

Explain the data collection methods, i.e. surveys, observations or archive, accompanied by details of the use of such methods. This section also describes the population, sampling and sample selection methods. (Calibri 10 Justify)

The use of English language should followed proper grammar and terms. Name of organism should be followed by its full scientific name in the first mention, in *italic* [3]. Author of the scientific name and the word of “var.” typed regular. Example: *Stellaria saxatillis* Buch. Ham. First abbreviation typed in colon after the abbreviated phrase.

Author must use International Standard Unit (SI). Negative exponent used to show the denominator unit. Example: g l⁻¹, instead of g/l. The unit spaced after the numbers, except percentage [4]. Example: 25 g l⁻¹, instead of 25gl⁻¹; 35% instead of 35 %. Decimal typed in dot (not coma). All tables and figures should be mentioned in the text.

RESULT AND DISCUSSION (Calibri 10 Bold, Left, Capslock)

This section contains the results of the analysis and interpretation or discussion of the results of the analysis. Describe a structured, detailed, complete and concise explanation, so that the reader can follow the flow of analysis and thinking of researchers [5]. Part of the results study should be integrated with the results of the

Correspondence address: (Calibri 8 Bold, Left)

Full name of correspondence author

Email : sapto@jurnal.ub.ac.id

Address : affiliation address include post code

analysis and the results and discussion are not separated.

Table

Table should be submitted within the manuscript and in separated file of *Microsoft Excel* (xls.). Table should not exceed 8 cm (one column) and 17 cm (two columns). Table should be embedded in different page after references.

Table should be numbered in sequence. Table title should be brief and clear above the table, with uppercase in initial sentence. Vertical line should not be used. Footnote use number with colon and superscripted. Symbol of (*) or (**) was used to show difference in confidence interval of 95 and 99%.

Table 1. Example of the Table (Calibri 8.5 Left)

No	Point (Calibri 8.5 Justify)	Description
1		
2		
3		
4		
5		

Sources: Journal of PPSUB (Calibri 8.5 Left)

Figures

Figures should be in high resolution and well contrast in JPEG or PDF with the following conditions:

- Monochrome image (line art), figures of black and white diagram (solid/no shades of gray), resolution 1000-1200 dpi (dot per inch).
- Combination Halftone, combine figure and text (image containing text) and coloured graphic or in grayscale format. Resolution 600-900 dpi.
- Halftone, coloured figure or grayscale format without text. Resolution 300 dpi.

- Black and white figure should be in the grayscale mode, while coloured figures should be in RGB mode.
- Figure should not exceed the width of 8 cm (one column), 12.5 cm (1.5 columns) or 17 cm (two columns).
- Figures title typed clearly below the figure.
- Figure with pointing arrow should be grouped (grouping).
- Figures were recommended in black and white.
- Legend or figure description should be clear and complete. If compressed, the figure should be readable.
- Statistic graphic should be supplemented with data sources.
- If the figures come from the third party, it should have the copyright transfer from the sources.

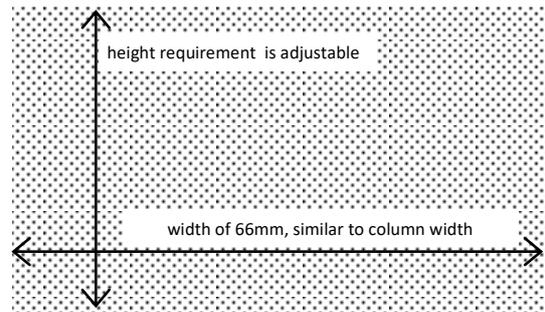


Figure 1. Illustration of Dimensional Figure of one column width. Figure dimension adjusted to the width of one column. Name the figure (diagram) written below the image. (Calibri 8.5 Justify)

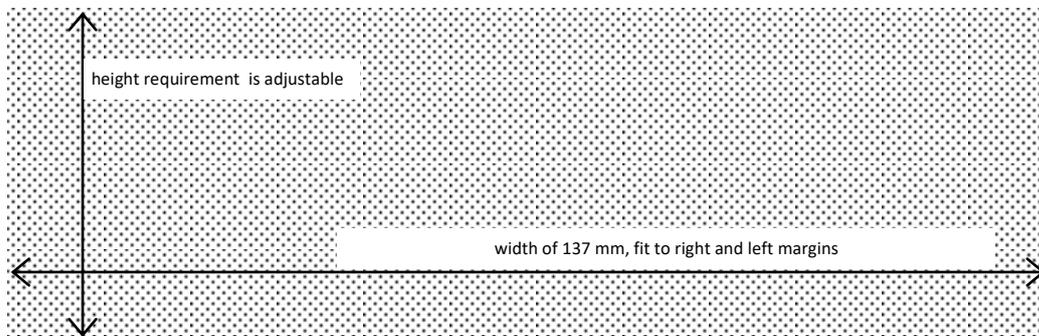


Figure 2. Illustration of Dimensional Figure of two column width. Figure dimension adjusted to the width of two columns (137 mm). Figure were align top or bottom of the page. (Calibri 8.5 Justify)

References

1. Primary references include journal, patent, dissertation, thesis, paper in proceeding and text book.
 2. Avoid self citation.
 3. Author should avoid reference in reference, popular book, and internet reference except journal and private ana state institution.
 4. Author was not allowed to use abstract as references.
 5. References should been published (book, research journal or proceeding). Unpublished references or not displayed data can not be used as references.
 6. References typed in numbering list (format number 1,2,3,...), ordered sequentially as they appear in the text (system of Vancouver or author-number style).
 7. Citation in the manuscript typed only the references number (not the author and year), example: Obesity is an accumulation of fat in large quantities which would cause excessive body weight (overweight) [1]. Obesity is a risk factor of diabetic, hypertension dan atherosclerosis [2].
- [4].Syafi'i, M., Hakim, L., dan Yanuwiyadi, B. 2010. Potential Analysis of Indigenous Knowledge (IK) in Ngadas Village as Tourism Attraction. pp. 217-234. In: Widodo, Y. Noviantari (eds.) Proceed-ing *Basic Science National Seminar 7* Vol.4. Universitas Brawijaya, Malang. (Article within conference proceeding)
- [5].Dean, R.G. 1990. Freak waves: A possible explanation. p. 1-65. In Torum, A., O.T. Gudmestad (eds). Water wave kinetics. CRC Press. New York. (Chapter in a Book)
- [6].Astuti, A.M. 2008. The Effect of Water Fraction of *Stellaria* sp. on the Content of TNF- α in Mice (*Mus musculus* BALB-C). Thesis. Department of Biology. University of Brawijaya. Malang. (Thesis)

CONCLUSION (Calibri 10 Bold, Left, Capslock)

Conclusion of the study's findings are written in brief, concise and solid, without more additional new interpretation. This section can also be written on research novelty, advantages and disadvantages of the research, as well as recommendations for future research.(Calibri 10 Justify)

ACKNOWLEDGEMENT (Calibri 10 Bold, Left, Capslock)

This section describes gratitude to those who have helped in substance as well as financially.(Calibri 10 Justify)

REFERENCES (Calibri 10 Bold, Left, Capslock)

- [1].(Calibri 10 Justify, citation labelling by references numbering)
- [2].Vander, A., J. Sherman., D. Luciano. 2001. Human Physiology: The Mecanisms of Body Function. McGraw-Hill Higher Education. New York. (Book)
- [3].Shi, Z., M. Rifa'i, Y. Lee, K. Isobe, H. Suzuki. 2007. Importance of CD80/CD86-CD28 interaction in the recognition of target cells by CD8⁺CD122⁺ regulatory T cells. *Journal Immunology*. 124. 1:121-128. (Article in Journal)

Cover:
Mount Bromo,
East Java, Indonesia
Photo by:
Buyung Prasmita

Editorial Address

1st floor Building B of Postgraduate School, University of Brawijaya
Mayor Jenderal Haryono street No. 169, Malang 65145, Indonesia
Phone: +62341-571260 / Fax: +62341-580801
Email: jitode@ub.ac.id
Website: jitode.ub.ac.id

