

BIODIVERSITY GENETIC CONSERVATION AS A KEY TO SUPPORT AGRO-ECO-EDU-TOURISM PROGRAM IN SOUTHEAST ASIA

Contributors: Shazali Bin Johari^{a*}, Dewi Rahmawati^b

^a Department of Recreation and Ecotourism, Faculty of Forestry and Environment, Universiti Putra Malaysia

^b Environmental Technology and Security Section, Science Innovation and Technology Department,
SEAMEO BIOTROP, Indonesia

***Corresponding author: zali_johari@upm.edu.my**

Biodiversity Genetic Conservation

ABSTRACT

Biodiversity will be a long-term asset that needs to be studied sustainably for human welfare. Genetic diversity is the main pillar of species and ecosystem diversity. Genetic conservation is an effort to manage and conserve species using a molecular approach to understanding various aspects of species biology. The existence of biodiversity has various benefits. From a social perspective, biodiversity can be utilized for agro-edu education, recreation, and research facilities. Preservation of genetic diversity is an effort to support the agro-eco-edu-tourism program, which has many benefits, including pleasure from tourism activities and visitors' education about biodiversity. Changes in land use cause forest degradation, habitat loss or damage, resulting in loss of biodiversity. Mitigation of biodiversity management is needed to maintain the balance of ecosystems and environmental functions.

Keywords: agro-eco-edu-tourism, biodiversity, genetic diversity



INTRODUCTION

Biodiversity is the number of different species in a given area. Biological and non-biological components comprise genetic diversity, species, ecosystems and human cultural diversity. Biodiversity is the diversity among living things from various sources, including terrestrial, coastal, marine and other aquatic ecosystems and the ecological complexity of which they are a part. The diversity includes within-species, between-species and ecosystem (IUCN) diversity. Biodiversity is a crucial development capital because of its character as a renewable natural resource. The more diverse genes, species and ecosystems, the stronger the environment's carrying capacity. The existence of biodiversity has various benefits, including ecosystem services such as soil stability, clean water supply, nutrient storage and recycling and others. The next benefit is as a biological resource for the provision

Source: Shazali Bin Johari



Source: Shazali Bin Johari

of human consumption in the form of food, medicines, industrial raw materials and much more. From a social perspective, biodiversity can be utilized for agro-eco-edu-tourism programs, education facilities and research facilities.

Conservation is the attempt to protect the vast biological diversity. Genetic conservation is an effort to manage and conserve species using a molecular approach to understanding various aspects of species biology. The concept of the agro-eco-edu-tourism program has many benefits, including pleasure from tourism activities and visitors' education about biodiversity. Biodiversity is essential for the continuity of human life. Biodiversity is a term to describe the wealth of various forms of life on earth. In general, biodiversity is a measure of variation divided into 3 types of biodiversity, namely: species biodiversity (the number of different species in an area), ecosystem diversity (how many types of habitats, ecosystems and

communities in an area), and genetic diversity (the number of genes in all members of a population).

RESULTS AND DISCUSSION

Proper management and conservation of all natural resources are indispensable. Using natural resources to meet human needs in large quantities and for a long time has led to the concept of conservation. The hope with appropriate conservation actions can sustainably maintain human welfare. The sustainability and preservation of biodiversity are increasingly threatened by the increasing number and intensity of stresses (stressors). Resources are threatened with extinction due to habitat destruction, environmental pollution, climate change, over-exploitation, environmental variation and natural disasters. Genetic diversity is the central pillar for species and ecosystem diversities. The main goal of conservation genetics is to apply the knowledge of genetics to reduce the risk of

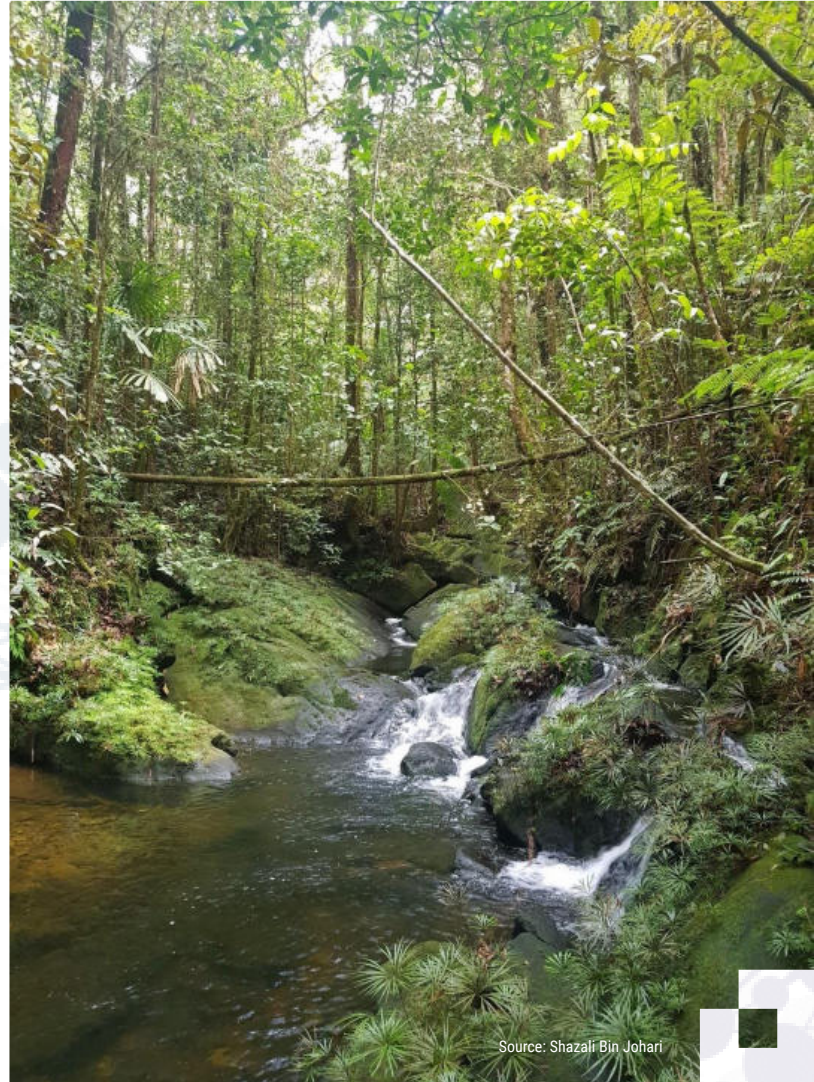
Biodiversity Genetic Conservation

extinction. Many wildlife populations have been reduced to small isolated, fragmented populations with reduced potential for survival. Currently, a large but unknown number of species are going into extinction at an alarming rate.

Challenges of managing biodiversity with genetic tools.

The field of genetics has been recognized as key in the efforts of biodiversity conservation. One crucial and constant factor facing the world's biodiversity is environmental change. Species have to cope with the ever-changing environment in order to survive. Maintenance of biodiversity is one of humankind's most important current concerns, as wild species and domestic breeds and strains are disappearing at an alarming rate. An increasing number of these require human intervention to guarantee their survival. Genetic diversity is the building block for other higher levels of biodiversity (populations, species). It is the basis of the evolutionary potential of species to respond to environmental changes and, as such, becomes an essential pillar in conservation genetics (Geffen, Luikart, & Waples, 2007). Inbreeding has been identified as a significant challenge in biodiversity conservation. Inbred populations are known to exhibit some genetic weaknesses known as inbreeding depression. Environmental impacts on the agro-eco-edu-tourism program that need attention include dual responsibility, recreation impact monitoring, carrying capacity and visitor management system.

Recreation Ecology is "the study of how people undertaking recreation activities interact with the environment". More specifically, it examines, assesses and monitors visitor impacts and considers their relationship to environmental conditions, vegetation resistance and resilience (Leung & Marion, 1996; Leung & Marion, 2000). The importance of recreation ecology indicates how successful managers are in balancing conservation and recreation. It can provide



Source: Shazali Bin Johari

information on ecosystem thresholds and recovery rates and thus suggest levels of acceptable use, determining the success of restoration and rehabilitation programs when damage has already occurred (Leung & Marion, 2000; Marion, 2001). Recreation activities can affect environmental components - soil, vegetation, water and wildlife.

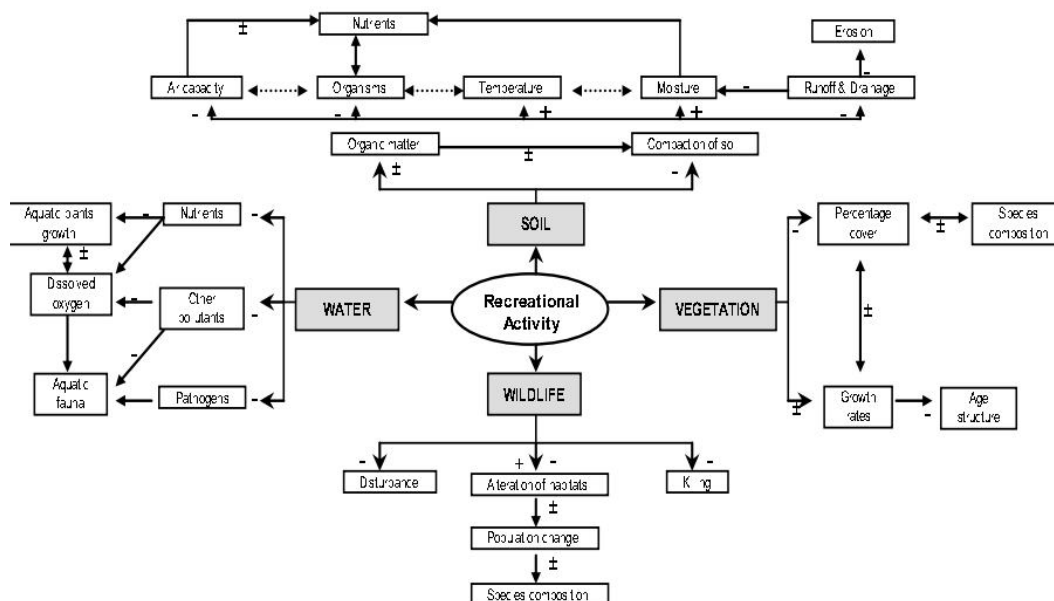


Figure 1. Recreation Impact Interrelationships [10].

RECREATION IMPACT

Recreation in natural areas encompasses a broad range of activities; trekking, camping, sightseeing, scuba diving, adventure pursuit and photography. Impacts from these activities can be direct (i.e. trampling of vegetation will reduce the amount of plant cover due to abrasion by boots) or indirect (i.e. compaction of soils can reduce plant growth as water infiltration rates become reduced) (Liddle, 1997; Newsome, 2002). Therefore must consider several important things, such as; How it affects the area because the effect of recreation activities on components are interrelated (a single activity can cause multiple impacts, and one impact may exacerbate others, causing changes to the entire system (Hammit & Cole, 1998). The intensity of recreation affects the activity of tourists in the environment. So a long-lasting agro-eco-edu-tourism program is needed. Irreplaceable areas of effect are ecosystem functions affecting rare ecosystem/community species. Figure 1 explains about recreation impact interrelationships (Wall & Wright, 1997).

Vegetation change is one of the most noticeable impacts of recreation. Typically, the damage is quantified by examining changes in vegetation cover, composition, growth (such as height and biomass) and tree condition

(impact parameters). Impact parameters to change in response to disturbance - vary over time (alterations to height are immediately evident while changes in vegetation cover can take days and weeks. Several efforts for recreation monitoring include:

- Dual mandates (rec ecosystem equilibrium). Provide high-quality recreation experiences and protect natural resources.
- Information collected can describe the nature and severity of resource impact and the relationships of controlling use-related, environmental and managerial factors-recreation ecology.
- Recreation ecology can be defined as a systematic and scientific study that examines, assesses and monitors visitor impacts in the wilderness and natural areas as well as other protected areas. Efforts to describe the types, amounts, and rates of ecological changes resulting from recreational use, including relationships with environmental and use-related factors that influence these changes.
- Monitor indicators by visitor impact management system.
- LAC, VIM, VERP, TOMM, ROS.



Source: Shazali Bin Johari

Table 1. List of physical impact indicators (related to trail and campsite condition).

Impact on soil	Impact on vegetation	Physical impact by human
Soil compaction	Ground vegetation cover	Evidence of human waste
Loss of organic layer	Loss of vegetation cover	Amount of litter found
Exposure of mineral soil	Vegetation density	Campfire scars
Bare rock area	Vegetation composition	Trenching around tents
Soil erodibility (erosion level)	Shrub damage	Removal tree by visitor
Problem areas coverage	Root exposure condition	Social or web trail
Problem area condition	Tree with exposed roots	Satellite campsite/illegal
Multiple trail	Tree with scars	Rock displacement
Width of trail	Tree mutilation	Evidence of exotic plants
Dept of trail	Leaned trees	Present of vandalism
Soil drainage condition	Tree felled	Presence of shortcut trail
Presence of wet surface	Tree stump	Presence of multiple trail
Presence of muddy area	Tree seedling	
Presence of gully	Tree sapling	
Campsite area (size of use areas)	Mature trees	
Bare surface area or barren core area	Canopy cover Broken twig	

Table 1. contains a list of physical impact indicators related to the condition of the trails and campsites. The list includes impacts on soil, vegetation, and physical impacts by humans.



Source: Shazali Bin Johari

AGRO-TOURISM

This type of rural tourism allows the tourist to visit farms and experience a farmer's daily life. Focus is an important tool in developing the rural community due to the significant positive impacts on farmers. Not only allows farmers to enjoy more significant economic benefits and helps maintain the next generation of the farming community in the rural areas instead of migrating to towns. The impacts of agro-tourism focused on the perception of the host community and the tourists.

ECOTOURISM

The definition of ecotourism has developed from time to time. However, ecotourism is a form of tourism responsible for preserving natural areas, providing economic benefits and maintaining cultural integrity for local communities. Based on this understanding, ecotourism is a form of the conservation movement. The first definition of ecotourism was introduced by the organization The Ecotourism Society (1990) as follows: Ecotourism is a form of travel to natural areas that are carried out to conserve the environment and preserve the life and welfare of the local population. The following definition is used for this plan: tourism experiences involve collaboration between

government, the private sector and local communities, and that includes the following element: respect for nature, contribution to conservation, benefit to local communities, components of education and awareness, sustainability-ecologically, socio-culturally and ethnically. Agro-tourism can be grouped into ecological tourism (ecotourism), namely tourism activities without destroying or polluting nature to admire and enjoy the beauty of nature, wild animals or plants in its natural environment as well as a means of education [7]. Based on various definitions of ecotourism over the years, the following are five distinguishing features.

1. Conservation of nature and culture.
2. Reinvestment of income to maintain the quality of resources and conservation.
3. Ecologically, economically and socio-culturally sustainable.
4. Ethical, demonstrating corporate social responsibility.
5. Education about biodiversity, habitats and cultures.

Ecotourism and agritourism adhere to the same principle. These principles [9] are as follows:

- a. Emphasize as low as possible negative impacts on nature and culture, which can damage the tourist destination area.
- b. Provide learning to tourists about the importance of preservation.
- c. Emphasize the importance of responsible business cooperation with government and community elements to meet the population's needs locally and benefit conservation efforts.
- d. Directing economic benefits directly for conservation purposes, management of natural resources and protected areas.
- e. Emphasizing the need for regional tourism zones and arrangements and management of plants for tourism purposes in areas designated for the tourist destination.
- f. Emphasize the usefulness of environmental-based studies and social and long-term programs to evaluate and suppress the lowest possible impact of tourism on the environment.
- g. Encouraging efforts to increase economic benefits for the state, businesses, and local communities, especially residents who live in the area around the area protected.
- h. Endeavour to ensure that tourism development is not exceeded acceptable social and environmental boundaries as defined by researchers who have collaborated with local residents.
- i. Entrust the utilization of energy sources, protect plants and wild animals, and adapt them to their natural and cultural environment.

National parks are nature conservation areas that have native ecosystems, managed by a zoning system. The role of national parks is in maintaining ecosystem balance and protecting life support systems, protecting species diversity and seeking the benefits of germplasm sources, scientific research and development facilities, education and training. Some of the functions of national parks include:

1. To preserve for future generations a representative proportion of a landscape in its natural form as a living, growing, and changing entity.
2. To show people the beauty and grandeur of landscape and of native flora and fauna in their natural habitats.
3. To educate people in the need for protection and maintenance of natural environment.
4. To act as reference points for scientific investigations including studies of the interaction between people and their environment.
5. To serve as storehouses of biological evolution both at the species and community level.
6. To conserve rare and endangered species.
7. To provide special outdoor recreation opportunities whilst leaving the area unimpaired for the enjoyment of future generation.

Source: Shazali Bin Johari

CONCLUSIONS

Biodiversity contains various genetics stored in every organism, so genetic diversity can support the Agro-Eco-Edu-Tourism Program. The sustainability and preservation of biodiversity are increasingly threatened by the increasing number and intensity of stresses (stressors). Proper management and conservation of all natural resources are necessary to preserve biodiversity and sustainably support the Agro-Eco-Edu-Tourism program and human welfare. For this reason, it is necessary to pay attention to the factors determining the success of implementing sustainable Agro-Eco-Edu-Tourism.

ACKNOWLEDGEMENTS

Department of Recreation and Ecotourism, Faculty of Forestry and Environment, Universiti Putra Malaysia, has been awarded to the first author. Thanks, SEAMEO BIOTROP has been invited the author to be a speaker in the Regional Workshop on the Development of Agro-Eco-Edu-Tourism Model in supporting Biodiversity Conservation Education for Southeast Asia, on 14 July 2022, SEAMEO BIOTROP. This article is based on the presentation at the regional workshop.

REFERENCES

- Geffen E, Luikart G, Waples RS. (2007). Impacts of modern molecular genetic techniques on conservation biology. Blackwell Publishing Ltd.
- Hammitt W.E., Cole D.H. (1998). Wildland Recreation: Ecology and Management, 2nd ed. John Wiley & Sons, New York.
- Leung YF, Marion JL. (1996). Trail degradation as influenced by environmental factors: A state-of-the-knowledge review. *Journal of Soil and Water Conservation*. 51(2):130-136.
- Leung YF, Marion JL. (2000). Recreation Impact and Management in Wilderness: A state-of-Knowledge Review. USDA Forest Proceedings RMRS-P-15.
- Liddle BT. (1997). Privatization Decision and Civil Engineering Projects. *Journal of Management in Engineering*. 13: 3.
- Marion. (2001). Leadership in complex organizations. Elsevier. 2(4): 389-418.
- Ministry of Agriculture. (2005). "Agrowisata Meningkatkan Pendapatan Petani" pada <http://database.deptan.go.id>.
- Newsome JG. (2002). The Use and Impact of Explicit Instruction about the Nature of Science and Science Inquiry in an Elementary Science Methods Course. *Science Education*. 11: 55-67.
- World Tourism Organization. (2000). *Tourism Trends*. Madrid.
- Wall G, Wright C. (1977). *The Environmental Impact of Outdoor Recreation*. Department of Geography University Waterloo.