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# Non-timber Forest Products in Bu Gia Map National Park: Local Use and Sustainable Management

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***Abstract***

*Non-timber forest products* (*NTFPs*) *in Bu Gia Map National Park* (*BGMNP*) *have played a critical role in local livelihood. Thus, the park resources have been threatened by local harvesting. Yet, the local perspective of the NTFP utilization between Indigenous Ethnic Minorities* (*IMs*) *and Kinh people* (*KPs*) *has been poorly understood. Besides, in order to analyze the resource use between the IMs and the KPs, the "walk-in-the-wood" method and the Participatory Rural Appraisal* (*PRA*) *were employed. This paper revealed that the local NTFP utilization gradually shifted from purely self-consumption to more income generation* (*p-value = 0.000 < 0.05*). *Besides, the IMs relied much upon the NTFPs, whereas the KPs were less dependent upon these resources. The IMs harvested these resources for more subsistence related to their traditional and basic needs than those KPs. Based on the local findings, the institutional management strategies in BGMNP should emphasize resource utilization patterns, human capital empowerment, and group-based arrangements. Likewise, group-based arrangements in BGMNP would play an important role in the local livelihood improvement and the sustainable park development.*

*Keywords*: *group-based arrangements, indigenous ethnic minorities, Kinh people, NTFP dependence, potential forest species*

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## Introduction

Historically, various groups of rural people in tropical countries have relied much on non-timber forest products (NTFPs). Likewise, various activities such as farming on forest land, logging, uncontrolled extraction of NTFPs, poaching, smuggling, and livestock grazing have threatened local NTFPs in tropical protected areas such as national parks, nature reserves, sustainable use reserves, protected landscapes, and wilderness areas (Budiman et al., 2020; Dinh, 2021; Hashiguchi, 2021; Dinh & Pham, 2023a; Bierkamp et al., 2023; Pham et al., 2023). Similarly, various rural people in different tropical regions have depended heavily upon NTFPs for both self-consumption and cash income (Dinh, 2019; Masy'ud et al., 2020; Budiman et al., 2020; Bakri et al., 2023; Dinh & Pham, 2023a; Andika et al., 2024). As a result, the local dependency on NTFPs has caused many negative impacts on protected areas in the tropical countries (Pangau-Adam, 2012; Talukdar et al., 2021; Dinh & Pham, 2023a; Bierkamp et al., 2023).

With regard to Bu Gia Map National Park (BGMNP), local poverty in its buffer zone has caused unsustainable harvesting practices of NTFPs (Dinh, 2019; Dinh & Pham, 2023b). Besides, many local households of Kinh people (KPs) and the indigenous peoples (IMs) in the buffer zone of BGMNP have depended on the NTFPs. Similarly, the local consumption has increased the management challenge of the park (Dinh & Pham, 2020; 2023b).

Despite of the laudable efforts in terms of society contributions for resource protection and enhancing the economic value of the park, the NTFP loss and the forest environment degradation in BGMNP have been reported (Dinh, 2019; Dinh & Pham, 2023b). Therefore, like the case in Cat Tien National Park (Dinh & Pham, 2023a), the sustainable forest development target in BGMNP has not been fulfilled yet. Nevertheless, the NTFP use context between the IMs and the KPs in Bu Gia Map has been poorly understood. Consequently, comprehending the perspective of the NTFP consumption between the two local groups in this special-use forest is necessary.

Thus, this study was to analyze the resource utilization context between the IMs and the KPs and to clarify the appropriate strategies for sustainable NTFP management and local livelihood development in BGMNP.

## Methods

**Research site** Lying in the southeast region of Vietnam, BGMNP's coordinates are N128'30"N127'3" and E1073'30"N1074'30". The core zone of BGMNP stretches over about 25,593.79 ha of land and its buffer zone covers an area of approximately 18,038 ha. There are over 35,000 people in its buffer zone. The national park consists of 835 fauna species and 1,114 vascular plant ones. Particularly, 11 forest plant species and 9 mammal ones of BGMNP are recorded in the Red List of Threatened Species of IUCN. Conventionally, the IMs have been living in BGMNP for many generations. Instead, the KPs moved to the buffer zone and settled in the areas about 40 years ago.

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**Data collection** The research data were collected within accessible sites where local residents were living near forest. Furthermore, the people relied on the NTFPs in BGMNP. Thanks to those criteria, 6 hamlets in the buffer zone were chosen. In the survey hamlets, the IMs and the KPs accounted for about 91.3% of the population. To gather primary research data, the Participatory Rural Appraisal (PRA) method (Chambers, 2007) was applied. To put it simply, 205 questionnaires, household interviews, focus group discussions, key informant panel KIP, semi structured interviews, analysis of Strengths, Weaknesses, Opportunities, Threats (SWOT), livelihood analysis, and trend analysis were carried out. Each group meeting consisted of about 5–10 respondents. Also, key informants like village headmen or elders, local authorities, foresters, and traders were interviewed. To ensure the validity and reliability of these study findings, triangulation was used in the data gathering. The research technique for gathering the field data in BGMNP complied with the Helsinki Declaration.

Moreover, the "walk-in-the-wood" method (Prance et al., 1987) was applied. Each field survey in BGMNP was organized with 1 or 2 local people who knew about the NTFP species. Scientific names of forest species were crosschecked with the local knowledge and the information in the monographs edited by Do (Do, 1995) and Pham (Pham, 2000).

**Data analysis** Harvesting intensity of an NTFP was categorized as (1) medium–a moderate quantity of a product gathered owing to moderate abundance or extraction setbacks, > 5–10 kg harvesting time$^{-1}$; and (2) high–a large amount of that collected owing to high demand, > 10 harvesting time$^{-1}$. On the basis of local demand, a level range was covered as (1) low–self-consumption and sometimes their NTFPs sold in the local markets and (2) high–not difficult to sell a large amount of NTFPs. Cash income of NTFPs was classified as (0) never, (1) 1 to 25%, (2) > 25 to 50%, (3) > 50 to 75%, and (4) > 75 to 100%. NTFP extraction frequency was categorized as (0) never, (1) rarely, (2) sometimes, (3) very often, (4) always. Also, scales of NTFP use categorization ranged as (1) low dependency (1–7 times month$^{-1}$), (2) medium dependency (8–15 times month$^{-1}$), (3) relatively high dependency (16–22 times month$^{-1}$), and (4) high dependency (> 22 times month$^{-1}$).

The equation UI = Us/N (Phillips & Gentry, 1993) was used to figure a use index (UI) for a forest species, where N and Us were the whole research families and the informant number gathering the NTFP species in BGMNP, respectively. Moreover, paired sample *t*-test, independent samples test, and Pearson's chi-square tests were carried out for the research analysis of the shifting consumption trend, the economic or educational status, and the NTFP use between the IMs and the KPs in BGMNP, respectively.

## Results and Discussion

**Demography** Overall, the IMs were approximately 3,252 people and made up about 47.3% of the population in the study areas and KPs, 44.0% (3,025), respectively. All of the informants self-identified as farmers. Nearly 45.9% of the interviewees (94) had non-farm activities such as local retail trading, official work, forest protection, and construction. Approximately 29.8% of the respondents (61 interviewees) were local farmers involved in off-farm jobs like handicraft or seasonal wage earnings. Still, most of them got low income from those activities (Dinh & Pham, 2023b). The poor and very poor households interviewed were 120 and accounted for 58.5% of the total respondents. The economic status between the IMs and the KPs varied significantly ($F$ = 0.372, $p$-value = 0.000).

Of the respondents in the survey hamlets, the rate of the male and female was as follows: 70.7% and 29.3%, respectively. The mean age of the informants was 47.6 years with a range from 21 to 73 years. A large majority of the interviewees had low educational backgrounds. More than one-tenth of them (10.2%) had non-formal education. Approximately 42.9% of the interviewees completed 1 to 5 years of formal education, whereas 3.4% of them had higher education. Among them, 32.3% completed 6 to 9 years of education, and only 11.2% of informants reached 10–12 years of formal education. The education status of the IMs and the KPs did not vary significantly ($F$ = 1.130, $p$-value = 0.150). Also, low education levels and poverty in BGMNP were the main reasons for encroaching on natural forest resources (Dinh & Pham, 2020).

**NTFP utilization** Overall, the study households in BGMNP extracted and used many NTFP categories, including edible mushrooms (98.0%), edible plants (100%), firewood (98.0%), medicinal plants (36.1%), fodder for grazing (45.4%), amphibians and aquatic animals (66.8%), and other wild animals (15.6%). The result showed that all of the interviewees harvested and utilized some or various edible species of wild plants and fungi. Altogether, 121 species of edible fungi and plants under 59 families were extracted by the IMs, whereas the KPs harvested 86 species in BGMNP (Table 1). Additionally, both of the groups' usage of the edible plants and fungi for food was more common than the others (Figure 1). Utilization patterns of the edible forest products related to herbal medicine, pickle, and vegetables between the KPs and the IMs were dissimilar. 100% of the IMs mentioned that the products of *Plectocomiopsis geminiflora* and *Gnetum gnemon* (UI = 1) retained their indigenous food culture. Some species, like *Scaphium macropodum, Termitomyces albuminosa, Ganoderma lucidum,* and some bamboo species, were much more essential for the two groups' cash income than for their subsistence.

As shown in Table 2, the most common plant parts consumed by the IMs in BGMNP were leaves (24.2%). 100% of the indigenous interviewees stated that various wild leaf products from BGMNP had become an essential part of their indigenous food culture. Surprisingly, like the indigenous peoples in Cat Tien National Park (Dinh & Pham, 2023a), the IMs in BGMNP used leaves of about 45 wild plant species in order to make their traditional alcohol called *Rượu cần* in Vietnamese. On the contrary, the utilization rate of stems (20.8%) among the KPs was much more than the others (Table 2). The stems were utilized for a variety of materials for construction, home appliances, farming tools, traditional medicine (Figure 2), and other instruments. It appeared that their dissimilar histories and cultures seemed closely linked to the forest product utilization in BGMNP.

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Table 1 Ratio of edible species consumed by the people in BGMNP

| Taxon | Family | | Edible species | | | |
|---|---|---|---|---|---|---|
| | | | Consumed by the IMs | | Consumed by the KPs | |
| | Number | Proportion (%) | Number | Proportion (%) | Number | Proportion (%) |
| Basidiomycota | 5 | 8.5 | 6 | 5.1 | 5 | 5.8 |
| Magnoliophyta | 47 | 79.7 | 108 | 91.5 | 77 | 89.5 |
| Pinophyta | 4 | 6.8 | 4 | 3.4 | 2 | 2.3 |
| Polypodiophyta | 3 | 5.1 | 3 | 2.5 | 2 | 2.3 |
| Total | 59 | 100 | 121 | 100 | 86 | 100 |

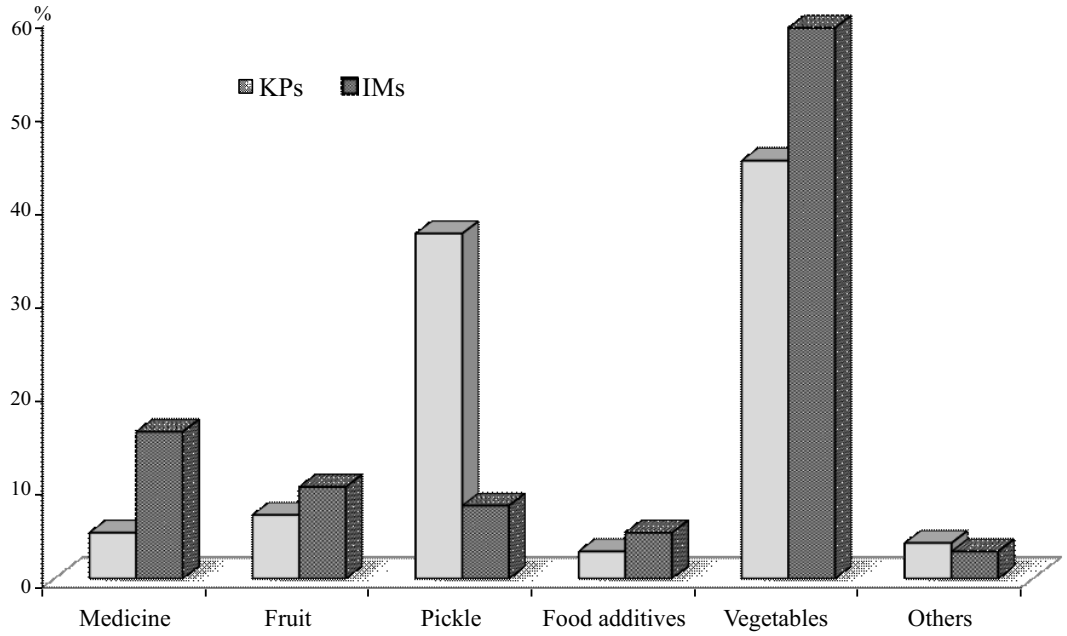


Figure 1 Usage pattern of edible fungi and plants by the IMs and the KPs.

According to the study, all of the IM respondents and 96.1% of KP ones gathered and used various wild plants as firewood (Figure 3). The locals collected about 10–20 kg of firewood at a time. The IMs harvested firewood and carried the product inside a dosser called *Gùi* in Vietnamese, whereas the KPs did not utilize those in order to convey firewood or other products. The two groups harvested bamboo, rattan, and wood poles for various uses like construction (Figure 4), furniture, traditional handicraft, agricultural amenities, and other instruments.

As shown in Figure 3, the use rate of some flora products differed significantly between the IMs and the KPs as follows: rattan $\chi^2 = 1.859$, $p$-value = 0.000; folder $\chi^2 = 17.074$, $p$-value = 0.000; and herbal medicine $\chi^2 = 34.450$, $p$-value = 0.000. Clearly, the influence on flora conservation and forest management likely differed significantly between the two groups. This appeared that the IMs were much more dependent upon the flora products in BGMNP than the KPs.

Many of them have poached fauna in the forest for self-consumption and sale. About 66.8% of the informants harvested wild aquatic animals and amphibians, and among them, 15.6% poached other forest animals (Figure 3). The local harvest of wild aquatic animals and amphibians in BGMNP has been the most common livelihood activity among the residents, as it has been considered as their customary needs. Similar to the study in Cat Tien National Park (Dinh & Pham, 2023a), the local people in Bu Gia Map poached wild animals in conjunction with the extraction of other products in the special-use forest. The use rate of wild aquatic animals and amphibians between the IMs and the KPs did not differ significantly, 72.5% and 61.2%, respectively ($\chi^2 = 29.996$, $p$-value = 0.083). Conversely, there was a significant difference in the poaching ratio of other animals between the IMs (23.5%) and the KPs (7.8%) ($\chi^2 = 65.614$, $p$-value = 0.000). Interestingly, all of the respondents were fond of the meat of *Sus scrofa*. Similar to the studies in Cat Tien (Dinh & Pham, 2023a) and Papua (Pangau-Adam et al., 2012), approximately 95.6% of the respondents agreed that animal poaching in Bu Gia Map had a gradual shifting tendency from self-consumption to income generation. Thus, the local use of fauna products in BGMNP was unsustainable, and the fauna conservation impact of this trend seemed high.

As shown in Figure 5, about 28.8% of the households highly depended on the resource products. The other dependent classifications were as follows: the relatively high

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Table 2 Utilization rate of NTFP parts by the KPs and the IMs in BGMNP (%)

| Group | Leaf | Fruit | Whole plant | Stem | Shoot | Bark | Flower | Tuber | Root | Seed | Petiole | Rhizome | Fruiting body | Resin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KPs | 15.6 | 9.4 | 12.5 | 20.8 | 14.6 | 3.1 | 3.1 | 1.0 | 2.1 | 6.3 | 1.0 | 3.1 | 5.2 | 2.1 |
| IMs | 24.2 | 14.0 | 11.3 | | 8.6 | 4.8 | 4.3 | 3.2 | 2.7 | 3.2 | 2.2 | 2.2 | 3.2 | 1.1 |

Figure 2 Product of An xoa (*Helicteres hirsuta* L.) harvested and pre-processed by a KP in the buffer zone of BGMNP.

Figure 3 An IM house made of bamboo and wood in the buffer zone of BGMNP.

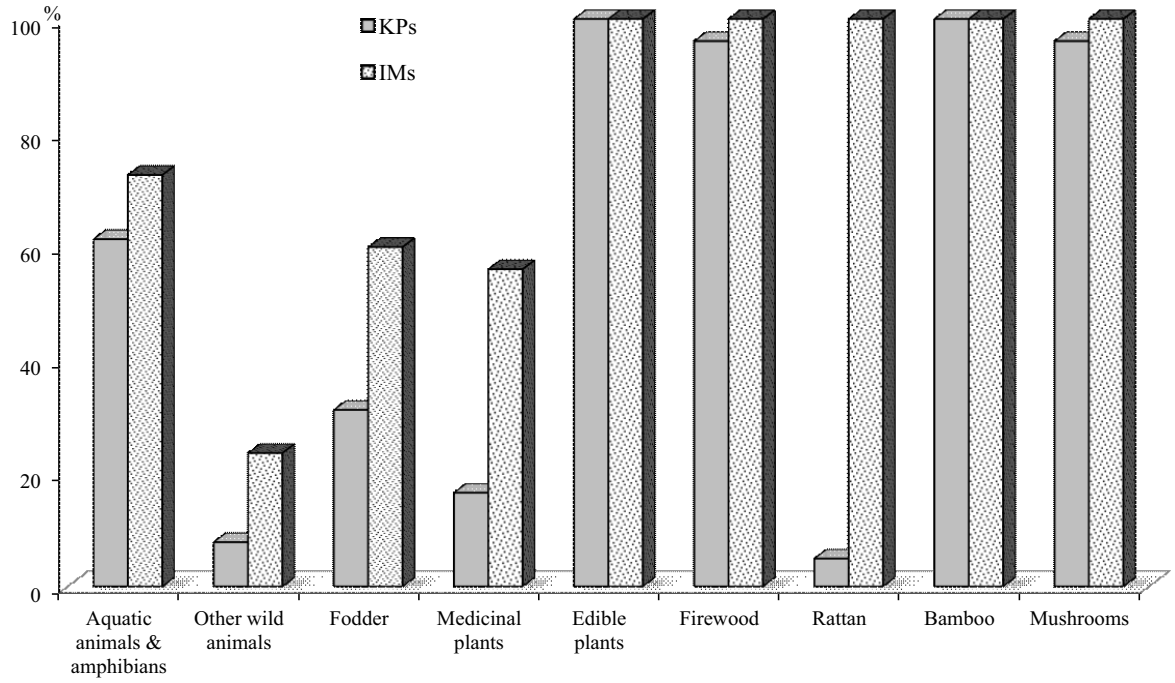


Figure 4 Frequencies of the NTFP usage between the IMs and the KPs.

dependency 11.7%, the medium dependency 13.2%, and the low one 46.3%. Particularly, approximately 50.0% of the IMs interviewed were the high-dependent households. Conversely, those of the KPs accounted for only 7.8%. The rate of NTFP utilization differed significantly between the KPs and the IMs ($\chi^2$ = 72.459, $p$-value = 0.000). This indicated that the IMs were much more dependent on the NTFPs than the KPs.

According to the paired sample $t$-test, the shifting trend differed significantly ($p$-value = 0.000 < 0.05). Based on the test and the trend analysis, the NTFP utilization in BGMNP shifted from purely self-consumption towards more income

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generation (Figure 6). Also, about 28.8% of the respondents utilized 76–100% of the forest products for cash income in 2023, while the figure was only 4.9% in 2002 (Figure 6). Furthermore, the figure of 51–75% of the resource consumption for sale between 2002 and 2023 differed: 8.8% and 11.2%, respectively. Moreover, in 2023 about 37.6% of the households did not consume the forest products for sale, but in 2002 that figure was 71.7%. As shown in Figure 7, the ratio of NTFP consumption for income generation differed significantly between the KPs and the IMs ($\chi^2$ = 1.014, *p*-value = 0.000). Certainly, the use patterns of the wild products in BGMNP had changed from subsistence to income generation. The negative conservation influence of this tendency remained likely to be really high. Consequently, it is vital to improve the livelihoods of the two groups in BGMNP through capacity building and participatory forest management, especially for the IMs.

**Management implications** Similar to the various studies in the tropical countries (Dinh, 2021; Bierkamp et al., 2023; Dinh & Pham, 2023a; Bakri et al., 2023), with the poverty in the buffer zone of BGMNP, the KPs and the IMs were much dependent on various NTFPs such as edible wild plants and fungi, forest meat, medicinal forest products, firewood, and materials for furniture, traditional instruments, handicrafts, construction, shelters, and farming tools. The findings confirmed that the IMs relied much on the resource products, whilst the KPs were less dependent on those. It appeared obvious that the main reasons for the high utilization of the forest products were that 58.5% of the study households were very poor or poor, and most of the residents had low schooling levels. Peculiarly, like previous studies in Papua (Pangau-Adam et al., 2012) and Cat Tien National Park (Dinh & Pham, 2023a), the poaching in BGMNP shifted from purely self-consumption to more cash income. This tendency raised the negative impact on its biodiversity conservation. The trend caused serious conflicts between the foresters and the harvesters. The IMs and the KPs have resided in a finite area, whilst the forest products in the core zone could not be maximized. Consequently, the tragedy of the commons (Hardin, 1998) occurred in BGMNP due to the unsustainable NTFP use. Despite its laudable efforts, the serious challenges in BGMNP were forestry law violation and local poverty. Still, the park did not have sustainable management practices of NTFPs. BGMNP faced difficulties like ineffective collaboration and shortage of physical capital (Dinh & Pham, 2023b). In order to overcome that local tragedy, participatory resource management has ever been effective enforcement as it has had a positive impact on socio-economic development and forest conservation (Dinh & Pham, 2020; McElwee et al., 2021; Dinh, 2021; Bakri et al., 2023). Also, the IMs and the KPs could be encouraged to participate in ecological services and income generation-based programs.

The IMs remained more likely to use the forest products for more self-consumption in terms of customary utilization than those KPs. Besides, with their cultural traditions, the IMs in BGMNP have the ecological knowledge related to the NTFP utilization for many generations. Interestingly, similar to the study case in Cat Tien (Dinh & Pham, 2023a), the IMs in BGMNP were really fond of the bitter taste of many wild plants like *P. geminiflora* (UI = 1), whilst nearly all of the KPs disliked the taste of these species (UI = 0.05). For instance, all of the IMs interviewed used the rattan shoots for common food and their canes for materials, whilst only 4.9% of the KPs consumed those products. According to the field result, among them, 14.9% the flora and fungi species used by the respondents had UI ≥ 0.8. Under Vietnam's Forestry Law, human intervention in the special-use forest integrity is strictly prohibited (National Assembly of the Socialist Republic of Vietnam, 2017). Yet, like the case in Cat Tien (Dinh & Pham, 2023a), to exclude the IMs from gathering

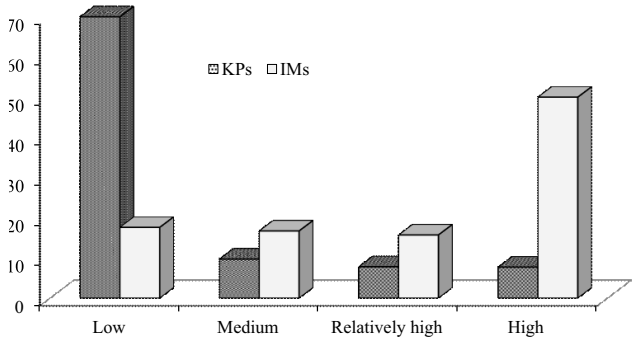


Figure 5 Frequencies of the NTFP usage between the IMs and the KPs.

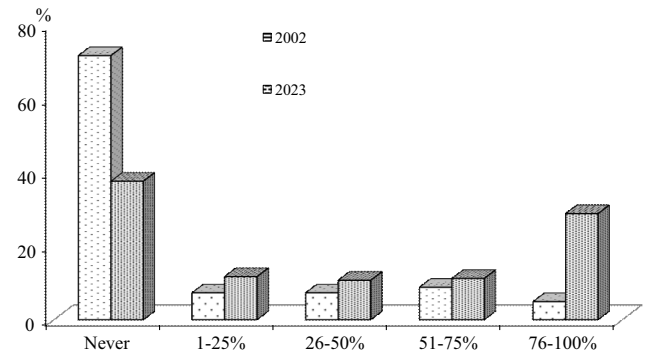


Figure 6 Ratio of the households using NTFPs for income generation.

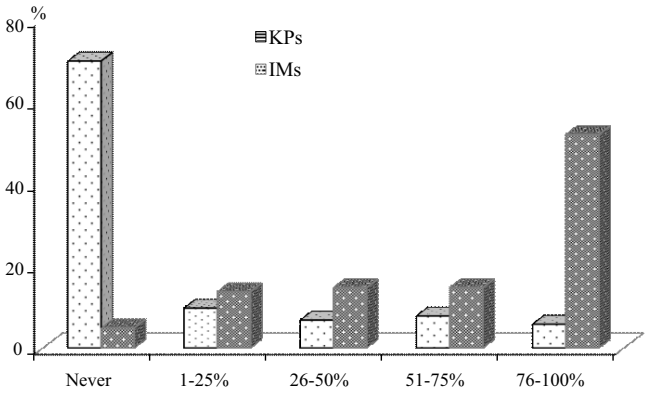


Figure 7 Ratio of the NTFP usage for income generation between the IMs and the KPs in 2023.

essential NTFPs may seem really awkward because they have been living in this area for various generations, and the forest resources consumed by them have been closely related to the indigenous culture. Moreover, as shown in Decree 75 (Government of the Socialist Republic of Vietnam, 2015), people involved in the conservation and management of forests are permitted to collect many types of NTFPs under sustainable conditions.

The findings identified that the IMs' dependency on the forest products in terms of traditional values was dissimilar to that of the KPs. In the same way, the IMs used a lot of NTFPs for more self-consumption related to the basic needs, whereas the KPs did not rely much upon the resources for subsistence. Thus, the biodiversity management impact of harvesting the wild flora in BGMNP for indigenous subsistence was likely to be high. In order to lighten their dependency on the NTFPs, the potential forest species such as *G. gnemon*, *P. geminiflora*, and *S. scrofa* could be domesticated for the IMs' self-consumption need and the KPs' demand. Also, more legal enforcement should be made. As suggested by the authors of the case studies in Vietnam (Dinh, 2019; Dinh & Pham, 2023a), the indigenous knowledge of the IMs in BGMNP should be studied and applied to biodiversity conservation and domestication of valuable forest species. The IMs should be motivated to participate in natural resource management *in situ*. Besides, based on the SWOT analysis, both of the groups should be engaged in planned harvesting practices, human capital empowerment, potential species domestication, ecological services, and employment opportunities. Moreover, BGMNP should place emphasis on evaluation of long-term effects of NTFP management techniques on biodiversity resources and ecosystem health.

## Conclusion

The findings illustrated that there was a gradual shifting trend of NTFP use from purely subsistence to more income generation in BGMNP. The IMs relied much upon the NTFPs, whilst the KPs were less dependent on the resources. Also, the IMs had a better knowledge about NTFPs and harvested the resources for more self-consumption related to their traditional and basic needs than those KPs. Nonetheless, the local poverty, low schooling levels, and the unsustainable NTFP extraction in the face of providing local subsistence as well as cash income endangered the forest environment and raised the biodiversity conservation challenges for BGMNP. Thus, the goal of sustainable forest development was not achieved in BGMNP.

## Recommendation

Based on the real perspective, appropriate institutional strategies for proper NTFP management and BGMNP administration are recommended. That is to say, both of the groups could be involved in human capital empowerment, income generation-based programs, employment opportunities, sustainable extraction, and conservation awareness. Besides, it is essential to promote the two groups' participation in forest protection and planned use of potential NTFPs. For planned utilization and sustainable resource management, BGMNP should place emphasis on group-based arrangements. The potential forest species traditionally used by the IMs should be domesticated and bred or planted in their home gardens or agroforestry farms. The IMs should be motivated to participate in natural forest management *in situ*. Further study should place emphasis on wildlife trade, the indigenous knowledge, and evaluation of long-term effects of NTFP management techniques on biodiversity resources and forest environments in BGMNP. Furthermore, ecological services and regular monitoring of local forest utilization would promote sustainable forest management and local livelihood improvement in Bu Gia Map.

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## References

Andika, E. J., Anwar, G., & Hendrastiti, T. K. (2024). Women's dependency rate on the Kerinci Seblat National Park area in fulfilling their basic needs. *International Journal of Advancement in Life Sciences Research*, *7*(1), 110–119. https://doi.org/10.31632/ijalsr.2024.v07i01.012

Bakri, S., Wulandari, C., Kurniasari, N., Safe'i, R., Ramdani, D., Anshory (2023). Effects of characteristics and perceptions of collectors of NTFPs to be members of the partnership program: A case study at Bukit Barisan Selatan National Park, Indonesia. *Jurnal Manajemen Hutan Tropika, 29*(2), 109–118. https://doi.org/10.7226/jtfm.29.2.109

Bierkamp, S., Nguyen, T. T., & Grote, U. (2023). Natural resource extraction and ethnic inequality in Dak Lak, Vietnam. *Environment and Development Economics*, *28*(6), 559–579. https://doi.org/10.1017/S1355770X23000062

Budiman, I., Fujiwara, T., Sato, N., & Pamungkas, D. (2020). Another law in Indonesia: Customary land tenure system coexisting with state order in mutis forest. *Jurnal Manajemen Hutan Tropika*, *26*(3), 244–253. https://doi.org/10.7226/jtfm.26.3.244

Chambers, R. (2007, July). *From PRA to PLA to pluralism: Practice and theory* (Institute of Development Studies Working Paper, 286).

Dinh, T. S. (2019). Potential and solutions for sustainable ecotourism development in Bu Gia Map National Park. *Science and Technology Journal of Agriculture & Rural Development*, *23*, 127–134.

Dinh, T. S. (2021). Participation of ethnic minorities in natural forest management: Cat Tien National Park, Vietnam case study. *Agriculture and Natural Resources*, *55*(2), 273–281.

Dinh, T. S., & Pham, T. V. (2020). Participation of residents in management and biodiversity conservation: A case study in Bu Gia Map National Park. *Science and Technology Journal of Agriculture & Rural*

*Development*, *13*, 106–115.

Dinh, T. S., & Pham, T. V. (2023a). Non-timber forest products in Cat Tien: Local use and sustainable management. *Jurnal Manajemen Hutan Tropika*, *29*(1), 79–87. https://doi.org/10.7226/jtfm.29.1.79

Dinh, T. S., & Pham, T. V. (2023b). Sustainable management of forest resources: A case in Bu Gia Map National Park. *Journal of Forestry Science and Technology*, *3*, 83–90.

Do, T. L. (1995). *Medicinal plants and traditional medicine in Vietnam* (7th ed.). Hanoi: Science & Techniques Publishing House.

Government of the Socialist Republic of Vietnam. (2015). *Decree 75/2015/ND-CP on forest protection development mechanisms and policies, associated with fast and sustainable poverty reduction and assisting ethnic minorities for the period 2015–2020*. Hanoi.

Hardin, G. (1998). Extensions of "The tragedy of the commons". *Science*, *280*(5364), 682–683. https://doi.org/10.1126/science.280.5364.682

Hashiguchi, H., Toda, M., Chew, W. C. & Hiratsuka, M. (2021). Ethnicity as a factor influencing sustainable forest resource management: A case study of a village in Taunggyi District in Myanmar's Shan State. *IOP Conference Series: Earth Environmental Science*, *690*, Article 012060. https://doi.org/10.1088/1755-1315/690/1/012060

Masy'ud., B, Felayati, N. R., & Sunarminto, T. (2020). Local wisdom in animal conservation and animal use as medicine of Orang Rimba in Bukit Duabelas National Park, Jambi. *Jurnal Manajemen Hutan Tropika, 26*(1), 72–79. https://doi.org/10.7226/jtfm.26.1.72

McElwee, P. D., Le, H. T. V., Nghiem, T. P., Vu, H. D., & Tran, N. H. (2021). Gender and payments for environmental services: Impacts of participation, benefit-sharing and conservation activities in Viet Nam. *Oryx*, *55*(6), 844–852. https://doi.org/10.1017/S0030605320000733

National Assembly of the Socialist Republic of Vietnam. (2017). *Forestry law*. 16/2017/QH14. Hanoi.

Pangau-Adam, M., Noske, R., & Muehlenberg, M. (2012). Wildmeat or bushmeat? Subsistence hunting and commercial harvesting in Papua (West New Guinea), Indonesia. *Human Ecology, 40*(4), 611–621. https://doi.org/10.1007/s10745-012-9492-5

Pham, H. H. (2000). *An illustrated flora of Vietnam*. Ho Chi Minh City: Youth Publishing House.

Pham, T. T., Nguyen, T. T. A., Nguyen, T. V. A., Tran, N. M. H., Nguyen, T. S., Nguyen, D. Y. K., Nguyen, D. T., & Tang, T. K. H (2023, December). *Forest stakeholders and forestry-based mitigation options: Contributions to low-emission food systems in the Mekong Delta, Vietnam* (CIFOR Working Paper, 23).

Phillips, O., & Gentry, A. H. (1993). The useful plants of Tambopata, Peru: I. Statistical hypotheses tests with a new quantitative technique. *Economic Botany, 47*, 15–32. https://doi.org/10.1007/BF02862203

Prance, G. T., Balee, W., Boom, B. M., & Carneiro, R. L. (1987). Quantitative ethnobotany and the case for conservation in Amazonia. *Conservation Biology*, *1*(4), 296–310. https://doi.org/10.1111/j.1523-1739.1987.tb00050.x

Talukdar, N. R., Choudhury, P., Barbhuiya, R. A., & Singh, B. (2021). Importance of non-timber forest products (NTFPs) in rural livelihood: A study in Patharia Hills Reserve Forest, Northeast India. *Trees, Forests and People*, *3*, Article 100042. https://doi.org/10.1016/j.tfp.2020.100042