

**Exploring Potential Utilities of Forest
Ecosystem Services and Local Resources**

Towards Livelihood Improvement

**- The Case of Bach Ma National Park and its
Buffer Zones in Vietnam**

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Abstract

In Vietnam, protected areas are designated as “prohibited areas” or “isolated areas”, which are managed by strict legal instruments including regulations. Despite such measures, there has been ongoing loss of forest biodiversity. Excessive dependence on forest ecosystem services, especially by poor local communities¹ living in the buffer zones of protected areas, is a major factor driving such biodiversity loss. Few studies have attempted to establish empirical data on the dependence of local communities on forest ecosystem services. This research aims (1) to understand details of the forest dependence, and (2) to provide a point of reference for the local government in considering alternative livelihood options for the forest-dependent communities through utilizing of local resources. The buffer zones of Bach Ma National Park situated in Central Vietnam were selected as the study area. A combination of qualitative and quantitative methods, such as participatory mapping, interviews, questionnaire surveys, ecosystem service valuation, and geographic information system (GIS)-based multi-criteria decision analysis, was used in this research.

The results showed that multiple forest provisioning ecosystem services, such as foods, materials, and water resources are depended by local communities, especially by an ethnic minority group, in certain months of year. The spatial distribution of the collection locations and frequency levels of collection were found to be influenced by factors such as land use, administrative units, terrain conditions,

¹ The meaning of “local communities” in this study is “all residents in local communities”.

accessibility, resource abundance, and forest governance. The most intensive collection was found to be carried out by the local communities living in the buffer zone to the southeast of the Park; furthermore, the collection was found to occur across a wide range of provisioning ecosystem services. In comparison to other studies, collection of forest ecosystem services is less intensive in other parts of the buffer zones and other regions in Vietnam. In addition, the monetary value of the collected ecosystem services makes a significant contribution (70.8%) to total household income.

The results also show the availability of local resources which could be used for tourism development. The value of local resources with natural values were highlighted at 11 sites with outstanding natural beauty, such as hot springs and waterfalls. Eight study units (which include eight of the 11 outstanding sites) were determined to have high possibility for tourism development in terms of scenic attractions, ease of access, and compliance with local legislative requirements. The local resources with tangible and intangible cultural values were also identified as potential resources for tourism development.

The results from this research are aimed at benefiting local policy makers in determining sustainable management strategies for the Park and its buffer zones. The results also provide a basis for planning, management and sustainable use of the local resources.

Keywords: forest ecosystem services, local resources, forest dependence, local livelihood, protected area, buffer zone, Bach Ma, Vietnam.

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Chapter 1 INTRODUCTION

1.1 Research Background

At the request of the United Nations Secretary-General, Kofi Annan, the Millennium Ecosystem Assessment (MEA) was carried out worldwide between 2001 and 2005. Its objectives were “to assess the consequences of ecosystem change for human well-being [,] and to establish the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems and their contributions to human well-being” (MEA, 2005, page V). The concept of “ecosystem services” gained recognition following the publication of the Millennium Ecosystem Assessment, and became defined as “the benefits people obtain from ecosystems” (MEA, 2003, page 57; MEA, 2005, page 40). The services can be divided into the following four categories: provisioning, supporting, regulating, and cultural ecosystem services (MEA, 2003, page 57; MEA, 2005, page 40). The ecosystem service approach is incorporated into environmental policies to ensure better management of ecosystems (Culhane et al., 2019). This approach has become increasingly prevalent in the field of biodiversity conservation. It allows comprehensive exploration of the complexity of socio-ecological systems (Elliff and Kikuchi, 2015; Zhang and Stenger, 2015; Cummings and Read, 2016). The ecosystem service approach also helps decision-makers to recognize the role of ecological processes and natural capital in supporting human well-being, and the integration of these values into their decisions (Schmidt et al., 2016).

Forests provide several ecosystem services that are important to human well-being (Lakerveld et al., 2015). Globally, 1.6 billion rural people are directly

dependent on forest ecosystem services (Chao, 2012). Previous studies have indicated that economically challenged local communities living in or near forests depend heavily for their livelihoods on provisioning ecosystem services, such as food, fibre, and firewood (Aung et al., 2015; Langat et al., 2016). However, it is also widely recognized that high dependence on forest ecosystem services causes ecosystem degradation that may lead to reduction in the provisioning services; in turn, this may impede poverty reduction efforts (Struhsaker et al., 2005; Delgado-Aguilar et al., 2017). Unsustainable utilization of ecosystem services, especially from protected areas and their buffer zones, may lead to problems such as ecological fragmentation (Struhsaker et al., 2005). Additionally, conservation of protected areas is likely to be challenging in the long term if the dependence of local communities on ecosystem services is not quantified and is not subsequently incorporated into relevant policies (McNeely, 1994; Palomo et al., 2013).

Vietnam has 164 terrestrial protected areas, which are designed as “prohibited areas” or “isolated areas” and cover 7.4% of the country’s total land area (De Queiroz et al., 2013). These protected areas are managed by “fine and fence” or “exclusion and punishment” policy style that is defined in a way that the access of local communities and their use of natural assets inside these areas are banned (Decree No. 117, 2010). However, even with such initiatives in place, the biodiversity in Vietnam has been declining so that the country has a high number of threatened species (Pilgrim and Nguyen, 2007). The International Union for Conservation of Nature (IUCN) assessed 3,990 species in Vietnam and found that 512 (13%) were threatened with extinction (De Queiroz et al., 2013). Of these, 152 are found in forests, 110 in inland wetlands, and 52 in near shore waters (De Queiroz et al., 2013). One of the factors driving forest biodiversity loss in Vietnam is the

excessive collection of timber and non-timber forest products (De Queiroz et al., 2013). This can be attributed to the poor socio-economic conditions of local communities living in the buffer zones of protected areas. Impoverished near-subsistence farmers in these communities have small paddy fields; they therefore lack the capacity to produce food in sufficient quantities. Consequently, they tend to depend on forest ecosystem services (Gilmour and Nguyen, 1999; De Queiroz et al., 2013). Owing to communities' dependence on the forests, it is difficult for sustainable management to be achieved by the responsible organizations. Few studies have attempted to establish empirical data on the extent of local communities' dependence on forests in the buffer zones of protected areas. A detailed understanding of this dependence can be a first step for realizing successful forest management.

Investment in local livelihood options has often been recommended to reduce the dependence of local communities on forests; this has further been suggested to facilitate sustainable forest management (Kamanga et al., 2009; Teshome et al., 2015; Hlaing et al., 2017). Appropriate utilization of local resources, defined in detail in Section 1.3, can briefly be outlined to include “natural and human resources, traditional culture, and connections between citizens” (Hori et al, 2019, page 1284). This can be an important step in achieving sustainable development in rural areas (Biswanath, 2017). Tourism is a key example of successful utilization of local resources. It makes use of a variety of local resources such as landscape, food, and culture (Uchiyama et al., 2016). Benefits from tourism, such as increase in job opportunities and establishment of markets for local products, can mitigate the dependence of local communities on natural resources (Munanura et al., 2019). Tourism also provides opportunities to preserve local culture and maintain local

social coherence (Ahebwa et al., 2016). Li et al. (2018) indicated that tourism could be a means to solving social issues such as unemployment and poverty. Sustainable tourism can be a “win-win” component of conservation strategies, and can improve livelihoods in poor communities (Toko 2016).

1.2 Research Objectives

The development of sustainable management strategies for protected areas requires a detailed understanding of the need for natural resources in local communities living in the buffer zones. Because poverty is a major factor leading to the excessive collection of forest ecosystem services in Vietnam, poverty alleviation should be integrated in the management strategies for forests as well as protected areas and buffer zones. Tourism may be a means for enhancing the livelihoods of poor communities dependent on forests. Thus, this study attempts to identify the specific ecosystem services collected, their harvest seasons, spatial distribution of collection, and the purposes for which they are collected. Such knowledge would provide a reliable point of reference for decision-making processes. The study also aims to explore the possibility of introducing tourism drawing on local resources. The specific objectives of this study are as follows:

- (i) To identify forest ecosystem services collected by local communities and to understand the need for these forest ecosystem services through mapping of the frequency of collection;
- (ii) To understand the contribution of the collected ecosystem services to local livelihoods;

- (iii) To identify local resources which could be utilized for tourism development to improve livelihoods of the forest-dependent communities.

1.3 Definition of Forest Ecosystem Services and Local Resources

This research focuses on two important keywords, namely “forest ecosystem services” and “local resources”. These words have several nuanced meanings; the definitions applied in this research are declared here to avoid ambiguity.

- (i) Forest ecosystem services are what local communities obtain for their livelihoods from forests.
- (ii) Local resources are natural assets or culture which exist in local communities, but which have not been explored as a means for supporting local livelihoods.

1. 4 Structure of Dissertation

The dissertation is divided into seven chapters (Figure 1.1). Chapter 1 presents the background, objectives, and structure of the dissertation. Chapter 2 consists of a literature review of concepts regarding ecosystem services, protected areas and buffer zones, contribution of tourism to socio-economic development, and the contexts regarding these concepts in Vietnam. Chapter 3 describes the study area and methodology applied in this research, after which Chapter 4 details the need for forest ecosystem services by local communities. Chapter 5 then discusses the contribution to local livelihoods of the collected ecosystem services. Thereafter, Chapter 6 identifies local resources which could be utilized for tourism development.

Chapter 7, which is the final chapter, then provides a brief summary of the chapters and general observations based on the results; it further sets out recommendations for the local government, and it outlines the importance of the research. Finally, the limitations of the research and perspectives on perspectives on future studies are provided.

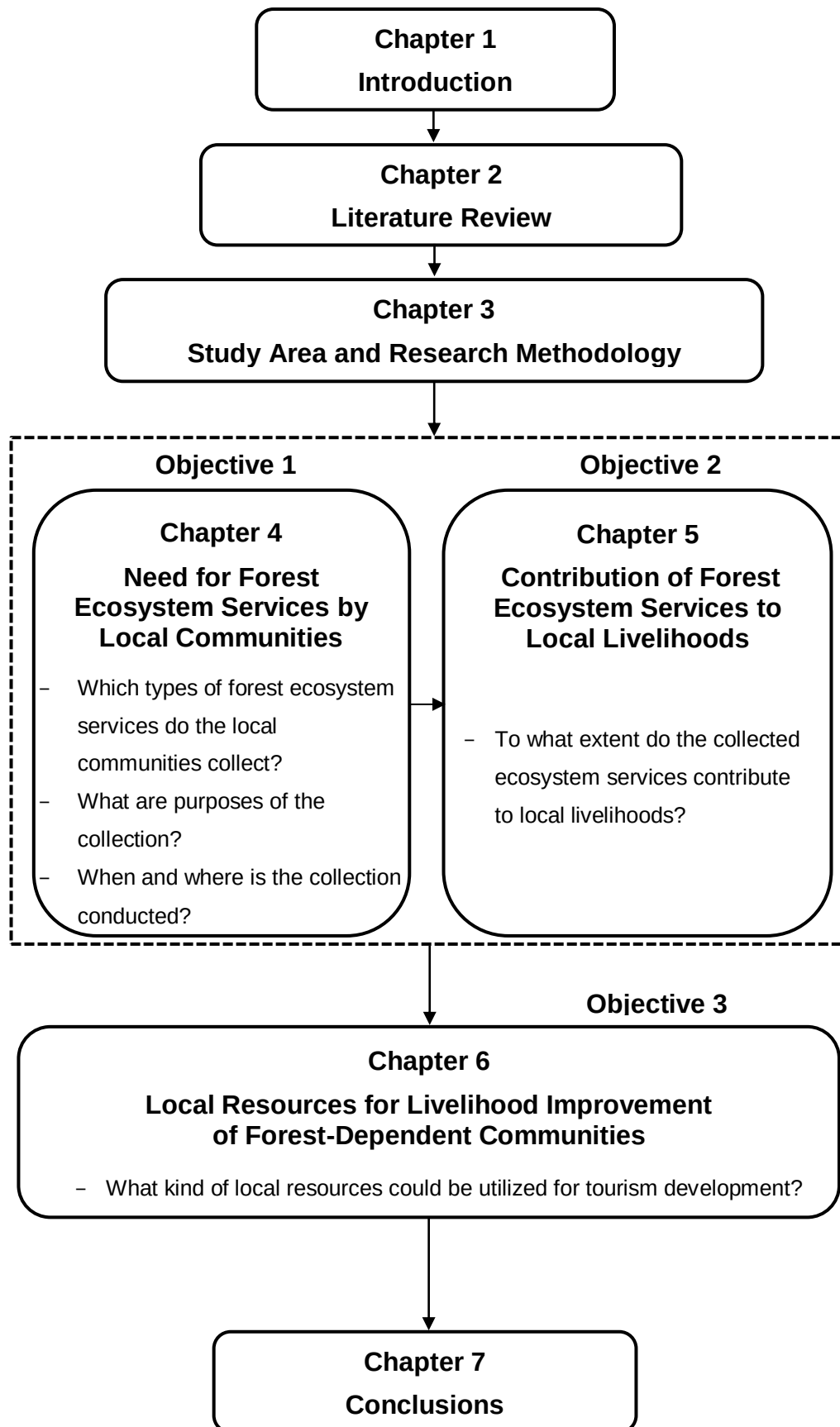


Figure 1.1 Structure of the dissertation

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Chapter 2 LITERATURE REVIEW

2.1 Overview of Ecosystem Services

2.1.1 Definition and Classification

In their 1970 report “Study of Critical Environmental Problems”, the Massachusetts Institute of Technology first introduced the concept of ecosystem services using the term “environmental services” (MIT, 1970; Hummel et al., 2019). The term “ecosystem services” was first used in 1981 by Ehrlich and Ehrlich (1981) (Hummel et al., 2019), and by the 1990s, the term had become popular in scientific research (De Groot et al., 2002; Hummel et al., 2019). By the following decade, the concept was integrated into policies, notably in 2003 with the publication of the Millennium Ecosystem Assessment (MEA, 2003). Since then, there has been a substantial increase in the literature on ecosystem services (Hummel et al., 2019). To date, the most commonly-cited definition of ecosystem service is that developed by the Millennium Ecosystem Assessment, namely:

“Ecosystem services are the benefits people obtain from ecosystems” (MEA, 2003, page 57; MEA, 2005, page 40).

According to the Millennium Ecosystem Assessment (MEA, 2003, page 57; MEA, 2005, page 40), ecosystem services are classified into the following four categories:

- (i) Provisioning ecosystem services—providing products which people can obtain directly from ecosystems (e.g., food, fresh water, and fuelwood).
- (ii) Regulating ecosystem services—providing benefits from the regulation of ecosystem processes (e.g., climate regulation, carbon sequestration, and pollination).
- (iii) Cultural ecosystem services—providing non-material benefits from ecosystems through spiritual enrichment, cognitive development, recreation, and aesthetic experiences (e.g., spiritual, religious, and aesthetic values).
- (iv) Supporting ecosystem services—those that are required for the functioning of other ecosystem services (e.g., nutrient cycling, pollination, and seed dispersal).

2.1.2 Evaluation Approaches

Two research approaches commonly applied to the evaluation of ecosystem services are mapping and valuing (De Groot et al., 2002; Howarth and Farber, 2002; Jing and Ren, 2008; Bai et al., 2011; Sherrouse et al., 2011; De Groot et al., 2012; Maes et al., 2012; Kubiszewski et al., 2013; Häyhä et al., 2015; Kindu, et al., 2016; Delgado-Aguilar et al., 2017). The following paragraphs elaborate each approach.

(i) Mapping of ecosystem services

Information from mapping exercises has been utilized in numerous studies to analyze spatial distribution of multiple ecosystem services (Bai et al., 2011; Maes et al., 2012; Häyhä et al., 2015). Mapping of ecosystem services has several applications; this includes evaluating of spatial congruence of ecosystem services with biodiversity, and identifying priority protection areas. It also provides valuable data for analyzing synergies and trade-offs between different ecosystem services. It furthermore highlights flows of ecosystem services, and provides the means for comparing ecosystem service supply with demand. Beside these applications, such mapping can assist with the estimation of costs and benefits of delivering ecosystem services, as well as the monetary valuation of biophysical assets (Maes et al., 2012).

There are several approaches to the mapping of ecosystem services. Firstly, deriving information on ecosystem services from land use/cover or habitat maps provides a simple approach for the mapping of ecosystem services (Vihervaara et al., 2010; Maes et al., 2012). This approach is thus suitable for instances where expertise is limited (Maes et al., 2012). It is further useful for conducting research on a large geographic scale, where implementation of empirical research activities would be impractical. A second approach involves participatory mapping. This can be applied to measuring of provisioning ecosystem services, as well as gauging of certain cultural ecosystem services. Participatory mapping can also be used for gathering knowledge, perceptions, and experiences of stakeholders in relation to ecosystem services. Such feedback can be integrated into scientific research programs leading to development of appropriate policies (Delgado-Aguilar et al., 2017). A third approach to mapping of ecosystem services is based on biological

data, such as functional traits of plants (e.g., vegetative height, leaf dry matter content, leaf nitrogen and phosphorous concentration, and flowering onset) or ecosystem structure and habitat data, using remote sensing. Fourthly, mapping of ecosystem services can be founded on process-based ecosystem models (Morales et al., 2005; Maes et al., 2012) or models estimating ecological production functions (Nelson et al., 2009; Maes et al., 2012). The approach can produce realistic changes in ecosystem service supply at both local and landscape scales (through taking underlying mechanisms driving ecosystem service delivery into account); however, the approach requires intensive investment, both in terms of acquisition of data and expert knowledge (Maes et al., 2012).

(ii) Valuing of ecosystem services

There are many approaches to valuing of ecosystem services (both quantitative and qualitative), with monetary and non-monetary assessments being the best examples. Monetary assessment is often aimed at measuring provisioning, as well as some of the cultural ecosystem services. This is done through: direct market valuation (applied to ecosystem services which can be traded); travel cost valuation (used for cultural ecosystem services in recreational/ecotourism areas); contingent valuation (aimed at calculating and estimating expenses which stakeholders are willing to pay for the conservation of local ecosystem services); and group valuation (where stakeholders discuss and value ecosystem services and their provision of public goods and services) (De Groot et al., 2002; Hummel et al., 2019). Non-monetary assessment often uses indicators; these may vary across ecosystems and are thus applicable to specific areas, habitats and ecosystems (Hummel et al., 2019). Using non-monetary assessments, the more aesthetic and

less tangible aspects of nature, ecosystems and biodiversity can be determined. The influences of these aspects on social relationships, cultural evolution, and spirituality can also be defined (Hummel et al., 2019).

2.1.3 Previous Research in Vietnam

A wide range of research on ecosystem services has been carried out in Vietnam and can be divided into three groups. The first group consists of research which has aimed at the measurement of carbon storage and its role as a regulating ecosystem services. This was done through identifying of forest cover and mapping of the distribution of aboveground biomass (Nguyen, 2012; Nguyen, et al., 2014; Tran, 2015; Tran et al., 2015; Nguyen and Nguyen, 2016; Dang et al., 2019). The second group is comprises research on (1) valuing of ecosystem services (Kuenzer and Vo, 2013; Kaida and Dang, 2014; Pham et al., 2018) and (2) assessing the implementation of payment for ecosystem services by the government (To et al., 2012; Suhardiman et al., 2013; Loft et al., 2019). This area of research has provided information on the potential and actual realization of, as well as challenges to, payment for ecosystem services in Vietnam. The most frequently applied technologies in the ecosystem services research are remote sensing, geographic information system (GIS) technologies, questionnaire surveys, machine-learning algorithms, and contingent valuation, which are applied in combination or separation. The third group covers research aimed at measuring the need for provisioning ecosystem services of local communities using questionnaire surveys (Tran and Ziegler, 2001; Wetterwald et al., 2004; Dao and Hölscher, 2018).

The research done to date has contributed substantially to the scientific literature on ecosystem services in Vietnam. However, there are still large data/information gaps in terms of the third research group, as discussed below:

- (i) There has been little research investigating the need for ecosystem services by local communities living in buffer zones of protected areas. Such information is important because it would provide a useful reference point for developing appropriate management policies (Jain and Sajjad, 2016; Delgado-Aguilar et al., 2017).
- (ii) The knowledge and perspectives of, and need for, ecosystem services by local communities has not been measured objectively and comprehensively. Several studies have deduced the needs of local communities based on their poor socio-economic conditions or/and traditional customs of using forest resources (Gilmour and Nguyen, 1999; ICEM, 2003). Some researchers have focused on a range of provisioning ecosystem services, such as non-timber forest products, and they have tried to assess needs through structured questionnaires (Wetterwald et al., 2004; Polesny et al., 2014; Polesny et al., 2014; Kim et al., 2017; Dao and Hölscher, 2018). This approach limits opportunities for respondents to express their needs in relation to other ecosystem services.
- (iii) Spatial distribution of activities involving collecting of ecosystem services has not been the focus of previous studies. However, this focus is necessary because the spatially-explicit data describing the

collection location of ecosystem services provides a basis for determining areas to prioritize for protection; it further provides guidance on building appropriate management policies (Delgado-Aguilar et al., 2017).

- (iv) The contributions from forest ecosystem services to local livelihoods have seldom been measured in the studies done to date. This data would help us to understand the degree of ecosystem service dependence by communities. It would also help with the development of appropriate management strategies that take account of the need to balance conservation and local livelihood development (Jain and Sajjad, 2016).

2.2 Overview of Protected Areas and Buffer Zones

2.2.1 Definition and Classification of a Protected Area

The most-used definition of a protected area in the literature is that of the International Union for Conservation of Nature (IUCN), which is:

“A protected area is a clearly defined geographical space, recognized, dedicated and managed through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (IUCN, 2008, page 8).

According to the IUCN (2008), protected areas are classified into seven categories (Table 2.1).

Table 2.1 Types of protected area classified by the IUCN

Types		Description
Ia	Strict Nature Reserve	– Strictly protected: human visitation; use and impacts are strictly controlled/limited to ensure protection of the conservation value of the area – Established to protect biodiversity and geological/geomorphic features – Can serve as reference area for scientific research and monitoring
Ib	Wilderness Area	– Unmodified or slightly modified area without permanent or extensive human habitation – Established to preserve the area in its natural condition
II	National Park	– Large natural or near-natural area – Established to protect large-scale ecological processes, characteristic species and ecosystems – Also set up to provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities
III	National Monument or Feature	– Generally, a small protected area that often has high value to visitors – Established to protect a specific natural monument (a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove)
IV	Habitat Species Management Area	– Established to protect particular species or habitats
V	Protected Landscape/Seascape	– Area created by the interaction of people and nature over time, which contains distinct characters with high ecological, biological, cultural and scenic values – Established to safeguard the integrity of the interaction. This is vital to protecting and sustaining the area and its associated nature conservation and other values
VI	Protected area with sustainable use of natural resources	– Most of the area is natural, under sustainable natural resource management and with low-level, non-industrial use of natural resources compatible with nature conservation – Established to conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems
Source: Adapted from IUCN (2008)		

2.2.2 Reasons for the Establishment of Protected Areas

According to the International Union for Conservation of Nature (IUCN, 2008), protected areas or networks of protected areas are principally established for biodiversity conservation through the maintenance of healthy natural ecosystems, ecological processes, and being refuges for species. Protected areas help to preserve specific habitats and special ecological processes. They furthermore provide spaces for ensuring normal ecological functions to prevent ecosystem fragmentation (Parrish et al., 2003; Chape et al., 2005; Hummel et al., 2019). Beside these functions, protected areas can also be established and managed to promote and preserve valuable cultural ecosystem services, such as recreation, research, education, and scenery (Scull et al., 2017; Hummel et al., 2019). In addition, because the quality of nature and ecosystem services in protected areas is better than the surrounding areas, they can be considered as a benchmark to assess the effects of human interactions with the natural environment (Hummel et al., 2019).

2.2.3 Global Extent of Protected Areas

Established in 1872, Yellowstone National Park managed under United States law was the first official protected area in the world. It was described as “a public park or pleasuring ground for the benefit and enjoyment of the people” (Keigley, 2019). Protected areas now form an essential part of most national and international conservation strategies. The number of protected areas around the world has increased significantly from 9,214 sites in 1962 to 238,563 sites in 2018. The number and size of protected areas varies significantly around the globe. At the global scale, Europe has the highest number of protected areas (61.7% of total

number of world's protected areas), followed by North America (17.7%), Oceania (7.3%), Asia (6.2%), Africa (3.5%), and others (3.6%). However, the total percentage area under protection per continent is the highest in Oceania (29.1% of total area of the world's protected areas), followed by North America (17.8%), South America (13.9%), Africa (10.8%), Asia (9.7%), Europe (9.2%), Southern Oceans (7.6%), and other (1.9%) (UNEP-WCMC, 2018).

Besides having protection at the national and sub-regional scale, some international and regional protected area networks have been established under global and regional regulations. Well-known networks include the United Nations Educational, Scientific and Cultural Organization's (UNESCO) World Heritage Sites, their Global Geoparks, as well as their Man and the Biosphere (MAB) Programme Reserves. Other global initiatives include the RAMSAR Convention on Wetlands of International Importance especially as Waterfowl Habitat, and the Natura 2000 network in Europe (Hummel et al., 2019).

2.2.4 Definition of "Buffer Zone"

There is no uniform definition for the term "buffer zone", and as such there is little consistency with how it is presented in the literature (Ebregt and De Greve, 2000). However, the definitions often refer to its function in supporting biodiversity conservation of protected areas, while taking the socio-economic development of local communities into account (Sayer, 1991; Wild and Mutebi, 1996; Ebregt and De Greve, 2000). In addition, the restriction in land/resource use is clearly presented in these definitions. Some of the most widely-cited definitions of "buffer zone" are as follows:

“Buffer zone is a zone, peripheral to a national park or equivalent reserve, where restrictions are placed upon resource use or special development measures are undertaken to enhance the conservation value of the area” (Sayer, 1991, page 2).

"Buffer zones are areas adjacent to protected areas, on which land use is partially restricted to give an added layer of protection to the protected area itself [,] while providing valued benefits to neighboring rural communities" (defined by Mackinnon as cited in Martino (2001), page 3).

“Buffer zone is any area, often peripheral to a protected area, inside or outside, in which activities are implemented [in] the area managed with the aim of enhancing the positive and reducing the negative impacts of conservation on neighboring communities and of neighboring communities on conservation" (Wild and Mutebi (1996) as cited in Ebregt and De Greve (2000), page 12).

2.2.5 Protected Areas and Buffer Zones in Vietnam

In Vietnam, protected areas are designated as “prohibited areas” or “isolated areas” and are managed by the “fine and fence” or “exclusion and punishment” policy style (as defined in Section 1.1) (ICEM, 2003; Decree No. 117, 2010). In 1962, the first protected area (then named Cu Phuong Protected Forest, and currently named Cuc Phuong National Park) was established. This marked the first attempt by the Vietnamese government to ensure forest biodiversity conservation (ICEM, 2003). Since then, the number of protected areas has rapidly increased. Over the period 1986–2002, the protected area coverage increased from 1.3 million hectares to approximately 2.4 million hectares. Vietnam has 164 terrestrial protected areas,

covering 7.4% of the country's total land area (De Queiroz et al., 2013, Nguyen, 2014). Protected areas in Vietnam are classified into five categories: nature reserves; national parks; landscape protection areas; scientific practice and research forests; and species/habitat conservation areas. Vietnam also has nine marine protected areas, covering 4.9% of the country's waters (Decree No.65, 2010; De Queiroz et al., 2013). These protected areas are equivalent to categories Ia, Ib, II, III, or IV as classified by the International Union for Conservation of Nature (IUCN) (Table 2.2). Vietnam does not have any protected areas in IUCN categories V and VI, which would allow sustainable use of natural resources in protected areas (ICEM, 2003; Nguyen, 2014). Among the existing protected areas in the country, "national parks" (category II) have the largest size (with an average area of 34,054 hectares), followed by "nature reserves" (category IB and with an average area of 26,236 hectares), and "species/habitat conservation areas" (category IV and with average area is 5,072 hectares) (Nguyen, 2014). Beside these protected areas, Vietnam has several other categories of protected areas which meet other criteria, both in terms of nature conservation and development priorities. Between 1993 and 2002, one RAMSAR site (Xuan Thuy), five World Heritage Sites (Ha Long Bay, Hoi An Ancient Town, Phong Nha-Ke Bang National Park, Trang An Landscape Complex, and the Complex of Hue Monuments), and two Man and Biosphere Reserves (Can Gio and Cat Tien) were certified in Vietnam (ICEM, 2003; Nguyen, 2014).

Table 2.2 Categories of protected areas in Vietnam and their equivalent IUCN categories

Vietnam categories	Equivalent IUCN categories	Number
National park	II	30
Nature reserve	IB	58
Species/Habitat conservation area	IV	11
Landscape protection area	III	45
Scientific practice and research forest	IA	20
Total		164
Source: Decree No.65, 2010; IUCN, 2008; Nguyen, 2014.		

The Vietnamese government has implemented several legal instruments to manage the protected areas, e.g., laws for Environment Protection in 2004, Protection and Development of Forest in 1991 and 2004, and Biodiversity in 2008. The key governmental organizations responsible for the management of protected areas are the: Ministry of Agriculture and Rural Development; Ministry of Natural Resources and Environment; Ministry of Culture and Information; Ministry of Planning and Investment; Vietnam National Administration for Tourism; and the Provincial People's Committees. Vietnam has participated in several international conventions with regard to natural and landscape conservation, such as the Convention on Trade in Endangered Species (CITES) signed in 1973, RAMSAR signed in 1989, and the Convention of Biodiversity signed in 1994 (Nguyen, 2014).

There have been major achievements in improving the country's protected area network, with forest area under protection having steadily increased between 1995 and 2004. In recent years, total forest coverage has been a slight increase from 37% to 39%. However, the biodiversity in Vietnam still faces challenges, including a concerning trend of forest fragmentation; biodiversity degradation has also been observed during the recent period (Nguyen, 2014). As cited in Nguyen (2014), only 4.6% of natural forest could be evaluated as "rich closed-canopy forest",

while about 67% has been categorized as "poor secondary forest". Wetland and marine ecosystems have also been degraded (Nguyen, 2014). Factors driving the degradation include population growth, poverty, and lack of a sustainable management mechanism (ICEM, 2003; Nguyen, 2014). De Queiroz et al. (2013) showed that there is a strong correlation between the distribution of protected areas and poverty in Vietnam. Poor local communities living in the buffer zones have limited paddy fields; these are too small to permit sufficient food production (Gilmour and Nguyen, 1999; De Queiroz et al., 2013). The governmental policies aim to ensure sufficient resources to cover operational costs for the protected areas, mainly staffing and administrative costs, as well as environmental monitoring and process (ICEM, 2003; Nghiem, 2017). However, the policies do not pay much attention to local livelihoods. Consequently, poor communities become dependent on forest ecosystem services (Gilmour and Nguyen, 1999; De Queiroz et al., 2013).

In Vietnam, "buffer zones" are defined as forest, land, wetland, coastal-island land, or marine areas, which are contiguous to protected areas (Decision No.186, 2006, Circular No.10, 2014). Buffer zones can be located either inside or outside the boundaries of protected areas. The establishment of buffer zones is aimed at preventing or reducing negative impacts on the protected areas. The establishment of buffer zones is also intended to attract the participation of local communities in co-management of the protected areas, and to gradually improve the livelihoods of those living in the buffer zones. However, these functions have not been clearly set out in the legal framework (Decision No.186, 2006, Circular No.10, 2014). There is also no general regulation to date determining the boundaries of buffer zones. Most buffer zone boundaries are contiguous with the boundaries of communes adjacent to protected areas. In several cases, buffer zones have their own boundaries (as in

the case of Bach Ma National Park, presented in Figure 3.1) (Gilmour and Nguyen, 1999). In practice, the buffer zones includes various land uses, such as forestland, agricultural land, and residential areas (Gilmour and Nguyen, 1999).

2.3 Overview of Tourism

2.3.1 Definition of Tourism

The United Nations World Tourism Organization (UNWTO) defines tourism as “a social, cultural, and economic phenomenon which entails the movement of people to countries or places outside their usual environment for personal or business/professional purposes” (UNWTO, n.d.).

2.3.2 Contributions to Socio-economic Development

The contributions of tourism can be seen clearly in economic and sociocultural aspects (Sithole, 2017), and includes direct and/or indirect injection into a country's local/regional/national gross domestic product (Sithole, 2017). It provides income-earning opportunities for local communities through increasing job opportunities and establishment of markets for local agricultural and other products (Sithole, 2017). Tourism drives development of local infrastructure and recreational areas; it therefore contributes considerably to improving the quality of life for local communities (Brunt and Courtney, 1999; Sithole, 2017). It furthermore provides opportunities for preserving local culture. This is achieved both through the introduction of tourists to an area, and through maintaining local social coherence (Ahebwa, 2013). Tourism connects people from different cultures so that it creates opportunities for cultural exchange (Sithole, 2017). It can also be a means for solving

social issues such as unemployment and poverty, and promoting social coherence among individuals of a local community (Li et al., 2018). Beside these, sustainable tourism can be a means to reducing dependence of poor local communities on natural resources (Toko, 2016). Because of the above benefits, tourism can indeed be a driver for development.

Many countries have realized that tourism is an important sector for their respective economies because of its contribution to social and economic development (Sithole, 2017). Globally, tourism is the third-largest industry after oil/gas and electronics. Annual revenue is estimated to be 3.5 trillion USD, accounting for 6.6% of world income (Neckermann, 2013). In the recent decades, a shift from standardized mass tourism to more individualistic patterns has been observed, in which greater flexibility and more meaningful experiences have gained prominence (Briedenhann and Wickens, 2004). Tourists to rural areas have such opportunities as experiencing ecological uniqueness, special adventure, local culture, or the peace and quiet of the countryside (Briedenhann and Wickens, 2004).

Tourism becomes an alternative development option for economic and social regeneration in rural areas of developed countries where there is decrease in economic activity and rural industrialization, and out-migration of youth with higher education (Briedenhann and Wickens, 2004). In developing countries affected by rural poverty, such as sub-Saharan Africa, tourism is one of the few feasible options for development (Briedenhann and Wickens, 2004). Tourism which aims to achieving a balance between economic development and natural conservation has been implemented in some developing countries such as Nepal (Lama, 2000), Tanzania (Nelson, 2003), Botswana (Mbaiwa, 2005), Kenya (Akama and Hall,

2007), Uganda (Ahebwa, 2013), Cambodia (Toko, 2016), and Malaysia (Goh, 2017). The main benefits from tourism for the local communities are from generation of income and increase in conservation awareness. The communities place value on the natural resources and work to conserve, rather than deplete, the resources.

2.3.3 Tourism in Central Vietnam

This section provides an overview of tourism development in administrative units in and around the study area, described further in Chapter 3.

Tourism has been a focus in Vietnam since the introduction of “Đổi Mới” (restoration) reform policies in 1986 (Bee, 2008). Recently, the government has attempted to develop tourism as a spearhead economic sector (Resolution No. 103, 2017). Following the reorientation of the central government, the administrative units in Central Vietnam have developed specific strategies for tourism, such as in Da Nang city via Decision No. 2551 (2012), Thua Thien Hue province via Decision No.1622 (2013) and Quang Nam province via Decision No.1117 (2018). Da Nang is the third-largest city in Vietnam, and has been developed for coastal tourism and the provision of modern services (Hildebrandt and Isaac, 2015). Tourism in Thua Thien Hue is based on well-known resources of historical and heritage value (Nguyen and Cheung, 2014; Hildebrandt and Isaac, 2015). Quang Nam is famous for two UNESCO World Heritage Sites (in Hoi An and My Son) (Hildebrandt and Isaac, 2015). Recently, the government of Quang Nam province has started to promote tourism in mountainous districts. The use of local resources and involvement of community participation in tourism plans is being encouraged by the government (Resolution No.47, 2018). In practice, only a part of the local culture

has been explored, with the focus being on traditional handicraft weaved by the Cotu people (FID/R, 2006; ILO, 2013). Local resources with other cultural and natural value have not been paid meaningful attention with regards tourism. Further investigation into the local resources with tourism potential, notably the mountainous districts, could provide scope for expansion of the industry, if this is accompanied by suitable investment.

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Chapter 3 STUDY AREA AND RESEARCH METHODOLOGY

3.1 Description of Study Area

3.1.1 Bach Ma National Park

This section provides an overview of Bach Ma National Park, with the description of administrative location; forest resource; climatic condition; and topographical and geological features.

Administrative Location

Bach Ma National Park was firstly established in 1991 as a protected area (Decision No. 214, 1991), and its area was extended in 2008 (Decision No. 01, 2008). Currently, the Park stretches from 15°59'28" to 16°16'02" North latitude and from 107°37'22" to 107°54'58" East longitude (Decision No. 01, 2008). The boundary of Bach Ma National Park is shown in Figure 3.1 and its characteristics of the spatial distribution are as follows:

- (i) The North is adjacent Phu Loc district, Thua Thien Hue province.
- (ii) The West is adjacent Nam Dong district, Thua Thien Hue province.
- (iii) The East is adjacent Hoa Vang district, Da Nang city.
- (iv) The South is adjacent Dong Giang district, Quang Nam province.

The total area of the Park is 37,487 hectares, of which 34,380 hectares in Thua Thien Hue province and 3,107 hectares in Quang Nam province. The Park consists of three subdivisions: strictly protected area (12,065 hectares); ecological restoration area (20,234 hectares); and administrative service area (5,188 hectares) (Decision No. 01, 2008).

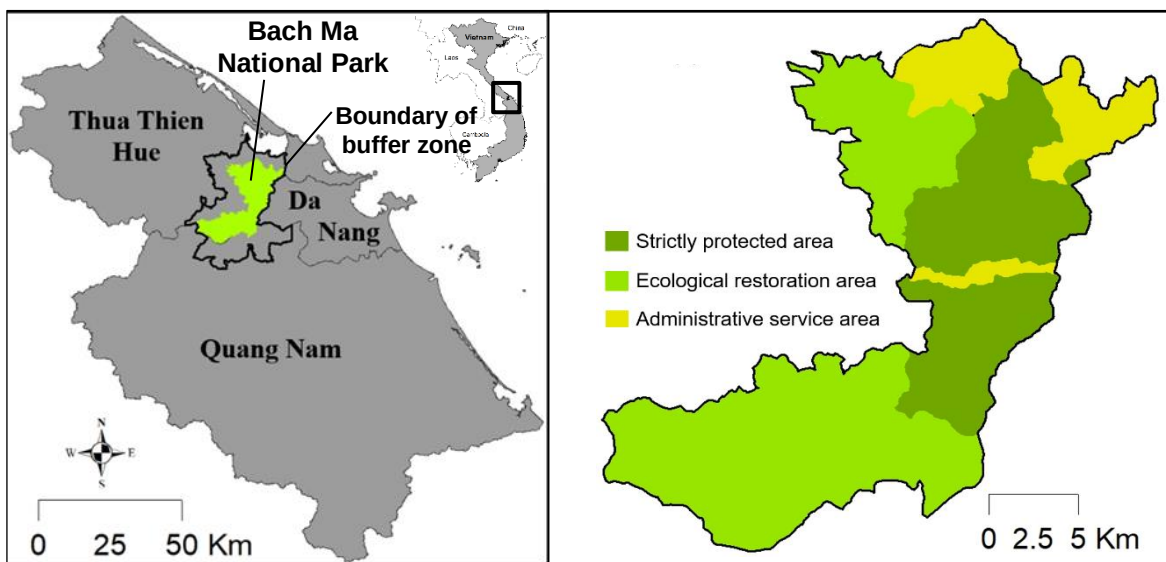


Figure 3.1 Location of Bach Ma National Park

Forest Resource

Total area of natural and planted forests in Bach Ma National Park is 32,428.2 hectares, with a dominance of natural forest (31,845.3 hectares). Based on the area of standing tree reserve, Vietnam government classified natural forest into following five categories: very rich forest (over 300 m³/hectare); rich forest (200-300 m³/hectare); medium forest (100-200 m³/hectare); poor forest (10-100 m³/hectare); and others (less than 10 m³/hectare) (Circular No. 34, 2009). Bach Ma National Park does not have very rich forest. The area of rich forest is 11,445.3 hectares, accounting for 30.5% total area of natural forest, and often distributes at the attitude above 500 m. The areas of medium and poor forests account for approximately

equal proportions, 22.9% and 23.5% of total area of natural forest, respectively. Poor forests are found mainly near settlements (Decision No.1633, 2011; Nguyen, 2015). The details of forest categories in the Park are shown in Table 3.1.

Table 3.1 Forest categories in Bach Ma National Park and their areas

Forest categories	Area (hectare)			Percentage (%)
	Thua Thien Hue	Quang Nam	Total	
Natural forest	28,738.3	3,107	31,845.3	86.5
Rich forest	9,844.3	1,601	11,445.3	30.5
Medium forest	7,931	642	8,573	22.9
Poor forest	7,929.9	864	8,793.9	23.5
Rehabilitation forest	3,033.1	-	3,033.1	8.1
Planted forest	582.9	-	582.9	1.6
Shrubs and regenerated forest	4,536.2	-	4,536.2	12.1
Non-forest	522.6	-	522.6	1.4
Total	34,380	3,107	37,487	100
Source: Decision No.1633, 2011.				

The common types of forest ecosystem are tropical monsoon forests at lowland areas and subtropical monsoon forests at altitudes between 900 m and 1,450 m (Tran and Ziegler, 2001). Around 7% of fauna (2,151 species) and 17% of flora (2,373 species) in Vietnam were identified in the Park. Regarding the flora, moss has 25 families and 87 species; fern and relatives are with 28 families and 183 species; mushroom consists of 55 families and 332 species; and conifer and non-conifer have 164 families and 1,771 species (Huynh and Tran, 2011). The fauna is also diverse, with a total of 293 families and 2,151 species. The details are as follows: fish is with 18 families and 76 species; reptile and amphibian with 21 families and 145 species; mammal with 31 families and 136 species; bird with 57 families and 365 species; and insect with 166 families and 1,429 species as shown in Table 3.2 (Huynh and Tran, 2011; Phan, 2015).

Although being managed strictly by specific legal policies, the forest resources and biodiversity of Bach Ma National Park have faced with many threats, such as land use policy changes, population pressure, poverty, illegal logging and hunting, and infrastructure development. The population of some rare species is at risk of decline. Some of these species have faced with extinction (Webb and Honda, 2007; De Queiroz et al., 2013; Huynh et al., 2016; Pham et al., 2018).

Table 3.2 Number of species in Bach Ma National Park

	Total number of species	Number of species mentioned in Vietnam's Red Book ¹
Flora	2,373	73
Coniferous and non-coniferous	1,771	68
Mushroom	332	4
Fern and relatives	183	1
Moss	87	0
Fauna	2,151	79
Insect	1,429	2
Bird	365	18
Reptile and amphibian	145	18
Mammal	136	39
Fish	76	2
Total	4,524	152

¹Vietnam's Red book shows a list of rare species native in Vietnam and species with decline in population or facing with the extinction. The book is used as legal basis for building governmental regulations regarding wildlife conservation in Vietnam. It consists of two parts: Animals (MSTE, 2007a) and Plants (MSTE, 2007b). Source: Huynh and Tran (2011).

Climatic Condition

Annual mean temperature in Bach Ma National Park is 25°C. The temperature changes by altitudes and regions. For example, the annual mean temperature is 24°C in low altitude areas of Nam Dong, and 19°C in areas with altitudes above 1,200 m (Nghiem, 2017). Bach Ma National Park is identified as one of areas with the highest rainfall total in Vietnam, with rainy season from September

to January (Gilmour and Nguyen, 1999). The annual mean rainfall in the whole region is 3,440 mm/year. The highest rainfall is identified in the top of the Park, around 8,000 mm/year. Annual mean humidity in the whole area is 85%. Because of high rainfall and high density of forest cover in the top, the annual mean humidity here is very high, around 90% (Nghiem, 2017). An example of climatic condition in Bach Ma National Park, which was measured in Nam Dong from 1973 to 2010, is shown in Figure 3.2.

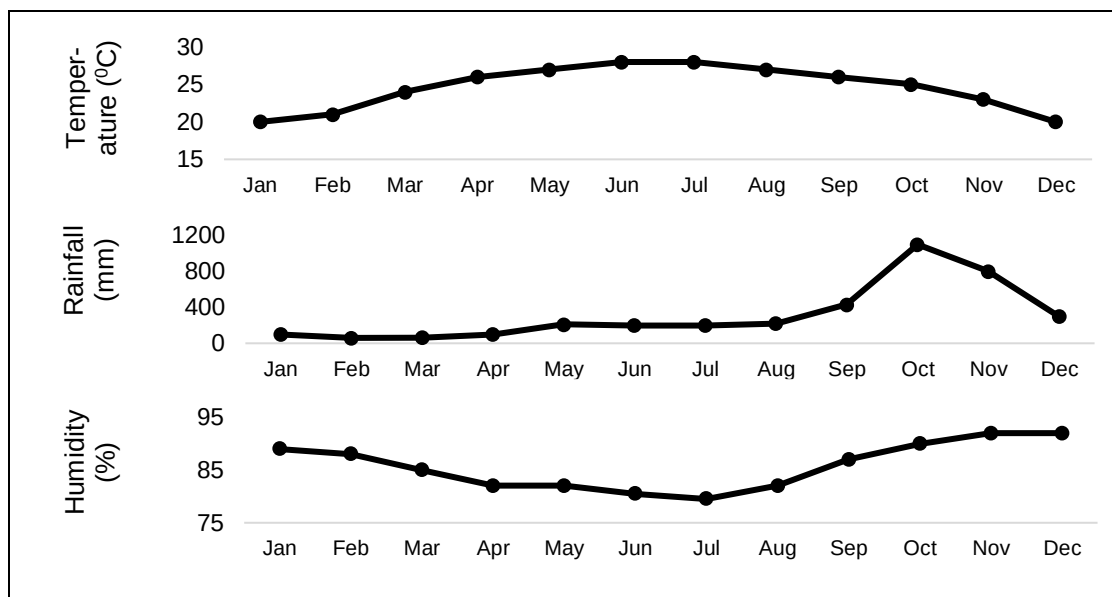


Figure 3.2 Climatic condition in Nam Dong from 1973 to 2010 (presented monthly in mean values) (Source: Thua Thien Hue hydro-meteorological office as cited in Nghiem (2017))

Topographical and Geological Features

Bach Ma National Park consists of many hills and mountains, which separate from each other by small, short, and sloping streams. The topography is mainly steep and rugged (Nguyen, 2015). As cited in Nghiem (2017), the area is covered mainly by ferrallitic soils which are often very desaturated, acidic, deficient in phosphor and nitro, and poor in bases.

3.1.2 Buffer Zone of Bach Ma National Park

This section provides an overview of administrative location; population and ethnic composition; and the life of local communities in the buffer zones.

Administrative Location

The buffer zones are located within 15 communes across three districts in two provinces (Figure 3.3), and cover an area of 58,676

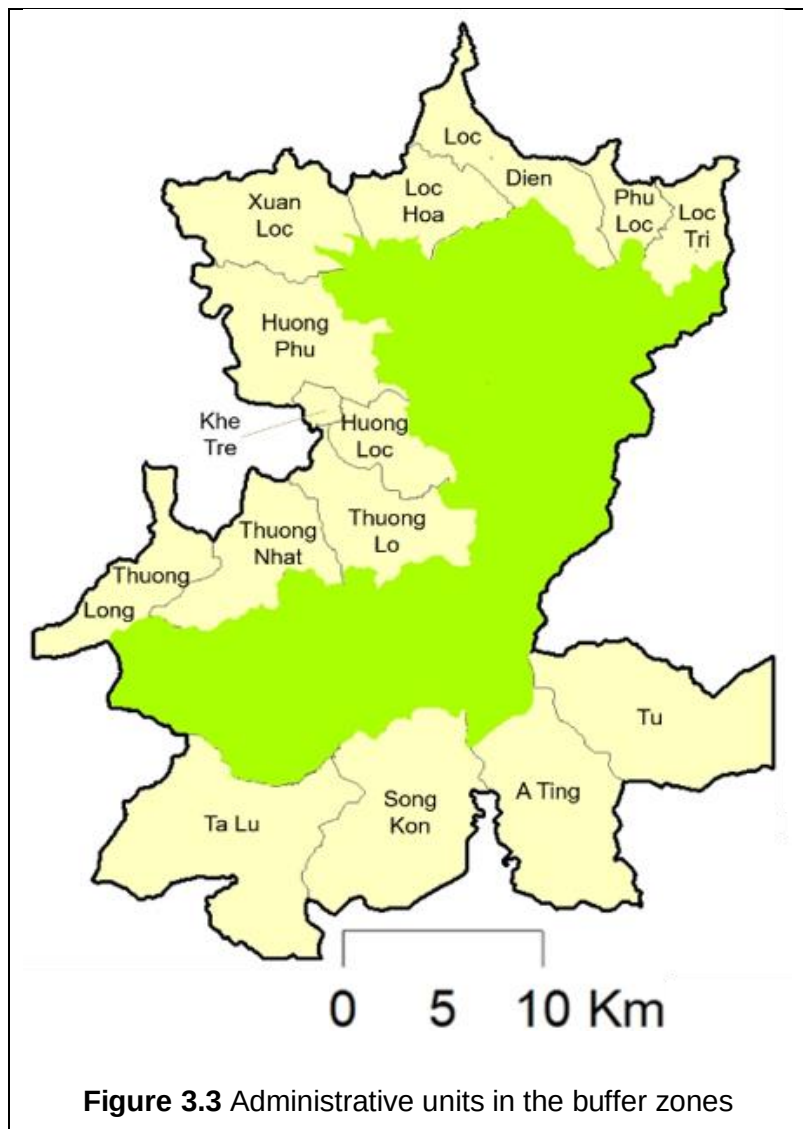


Figure 3.3 Administrative units in the buffer zones

hectares. In Thua Thien Hue province, Phu Loc (plain district) is with four communes and one town, and Nam Dong (mountainous district) has five communes and one town. In Quang Nam province, there are four communes of Dong Giang district (mountainous district) belonging to the buffer zones. The features of administrative units are shown in Table 3.3

Table 3.3 Features of administrative units in the buffer zones

	Area (km ²)	Population	Poor socio-economic unit classified by the government
Thua Thien Hue province			
Phu Loc district			
Xuan Loc	43.8	2,709	✓
Loc Hoa	32.5	2,502	✓
Loc Dien	115.4	13,124	
Loc Tri	62.6	7,307	✓
Phu Loc (town)	27.7	10,613	
Nam Dong district			
Thuong Long	50.7	2,694	✓
Thuong Nhat	113.8	2,223	✓
Thuong Lo	106.5	1,285	✓
Huong Phu	79.6	3,322	
Huong Loc	65.7	2,310	
Khe Tre (town)	4.3	3,818	
Quang Nam province			
Dong Giang district			
Ta Lu	82.5	938	✓
Song Kon	79.9	2,398	✓
A Ting	77.1	2,382	✓
Tu	93.4	1,456	✓
Total	1,035.4	59,081	

Source: Decision No. 01, 2008; Decision No. 73, 2016; DGS, 2017; NDS, 2017; PLS, 2017.

Population and Ethnic Composition

There is no human habitation inside Bach Ma National Park. A population of 59,081 people living in the buffer zones (Table 3.3). In whole area, mean population density is about 57 people/km² (calculated from Table 3.3). Among the districts of the buffer zones, Dong Giang has the lowest population density (21 people/km²) and the highest population growth rate (1.9%). In contrast, Phu Loc is with the highest population density (135 people/km²) and the lowest population growth rate (0.8%) (BMNP, 2013).

Four ethnic groups inhabit the area: Kinh constitute 84.1% of the population; Cotu with 15.6%; Van Kieu with 0.7%; and Muong with 0.04% (Van et al., 2016). While most Kinh people live in Phu Loc (80.4%), Cotu ethnic minorities inhabit in Dong Giang (53.1%) and Nam Dong (46.9%). Van Kieu and Muong ethnic minorities live in Phu Loc (Table 3.4).

Table 3.4 Ethnic composition and population density in the buffer zones

District	Ethnic (%)				Average population density (people/km ²)
	Kinh	Cotu	Van Kieu	Muong	
Phu Loc	80.4	0	100	100	135
Nam Dong	17.8	46.9	0	0	34
Dong Giang	1.8	53.1	0	0	21
Total	100	100	100	100	-

Source: BMNP, 2013.

The Life of Local Communities

The life of local communities living in the buffer zones has faced with many economic difficulties. Ten out of 15 administrative units of the buffer zones are classified into poor socio-economic units by Vietnam government (Table 3.3). The rate of poor households is clearly different between Thua Thien Hue (8.0%) and Quang Nam (18.2%) (Decision No.749, 2013). In the administrative units of the two provinces belonging to the buffer zones, the rate is also clearly different. The rate is from 9% to 24% in the administrative units of Phu Loc, and from 9% to 22% in the units of Nam Dong (Thua Thien Hue). In contrast, the rate of poor households is much higher in Dong Giang of Quang Nam, e.g. 57% in Song Kon commune and 41% in Ta Lu commune (BMNP, 2013).

In the plain district (Phu Loc), local livelihoods are more diverse than in mountainous districts like Nam Dong and Dong Giang. Beside agriculture (mainly

for wet rice cultivation), most of local communities have chances to generate income from aquaculture, industry, and commerce because this area is near Cau Hai lagoon, Phu Bai industrial park, and Hue city. In the mountainous districts, agriculture (mainly for dry rice cultivation) and forestry (mainly for Acacia or/and rubber plantation) are main livelihoods.

Through field surveys, the author observed that among the districts of the buffer zones, Phu Loc has the greatest number of permanent houses, next to Nam Dong. In contrast, houses made mainly from forest provisioning ecosystem services are very popular in Dong Giang. An example of local houses in the districts is shown in Figure 3.4.

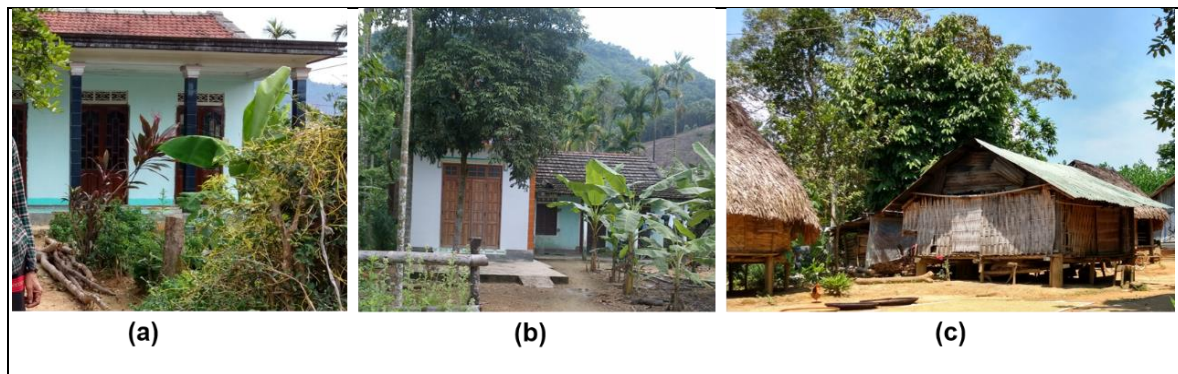


Figure 3.4 Examples of local houses in: (a) Phu Loc, (b) Nam Dong, and (c) Dong Giang

3.2 Research Methodology

This research used a combination of qualitative and quantitative methods, which consist of participatory mapping; interviews and questionnaire surveys; ecosystem services valuation; and geographic information system (GIS) - based multi-criteria decision analysis. This section provides theoretical basis of these methods. Their applications in detail are described in Chapter 4, 5, and 6.

Participatory mapping is defined as “a set of approaches and techniques that combine tools of modern cartography with participatory methods to represent the spatial knowledge of local communities” (UNFCCC, 2016). Participatory mapping is suitable for identifying spatial distribution of provisioning and some cultural ecosystem services to support various stakeholders in decision-making process (Ramirez-Gomez et al., 2016; Reilly et al., 2018; Ardaya et al., 2019). Participatory mapping can help to collect local ecological knowledge; stakeholders’ perceptions; and stakeholders’ experiences of ecosystem services (Fagerholm et al., 2012; Brown, 2013; Reilly et al., 2018). In this research, participatory mapping was employed to identify experiences and perceptions of local communities in forest ecosystem services. There are several options for participants to express their opinions during mapping exercises. The followings are examples. The first option is delineating sites on a map using pencils or markers (Fagerholm et al., 2012; Klain and Chan, 2012). Second option is locating sites on a map or aerial photographs using color-coded stickers/markers (Brown, 2004; Raymond et al., 2009; Delgado-Aguilar et al., 2017). Third option is answering questionnaires regarding sites/areas marked on a map (Tyrväinen et al., 2007). In this research, the second option was applied to identify sites where local communities often collect forest ecosystem services in Chapter 4, and the third option was used to determine local resources, which could be utilized for tourism development in Chapter 6.

As mentioned in section 2.1.2, monetary and non-monetary valuations are examples to identify values of ecosystem services. In this research, monetary valuation was chosen. There are three common objectives of monetary valuation of ecosystem services. The first one is to highlight the significance of ecosystem services in the society and economy. The second one is to provide a significant

reference in development of cost-effective policy instruments for natural restoration and management. The third one is to support impact assessments in cost-benefit analysis (Lieken et al., 2013). This research focuses on the first objective of monetary valuation in Chapter 5.

GIS based multi-criteria decision analysis focuses on integrating the information from multiple criteria to form a single index of evaluation (Chen et al., 2010). The analysis helps to evaluate issues/objectives with different views, multiple components, and consider comprehensive relationships between these components (Malczewski, 2006). In the process of selecting suitable sites for tourism, GIS based multi-criteria decision analysis is applied popularly. Studies conducted by Bunruamkaew and Murayam (2011) in Thailand, Ahmadi et al. (2015) in Iran, Wong and Fung (2016) in China, Çetinkaya et al. (2018) in Turkey, and Mansour et al. (2019) in Oman are typical examples of the application. Multiple criteria were considered in integrating GIS technology in these studies. The common criteria are landscape, topography, and accessibility. In this research, GIS based multi-criteria decision analysis was applied to assess the local resources with natural values, which could be utilized for tourism development in Chapter 6.

Interview, questionnaire survey, and group discussion are popular approaches to collect data in various research fields. These approaches were conducted with individuals working on local natural resources and benefiting from forest ecosystem services in Chapter 4, 5, and 6.

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Chapter 4 NEED FOR FOREST ECOSYSTEM SERVICES BY LOCAL COMMUNITIES

4.1 Introduction

Measurement of the dependence of local communities on natural resources can provide significant references to develop sustainable management strategies for protected areas (McNeely, 1994; Palomo et al., 2013). The forest resources and biodiversity of Bach Ma National Park are under various threats, of which excessive harvest of forest ecosystem services, such as timber and non-timber forest products, is supposed as one of direct threats (Webb and Honda, 2007; De Queiroz et al., 2013; Huynh et al., 2016; Pham et al., 2018). Most local communities living in the buffer zones of the Park are classified into poor ones by Vietnam government (Table 3.3). Although there is a strong correlation between poverty and forest dependence (Byron and Arnold, 1999; Belcher, 2005; Sunderlin et al., 2005; Asfaw et al., 2013; Dash and Behera, 2016), very few studies have attempted to reveal empirical data on the forest dependence of local communities living in the buffer zones. Measuring the forest dependence and subsequently incorporating understandings from the measurement into making relevant policies can be important steps for realizing successful management for Bach Ma National Park and its buffer zones.

This chapter aims to provide an understanding of the forest dependence of local communities living in the buffer zones of Bach Ma National Park through discussing the following research questions:

- (i) Which types of forest ecosystem services do local communities collect?
- (ii) What are purposes of the collection?
- (iii) When and where is the collection conducted?

4.2 Methodology

A combination of qualitative methods, such as interviews and participatory mapping, and a quantitative method, such as spatial analysis, were applied in this study.

The survey was conducted from April to

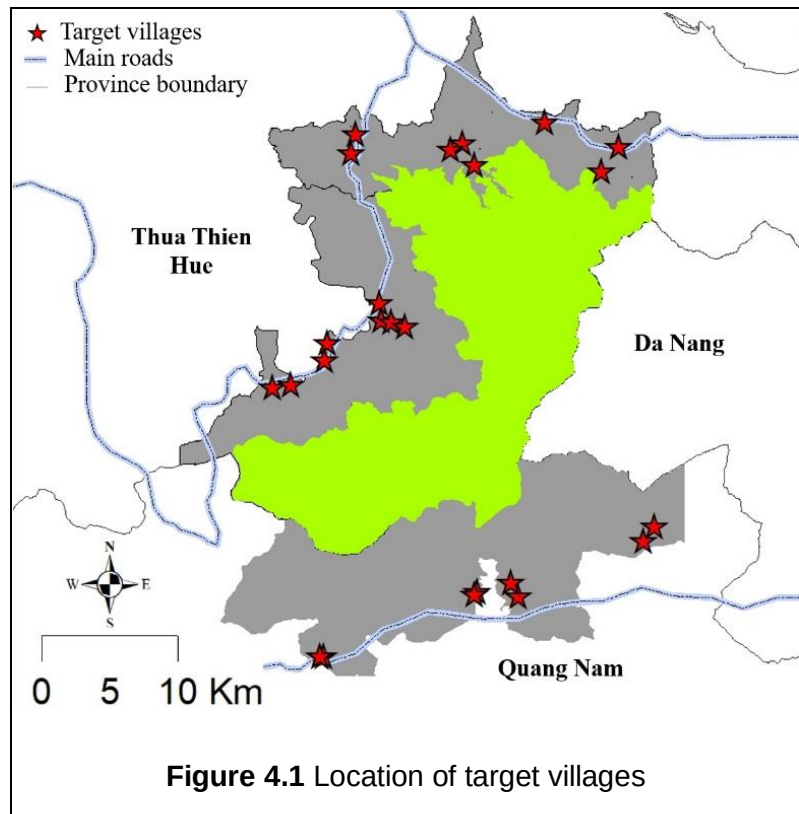


Figure 4.1 Location of target villages

June in 2017. Interviews were based on semi-structured questionnaires and were initially conducted with 20 respondents to identify crucial forest ecosystem services for local communities. Interviewees were experts and local officials working in governmental or non-governmental organizations, who were familiar with the natural resources existing in the area as well as the local livelihood practices.

Based on consultation with commune officials, 24 villages, which consist of the highest number of poor households living near the forests, were selected as target villages (Figure 4.1). Twenty-four meetings with 170 participants, including

local community representatives, were undertaken to elucidate the crucial ecosystem services. The participants in meetings were selected based on the results of interviews with village leaders. Generally, the men access the forests to collect forest provisioning ecosystem services, occasionally staying for several days to collect the varieties and amounts they need. The role of women was rarely mentioned. In several villages, they collected only foods (vegetables and mushrooms), but their main responsibilities were cited as housework, children, and cultivating agricultural crops. Structured questionnaires were employed to obtain the information regarding (1) socio-demographic aspects of respondents, (2) ecosystem services collected by local communities, (3) harvest seasons and usages of ecosystem services, and (4) collection locations. The questions followed a simple and straightforward design, e.g., “where do you often get forest food?” because the local community members were not familiar with the concept of ecosystem services.

A base map and coloured beans were used for the participatory mapping exercise (Figure 4.2). The participants were asked to indicate the locations where they often collected ecosystem services by putting coloured beans on the base map. This mapped information was subsequently digitized using ArcGIS 10.5. The group layers for foods, materials, and water resources were created by merging the separate layers followed by calculation of their densities. Vegetables, bamboo shoots, fruit, mushroom, fish, honey, and wild animal layers were merged into the food layer. Firewood, roof covering material, wood, rattan, medicinal plants, broom materials, and traditional Vietnamese hat material were merged into the material layer. The characteristics of spatial distribution of collection locations and frequency levels of collection were considered in relation to land use, administrative units,

terrain conditions, the proximity to village centers and main roads (Figure 4.3), resource abundance, and forest governance.



Figure 4.2 Mapping the ecosystem services by the local communities

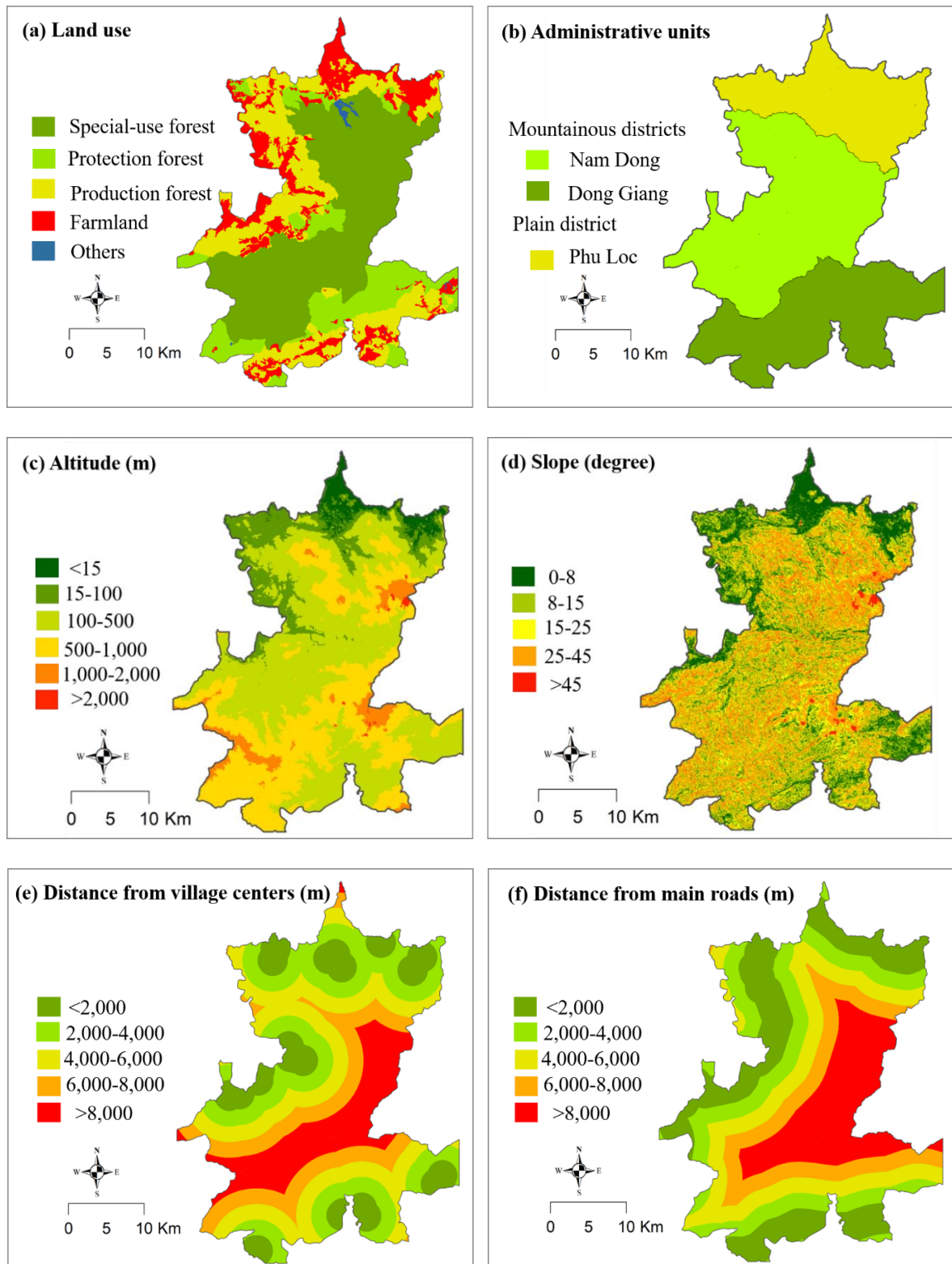


Figure 4.3 Maps of factors considered in relation to the spatial distributions of ecosystem service collection

4.3 Results and Discussion

4.3.1 Socio-Demographic Characteristics of Participants in the Community Meetings

The participants consisted of 97.6% (n = 166) males and 2.4% (n = 4) females (Table 4.1). Previous studies have indicated that males play a greater role in collecting forest products (Cavendish, 2000; Sunderland et al., 2014; Garekae et al., 2017). In this study, males were reported as also hunting, logging, and harvesting of other high-value forest products. More than a half of participants (65.9%, n = 112) were aged between 38 and 49 years, followed by 18–37 years (21.1%, n = 36), and 50–59 years (11.8%, n = 20). Participants over 60 years constituted a small fraction (1.2%, n = 2). Mamo et al. (2007) and Garekae et al. (2017) indicated that young people tend to collect forest products more than elderly people; however, in this study an opposite trend was found when comparing the age groups of 38–49 years and 18–37 years. This is likely because the 38–49 years age group had fewer choices for temporary alternative occupations in comparison to the younger age group. Additionally, two ethnic minority groups, i.e., the Cotu and Muong, accounted for 64.1% (n = 109) and 4.1% (n = 7) respectively of all participants when compared to the Kinh (the largest main ethnic group in Vietnam) who constituted 31.8% (n = 54). The ethnic minorities have been classified as at or below the Vietnam poverty line for many generations (Decision No. 447, 2013; Decision No. 601, 2015; Decision No. 73, 2016) while the Kinh are more wealthy and have several livelihood options such as agriculture, aquaculture, and forestry. With regard to occupation, most participants were farmers (82.4%, n = 140), followed by village officials (15.3%,

n = 26), and housewives (2.4%, n = 4). Indigenous people constituted 96% (n = 163) of the population while immigrant populations constituted (4%, n = 7).

Table 4.1 Sociodemographic characteristics of the participants

Socio-demographic characteristics	Percentages of participants (%) (n=170)
Gender	
Male	97.6
Female	2.4
Age group (years)	
18-37	21.1
38-49	65.9
50-59	11.8
Over 60	1.2
Ethnicity	
Main group (Kinh)	31.8
Ethnic minority	68.2
Cotu	64.1
Muong	4.1
Occupation	
Farmer	82.4
Village official	15.3
Housewives	2.3
Origin of resident	
Indigenous	96
Immigrant	4

4.3.2 Collection of Forest Ecosystem Services

The experts and local officials mentioned eight major ecosystem services which could be divided into provisioning and cultural ecosystem services in accordance with the Millennium Ecosystem Assessment report (MEA, 2003) (Table 4.2). More than half of the interviewees considered provisioning ecosystem services, such as food, water resources, and materials, to be more important to the communities than other services. This finding is similar to previous studies, which have indicated that the dependence on provisioning ecosystem services was more

popular than cultural, regulating, and supporting services (López-Feldman and Wilen 2008; Sakai et al.2016).

Table 4.2 Forest ecosystem services mentioned by experts and local officials

Ecosystem services	Numbers of experts and local officials (n=20)
Environmental education	1
Fiber	1
Tourism	5
Seeds and animal breeding	6
Aesthetics	12
Materials	14
Food	20
Water resources	20

Overall, forest foods were mentioned more frequently than materials and water resources (Table 4.3). Among forest foods, fish was most commonly mentioned (n = 21), followed by bamboo shoots (n = 19), fruit (n = 18), vegetables (n = 18), mushroom (n = 18), honey (n = 16), and wild animals (n = 15). There were significant differences among forest materials. Firewood was most frequently mentioned (n = 22), followed by wood (n = 18), broom materials (n = 14), rattan (n = 12), roof covering materials (n = 12), and medicinal plants (n = 10). In addition, natural springs were the main source of water supply to the villages and were mentioned by the ethnic minorities in 14 meetings and by Kinh in two meetings.

Table 4.3 Forest ecosystem services mentioned by participants in meetings

Ecosystem services	The number of meetings (n=24)		Total
	Ethnic minority participants (n=17)	Kinh participants (n=7)	
Foods			
Wild animals	12	3	15
Honey	15	1	16
Fruit	14	4	18
Vegetables	14	4	18
Mushroom	14	4	18
Bamboo shoots	14	5	19
Fish	15	6	21
Materials			
Vietnam traditional hat materials	8	0	8
Medicinal plants	7	3	10
Roof covering materials	12	0	12
Rattan	10	2	12
Broom materials	12	2	14
Wood	14	4	18
Firewood	15	7	22
Water resources	14	2	16

Previous studies have shown that most local communities living in or near forests in developing countries are poor and rely heavily on natural resources for their subsistence (Mamo et al., 2007; van Noordwijk, 2019). The results in this study show that the number and type of ecosystem services increased in proportion to the number of ethnic minority participants in the meetings. At seven of eight meetings in Dong Giang district, the Cotu participants emphasized that their food requirements were largely met by forest ecosystem services and the agricultural products. However, in meetings organized in Phu Loc district where Kinh people were the majority of participants, forest foods were not mentioned as the main source of supply. In addition, firewood was the most frequently mentioned material

in meetings organized in the two mountainous districts. This is consistent with Tran et al.'s (2017) conclusion that firewood is main energy source in rural families in Vietnam. Moreover, Ramage et al. (2017) highlighted that the demand for wood for the construction of houses is one of the major forest dependences globally, especially among poor communities. The results in this study reflect this as at 75% of the meetings (n = 18) participants indicated dependence in this regard.

The overall responses to harvest seasons of collected ecosystem services were not significantly different among the meetings (Table 4.4). Most foods, except mushrooms and honey, could be collected year-round. Water resources were available year-round; however, participants frequently mentioned some water quality problems, such as bad smell and muddy colour. Eighty percent or more of collected foods, except honey and bamboo shoots, were collected for family consumption; 88% of honey was sold to local markets or traders, and bamboo shoots were used for both the family consumption and sale (Table 4.5). Harvest of materials was conducted mainly during the summer months of July and August, which are marked by little rain and highest monthly temperatures that facilitate collection and preliminary processing (Table 4.4). Movement in mountainous terrain during rainy season is challenging and most forest materials have to be dried before consumption or sale. Sixty percent or more of the collected materials, except rattan and traditional Vietnamese hat materials (10%), were also used for family consumption (Table 4.5). The percentage consumption of collected wood, roof covering materials, and firewood for community activities were 20%, 3%, and 1%, respectively.

Table 4.4 Harvest seasons of the ecosystem services

Ecosystem services	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Food												
Wild animals	+	+	+	+	+	+	+	+	+	+	+	+
Honey			++	++	++	++	++					
Fruit	+	+	++	++	++	++	++	+	+	+	+	++
Vegetables	++	++	++	++	++	++	++	+	+	+	+	++
Mushroom										++	++	++
Bamboo shoots	+	++	++	++	++	++	++	+	++	+	+	+
Fish	+	+	++	++	++	++	++	++	+	+	+	+
Materials												
Vietnam												
traditional hat materials				+	+	+	++	++				
Medicinal plants	+	+	++	++	++	++	++	++	++	+	+	+
Roof covering materials							++	++				
Rattan			+	+	+	++	++	++				
Broom materials				+	+	+	++	++				
Wood							++	++				
Firewood		+	+	+	+	++	++	++				
Water resources												
	++	++	++	++	++	++	++	++	++	++	++	++

The assessment was derived from the most frequent opinions of participants in the meetings.

“++” refers to the main harvest season and “+” refers to the extra harvest season.

Table 4.5 Utilization of the ecosystem services

Ecosystem services	Family consumption (%)	Sale (%)	Village activities (%)
Foods			
Wild animals	90	10	0
Honey	12	88	0
Fruit	80	20	0
Vegetables	92	8	0
Mushroom	90	10	0
Bamboo shoots	48	52	0
Fish	86	14	0
Materials			
Traditional hat materials	10	90	0
Medicinal plants	60	40	0
Roof covering materials	97	0	3
Rattan	10	90	0
Broom materials	90	10	0
Wood	80	0	20
Firewood	96	3	1
Water resources	100	0	0

4.3.3 Spatial Characteristics of Ecosystem Service Collection

In the forestland, 84% (n = 833) and 89% (n = 1,168) collection locations were observed for foods and materials, respectively, of which the production forest was most popular (Table 4.6). The concentration of collection locations was not influenced by resource abundance, but rather by legal regulation of the local community's access to the forests. Using the government criteria of forest classification, the special-use forest covering the Park has the most resource abundance among the three forest types, followed by the protection forest, and the lowest resource abundance is in the production forest (Decision No.61, 2005; Decision No.62, 2005; Circular No.34, 2009). With regard to the governance, the forest resources and forestland are under government management through state

forest organizations. Administratively, the national park management board is responsible for the management of Bach Ma National Park, and the district and commune people's committees and state forest enterprises are responsible for the management of the forests located in the buffer zones. The local communities' access to these forests has been limited by different restriction levels placed on them (the most restrictive in the special-use forest, and the least restrictive in the production forest) (Decree 117, 2010; Decision No. 17, 2015; Decision No. 49, 2016). The number of collection locations for water resources was equivalent in the forests and farmlands ($n = 101$ and 107 , respectively). In addition, the number of collection locations was highest in the mountainous districts, and Dong Giang district showed the highest number of locations for collection of foods, materials, and water resources at 53% ($n = 525$), 51% ($n = 667$), and 48% ($n = 100$), respectively.

With regard to terrain conditions, around 60% of collection locations ($n = 587$ for foods, $n = 752$ for materials, and $n = 139$ for water resources) were located in hilly areas (altitudes from 100 to 500 m). The majority of food and material collection locations were on flatter slopes (from 8 to 15 degrees) and undulating slopes (from 15 to 25 degrees). In addition, the results indicated that the number of collection locations for foods and materials decreased at a distance of over 4 km from the village centers, and increased at a distance of 6 km from the main roads. The measurements showed that most water collection locations were within a distance of 2 km from village centers and main roads.

Table 4.6 Number of the collection locations by the factors

Factors	Area (km ²)	Number of collection locations		
		Food (n=991)	Material (n=1,316)	Water resources (n=208)
Land use				
Forest land				
Special-use	418.2	196	439	6
Protection	149.1	315	284	18
Production	239.1	322	445	77
Farmland	147.3	150	148	107
Others	4.3	8	0	0
Administrative units				
Mountainous districts				
Dong Giang	302.4	525	667	100
Nam Dong	420.5	362	443	95
Plain district				
Phu Loc	235.0	104	206	13
Altitude (m)				
15-100 (lowland)	146.0	78	59	35
100-500 (hill)	434.0	587	752	139
500-1,000 (high hill)	320.0	307	493	34
1,000-2,000 (mountain)	53.0	19	12	0
>2,000 (high mountain)	1.0	0	0	0
Slope (degree)				
0-8 (flat/level)	165.0	132	144	23
8-15 (rather flat)	282.0	283	411	69
15-25 (undulating)	286.0	324	429	78
25-45 (steep)	208.0	242	322	38
>45 (very steep)	13.0	10	10	0
Proximity to village centers (m)				
<2,000	-	145	252	107
2,000-4,000	-	348	506	77
4,000-6,000	-	284	312	24
6,000-8,000	-	190	156	0
>8,000	-	24	90	0
Proximity to main roads (m)				
<2,000	-	200	215	148
2,000-4,000	-	216	283	37
4,000-6,000	-	227	406	9
6,000-8,000	-	202	200	12
>8,000	-	146	212	2

The densities of collection locations of ecosystem services were calculated over 1 km² grids (Figure 4.4). The frequency levels of collection were evaluated as “high” (13–19 locations for foods, 24–35 locations for materials and water resources), “medium” (7–13 locations for foods, 13–24 locations for materials and water resources), and “low” (0–7 locations for foods and 0–13 locations for materials and water resources). The results showed that “high” collection levels were observed at three locations for foods, one location for materials, and one location for water resources.

The “high” collection level for foods and materials was mainly observed in the production forest while the “high” level of water resources was seen in the farmland. The densities of collection at “medium” and “low” levels were spread largely in the special-use forest and farmland, with their main concentration in the forests (Figure 4.3a and Figure 4.4). Some previous studies have indicated that poor households living near the forests often depend strongly on the forest ecosystem services (Mamo et al., 2007; van Noordwijk, 2019). In this study, “high” collection levels for all ecosystem services were observed only in the mountainous districts where participants in the participatory mapping exercise were Cotu people (Figure 4.3b and Figure 4.4).

The “high” collection level for foods was mainly in the area of altitudes from 100 to 500 m and slopes from 25 to 45 degrees (Figure 4.3c, Figure 4.3d, and Figure 4.4), which is equivalent to the classification of hilly and steep terrain (Rahayuningsih et al., 2016). The “high” collection level for materials was located in high hills and undulating terrain (altitudes from 500 to 1000 m, and slopes from 15 to 25 degrees), and lowland and rather flat terrain (altitudes from 15 to 100 m and

slopes from 0 to 8 degrees) for water resources (Figure 4.3c, Figure 4.3d, and Figure 4.4).

Delgado-Aguilar et al. (2017) noted that the high density of ecosystem service collection is often located close to main roads. The proximity to village centers also influences the distribution in this study. The “high” collection level for water resources was located within a distance of 2 km from village centers, and the collection level for materials was within 2–4 km from village centers. The “high” collection level for foods occurred at distances of up to 6 km from village centers (Figure 4.3e and Figure 4.4).

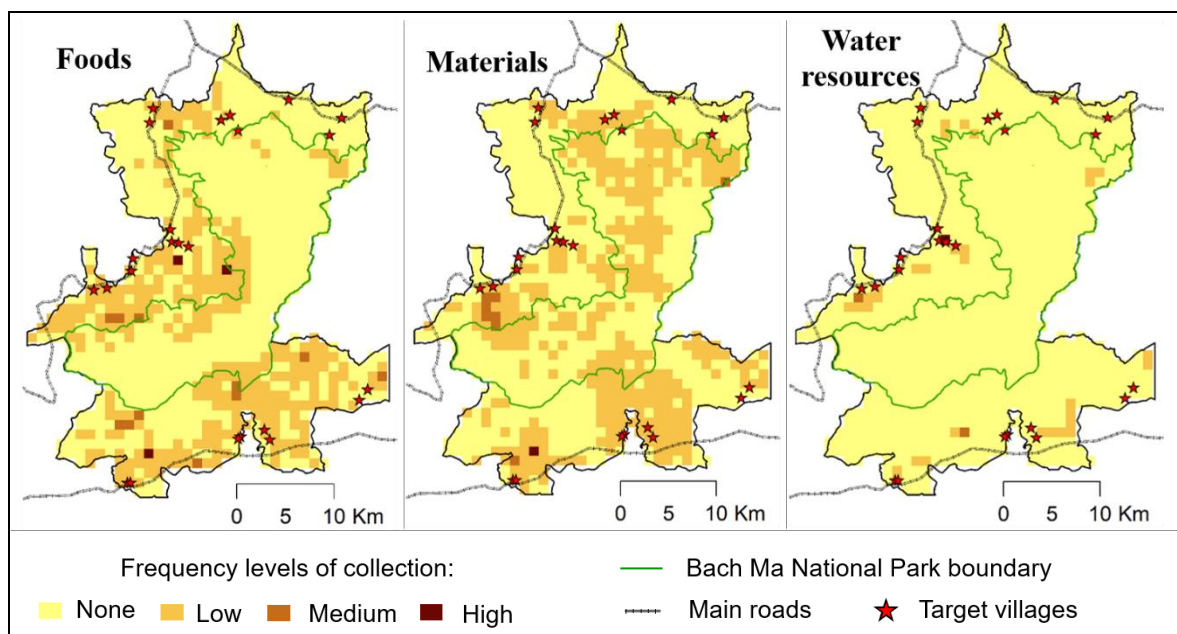


Figure 4.4 Maps showing spatial distributions of frequency levels of the collection

4.4 Conclusion

The study revealed a list of forest provisioning ecosystem services, which were collected by local communities living in the buffer zones of Bach Ma National Park. These services were grouped into food, material, and water resource, which were collected in certain months of year and mainly for family consumption. The

ethnic minority communities living in the mountainous districts collected more types of the ecosystem services than others in the plain district. The characteristics of spatial distribution of collection were determined by land use, administrative units, terrain conditions, accessibility, resource abundance, and forest governance. As a consequence of the collection of forest ecosystem services, the forest ecosystem may face ecological imbalance due to slow regeneration of long-lived species and colonization by invasive species (Fredericksen and Mostacedo, 2000; Sunderland et al., 2011; Muler et al., 2014). Cummings and Read (2016) concluded that intensive collection of one forest ecosystem service caused substantial declines in other services. For example, logging of trees may result in habitat loss for wildlife, and fires used by the Cotu to smoke out bees during traditional collection of honey may cause forest fires. Due to the forest dependence, forest management organizations have been facing a big challenge for achieving sustainable management. Investment in local livelihood options is proposed to reduce the forest dependence and thus facilitate the sustainable forest management.

Development of agriculture or agroforestry has been proposed to both enhance rural areas and reduce forest dependence (Hlaing et al., 2017). A study conducted by Nguyen et al. (2015) in Nam Dong district indicated that agricultural activities on household-scale farmlands relied entirely on weather conditions and the lack of irrigation water in the dry season was a significant challenge in the highland areas of Central Vietnam. Meanwhile, local resources available to community-based tourism, such as natural landscapes and local culture (Masud et al., 2017), have been documented in the study area. The mountainous districts are located in the transition zone of northern (Sino-Himalayan, Indo-Burmese) and southern (Malesian) floras, which were assessed as an important “Floristic

Biodiversity Center” for the Indochina region (Tran and Ziegler, 2001). In addition, these districts are located inside the original area occupied by the minority Cotu with their distinct culture (Tran, 2009). Because tourism can give socio-economic benefits, such as employment and income generation, contributions to natural resource conservation and local culture preservation (as presented in section 2.3.2), it appears to be a possible solution to reduce the forest dependence of local communities in the mountainous areas.

Finally, this study indicates that the livelihoods of ethnic minorities living in the mountainous districts, especially in Dong Giang district, need to be improved to significantly reduce impacts on ecosystem services. Based on the analysis of local conditions, community-based tourism is proposed as an alternate livelihood option, which can not only enhance lives of the forest-dependent communities, but also increase their awareness in forest conservation and cultural preservation. These findings from this study can also be used as a reliable point of reference in developing sustainable forest management and restoration strategies in Bach Ma National Park and its buffer zones.

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Chapter 5 CONTRIBUTION OF FOREST ECOSYSTEM SERVICES TO LOCAL LIVELIHOODS

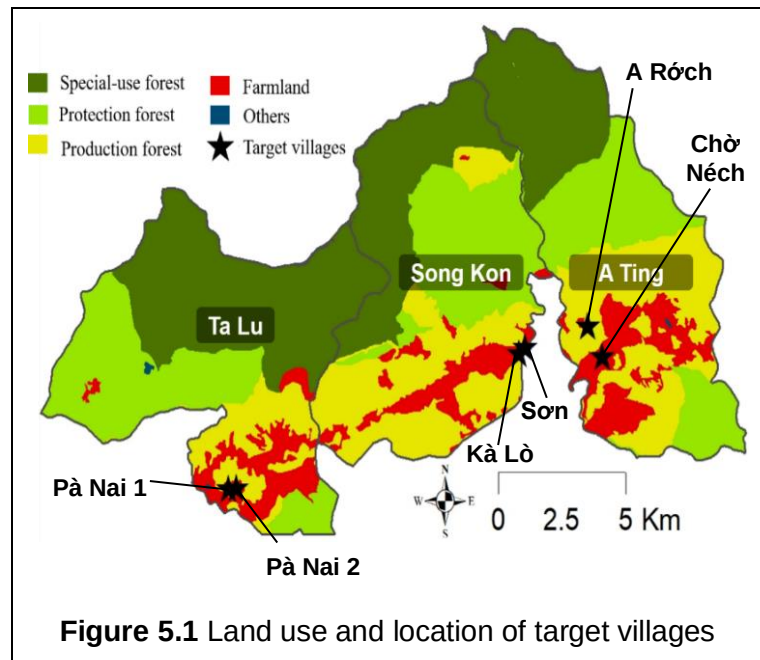
5.1 Introduction

Measurement of the degree of forest dependence can help generate sustainable forest management strategies (Jain and Sajjad, 2016). In practice, empirical studies focusing on the matter of forest dependence were conducted commonly in developing countries, such as Ethiopia (Mamo et al., 2007), India (Belcher et al., 2015), Myanmar (Yali et al., 2017), and Pakistan (Hussain et al., 2019). These studies explained the contributions of forest resources to household income and assessed the degree of forest dependence based on the total household livelihood pattern. Using a similar approach, this chapter aims to provide a detailed understanding of the degree of forest dependence in the Cotu communities at the buffer zones of Bach Ma National Park. Dong Giang district, which was highlighted in Chapter 4, was selected as the study area. This chapter discusses the following research questions:

- (i) What kind of forest provisioning ecosystem services do the local households collect?
- (ii) To what extent do the collected ecosystem services contribute to the local livelihoods?

5.2 Methodology

This study was conducted from May to June in 2017 in Dong Giang district, which was located to the southeast of Bach Ma National Park. Six target villages are located near the forests in Ta Lu, Song Kon, and A Ting communes (Figure 5.1). The total



population in the target villages was 3,247 people, of which 97% were the Cotu people (Table 5.1). The dominant land use in the study area is forestland, which was designed for different types of forest by the government (Figure 5.1). In particular, 82.7% of total area is forestland in Ta Lu, 81.4% in Song Kon, and 76.8% in A Ting (DGS, 2017).

Table 5.1 Population and ethnic composition in target villages

Village	Population	Ethnicity (people)	
		Cotu	Kinh
Pà Nai 1	456	451	5
Pà Nai 2	461	456	5
Kà Lò	472	461	11
Sơn	561	550	11
A Róch	621	608	13
Chờ Néch	676	624	52
Total	3,247	3,150	97

The data was derived from the results of interviews with village leaders.

Random interviews (Figure 5.2) using structured questionnaires were conducted with 64 Cotu householders to obtain information regarding (1) socio-demographic characteristics of respondents and their families, (2) local names of ecosystem services

**Figure 5.2** Interview with a local householder

which they were collecting, (3) average quantities of the ecosystem services and agricultural products (including livestock products), and (4) cash income from other livelihoods such as afforestation, hireling, and veteran's pension. A market survey was conducted in the central market of Dong Giang to obtain local market prices of the ecosystem services and agricultural products. Then, monetary values of the ecosystem services were calculated based on the quantity, which they collected, and the market price. Forest income, which is total monetary value of all ecosystem services, was calculated in each household. Monetary values of agricultural

products and agricultural income were also calculated in the same way. Cash income from afforestation (*Acacia*) was included as a part of other income, which was the sum of cash income from other livelihoods. Total household income is the sum of forest income, agricultural income, and other income.

5.3 Results and Discussion

5.3.1 Socio-Demographic Characteristics of Interviewed Households

The respondents (householders) consisted of 81.3% males and 18.7% females with an average age of 39 years (Table 5.2). 43.6% of the respondents had only 1 to 5 years of schooling. The average size of a household was six members, and four children per household on average, which is double of two-child family policy of Vietnam government. The number of households classified as poor and near poor ones by the government made up to 71.9% in the sample. In addition to the collection of forest ecosystem services, the household livelihoods consisted of household-scale agriculture (cultivating dry rice, cassava, and corn; and livestock and poultry keeping, e.g., cow, pig, chicken), afforestation, hireling, and veteran's pension. Generally, the households depended on a combination of these livelihoods and practiced at least three livelihoods per household (including the collection of ecosystem services) (Table 5.2). Most houses of the interviewed households were made mainly from forest provisioning ecosystem services. Some types of the local houses are shown in Figure 5.3.

Table 5.2 Socio-demographic characteristics of the households

Socio-demographic characteristics	
Gender of householder (%)	
Male	81.3
Female	18.7
Average household size (people)	6
Average age of householder (year)	39
Household livelihoods (%)	
Collection of forest ecosystem services	100
Agriculture and forestry	34.4
Agriculture, forestry and hireling	32.8
Agriculture, forestry, and veteran's pension	12.5
Agriculture, forestry, hireling, and veteran's pension	20.3
Education level of householder (years of schooling) (%)	
Primary school (1-5)	43.6
Secondary school (6-9)	31.9
High school (10-12)	19.4
Higher education (>12)	5.1
Economic status of household (%)	
Poor	67.2
Near poor	4.7
Other	28.1

**Figure 5.3** Local houses with forest provisioning ecosystem services

5.3.2 Forest Ecosystem Services Collected by the Local Communities

Table 5.3 shows a list of ecosystem services collected by the respondents (householders) or/and their family members. Compared to studies of Wetterwald et al. (2004) and Tokito et al. (2017) which were conducted among Cotu households in Nam Dong district, located to the west of Bach Ma National Park, the ecosystem services collected by the Cotu households in this area were more diverse. Generally, the Cotu people living to the west of the Park collected honey, mushroom, bamboo shoots, rattan, and medicinal plants (Wetterwald et al., 2004; Tokito et al., 2017). Meanwhile, those in this area collected a much larger number of ecosystem service types, which are grouped into food, material, and water resource (Table 5.3). Some ecosystem services collected by the households are shown in Figure 5.4.

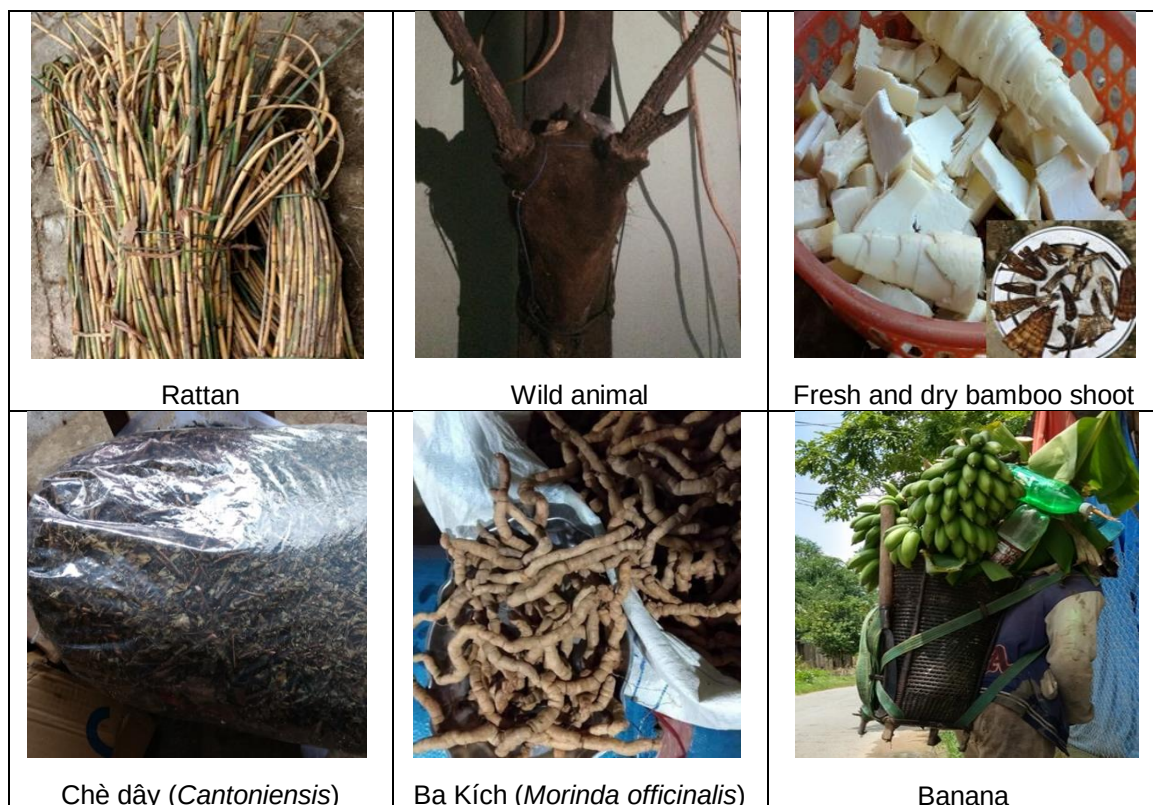


Figure 5.4 Examples of ecosystem services collected by the households

Table 5.3 Forest ecosystem services collected by the households

Ecosystem services	Local name	Scientific name
Food		
Vegetables	Dớn	<i>Diplazium esculentum</i>
	Bắp chuối	<i>Flower of Musa sp.</i>
	Lá dong	<i>Stachyphrynium placentarium</i>
	Rau má	<i>Centella asiatica</i>
	Dọc mùng	<i>Colocasia gigantea</i>
	Tàu bay	<i>Gynura crepidioides</i>
	Bùi ngọt núi	<i>Melientha suavis</i>
	Vông	<i>Erythrina orientalis</i>
	Ổ qua	<i>Momordica charantia</i>
	Lá lốt	<i>Piper lolot</i>
	Mã đề	<i>Plantago asiatica</i>
Bamboo shoots	Giang	-
	Lồ Ô	<i>Bambusa balcooa</i>
	Nửa	-
Fruit	Chôm chôm	<i>Nephelium sp.</i>
	Chuối	<i>Musa sp.</i>
	Xoài	<i>Mangifera sp.</i>
	Ươ	<i>Scaphium macropodum</i>
	Ồi	<i>Psidium sp.</i>
Mushroom	Thơm/Dứa	<i>Ananas sp.</i>
	Hương	<i>Lentinula edodes</i>
	Mèo	<i>Auricularia auricula-judae</i>
	Mối	<i>Termitomyces albuminosus</i>
Fish and Frog	Nấm tràm	<i>Tylopilus felleus</i>
	Lóc	<i>Channidae sp.</i>
	Diếc	<i>Carassius sp.</i>
	Rô phi	<i>Cichlidae sp.</i>
	Trắng	<i>Salmonidae sp.</i>
	Chình	<i>Anguilliformes sp.</i>
Honey	Ếch đá	<i>Ranidae sp.</i>
	Mật ong ruồi	<i>Honey of Micrapis</i>
Wild animals	Mật ong Mật	<i>Honey of Apis sp.</i>
	Chồn vàng	<i>Mustela sp.</i>
	Sóc	<i>Sciuridae sp.</i>
	Gà rừng	<i>Gallus gallus sp.</i>
	Heo rừng	<i>Suidae sp.</i>
	Nai	<i>Rusa unicolor sp.</i>
	Chuột rừng	<i>Muridae sp.</i>
Materials		
Firewood		
Roof covering materials	Cỏ Tranh	<i>Imperata cylindrica</i>
	Cọ	<i>Livistona sp.</i>
Wood	Chò chỉ	<i>Parashorea chinensis</i>
	Kiên kiên hoa nhẵn	<i>Hopea siamensis</i>
	Sao đen	<i>Hopea odorata</i>
Rattan	Chi Mây	<i>Calamus sp.</i>
Medicinal plants	Nấm Linh Chi	<i>Ganoderma lucidum</i>
	Củ Ka Kun (named by Cotu people)	-
	Chè dây (rau rá)	<i>Ampelopsis cantoniensis</i>
	Rễ Ba kích	<i>Morinda officinalis</i>
	Sâm bẫy lá	<i>Paris polyphylla Smith</i>
	Mật nhân	<i>Eurycoma longifolia</i>
Broom materials	Lá Cọng Sắn	<i>Chromolaena odorata</i>
	Đốt	<i>Thysanolaena latifolia</i>
Vietnam traditional hat materials	Lá nón	<i>Livistona sp.</i>
Water resources	Nước tự chảy	
“-“refers that scientific names are not found.		

Figure 5.5a shows the proportion of households regarding the collection of ecosystem services. All (100%) interviewed households confirmed the collection of foods; construction materials (roof covering materials and wood); other materials such as medicinal plants, firewood; and water resources. The proportion is much higher than the investigations conducted in the communities living to the west of the Park. Wetterwald et al. (2004) showed that only 14.6% of interviewed households (55 out of 377 households) in Thuong Long commune of Nam Dong district confirmed the collection of limited ecosystem service types (such as rattan, medicinal plants, and honey), and the rest of interviewed households either collected none or only small quantities. Also, Tokito et al. (2017) showed that 34.6% of interviewed households (28 out of 81 households) in Thuong Lo commune of Nam Dong district confirmed the collection of ecosystem services. In addition, all (100%) interviewed householders in this area confirmed the collection of water resources from natural springs for their family consumption (Figure 5.5a and 5.5b). In contrast, the collection of water resources was not mentioned in the previous studies conducted in the communities living to the west of the Park by Wetterwald et al. (2004) and Tokito et al. (2017).

The utilization of the ecosystem services was also different between the Cotu households in this area and the west of the Park. Although Wetterwald et al. (2004) showed that most Cotu households in Thuong Long commune collected the ecosystem services for sale, an opposite trend, that family consumption was the main purpose of the collection, was found in this area (Figure 5.5b). The finding is in accordance with the results obtained from the meetings with the local community representatives (Chapter 4).

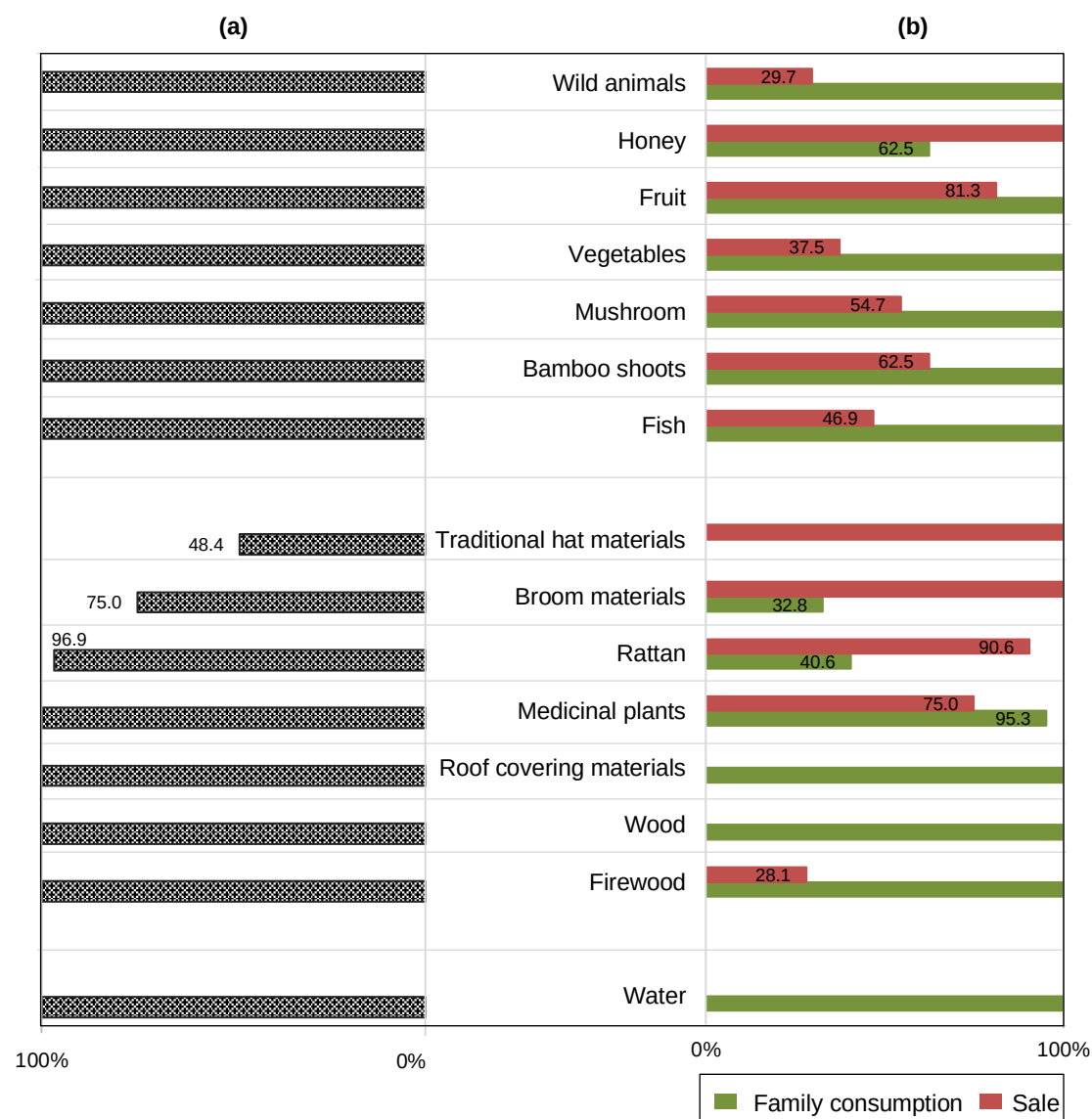


Figure 5.5 Proportion of households: a) collecting the ecosystem services, and b) by the utilization of these ecosystem services

5.3.3 Contributions of the Ecosystem Services to Local Livelihoods

Figure 5.6 shows monetary values generated from the livelihoods of households. The detail of the monetary values in each household is shown in Table 5.4. The monetary values of ecosystem services (forest income) made a significant contribution to total household income rather than those of agricultural products (agricultural income) and other livelihoods (other income). On average, forest income was approximately 3.2 times higher than agricultural income and 4.0 times higher than other income (Figure 5.6). Figure 5.7 shows the number of households

by forest income. The highest number of households was having forest income between 30 and 40 million VND per year (n=35; 54.7%), followed by 40-50 million VND (n=13; 20.3%), 20-30 million VND (n=7; 10.9%), 10-20 million VND (n=5; 7.8%), and more than 50 million VND (n=4; 6.3%). None of household had forest income less than 10 million VND.

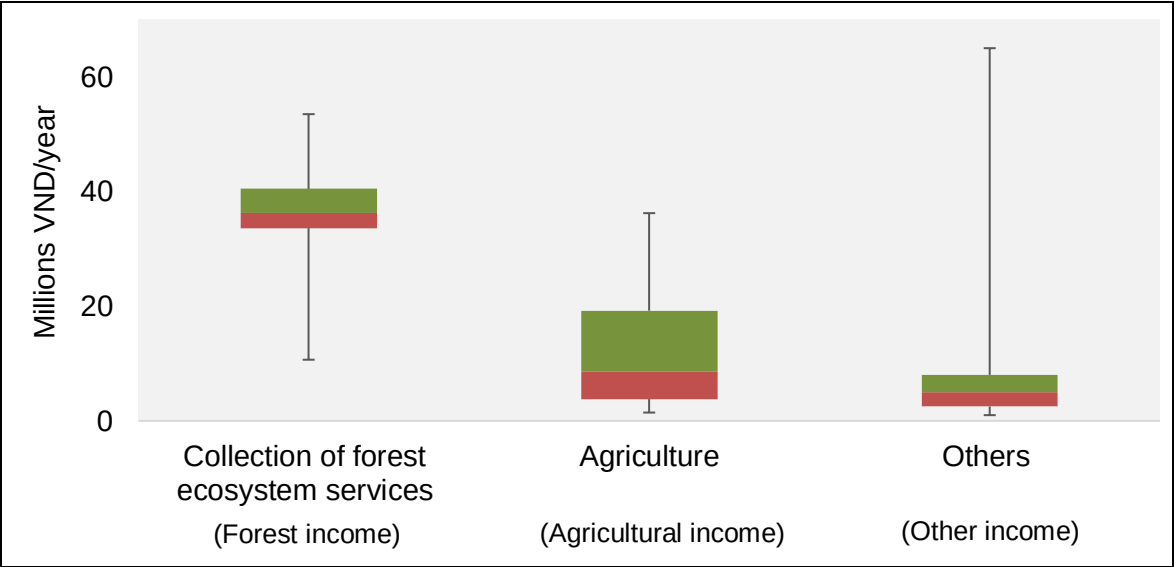


Figure 5.6 Monetary values generated from the livelihoods

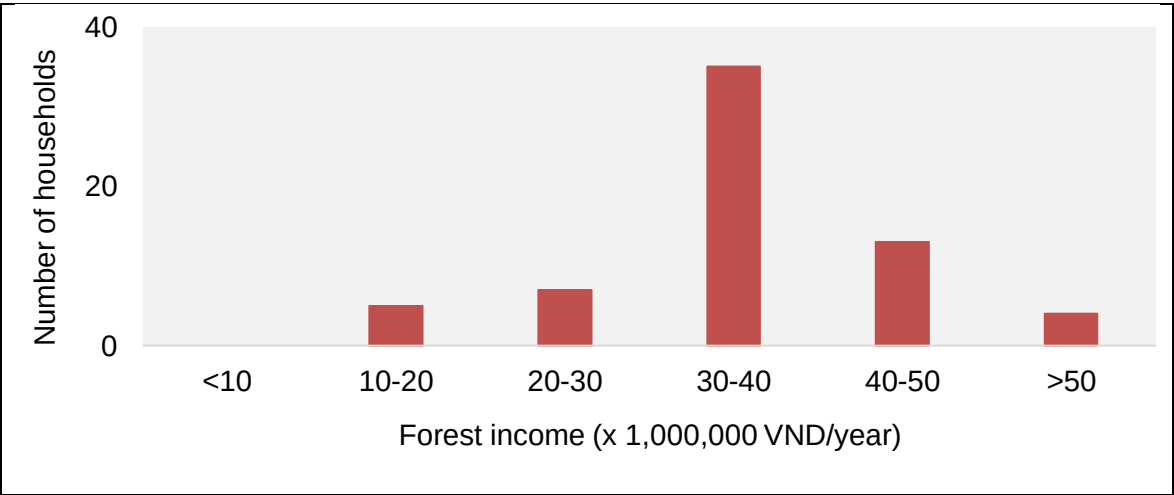


Figure 5.7 The number of households by forest income

Table 5.4 Monetary values generated from the livelihoods of households

Household	Monetary values generated from the livelihoods (VND)			
	Total household income	Collection of ecosystem services	Agriculture	Others
1	21,137,571.3	14,757,571.3	3,880,000.0	2,500,000.0
2	28,611,540.4	24,406,540.4	1,005,000.0	3,200,000.0
3	29,546,797.8	15,401,797.8	4,545,000.0	9,600,000.0
4	31,086,458.7	25,156,458.7	2,330,000.0	3,600,000.0
5	38,294,963.8	33,984,963.8	1,810,000.0	2,500,000.0
6	38,710,250.4	12,550,250.4	10,360,000.0	15,800,000.0
7	39,487,940.7	33,992,940.7	1,995,000.0	3,500,000.0
8	39,537,752.1	29,462,752.1	3,975,000.0	6,100,000.0
9	39,713,061.7	33,963,061.7	3,750,000.0	2,000,000.0
10	39,725,044.3	35,125,044.3	740,000.0	3,860,000.0
11	40,084,952.5	34,404,952.5	680,000.0	5,000,000.0
12	40,358,415.5	33,995,415.5	3,163,000.0	3,200,000.0
13	41,529,543.4	26,279,543.4	1,450,000.0	13,800,000.0
14	42,037,706.2	34,750,706.2	2,287,000.0	5,000,000.0
15	42,488,028.7	36,610,028.7	4,378,000.0	1,500,000.0
16	42,600,745.0	35,928,745.0	4,172,000.0	2,500,000.0
17	43,158,829.7	37,323,829.7	3,235,000.0	2,600,000.0
18	43,376,772.9	36,686,772.9	4,190,000.0	2,500,000.0
19	44,306,715.5	36,396,715.5	2,910,000.0	5,000,000.0
20	45,459,063.1	40,439,063.1	2,020,000.0	3,000,000.0
21	46,623,870.6	42,833,870.6	1,790,000.0	2,000,000.0
22	47,123,048.9	25,075,048.9	11,248,000.0	10,800,000.0
23	47,169,954.3	36,289,954.3	5,880,000.0	5,000,000.0
24	47,714,033.6	33,724,033.6	9,990,000.0	4,000,000.0
25	48,212,058.2	35,482,058.2	4,730,000.0	8,000,000.0
26	48,453,673.8	42,968,673.8	1,485,000.0	4,000,000.0
27	48,633,481.3	43,893,481.3	1,740,000.0	3,000,000.0
28	48,748,203.7	38,213,203.7	9,035,000.0	1,500,000.0
29	49,531,962.0	36,763,962.0	9,768,000.0	3,000,000.0
30	50,487,509.4	36,245,509.4	10,242,000.0	4,000,000.0
31	51,329,231.5	36,899,231.5	12,930,000.0	1,500,000.0
32	54,173,061.3	37,553,061.3	2,820,000.0	13,800,000.0
33	55,801,615.0	33,991,615.0	19,310,000.0	2,500,000.0
34	57,080,178.4	33,260,178.4	21,320,000.0	2,500,000.0
35	57,660,230.9	43,630,230.9	11,030,000.0	3,000,000.0
36	58,002,599.5	40,612,599.5	9,790,000.0	7,600,000.0
37	59,550,019.4	35,360,019.4	19,190,000.0	5,000,000.0
38	59,883,597.2	37,553,597.2	10,230,000.0	12,100,000.0
39	60,407,434.8	50,667,434.8	2,740,000.0	7,000,000.0
40	60,618,214.2	29,353,214.2	24,665,000.0	6,600,000.0
41	60,777,628.8	37,067,628.7	18,710,000.0	5,000,000.0
42	60,935,649.5	41,239,649.5	11,596,000.0	8,100,000.0
43	61,986,821.0	32,536,821.0	25,450,000.0	4,000,000.0
44	62,125,975.2	36,885,975.2	20,240,000.0	5,000,000.0
45	62,754,244.3	48,844,244.3	12,410,000.0	1,500,000.0
46	63,514,840.9	53,284,840.9	5,230,000.0	5,000,000.0
47	64,102,258.2	42,062,258.2	20,040,000.0	2,000,000.0
48	64,999,964.0	39,669,964.0	20,330,000.0	5,000,000.0
49	66,492,139.7	29,576,139.7	19,916,000.0	17,000,000.0
50	67,725,017.8	36,520,017.8	28,705,000.0	2,500,000.0
51	68,732,201.4	53,492,201.4	13,740,000.0	1,500,000.0
52	69,423,309.4	36,738,309.4	18,085,000.0	14,600,000.0
53	69,703,580.2	30,243,580.2	3,860,000.0	35,600,000.0
54	71,092,900.3	40,772,900.3	25,320,000.0	5,000,000.0
55	71,521,506.6	35,811,506.6	25,710,000.0	10,000,000.0
56	72,098,288.7	40,528,288.8	30,570,000.0	1,000,000.0
57	72,279,744.4	31,689,744.4	5,190,000.0	35,400,000.0
58	72,910,102.9	51,210,102.9	19,700,000.0	2,000,000.0
59	73,270,493.8	35,750,493.8	32,520,000.0	5,000,000.0
60	74,867,581.4	10,667,581.4	8,200,000.0	56,000,000.0
61	75,716,065.1	10,716,065.1	3,000,000.0	65,000,000.0
62	76,181,808.5	35,817,808.5	35,364,000.0	5,000,000.0
63	85,896,347.4	47,186,347.5	3,810,000.0	34,900,000.0
64	111,857,206.5	41,727,206.5	36,230,000.0	33,900,000.0

Table 5.5 shows the proportion of the monetary values of each ecosystem service in forest income and total household income. Overall, the monetary values of all ecosystem services (forest income) contributed significantly about 70.8% of total household income. In particular, the highest proportion is of materials (50.3%), followed by foods (16.6%), and water resources (3.9%). The contribution is higher than those measured in India (Belcher et al., 2015), Bangladesh (Mukul et al., 2016), Myanmar (Hlaing et al., 2017; Yali et al., 2017), and Pakistan (Hussain et al., 2019). Mamo et al. (2007) concluded that poor communities living in or near forests often depend highly on forest resources. The results of this study are in accordance with this conclusion.

Jain and Sajjad (2016) indicated that the lack of sustainable livelihoods is root cause of poverty and forest dependence. In this area, agriculture and forestry are main local livelihoods which were designed by the government (DGS, 2017); however, the effects of these livelihoods were limited due to local conditions. Agricultural activities depended on weather conditions and faced with lack of irrigation water in dry season (Nguyen et al., 2015). Afforestation activities generated limited incomes due to small allocated areas of local households (1.5 ha/household on average) (Nguyen et al., 2016).

Table 5.5 Proportion of the monetary value of ecosystem services in forest income and total household income

Ecosystem services	Proportion (%) to	
	Forest income	Total household income
Food	22.8	16.6
Wild animals	1.7	1.2
Honey	3.0	2.2
Fruit	3.9	2.8
Vegetables	3.8	2.7
Mushroom	1.1	0.8
Bamboo shoots	1.7	1.2
Fish	7.8	5.7
Materials	70.1	50.3
Vietnam traditional hat materials	1.2	0.8
Medicinal plants	1.1	1.0
Roof covering materials	1.2	0.8
Rattan	57.0	41.3
Broom materials	0.1	0.1
Wood	4.7	2.7
Firewood	4.9	3.6
Water resources	7.1	3.9

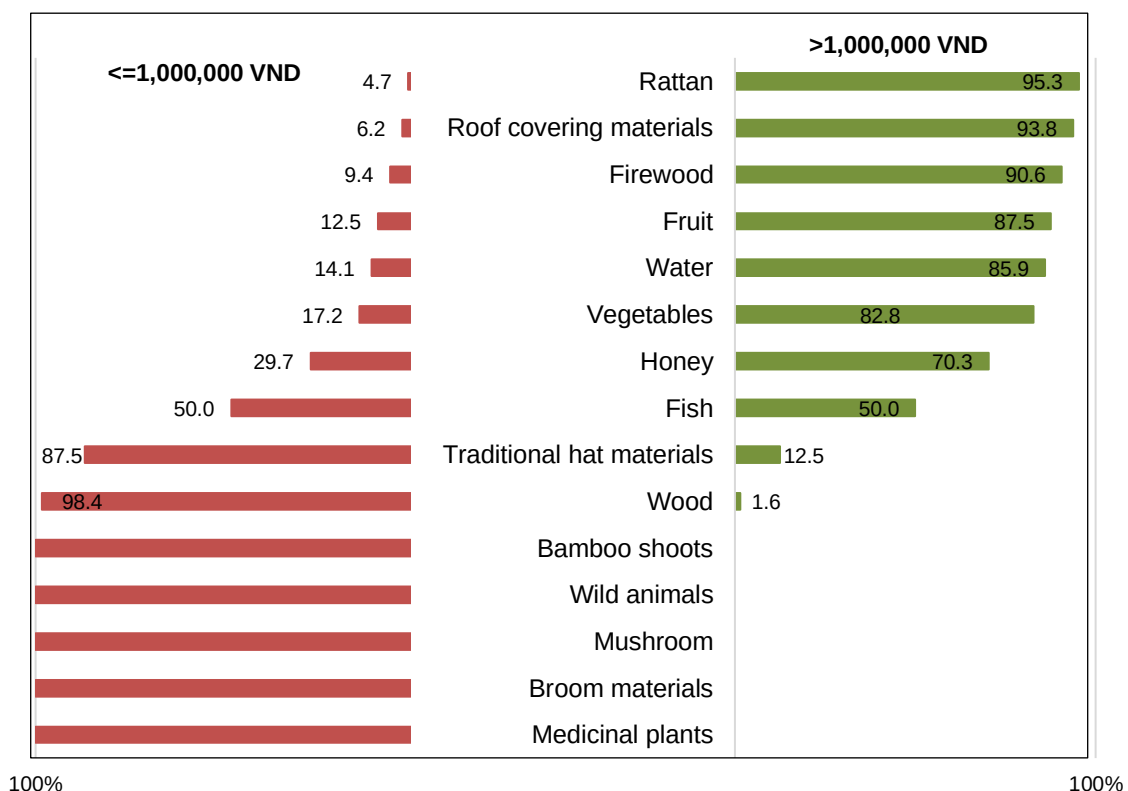


Figure 5.8 Proportion of households by monetary values generated from the ecosystem services

Figure 5.8 shows the proportion of households by monetary values generated from the ecosystem services. One million VND as monthly income, which is one of the criteria for classifying economic status of a household in rural areas, was selected to divide the monetary values into two groups. More than 80% of the households collected six types of ecosystem services with their monetary values more than one million VND. Most of these ecosystem services are indispensable things in daily life such as water, firewood, and vegetables. The interviewed householders mentioned that their families depended completely on natural springs for water supply. In addition, the temperature in winter in the mountainous district is often low (around 10°C) (DGS, 2017). Because of the weather condition, forest firewood was used especially for heating in winters besides daily cooking. The households experienced that forest firewood, especially from aged trees, gives longer burning hours than others like *acacia* firewood. Beside this, the Cotu households have traditional custom of preserving meat by heating using some special types of forest firewood (the food is named in Vietnamese as “thịt treo giàn bếp”). In the other hand, more than 98% of households also confirmed their collection of some foods such as bamboo shoots, wild animals, mushroom, and some materials such as broom materials, wood, and medicinal plants, which were with monetary values equal or less than one million VND. The monetary values depend on the local market prices and the quantities of collected ecosystem services. Although some ecosystem services, such as wild animal, had considerable market prices (e.g., the price of wild animal was between 100,000 VND and 150,000 VND per kg), their quantities of collection were negligible due to limitation of harvest seasons (Table 4.4) and/or strict management of the forest management organizations (especially for wild animal and wood). In contrary, some ecosystem

services could be collected with considerable quantities, such as mushroom and bamboo shoots; however, their local market prices were negligible (e.g., the price of bamboo shoots was 7,000VND/kg, and mushroom with 10,000VND/kg).

5.4 Conclusion

This study reveals that the local households collected multiple types of forest provisioning ecosystem services for their livelihoods. The rate of households collecting the ecosystem services in this area (100%) is much higher than those investigated in the communities living to the west of Bach Ma National Park (by Wetterwald et al. (2004) and Tokito et al. (2017)). Also, the types of collected ecosystem services in this area were more diverse than those investigated in the communities living to the west. In comparison to investigations in other region, although there are similarities in the types of collected ecosystem services, the rate of households collecting these services in this area is higher than those investigated in North Central Vietnam (88%) (by McElwee (2010)). In addition, this study also reveals that the forest ecosystem services played an important role in the local livelihoods. The monetary values of these services made a significant contribution, around 70.8%, to total household income. This rate is much higher than those investigated in communities implicating in using forest resources in whole Vietnam (20%) (De Jong et al., 2006). Also, this rate is higher than those investigated in North Central Vietnam (e.g., 22% in the Kinh households in Ha Tinh province (McElwee, 2010) and 33% in Muong households in Nghe An province (Dang and Tran, 2006)).

Based on the above discussion, the Cotu communities in this area can be considered highly dependent on the forests. According to legal documents, the

collection of forest ecosystem services by local communities is an illegal activity in most cases, especially for wood and wild animals (Decree No. 117, 2010; Decision No. 17, 2015; Decision No. 49, 2016). Because of the high forest dependence, the limitation of collecting the ecosystem services without alternative livelihood options may lead to impoverish the Cotu people. In addition, with the increasing population in Dong Giang district (1.9%) as indicated in Chapter 3, the need for ecosystem services would increase and, consequently, the forests would be under intense pressure. In communities living near or in forests, their impoverishment and deforestation have positive relationship (Angelsen et al., 2014). Thus, to facilitate for forest management organizations in achieving the sustainable management, investment in local alternative livelihood options should be done as a first priority. As discussed in conclusion section of Chapter 4, community-based tourism can be a livelihood option for the Cotu communities in this area.

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Chapter 6 LOCAL RESOURCES FOR LIVELIHOOD IMPROVEMENT OF FOREST-DEPENDENT COMMUNITIES

6.1 Introduction

Proper utilization of local resources can be an important step to achieve sustainable development of rural areas (Biswanath, 2017). Tourism is one of typical examples of successful local resource utilization because tourism involves various local resources, such as landscape, food, and culture (Uchiyama and Kohsaka, 2016). As presented in section 2.3.2, tourism can give benefits to local livelihoods through increasing job opportunities and establishing markets for local products. In practice, community-based tourism, which is a sustainable form of tourism in which beneficiaries are involved by mobilising their own resources (Li, 2004), has been popularly implemented and has benefited considerably forest-dependent communities in developing countries. Some successful cases of community-based tourism were identified in Nepal (Lama, 2000), Tanzania (Nelson, 2003), Kenya (Akama and Hall, 2007), Uganda (Ahebwa, 2016), Cambodia (Toko, 2016), and Malaysia (Goh, 2017).

Quang Nam government has a specific strategy for tourism development in mountainous districts to promote the specific local livelihoods in which the usage of local resources and community participation in tourism are especially encouraged (Resolution No.47, 2018). In practice, tourism development in Dong Giang is limited.

A part of Cotu culture, with a focus on traditional handicraft of weaving, has been explored in tourism, which is being implemented in Drhoong village (Song Con commune). The tourism was benefiting to 30 Cotu women (1.3% of total population of Song Kon) (Dong Giang office, 2017). Another destination in Dong Giang is Quyet Thang (Quyết Thắng) tea farm in Ba commune (does not belong to the buffer zone of Bach Ma National Park) (Vntrip company, 2018). Although tourism activities have not been designed officially by the local government or tea management company, there are some spontaneous activities, such as sightseeing and tourist photography especially for wedding occasion, doing by young people from neighbour cities. Due to the limited tourism products, tourism in Dong Giang may face with big challenges to ensure competitiveness on the tourism market in the future. Diversifying tourism products is one of important steps to strengthen competitive advantages of destinations (Sasana, 2017). Tourism products in Dong Giang can be diversified through incorporating both the natural and cultural values from the local resources.

Based on the background, this chapter aims (1) to detect what kind of local resources with natural and cultural values which are not well-known to outside but are recognized within the local communities, and (2) to discuss the possibility that these detected resources can be utilized for the tourism development. The local resources were detected based on a community-based approach, which was conducted in the Cotu communities. Dong Giang district, which was highlighted in Chapter 4 and 5, was selected as the study area.

6.2 Overview of the Cotu People

To provide an initial understanding of Cotu people in Vietnam, this section gives a brief description of their resident areas, and their traditional livelihoods and culture through literature reviews.

The Cotu people is one of 53 ethnic minority groups in Vietnam. They reside mainly in the mountainous districts of Quang Nam province (74.2%) and Thua Thien Hue province (23.8%). The traditional livelihood of Cotu people is agriculture, with the cultivation of dry rice, cassava, and corn by the slash and burn method (cutting and burning plants on the land). Beside this, their traditional livelihoods also consist of hunting, gathering forest products, and fishing (from natural springs in forests) using self-produced tools (Århem, 2009; Nguyen, 2016).

The Cotu people's culture is completely different from other ethnic groups. The culture has developed based on their life of self-sufficiency and spiritual belief in the power of local gods (Århem, 2009; Tran, 2009). Their tangible culture consists of traditional architecture, handicraft, and cuisine, for which forest resources are used as main materials/ingredients (Tran, 2009). The Cotu people have a strong belief in local gods, such as forest, land, mountain, stream, village, and house gods, who are believed to heavily influence human well-being and crops. This belief can be found clearly during performances at festivals, rituals, and ceremonial occasions (Århem, 2009; Tran, 2009).

The language of the Cotu people is Katuic, a branch of the Mon-Khmer linguistic family in Vietnam, which has been used well for conversation in Cotu villages. Meanwhile, its character has recently become extinct (Århem, 2009).

Villages are the most fundamental social unit for Cotu people. In the past, a village was a self-managed social unit and governed by a village patriarch (male person). Nowadays, the power of the village patriarch is shared with a village leader who is appointed by the Commune People's Committee (Århem, 2009). The village patriarch influences significantly the Cotu villagers because he has considerable experiences in traditional worship, customs, cultivation, and plays an important role in maintaining community solidarity. The pictures of Cotu people in surveyed villages are shown in Figure 6.1



Figure 6.1 Pictures showing the Cotu people in the area

6.3 Methodology

6.3.1 Methods of Identification of Local Resources with Natural Values

(i) Interview and Participatory Mapping

Field surveys were conducted from May to June 2017 at six target villages in Ta Lu, Song Kon, and A Ting communes (Figure 5.1). Twelve meetings with sixty local participants, who were collecting forest ecosystem services for their livelihoods

as indicated in Chapter 4, were organized. Twelve participatory mapping exercises and semi-structured questionnaires were undertaken to determine sites with outstanding natural beauty, such as hot water springs, waterfalls, hills, and



Figure 6.2 Mapping local resources with natural values by local participants

natural lakes (Figure 6.2). A base map of topographic characteristics was used for a mapping exercise, in which the participants were asked to place colored beans on the map to indicate the locations of the sites. Descriptions of the surrounding landscape and preliminary assessment of the mentioned sites were also discussed in the meetings. Many kinds of waterfalls were mentioned so that classifications of waterfalls proposed by Bătinaş (2010) were shown to the participants in order to hear their description of the sites. The mapped information from the mapping exercise was digitized using ArcGIS 10.5. Forest lot, which is the smallest unit in forestland management and forest resource statistic designed by Vietnam government (Decree No. 23, 2006), is employed as the study unit.

(ii) Criteria for Assessing the Local Resources with Natural Values

Assessing the possibility of resources with natural values to be utilized for tourism development is often based on landscape quality and conditions regarding the enjoyment of visitors (Priskin, 2001). A tourist destination should consist of following main elements: (1) presence of attractions; (2) accessibility, facilities and services related to tourism activities; (3) political stability for conducting tourism

development activities; and (4) supports of destination products by tourism stakeholders (Boniface et al., 2016; Manhas et al., 2016). In this study, three criteria were considered, consisting of (1) attraction, (2) accessibility, and (3) adaptation to local legal condition.

Tourists often expect to have access to diverse, rare, or unique destinations (Deng et al., 2002). In this study, the diversity of landscape, the possibility to be a tourism destination, and topographic characteristics were taken into account in the *attraction criterion*, as illuminated in previous studies by Aiping et al. (2015) and Rahayuningsih et al. (2016). This study applied a list of elements and sub-elements in attraction criterion of nature-based tourism assessment made by Rahayuningsih et al. (2016). Scores from 0 to 5 were assigned for the study units based on the number of sub-elements they contained. Three types of datasets, consisting of land use map, digital elevation model (DEM) data, and the information from the meetings with the local participants, were used for counting the number of sub-elements and scoring (Table 6.1).

Table 6.1 Criteria of attraction

Elements	Sub-elements	Score of study unit					
		Number of sub-elements					
		5	4	3	2	1	None
Landscape (based on land use map and participant opinions in meetings)	1. Forest scenery/view 2. Rice field scenery/view 3. Plantation scenery/view 4. Garden/field scenery/view 5. Waterbody (lake, river, etc.)	5	4	3	2	1	0
Tourism objective distribution (based on land use map and participant opinions in meetings)	1. Natural beauty (forest, plantation, etc.) 2. Natural phenomenon (Cave, crater, etc.) 3. Waterbody (lake, waterfall, river, etc.) 4. Cultural attraction 5. Historical heritage	5	4	3	2	1	0
Uniqueness of resources (based on land use map and participant opinions in meetings)	1. Forest ecosystem 2. Karst ecosystem 3. Landscape scenery/view 4. Hot water spring/waterfall/lake/river 5. Cultural and historical heritage	5	4	3	2	1	0
Value (based on participant opinions in meetings)	1. Ecological value 2. Knowledge value 3. Medicinal value 4. Economic value 5. Belief, cultural, and historical value	5	4	3	2	1	0
Possible tourism activities (based on participant's opinion in meetings)	1. Research/education 2. hiking/tracking/climbing 3. Photography 4. Enjoying scenery 5. Viewing cultural /historical heritage attraction	5	4	3	2	1	0
Altitude (based on DEM)	1. > 2.000 meter (high mountain) 2. 1.000 - 2.000 meter (mountain) 3. 500 - 1.000 meter (high hills) 4. 100 - 500 meter (hills) 5. 15 – 100 meter (lowland)	5	4	3	2	1	0
Slope (based on a transformation of DEM)	1. >45 (very steep) 2. 25-45 (steep) 3. 15-25 (wavy/undulating) 4. 8-15 (rather flat) 5. 0-8 (flat/level)	5	4	3	2	1	0

Accessibility refers to the ease of being able to physically access destinations (Priskin, 2001). The criterion of accessibility was divided into five distance ranges from a main road to the sites mentioned by the

Table 6.2 Criteria of accessibility

Distances to main road	Score
>20 km	0
15-20 km	1
10-15 km	2
5-10 km	3
0-5 km	4

participants in the meetings. A mentioned site was assigned a score from 0 to 4 depending on the distance. The study unit's score was calculated by averaging the scores of all sites distributing within the study unit (Table 6.2).

The *criterion of adaptation to local legal condition* was considered with respect to the local legal documents on forest management and usage (Decree No. 117, 2010; Decision No. 17, 2015; Decision No. 49, 2016). This criterion was scored from 0 to 3 based on the regulations

Table 6.3 Criteria of adaptation to local legal condition

Land use	Score
Special-use forest	0
Protection forest	1
Production forest	2
Farmland and others	3

mentioned in these documents regarding the community's access to different forest types (Table 6.3). Generally, the communities' access is determined by the function of forests where they assess. In particular, the special-use forest is designed to conserve the natural forest ecosystem and genetic sources; thus the access here is limited completely (Decree No. 117, 2010). The protection forest is designed to prevent erosion and desertification and to maintain its function of regulating climate so that the access is limited in some cases (Decision No. 17, 2015). Compared to the special-use forest and the protection forest, the access to the production forest is least restricted because its main function is to produce and trade timber and non-timber resources (Decision No. 49, 2016).

Finally, the possibility of study units to be utilized for tourism development was delineated by a sum of scores from *attraction*, *accessibility*, and *adaptation to local legal condition*. The possibility was classified into five classes as shown in Table 6.4.

Table 6.4 Scores for classification of study units by criteria

Criteria	Classes of classification and scores				
	Very low	Low	Moderate	High	Very high
Attraction	0-7	7-14	14-21	21-28	28-35
Accessibility	0-0.8	0.8-1.6	1.6-2.4	2.4-3.2	3.2-4.0
Adaptation to local legal condition	0-0.6	0.6-1.2	1.2-1.8	1.8-2.4	2.4-3.0
Suitability	0-8.4	8.4-16.8	16.8-25.2	25.2-33.6	33.6-42.0

6.3.2 Methods of Identification of Local Resources with Cultural Values

The field survey was conducted in the target villages in July 2018. Six group discussions were held with 30 local managers to confirm the existence of the local resources with cultural values of the Cotu people in the area (Figure 6.3). Then, these local managers



Figure 6.3 The local managers participated in a group discussion

classified these confirmed resources into different categories. The classification criterion was the popularity of these confirmed resources in the area, which was considered based on the number of local households whose members have preserved these local resources. The four categories were “very popular” (more than 80% of local households with family members preserving the local resources); “popular” (50–80% of the households); “slightly popular” (less than 50% of the households); and “extinct” (none of the households). In addition, the possibility of reintroducing “extinct” local resources and reviving “slightly popular” local resources

was also explored through the discussions with these local managers. Based on these results, the detected resources with cultural values available in the area were those classified into “very popular,” “popular,” “slightly popular,” and “extinct”. Among these local resources, the latter two ones showed the possibility of being reintroduced or revived.

Demographic characteristics of local people who have continually preserved the local resources were determined through 158 face-to-face interviews using structured questionnaires (Figure 6.4). The structured questionnaires were



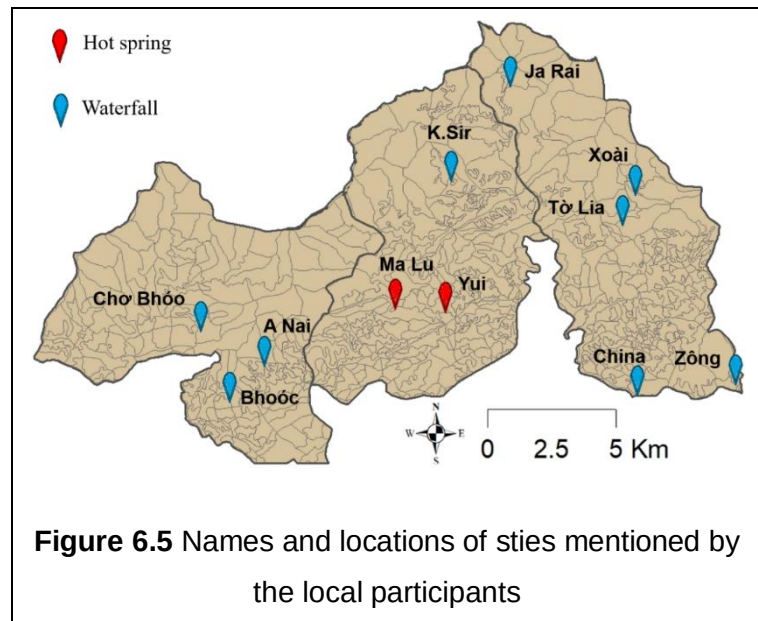
Figure 6.4 Interview with a local person doing knitting

employed to obtain information regarding: (1) socio-demographic characteristics of respondents such as age, gender, and local unions to which they were belonging; and (2) the local resources with cultural values preserved by the respondents.

6.4 Results and Discussion

6.4.1 Description and Assessment of Local Resources with Natural Values

Eleven sites with outstanding natural beauty were mentioned and mapped by the local participants in the meetings. These sites were digitized and a map was generated to show their locations (Figure 6.5). In particular, two types



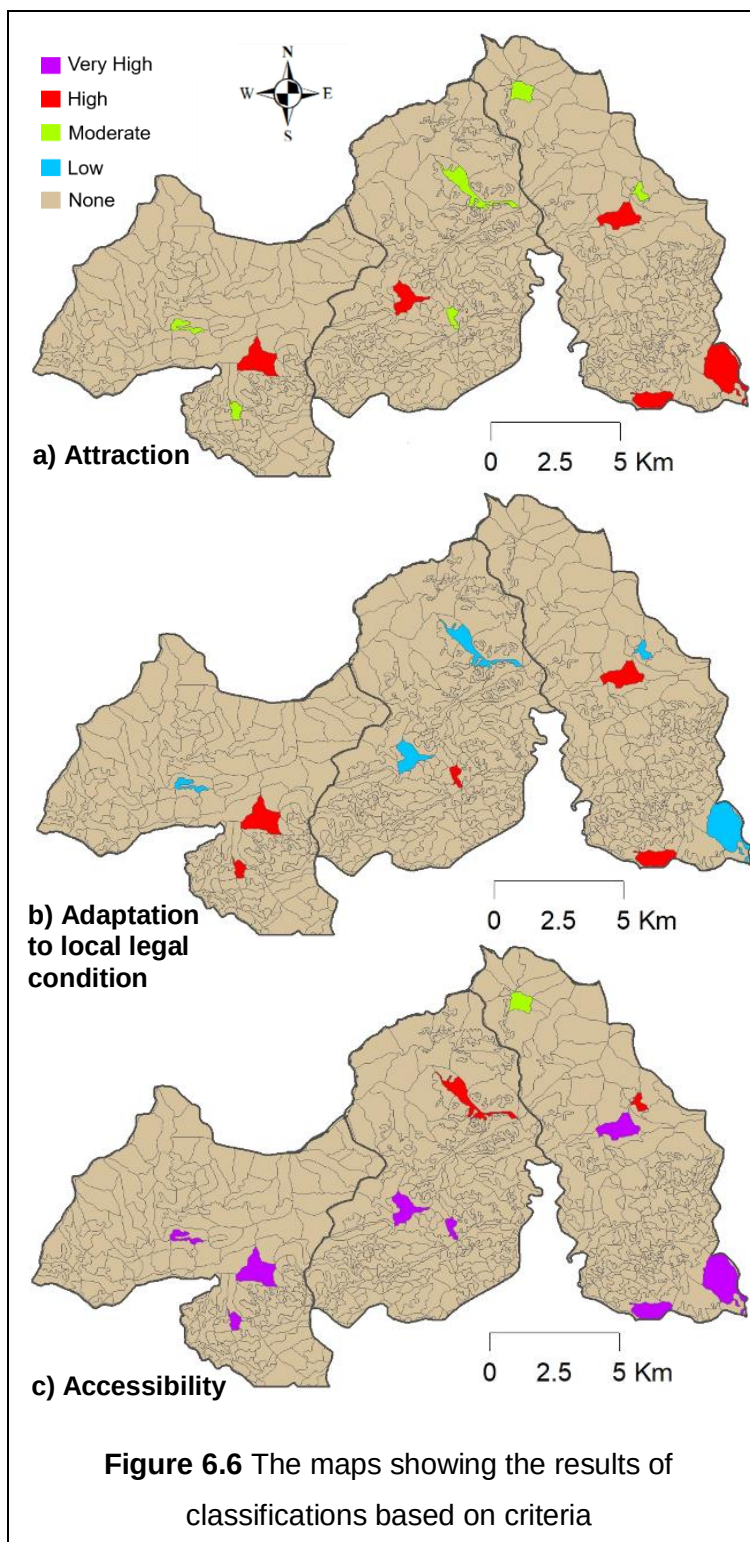
of local resources, waterfall and hot water spring, were mentioned by the participants. These types have been deemed significant in tourism by the tourism planners and managers because of their high attraction to visitors (Samsudin et al., 1997; Prasetyo et al., 2017). In this area, there are 7 types of waterfalls, and slide and tiered waterfalls are common (Table 6.5).

Table 6.5 Description of the sites mentioned by the local participants

Type	Local name	Description
Waterfall	Fan	Thác Chơ Bhoóc The fall looks like a fan, with the base is much wider than the top.
	Curtain	Thác Bhoóc Wide breadth, thin flow, and its height is taller than the width.
	Cascade	Thác Tờ Lia The fall descends gradually on sloping rocks, a series of small steps in quick succession is observed.
	Slide	Thác Xoài (other name is Chơ Run) Thác A Nai The fall is thin and descends on a smooth, inclined surface.
	Horsetail	Thác China The fall is very high, looks like a horsetail, with a spreading tail.
	Tiered	Thác Zông Thác K.Sir The height of flow decreases with the stratification of rock.
	Punchbowl	Thác Ja Rai The fall is short, small, and then spreads out in a vast basin.
Spring	Hot water	Suối nước nóng Yui Since the spring links to a freshwater spring, water's temperature is safe for bathing.
		Suối nước nóng Malu Since the spring links to a freshwater spring, water's temperature is safe for bathing. It stems from Malu mountain, a very high mountain, where Cotu people believe that the mountain gods are dwelling.
The summary is derived from the opinions of the local participants in the meetings		

Figure 6.6 shows the results of classification based on the mentioned criteria. Among five classes of the classification for the *attraction criterion*, only classes of moderate and high were observed, with six and five units, respectively (Figure 6.6a).

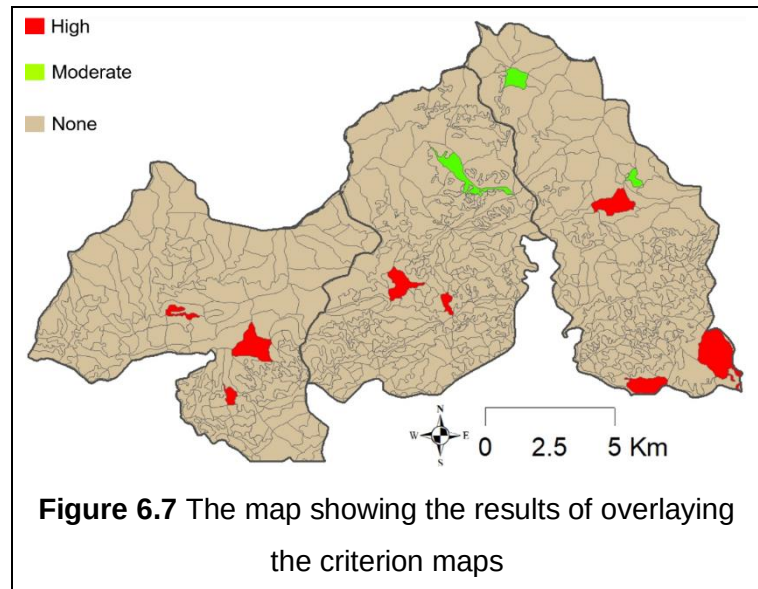
While some of the sites exhibited low *adaptation to local legal condition* on forest management and usage as shown in Figure 6.6b, tourism activities are still planned in the protection and production forests. Article 17, Decision No. 17 (2015) shows that ecotourism in the protection forest can be started if the activities meet some requirements for forest conservation. Meanwhile, it is much easier to launch ecotourism in the production forest when the planned activities are not having negative impacts to timber and non-timber production and the soil environment (article 19, Decision No. 49, 2016). Furthermore, most



identified sites were within a distance of 5 km to the road connecting to neighboring

city (Da Nang) and district (Tay Giang) with very high evaluation scores for *accessibility* (Figure 6.6c).

Figure 6.7 shows a map, which was built by overlaying all assessed scores. A significant percentage, 72.7% (8/11), of the study units which contain the mentioned sites was classified as high possibility to be utilized for



tourism development. The distribution of these units (with the high possibility) is spread widely throughout the area, which could boost the local economy of multiple villages by the tourism development.

6.4.2 Description and Discussion of Local Resources with Cultural Values

This section presents the results of the local resources with cultural values detected through the group discussions with the local managers and discusses the possibility that these detected resources could be utilized for tourism development through literature reviews.

Seventeen local resources with tangible and intangible cultural values were detected based on the selection method mentioned in section 6.3.2. These local resources with tangible cultural values are handicrafts (knitting, traditional musical

instruments, weaving, jewelry), local cuisines (lam rice, toasted buffalo meat, ants and their eggs, buffalo horn-shaped cakes), and traditional architecture (community houses – Guol house) (Table 6.6). These local resources with intangible cultural values are festivals (new rice festival, twinning festival), rituals (killing buffalo and tung tung ya ya dance in the new rice festival; food festival and tung tung ya ya dance in the twinning festival), and ceremonial occasions (wedding, funeral) (Table 6.7). Figure 6.8 shows some pictures of these resources.



Figure 6.8 Some detected local resources with cultural values

Generally, the local resources with tangible cultural values were with a variety of references (“very popular,” “popular,” or “slightly popular”) (Table 6.6). Pérez-Llorente et al. (2013) confirmed that changes in indigenous cultures are relative to economic and social changes. Since the 2000s, the infrastructures of the area have been invested to stop nomadism, such as roads connecting the district center to remote villages and nearby districts (Århem, 2009). The investment gives an opportunity for appearance of modern materials and goods produced by the Kinh

people in the area, which have limited the preservation of the local resources classified as “slightly popular”. In addition, legal barriers on the usage of forest resources also contribute to this limitation. The results of the discussion groups with the local managers showed that there is a possibility to revive “slightly popular” resources, such as musical instruments and jewelry, which are related to the spirituality of Cotu people. The Cotu men often use the musical instruments in community gatherings, such as festivals and unplanned gatherings after working. Meanwhile, the Cotu women favour the jewelry, which is believed to help them to be more beautiful. The participants in the group discussions mentioned: “we do not want to lose the resources because they are an essential part of who we are”. On the other hand, most local resources with intangible cultural values were being well preserved in the villages (classified as “very popular” or “popular”) (Table 6.7). The good preservation of the festivals and rituals can stem from the Cotu people’s strong belief in the power of local gods. Århem (2009) indicated that through worshipping and performing rituals in festivals, the Cotu people communicate with and thank the local gods for their supports to the lives and crops of local communities.

Table 6.6 Local resources with tangible values and socio-demographic characteristics of local people preserving the resources

Local resources	Brief description	Popularity	Socio-demographic characteristics		
			Gender	Age	Union
Traditional handicraft					
Knitting	Making papooses and baskets using forest products	Popular	Male	51±7	Farmer, elderly
Musical instruments	Making local musical instruments using forest products and animal horns	Slightly popular	Male	57±6	Farmer, elderly
Weaving	Weaving threads into cloth and making traditional clothes	Popular	Female	33±8	Women
Jewelry	Making jewelry using beads and wild animal fangs	Slightly popular	Female	56±7	Women, elderly
Local cuisine					
Lam rice	Made by filling bamboo tubes by local rice, covering the heads of tubes with banana leaves, and cooking using firewood	Very popular	Female	35±10	Women
Toasted buffalo meat	Made by mixing buffalo meat with local spices and toasting using charcoal	Slightly popular	Female	37±10	Women
Ants and their eggs	Various foods made from local ants (kiến chua) and their eggs	Popular	Female	43±1	Women
Buffalo horn-shaped cake	Made from local rice (proong) and local spices and covered by leaves of a local plant (đót)	Very popular	Female	36±9	Women
Traditional architecture					
Community house (Guol)	The floor is with a rectangle/oval shape and is made with a wooden frame. The roof is arched at two gables. There is a big pillar at the house's center, which is decorated by sculptural and painting artwork. All used materials are collected from the forests.	Very popular	Male	Over 18	Farmer, youth, and elderly

Table 6.7 Local resources with intangible values and socio-demographic characteristics of local people preserving the resources

Local resources	Brief description	Popularity	Socio-demographic characteristics		
			Gender	Age	Union
Festivals and rituals					
New rice festival	Conducted in October or November to thank local gods for supporting local people's lives and crops. The ritual lasts two days and takes place in front of community houses. On the first day, local people sing and dance around a buffalo tied to a pillar.	Very popular	Male	Over 40	Farmer, elderly
Killing buffalo	On the second day, the village patriarch prays and invites local gods by singing special songs. Healthy and prestigious men dance around the buffalo and puncture it while villagers cheer for them				
Community dance	The Tung Tung Ya Ya dance	Very popular	All genders	All ages	All local unions
Twinning festival	Conducted out of crop seasons; to strengthen relationships between villages				
Food festival	Villagers gather, enjoy local foods and drinks, and then sing and dance	Very popular	All genders	All ages	All local unions
Community dance	The Tung Tung Ya Ya dance	Very popular	All genders	All ages	All local unions
Ceremonial occasions					
Wedding	Representatives of families of the bride and groom sing rhyming songs about love and happiness. The two families exchange gifts comprising forest and agricultural products. The bride and groom drink local wine, pray to their ancestors, and receive gifts from relatives. They perform the Pàzùm ceremony (wherein the new couple is covered by a blanket), which officially recognizes their marriage	Slightly popular	All genders	Over 18	All local unions
Funeral	Traditional music is used during the funeral. The relatives pray to local gods and ancestors for the deceased by singing special songs. Relatives and villagers prepare offerings for the deceased and bury them at a charnel house.	Popular	All genders	All ages	All local unions

There has been recently an increasing demand for tourism development based on culture (Richards, 2018). Specific form of tourism development based on culture can be found in literature reviews as “cultural tourism” or “culture-based tourism” (Bachleitner and Zins, 1999; Ahebwa et al., 2016; Richards, 2018). This form of tourism is also identified and defined by UNWTO (n.d.) as “a type of tourism activity in which the visitor’s essential motivation is to learn, discover, experience and consume the tangible and intangible cultural attractions/products in a tourism destination”. Richards (1996) indicated that tourists tend to visit to destinations with specific cultural attractions, which are different from their normal places of residence. Thus, local resources with uniquely tangible and intangible cultural values become significant tourism resources (Ahebwa et al., 2016). In practice, tourism development based on the local resources with cultural values has been implemented in many countries, such as New Zealand (McIntosh, 2004; Māori Tourism, n.d.); China (Yan and Bramwell, 2008); Uganda (Ahebwa, 2016), and Japan (Sunaga, 2018). The followings show some examples of the tourism development. In Japan, the tourism is well-known in Hokkaido, with a focus on the culture of the Ainu ethnic minority. Some tangible and intangible cultural values of the Ainu people, such as handicrafts (wood carving, textiles made from tree bark (attus), and embroidery products); museums; and traditional dances and songs, have been utilized to serve tourists (Sunaga, 2018). In New Zealand, the culture of the Māori people, such as tribal meeting grounds; handicrafts of carving; weaving; tattooing; and traditional dances and songs, has also been utilized successfully for tourism development (McIntosh, 2004; Māori Tourism, n.d.). In Vietnam, tourism drawing on local resources with cultural values has also been developed recently. For example, tourism based on the culture of the Yao people (one of ethnic

minorities) is well-known in Sapa district, Lao Cai province, which is located in the northwest of Vietnam (Dinh and Yos, 2013).

The culture of the Cotu people is separated from those of Kinh people (main ethnic) and others in Vietnam so that its uniqueness has been appreciated not only by domestic scholars, such as Le (2001); Ta (2002); Nguyen (2004); Dinh (2006); and Tran (2009), but also by foreign scholar, such as Århem (2009). Thus, the local resources with cultural values of the Cotu people could be significant resources for the tourism.

6.4.3 Socio-Demographic Characteristics of Local People who are Familiar with or Preserving the Local Resources

The participants in detecting the local resources with natural values were the local people who collected the ecosystem services for their livelihoods as indicated in Chapter 4. More than a half of the participants were aged between 38 and 49 years (61.7%, $n = 37$), followed by 50–59 years (20.0%, $n = 12$), and 18–37 years (18.3%, $n = 11$). These local participants were men belonging to the farmer union.

Table 6.6 shows socio-demographic characteristics of the local people who were preserving the local resources with tangible cultural values. The knitting and musical instruments were preserved by the men who were 51 and 57 years old on average, respectively, and belonging to the farmer or elderly unions. The main labor for other handicrafts were the women belonging to women or elderly unions. In particular, the women who were 33 years old on average were preserving the weaving while the older those, 56 years old on average, were preserving the jewelry. In addition, the women who were belonging to the women union played a key role

in preserving the local cuisines. In contrast, the men were being main labor for the preservation of community houses (Guol house). In particular, according to the rule of village, the men older than 18 years old and younger than 60 years old (belonging to the youth or farmer union) were being responsible for practicing the construction and restoration of the community houses. Meanwhile, the older men (belonging to the elderly union) who were being better acquainted with house architecture, history, and functions responsible for managing the construction, usage, and restoration of the community houses. On the other hand, there is a diversity in gender and local unions of the main labor for the preservation of local resources with intangible cultural values, except for the ritual of killing buffalo in the new rice festival (Table 6.7). Only men over 40 years old were doing the ritual of killing buffalo. Among them, the village patriarchs (belong to the elderly union) performed worships (praying and inviting local gods by singing special songs), and others (belong to the farmer union and were healthy and prestigious) did the rest of the ritual activity like dancing around the buffalo and puncturing it.

6.5 Conclusion

The study revealed the local resources with natural and cultural values, which were recognized and being preserved by the local communities. The resources with natural values were highlighted at eleven sites with outstanding natural beauty, such as waterfalls and hot springs. Also, eight study units which contain some of these sites were assessed as high possibility of utilization for tourism development in terms of attraction, accessibility, and adaptation to local legal condition criteria. In addition, seventeen local resources with tangible and intangible cultural values were pointed out. While most local resources with intangible cultural values were being

well preserved in the local communities (classified as “very popular” or “popular”), the resources with tangible cultural values were with a variety of references (classified as “very popular”, “popular”, or “slightly popular”). Based on the discussion, these local resources with cultural values could be significant resources for tourism development.

The indigenous values which are only saved in local communities and not managed by any agencies from the public may be gradually disappeared because of impacts of economic and social development (Groenfeldt, 2003; Dlamini, 2017). The local resources with natural and cultural values in the area may also face with the disappearance if these resources are not detected, valued, and managed. In addition, Biswanath (2017) emphasized the important role of local resources in sustainable rural development. Considering tourism assessment, previous researches, and practices in tourism development, the local resources revealed in this study could be utilized for tourism development to some extent. Meanwhile, as revealed in previous studies, the livelihood activities in the highland areas of Central Vietnam have faced with some limitations of local conditions, e.g., the lack of water irrigation for agricultural activities in the dry season (Nguyen et al., 2015) and small allocated areas of forestland to local households (Nguyen et al., 2016). Thus, tourism development could be an alternative livelihood option for the forest-dependent communities in the area. Because tourism development is a complicated activity which overlaps different sectors of the society and economy (Inskeep, 1991; UNWTO, 1994), there is a need for further discussions between multiple stakeholders, such as local communities, local governments, professional consulting organizations in tourism, and governmental organizations which are being responsible for culture and forest conservation. The findings from this study

could be contributing to the discussion of tourism introduction in the area as well as the construction of appropriate regional planning in the future.

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Chapter 7 CONCLUSIONS

7.1 Summary

The research has explored the livelihoods of local communities living in the buffer zones of Bach Ma National Park in Vietnam. The key purposes were (1) to understand details of local communities' dependence on forest ecosystem services, and (2) to identify local resources which could be utilized for livelihood improvement of forest-dependent communities. This section provides a summary of previous chapters, and general observations based on the results.

Chapter 1 described the background of this research in which biodiversity loss in protected areas in Vietnam and its driving factor relative to livelihoods of poor local communities was clarified. Chapter 2 presented a literature review on the concepts used in this research. Details of the study area were outlined in Chapter 3, which also provided an overview of the methodology used in this research. The main research findings were presented in Chapters 4, 5 and 6. The collection of forest ecosystem services by local communities from both a plain and mountainous districts, all within the buffer zones, was described and analyzed in Chapter 4. The results showed that local communities, especially the ethnic minorities living in the mountainous districts, depend on a wide range of forest provisioning ecosystem services to supplement their livelihoods. These ecosystem services comprise foods, materials, and water resources collected during certain months of year. These ecosystem services are mainly consumed by individual families conducting the collection. In addition, the spatial distribution of the collection locations and frequency of collection were clarified in relation to factors such as land use,

administrative units, terrain conditions, accessibility, resource abundance, and forest governance. In Chapter 5, the dependence of the local communities living in the buffer zone to the southeast of the Park on the forests was clarified, and details of the collection of forest ecosystem services were described. The calculation of monetary value of these collected ecosystem services and the assessment of their contribution to total household incomes were also carried out. The types of ecosystem services collected, the rate of their contributions to the total household income, and the rate of households conducting the collection were compared to those investigated in other parts of the buffer zones and other regions in Vietnam. Based on the comparisons, it was deduced that the local communities in the area are highly dependent on the forest ecosystem services for their livelihoods. In Chapter 6, by employing participatory mapping and multi-criteria decision analysis, the local resources with natural values were identified and their possibility to be utilized for tourism development was assessed in term of scenic attractions, ease of access, and compliance with local legislative requirements. Local resources with cultural value were also identified based on group discussions with the local managers (village leaders, village patriarchs, and heads of local unions), and their possibility to be utilized for tourism development was discussed in relation to previous studies. Based on the assessment and discussions, it can be concluded that these local resources should be considered as important assets for tourism development.

The results showed that the forests provide important benefits contributing to the well-being of local communities through the provision of foods, materials, and water resources. This research has revealed that forest ecosystem services play a key role in meeting consumption needs of the households (family/subsistence

consumption). In comparison to other communities in the buffer zones, the ethnic minorities living in the buffer zone to the southeast of the Park are considered to be highly dependent on the forest ecosystem services. With the increasing population (the population growth rate per year is 1.9%, as presented in Chapter 3), the dependence on ecosystem services by the local communities is likely to increase in the future. Although the collection of many of the forest ecosystem services is an illegal activity, with high poverty rates in the communities (e.g., 57% in Song Kon commune, 41% in Ta Lu commune, as presented in Chapter 3), the imposition of stricter legal requirements on the collection of forest ecosystem services may lead to further impoverishment in these local communities. To avoid problems caused by the interaction between poor local communities and their surrounding forests, some approaches have been suggested such as resettlement (Hummel et al., 2019), or attempting to reduce their poverty levels (Kamanga et al., 2009). However, the ethnic minorities living in the buffer zone to the southeast of the Park depend on the forests not only for their livelihoods (Chapter 5), but also to some extent for their cultural lives (e.g., the belief in a forest God which is displayed in festivals) (Chapter 6). Thus, it does not appear feasible for the communities to be moved, without severe disruption to their culture and social-wellbeing. This research proves the availability of local resources which have existed along with the local communities and their possibility to be utilized for tourism development. The findings furthermore provide an opportunity to consider local livelihood improvement while still maintaining the indigenous cultural values.

7.2. Recommendations for the Local Government

Although the conservation strategies for the Park and its buffer zones incorporate strict legal instruments including regulations, the results from Chapter 4 and 5 indicated that local communities, especially the ethnic minorities living in the mountainous districts, are not in a position to comply with legal requirements due to their poverty. Introducing other local livelihood opportunities could mitigate their poverty and dependence on the forests, and thus facilitate sustainable management of the Park and its buffer zones.

As revealed in previous studies, household-scale agriculture and forestry in the highland areas of Central Vietnam have been limited by local conditions, e.g., the lack of irrigation water for agricultural activities in the dry season (Nguyen et al., 2015). A further restriction is the small size of forestland areas allocated to local households for forest plantation (Nguyen et al., 2016). Meanwhile, the results in Chapter 6 showed the availability of local resources which could be utilized for tourism development. Also, tourism development in mountainous districts, with a focus on local resources and community participation, has been encouraged by Quang Nam government (Resolution No.47, 2018). Based on the results revealed in this research and the development orientation, it is recommended that tourism development should be considered as an alternative livelihood option for the forest-dependent communities in the area.

7.3 Significance of the Research

Incorporating understanding from local practice into design of management policies for protected areas can be an important step to meeting conservation goals

(West et al., 2006; Chu, 2017; Hummel et al., 2019). The results from this research, involving detailed understanding of the degree of forest dependence by local communities, could benefit policy makers in designing sustainable management strategies for the Park and its buffer zones. Beside this, the detailed information on the collection of forest ecosystem services provides a useful point of reference for developing forest restoration strategies and determining areas requiring prioritized protection. This research has also helped local communities express their needs, perspectives, and knowledge, which have seldom been measured and incorporated into policies directly affecting their lives.

The local natural and cultural resources, which are not well-known to outsiders but are recognized within the local community may disappear due to impacts of economic and social development (Groenfeldt, 2003; Dlamini, 2017). The identification and valuation of these resources, which were carried out during this study, have provided a basis for planning, management and sustainable use of the local resources.

7.4 Limitations of the Research and Perspectives on Future Studies

Although this research has shown the availability of local resources for tourism development, detailed evaluation of how this can be realized was not carried out due to time limitations. This study concludes by highlighting three aspects needing further research before tourism development is implemented in the area. Firstly, the relative competitiveness of the area in the tourism market should be verified. To do this, the current status of tourism in the greater area should be evaluated, and advantages and disadvantages of tourism development in the area

should be weighed up. Secondly, the adaptability of the area to tourism development should be assessed. The strengths and weakness of current physical, economic, human, and policy capacities which can support or limit tourism development should be clarified. Finally, negative impacts from tourism development, such as environmental degradation including from increased infrastructure, economic risks such as from increase in prices, and social impacts such as from culture clashes, should be clarified and shared with the local communities. The local communities should then decide whether or not tourism should be introduced.

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Appendix I

Collected Information regarding the Need of Forest Ecosystem Services and Local Livelihoods

I. Information collected by meeting with the local representatives

Province _____ District _____
Commune _____ Village _____

1. Socio-demographic characteristics of participants

Name	Gender	Age	Occupation	Ethnicity	Origin of resident

2. Collection of forest ecosystem services

Type	Harvest seasons (month)		Utilization		
	Main season	Extra season	Family consumption	Sale	Others

3. Locations of forest ecosystem service collection location through doing participatory mapping exercises.

II. Information collected by interviewing with the local households

1. Socio-demographic characteristics of respondents and their families

- Commune
- Village
- Gender: Male/Female
- Age of householder
- Ethnicity: Cotu/Kinh/Others
- Family size
- Education level of householder: Primary school/Secondary school/High school /College/University
- Economic status of household: Poor/Near-poor/Others
- Household's livelihoods

2. Information about household's livelihood

Agriculture

Type	Amount (kg)

Livestock

Name	Number

Forest plantation

Area of forestland	Income from forest plantation (VND/year)

Collection of forest ecosystem services

Type	Local name	Amount	Utilization		
			Family consumption	Sale	Others

Other incomes

Income sources	Income (VND/year)

Appendix II

Collected Information regarding Local Resources

I. Information collected by meeting with the local people

1. Socio-demographic characteristics of participants (name, gender, age, local unions that the local participants were members).
2. Sites which are with outstanding natural beauty in the area and not well-known to outside.
3. Names of the mentioned sites, their descriptions, classifications, and preliminary assessment.
4. Locations of these sites through doing participatory mapping exercises.

II. Information collected by meeting with the local managers

1. Existence of local resources with Cotu culture in the villages.
2. Names and descriptions of the mentioned local resources.
3. Classification of the mentioned local resources based on the number of households whose members have preserved these local resources.
 - “very popular”: more than 80% of local households with family members preserving the local resources;
 - “popular”: 50–80% of the households;
 - “slightly popular”: less than 50% of the households;
 - “extinct”: none of the households.

III. Information collected by interviewing with the local people preserving the local resources

1. Socio-demographic characteristics of respondents
 - Commune
 - Village
 - Gender
 - Age
 - Local union that the local participants are members
2. Local resources with cultural values are being preserved by the respondents

Name of the local resources	Description

Appendix III

Socio-Demographic Characteristics of Local People Preserving

Local Resources with Cultural Values

Interview period: 2018 July 9th – 22nd

Local People	Gender	Age	Local Union	Preserved local resource
1	Male	60	Elderly	Knitting
2	Male	43	Farmer	Knitting
3	Male	48	Farmer	Knitting
4	Male	51	Farmer	Knitting
5	Male	50	Farmer	Knitting
6	Male	53	Farmer	Knitting
7	Male	52	Farmer	Knitting
8	Male	60	Elderly	Knitting
9	Male	60	Elderly	Knitting
10	Male	37	Farmer	Knitting
11	Male	50	Farmer	Musical instruments
12	Male	60	Elderly	Musical instruments
13	Male	61	Elderly	Musical instruments
14	Male	48	Farmer	Musical instruments
15	Male	49	Farmer	Musical instruments
16	Male	65	Elderly	Musical instruments
17	Male	59	Farmer	Musical instruments
18	Male	58	Farmer	Musical instruments
19	Male	56	Farmer	Musical instruments
20	Male	67	Elderly	Musical instruments
21	Female	35	Women	Weaving
22	Female	40	Women	Weaving
23	Female	30	Women	Weaving
24	Female	32	Women	Weaving
25	Female	22	Women	Weaving
26	Female	38	Women	Weaving
27	Female	21	Women	Weaving
28	Female	36	Women	Weaving
29	Female	46	Women	Weaving
30	Female	27	Women	Weaving
31	Female	60	Elderly	Jewelry
32	Female	55	Women	Jewelry
33	Female	53	Women	Jewelry
34	Female	58	Women	Jewelry
35	Female	56	Women	Jewelry
36	Female	59	Women	Jewelry
37	Female	60	Elderly	Jewelry
38	Female	40	Women	Jewelry
39	Female	65	Elderly	Jewelry
40	Female	49	Women	Jewelry
41	Female	21	Women	Lam rice
42	Female	37	Women	Lam rice
43	Female	42	Women	Lam rice
44	Female	32	Women	Lam rice
45	Female	34	Women	Lam rice
46	Female	43	Women	Lam rice
47	Female	56	Women	Lam rice
48	Female	32	Women	Lam rice
49	Female	36	Women	Lam rice
50	Female	20	Women	Lam rice
51	Female	40	Women	Toasted buffalo meat

52	Female	35	Women	Toasted buffalo meat
53	Female	43	Women	Toasted buffalo meat
54	Female	43	Women	Toasted buffalo meat
55	Female	45	Women	Toasted buffalo meat
56	Female	30	Women	Toasted buffalo meat
57	Female	32	Women	Toasted buffalo meat
58	Female	24	Women	Toasted buffalo meat
59	Female	59	Women	Toasted buffalo meat
60	Female	23	Women	Toasted buffalo meat
61	Female	43	Women	Ants and their eggs
62	Female	43	Women	Ants and their eggs
63	Female	42	Women	Ants and their eggs
64	Female	44	Women	Ants and their eggs
65	Female	45	Women	Ants and their eggs
66	Female	42	Women	Ants and their eggs
67	Female	43	Women	Ants and their eggs
68	Female	41	Women	Ants and their eggs
69	Female	43	Women	Ants and their eggs
70	Female	42	Women	Ants and their eggs
71	Female	45	Women	Buffalo horn-shaped cake
72	Female	40	Women	Buffalo horn-shaped cake
73	Female	35	Women	Buffalo horn-shaped cake
74	Female	43	Women	Buffalo horn-shaped cake
75	Female	32	Women	Buffalo horn-shaped cake
76	Female	21	Women	Buffalo horn-shaped cake
77	Female	46	Women	Buffalo horn-shaped cake
78	Female	48	Women	Buffalo horn-shaped cake
79	Female	23	Women	Buffalo horn-shaped cake
80	Female	28	Women	Buffalo horn-shaped cake
81	Male	60	Elderly	Guol house
82	Male	45	Farmer	Guol house
83	Male	61	Elderly	Guol house
84	Male	45	Farmer	Guol house
85	Male	25	Youth	Guol house
86	Male	64	Elderly	Guol house
87	Male	24	Youth	Guol house
88	Male	60	Elderly	Guol house
89	Male	26	Youth	Guol house
90	Male	30	Youth	Guol house
91	Male	45	Farmer	Killing buffalo
92	Male	62	Elderly	Killing buffalo
93	Male	49	Farmer	Killing buffalo
94	Male	60	Elderly	Killing buffalo
95	Male	47	Farmer	Killing buffalo
96	Male	63	Elderly	Killing buffalo
97	Male	62	Elderly	Killing buffalo
98	Male	59	Farmer	Killing buffalo
99	Male	53	Farmer	Killing buffalo
100	Male	54	Farmer	Killing buffalo
101	Male	18	Youth	Community dance
102	Male	20	Youth	Community dance
103	Female	23	Youth	Community dance
104	Male	49	Farmer	Community dance
105	Female	15	Teenager	Community dance
106	Male	14	Teenager	Community dance
107	Male	45	Farmer	Community dance
108	Female	34	Women	Community dance
109	Male	16	Teenager	Community dance
110	Male	42	Farmer	Community dance
111	Female	13	Teenager	Community dance
112	Female	60	Elderly	Community dance
113	Male	25	Youth	Community dance
114	Male	27	Youth	Community dance
115	Male	35	Youth	Community dance

116	Male	39	Farmer	Community dance
117	Male	42	Farmer	Community dance
118	Female	26	Youth	Community dance
119	Male	39	Farmer	Community dance
120	Female	41	Women	Community dance
121	Female	18	Teenager	Community dance
122	Male	36	Youth	Community dance
123	Male	60	Elderly	Community dance
124	Female	59	Women	Community dance
125	Female	57	Women	Community dance
126	Male	61	Elderly	Community dance
127	Male	29	Youth	Community dance
128	Female	16	Teenager	Community dance
129	Female	49	Farmer	Food festival
130	Female	32	Youth	Food festival
131	Male	16	Teenager	Food festival
132	Female	35	Women	Food festival
133	Female	49	Farmer	Food festival
134	Male	61	Elderly	Food festival
135	Male	62	Elderly	Food festival
136	Female	59	Women	Food festival
137	Male	27	Farmer	Food festival
138	Female	39	Farmer	Food festival
139	Female	35	Women	Wedding
140	Male	21	Farmer	Wedding
141	Female	30	Women	Wedding
142	Male	53	Farmer	Wedding
143	Female	19	Women	Wedding
144	Male	61	Elderly	Wedding
145	Male	56	Farmer	Wedding
146	Male	26	Farmer	Wedding
147	Female	22	Women	Wedding
148	Male	30	Farmer	Wedding
149	Male	65	Elderly	Funeral
150	Male	49	Farmer	Funeral
151	Male	35	Farmer	Funeral
152	Female	50	Women	Funeral
153	Male	41	Farmer	Funeral
154	Male	43	Farmer	Funeral
155	Female	29	Women	Funeral
156	Male	38	Farmer	Funeral
157	Female	42	Women	Funeral
158	Male	46	Farmer	Funeral