RESEARCH ON ECOTOURISM ROUTE AND ENVIRONMENTAL INTERPRETATION AT VIETNAM NATIONAL UNIVERSITY OF FORESTRY CONTRIBUTE TO BIODIVERSITY CONSERVATION AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

Ecotourism is a form of tourism based on nature and indigenous culture that involves education and interpretation of the natural environment and improving the well-being of the local people. With the advantages of a large campus, spacious and modern facilities, especially an experimental forest with an area of over 130 hectares with high biodiversity value, Vietnam National University of Forestry is considered as a suitable place for environmental interpretation and ecotourism development. Secondary data collection, interview, and field survey methods have been applied in this research. As a results, an ecotourism route at Vietnam National University of Forestry with a total length of 5.26 km and seven points of environmental interpretation has been established. Interview results show that the ecotourism route is really need to help students and visitors discover the value of biodiversity resources in the experimental mountain forest and environmental interpretation activities. Simultaneously, this research proposed some solutions to support the operation and management of ecotourism routes, including human resource, technical, and promotion solutions.

NGHIÊN CỨU XÂY DỰNG TUYẾN DU LỊCH SINH THÁI VÀ DIỄN GIẢI MÔI TRƯỜNG TẠI TRƯỜNG ĐẠI HỌC LÂM NGHIỆP GÓP PHẦN BẢO TỒN ĐA DẠNG SINH HỌC VÀ PHÁT TRIỂN BỀN VỮNG

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TỪ KHÓA

Đa dạng sinh học
Du lịch sinh thái
Diễn giải môi trường
Phát triển bền vững
Đại học Lâm nghiệp

TÓM TẮT

Du lịch sinh thái là loại hình du lịch dựa vào thiên nhiên và văn hoá bản địa gắn với giáo dục và diễn giải môi trường và cải thiện điều kiện sống của cộng đồng địa phương. Với những lợi thế về khuôn viên rộng, cơ sở vật chất khang trang, hiện đại đặc biệt là khu rừng thực nghiệm có diện tích trên 130 ha mang giá trị đa dạng sinh học cao, trường Đại học Lâm nghiệp được đánh giá là một địa điểm thích hợp cho diễn giải môi trường và phát triển du lịch sinh thái. Các phương pháp thu thập tài liệu thứ cấp, phỏng vấn và điều tra thực địa đã được áp dụng trong nghiên cứu này. Kết quả nghiên cứu đã đề xuất thành lập một tuyến du lịch sinh thái tại trường Đại học Lâm nghiệp có tổng chiều dài 5,26 km với 7 điểm diễn giải môi trường chính. Kết quả phỏng vấn cũng chỉ ra rằng thành lập tuyến du lịch sinh thái là thực sự cần thiết nhằm giúp cho sinh viên và du khách khám phá giá trị tài nguyên đa dạng sinh học tại khu rừng thực nghiệm núi Luốt và các hoạt động diễn giải môi trường. Đồng thời, nghiên cứu cũng đã đề xuất một số giải pháp hỗ trợ hoạt động và điều hành tuyến du lịch sinh thái được xây dựng bao gồm: giải pháp về nhân sự, giải pháp về kỹ thuật và giải pháp về truyền thông.

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1. Introduction

Tourism is an inevitable product of the socio-economic development of human society at a certain historical period [1]. When people have a full material and spiritual life, the need for tourism will arise more often. Therefore, tourist routes and travel programs are increasingly developed and perfected to meet the increasing needs of tourists, especially when they tend to favor tourism close to nature – ecotourism [2]. Tourism in general and ecotourism in particular are both growing strongly on a global scale, especially in the past two decades, ecotourism has emerged as a phenomenon and a trend [3]. The growing world has captured the attention of many people [4]. Vietnam is one of the countries with great potential for ecotourism development with many favorable conditions [5]: the bestowed natural beauties, rich in nature, diverse in ecosystems, landscapes, biodiversity, and indigenous culture.

Vietnam National University of Forestry (VNUF) is a leading university, training highly qualified human resources to meet the development needs of the forestry sector and rural development. With spacious and modern facilities, a large campus with an area of 27 ha, an experimental forest of over 130 ha in Luot mountain [6] with high biodiversity value with 521 species of higher vascular plants [7], 156 species of vertebrates [8], and 415 species of insects [9]. Among them, many species are listed in the Vietnam Red Data Book (2007) [10]. With these values, the university can well meet the needs of research and visit on biodiversity and science for students inside and outside the university as well as visitors. The VNUF is known as a "Student Tourist Area". However, with existing values, the advantages of ecotourism of the university have not been researched and maximized with students, and visitors. On the other hand, there is no ecotourism route as well as no environmental education system at Luot mountain, the awareness of environmental protection is not high when there is still the phenomenon of indiscriminate waste. This directly affects the habitat of the animals as well as reduces the beauty of people when visiting the school. Therefore, building an ecotourism route and explaining the environment is of great significance to contribute to biodiversity conservation and sustainable development, helping staff, students, and guests of the university. Visitors have more understanding about nature and biodiversity conservation when experiencing ecotourism at the VNUF.

2. Materials and Methods

2.1. Secondary data collection method

Inheriting statistical documents and publications on biological resources at the VNUF and related references on the basis of selectively processing and processing information for research content. Inheriting documents on natural, economic and social conditions of the research area. Refer to documents on ecotourism route construction, environmental interpretation, education and communication.

2.2. Interview method

Interview surveys were conducted in April, 2020 by two main target groups, students from the Forestry High School (F-school) and students from VNUF on building an ecotourism with a total of 115 surveyed votes, in which the number of students surveyed accounted for less than 11 votes (accounting for 9.6%), the number of surveyed students accounted for 104 votes. votes (accounting for 90.4%). Because this topic is closely related to students, especially students from Ecotourism bachelor program. Purpose of this interviews is to know the needs of students and students about building ecotourism routes at the school in order to provide a practical basis for the construction of the route.

Questions of the interview sheets included frequently encountered animals, favorite plant species at Luot mountain, the frequency of going to the forest and the locations in the school, the

level of consent to building an ecotourism route, the level of willingness to contribute to the construction of the ecotourism route.

2.3. Field survey method

The purpose of this method is to identify the typical types of resources on the ecotourism route at Luot mountain and VNUF campus for the construction of ecotourism route and interpret the environment at the university.

Survey activities: Examine topography, choosing tourist routes and environmental education points on the route; investigate biodiversity resources of the study area, in particular valuable plant and animal species in the campus, Luot mountain and in the practice centers; make a list of flora and fauna resources at Luot mountain and VNUF campus based on the results of previous studies and this field surveys.

Based on the established list of flora and fauna resources and the encounter level of species on the ecotourism route, it is expected to design a list of easily encountered species on the ecotourism route. Use the digital camera (Panasonic LUMIX DC-ZS70) to collect images of typical animals and plants on the tourist route. Taxonomic identification and main characters of species followed Nguyen et al. (2000) [11], Le & Bui (2015) [9], Vuong et al. (2017) [7], Luu & Pham (2018) [8].

2.4. Building ecotourism route method

2.4.1. Theoretical basis for designing ecotourism routes

In general, tourist routes are considered as special tourism products, the identification of tourist routes must be based on certain criteria to ensure the high attractiveness of this special tourism product. In addition, the ecotourism route is also built based on the Forestry law of Vietnam [12] and the practical environmental education documents for university students [13] and for High School students [14]. Therefore, the ecotourist route at the VNUF has been based on the following four main criteria: Orientation to organize the main tourist space of the whole territory; tourist resources and attractions of the scenery along the route and at tourist attractions; areas and places for rest and entertainment with the ability to attract guests; and the purity of the natural environment and social culture.

2.4.2. Identifying the ecotourism route

The determined route has been suitable with the topography of the study area, following a certain tour through from the starting point to the ending point. The route was selected based on natural conditions (terrain, path) and available resources at the VNUF. Locations for environmental interpretation have been selected on the route going from the starting point to the end point. The tourist route map at the VNUF is designed based on the map from Google Maps and Photoshop software 2020.

3. Results and Discussion

3.1. The current situation of ecotourism at the VNUF

3.1.1. Ecotourism resources

a. Plant resources

According to the combined results from previous studies, the experimental forest of Luot mountain was recorded with 521 species of higher vascular plants, including 31 species listed in the Vietnam Red Data Book (2007) [10]. At the same time, the centers and laboratories at the VNUF kept 282 specimens of different plant species collected from many places in the territory of Vietnam [7].

According to the results of two main groups of students, the most popular plants here are *Vernicia montana* Lour. (Trẩu nhăn), *Tithonia diversifolia* (Dã quỳ), *Lagerstroemia speciosa* (Bằng lăng), *Delonix regia* (Hook.) Raf. (Phượng vĩ) that show off their full bloom in the summer season. Moreover, these are also plant species that are distributed along the available route in Luot mountain and the campus. Besides these flowers, there are also a number of plant species such as *Erythrophloeum fordii* Oliver (Lim xanh), *Peltophorum pterocarpum* (DC.) K. Heyne (Lim xẹt), *Elaeocarpus griffithii* (Wight) A.Gray (Côm tầng), *Dracontomelon duperreanum* Pierre (Sấu), *Ficus auriculata* Lour. (Vả), *Cinnamomum camphora* (L.) J. Presl (Long não) that are encountered along the route which creating an extremely attractive landscape. This row of trees is dubbed the "valley of love" by forestry students because it is located at the position of the curve with a rather steep slope, the trees line up and hang to the side of the road, making the road become poetic. In addition, the landscape of the lecture hall is also beautified by plants. In particular, it is impossible to miss the beauty of linden in the flowering season at G5 lecture hall (Figure 1).

(a) (b)

Figure 1. *Representative plant species on the ecotourism route*
(a) Peltophorum pterocarpum (Lim xẹt) and (b) Ficus auriculata (Vả)
Photos: Phung Thi Thanh Hai

b. Animal resources

According to the combined results from the studies, 156 species of vertebrates, 11 species of reptiles and 415 species of insects have been recorded in the Luot mountain [8, 9], in which 21 vertebrate species, 2 reptile species and 3 insect species are listed in the Vietnam Red Data Book (2007) [10]. In addition, Center for Biodiversity and Sustainable Forest Management is home to many collected specimens with 222 species of vertebrate animals including 56 mammal species, 72 bird species, 54 reptile species, 20 amphibian species, and 20 fish species. Among them, 36 mammal species, 11 bird species, 14 reptile species, and 3 amphibian species are listed as precious and rare species in the Vietnam Red Data Book (2007) [10] and some endemic species of Vietnam such as Delacour's langur (*Trachypithecus delacouri*), Grey Shanked Douc Langur (*Pygathrix cinerea*), Annam Leaf Turtle (*Mauremys annamensis*),…

Forestry High School and VNUF students said that they often encounter birds belonging to the order Sparrows such as Yellow-billied Blue Magpie (*Urocissa flavirostris*), Oriental Magpie-Robin (*Copsychus saularis*), Gray Treepie (*Dendrocitta formosae*), Red-whiskered Bulbul (*Pycnonotus jocosus*), Red-vented Bulbul (*Pycnonotus cafer*) (Figure 2), and some reptiles such as snakes and Long-tailed Sun Skink (*Mabuya longicaudata*). Many students have seen squirrel species at Luot mountain. But the easiest to see, the most attractive are still birds (Table 1).

Table 1. *Representative birds on the ecotourism route*

No.	Species	Main characters
1	Yellow-billied Blue Magpie (*Urocissa flavirostris*)	Big size. The back, wings, and upper side of the tail are blue and are easily seen. The tail is very long with white tips. Usually feeds in small flocks and flies close to the ground and is very noisy.
2	Gray Treepie (*Dendrocitta formosae*)	The main colors are gray, brown and black. Large body like a dove. Foraging in swarms on the ground.
3	Red-whiskered Bulbul (*Pycnonotus jocosus*)	Easy to recognize by its small body, long and pointed crest, bright red feathers under the tail. Singing creates a sense of fun.
4	Red-vented Bulbul (*Pycnonotus cafer*)	Popular and very easy to see. The main coat color is light gray. The head is light black, the crest is low, the feathers under the tail are bright red like a crest. Usually follows the crowd quite loudly.
5	Grey-backed Shrike (*Lanius tephronotus*)	The upper back is gray-brown, the belly is white, the legs are black. Often go alone, in an empty place. Various songs.
6	Common Tailorbird (*Orthotomus sutorius*)	Small size. The tail is long and often raised. The sound is loud and often repetitive.
7	Oriental Magpie-Robin (*Copsychus saularis*)	The tail is often curled, the main coat color is black and white. Often goes alone or in pairs in open spaces or on green grass.
8	Scarlet-backed Flowerpecker (*Dicaeidae cruentatum*)	Small size, short beak. The back is bright red extending to the base of the tail. Very flexible. The singing is high and repetitive.
9	Crimson Sunbird (*Aethopyga siparaja*)	Small size. Curved beak, crimson chest, dark brown back.
10	Great Tit (*Parus major*)	Small size, main coat color is black, cheeks white. Calls are most diverse in spring.
11	White Wagtail (*Motacilla alba*)	The plumage has two main colors, black and white, often feeding on the ground and flying very quickly. Likes places near water.
12	White-throated Fantail (*Rhipidura albicollis*)	Main coat color is black. The tail is often spread out when dancing with a white tail, white belly.

Figure 2. *Representative animal species on the ecotourism route:* (a) Oriental Magpie-Robin (*Copsychus saularis)*; (b) Gray Treepie (*Dendrocitta formosae)*; (c) Red-vented Bulbul (*Pycnonotus cafer*); (d) Yellow-billied Blue Magpie (*Urocissa flavirostris*)
Photos: Phung Thi Thanh Hai (a, b, d) and Luu Quang Vinh (c)

3.1.2. The needs of building an eco-tourist route at the VNUF

The proposed ecotourism route received high approval (97%) and no other routes were suggested. The majority (86%) of the survey respondents prioritized the construction of ecotourism routes focusing on both ecotourism and environmental education goals. There are still a few opinions that this route only has one of two meanings: environmental education or ecotourism (Figure 3). The chart shows the combination of ecotourism and environmental education is the most positive and comprehensive direction to both develop ecotourism and protect environmental resources as well as landscape values at the VNUF.

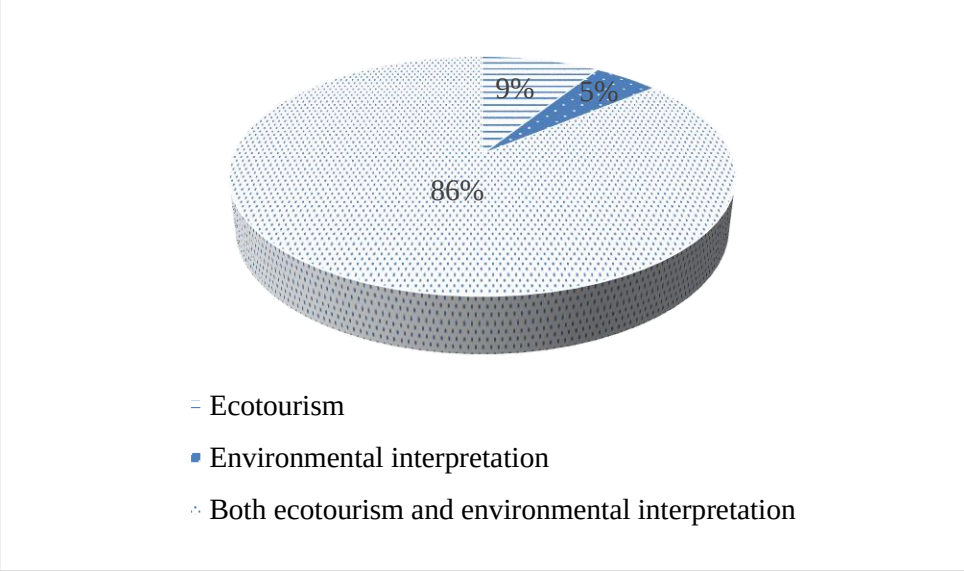

Figure 3. *Opinions of students about the ecotourism route goal*

Besides, this route is especially important for the bachelor program of ecotourism being trained at the VNUF with the rate of 97.4% (112/115 people) agreeing with this point of view. The willingness of students to be a tour guide when the route is built is quite high (65%), whereas 35% of people are still unwilling due to the passion and ability of each person.

In general, the survey results show that the proposed ecotourism route is suitable with the natural conditions of the study area to develop ecotourism and environmental education. On the route there are many tourist potentials such as beautiful animals and flowers that attract visitors. The construction of the route also attracts students to participate in the process of implementing and improving their knowledge and skills as well as making an important contribution to their learning and training.

3.2. Proposed ecotourism route and environmental interpretation at VNUF

The ecotourism route for environmental education has designed a total length of 5.26 km with 07 environmental education points. Of which, 05 environmental education points are located at the Luot mountain, 02 points are located at the Center for Biodiversity and Sustainable Forest Management and the Center for Environmental Analysis and Application of Geotechnology. The route details and environmental interpretation points are shown in Figure 4 and Table 2.

Thus, the distance between tourist attractions is not too far from each other, the route has been paved widely, convenient for all means of circulation. Most of the roads are flat, low slope, only the position of the commando slope has a large slope and a bend, the level of danger is low.

Figure 4. *Map of proposed ecotourism route at the VNUF*

Photo: Luu Quang Vinh

Table 2. *Distance among points on the route*

Point	From	To	Distance (km)	Types of transportation
1	Main entrance	Biodiversity and Sustainable Forest Management Center	0.13	walk, bicycle, motorbike, car
2	Center for Biodiversity and Sustainable Forest Management	Butterfly and insect conservation area	0.52	walk, bicycle, motorbike, car
3	Butterfly and insect conservation area	Iron gate crossroads	0.55	walk, bicycle, motorbike, car
4	Iron gate crossroads	Horse saddle crossroads	0.47	walk, bicycle, motorbike, car
5	Horse saddle crossroads	Observation tower	0.77	walk, bicycle, motorbike, car
6	Observation tower	Meteorological station	2.02	walk, bicycle, motorbike, car
7	Meteorological station	Environmental Analysis and Geospatial Technology Application Center	0.8	walk, bicycle, motorbike, car

3.3. Some solutions for management, engineering and operation of ecotourism routes

The VNUF should assign tasks to units in charge of ecotourism routes. Ecotourism route is a practical place for training and improving skills for students, especially students of ecotourism program. Messages, slogans and signs one the route need to develop on the route. Ecotourism students are encouraged to collect the information of animal species on the route to continuously

update the species list, supplement the online presentation as well as increase the attractiveness of the ecotourism route to attract visitors.

The observation tower is an important point to have an overview of the landscape of Luot mountain. However, currently, the quality of the tower is seriously degraded, not safe for tourists, especially children, so it needs to be upgraded. Finally, it is necessary to develop brochures for introducing biodiversity values and the information on the route.

4. Conclusion

Vietnam National University of Forestry has 27 ha of campus and 130 ha of experimental forests with rich and diverse flora and fauna which is a potential place for ecotourism development and environmental interpretation.

With the rate of 97% of the interviewees agreeing to the proposal of ecotourism route, it has shown the necessity of the ecotourism route for not only training and research activities at the university, especially for the ecotourism program but also meaningful combination between ecotourism and environmental education. This is the most positive and comprehensive trend to both develop ecotourism and protect environmental resources as well as landscape values at the VNUF.

The willingness of students to be a tour guide when the route is built is quite high (65%), whereas 35% of people are still unwilling due to the passion and ability of each person.

The ecotourism and environmental interpretation route is designed a total length of 5.26 km with 07 environmental education points. Some solutions for effective operation activities have been proposed.

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