



# Conflict Mitigation Practices and Conservation Awareness of Orangutans: A Case Study from Tangkahan Ecotourism, Leuser Ecosystem, Indonesia

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## ARTICLE INFO

### Article history:

Received 23 Desember 2023

Revised 11 Januari 2024

Accepted 16 February 2024

Available online

<https://talenta.usu.ac.id/ijoep>

E-ISSN: 2656-0674

### How to cite:

Sitompul R., Berliani K., Lhota S. (2024). Conflict Mitigation Practices and Conservation Awareness of Orangutans: A Case Study from Tangkahan Ecotourism, Leuser Ecosystem, Indonesia. *International Journal of Ecophysiology*, 6(1), 28-35.

## ABSTRACT

Killing orangutans in human-orangutan conflicts threatens their populations. Individuals with high conservation awareness tend to tolerate orangutans' crop foraging. In our study in Tangkahan ecotourism, Leuser Ecosystem, Indonesia, we examined local community mitigation methods and their understanding of orangutan conservation. We utilized a convenience sampling method for this study, primarily serving as a pilot study to test the questionnaire we had designed. This questionnaire consisted of open-ended questions used in semi-structured interviews. We conducted interviews with 16 respondents, all of whom willingly participated and allowed us to record their responses. Our findings revealed that the most commonly employed mitigation methods by the local community were the use of firecrackers and traditional crop guarding. Notably, these methods were non-lethal in nature, which aligns with the respondents' overall conservation awareness. All participants demonstrated knowledge of the protected status of orangutans, and some provided further insights into their rarity, endangerment, population decline, habitat degradation, and endemism. Their positive attitude likely stems from the impact of ecotourism.

**Keyword:** Orangutan, Conflict, Mitigation method, Conservation awareness, Ecotourism

## ABSTRAK

Kematian orang utan akibat konflik manusia-orangutan mengancam kelestarian orang utan. Masyarakat yang memiliki kesadaran konservasi tinggi cenderung toleran terhadap perilaku orang utan mencari makan di kebun. Penelitian di Ekowisata Tangkahan, Ekosistem Leuser, Indonesia, ini bertujuan mengeksplorasi metode mitigasi konflik dari masyarakat dan pemahaman mereka tentang konservasi orang utan. Kami menggunakan metode convenience sampling sebab penelitian ini juga merupakan pilot study untuk menguji kuisioner yang kami rancang untuk wawancara semiterstruktur. Terdapat 16 responden yang bersedia diwawancara dan mengizinkan kami merekam. Hasilnya menunjukkan metode mitigasi yang umum digunakan adalah petasan dan penjagaan kebun tradisional, yang bersifat non-lethal dan sesuai dengan kesadaran konservasi responden. Semua peserta tahu tentang status dilindungi orangutan dan beberapa menambahkan terkait kelangkaan, ancaman punah, penurunan populasi, degradasi habitat, dan endemisitas orang utan. Sikap positif ini mungkin dipengaruhi oleh ekowisata.

**Keyword:** Orang utan, Konflik, Metode mitigasi, Kesadaran konservasi, Ekowisata



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## 1. Introduction

The conflict between humans and orangutans is often triggered by the crop raiding behaviour of orangutans, especially when it comes to durians [1]-[4]. The economic loss by the local farmer was relatively high [5]. Besides these losses, the local community also could take action on orangutans because of their fear [6]. The large body of orangutans could influence local farmers to overestimate the actual damage, making them more detested [2][5]. However, some studies promote the term crop foraging rather than crop raiding, because orangutans are not aware to steal the crops [7][8]. Nevertheless, the killing caused by conflict is still one of the priority threats to orangutan populations [9]. The use of lethal approaches in human-orangutan conflict should be stopped to secure orangutan populations [10].

Stabilizing the orangutan population is one of the purposes of the conservation programme. The Indonesian government support this campaign by launching a law that protects orangutans from killing and harmed by people [9]. To gain protection law, much research must be conducted to support the information that the species, in this specific example the Sumatran orangutan (*Pongo abelii*) is indeed critically endangered [11]. All information related to the conservation status of the Sumatran orangutan constantly needs to be updated such as the population growth and current distribution [11]. The law of protection is only effective if there is law enforcement and awareness from the local community who live alongside the protected species. In relation to human-orangutan conflict, we should do no harm to establish a sustainable way to create a harmonious coexistence [10][12].

The local community practice in the context of human-wildlife conflict and their conservation awareness perhaps could be better understood using the qualitative approach [13]. The qualitative approach is strong in internal validity, which means the data and the actual condition in the field are relatively represented [13]. The qualitative approach was recently accepted as one of the most effective tools to conduct primate conservation research [8][14]. The term ethnoprimateology has been arising alongside this trend in the research of the relationship between human and non-human primates [15]. Primates are unique due to their position as bridges between human and non-human animals [16][17]. This article is also included in this trend by using the ethnoprimateological approach to study the conflict mitigation methods and conservation awareness of orangutans among the local community who live in the Tangkahan ecotourism area.

## 2. Method

This study was conducted at an ecotourism destination in North Sumatra Province, Indonesia. The area is best known as Tangkahan. The ecotourism could gain IDR 72,708,168,000 economic value per year [18]. We are focused on one village where there is a Conservation Response Unit (CRU) operations, the Namu Sialang village. Specifically, we conducted a field study on the 2 hamlets, Kwala Buluh and Kwala Gemoh (Figure 1). We purposively choose this location because there is a previous study reported that there is a human-orangutan conflict here [1][2]. Besides that, the area is also relatively available and accessible from Universitas Sumatera Utara (USU). The village's most popular crop is palm oil (*Elaeis guineensis*), nevertheless, there is also horticulture commodity such as Durian (*Durio zibethinus*) [19] which is often reported as the target of the orangutan crop foraging behaviour [1][3]. The village area includes the conservation forest of Gunung Leuser National Park (GLNP).

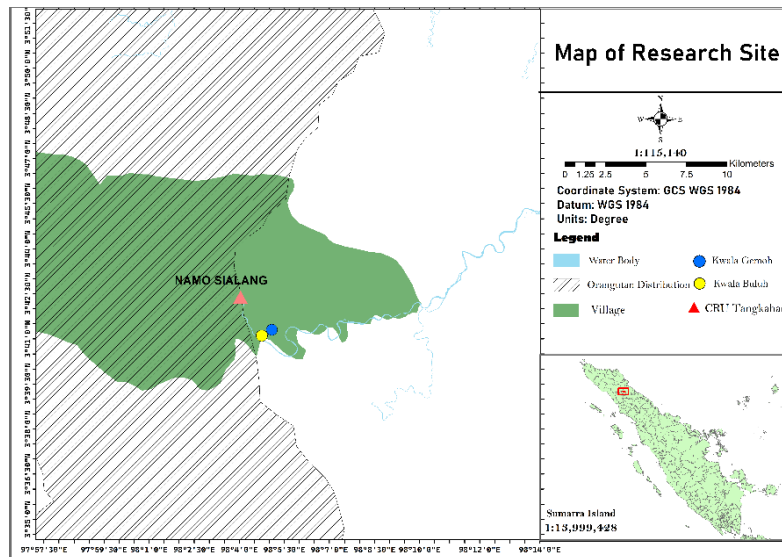


Figure 1. Map of village location bordering orangutan habitat as part of Tangkahan Ecotourism

This research side purpose is also as a pilot study, thus acting to test the questionnaire design to gain a more effective and less sensitive version [20]. The result of this study was also used as a consideration to modify the questionnaire used in the main research in the Batang Toru ecosystem. Because of this we only use a relatively small sample size. As a qualitative study, we use the interviews as the main method to gain data from the local community. Specifically, we use semistructured interviews [13], which are using open-ended questions [21]. Table 1 shows The questionnaire, which was designed based on the research questions: "How local community mitigate the human-orangutan conflict?" and "How is the local community's knowledge about orangutan conservation?."

Table 1. The questionnaire design.

No	List of questions	List of probing questions
1	What happens when people encounter orangutans?	Are they driving away the orangutans? how?
2	What is the regulation of orangutans according to the government or forestry minister?	Why are orangutans protected? can orangutans go extinct? why?

In the field, we actually use more questions. However, we just show the question related to the conflict mitigation methods and conservation awareness in this article, so the discussion could be more focused. We also use the probing question to make the respondent tells more if necessary [22]. We selected respondent using convenience sampling [23], we choose them based on their availability and accessibility around the Tangkahan ecotourism area during the field study, starting from 15 until 20 February 2023. We have 16 people who are willing to be interviewed (Table 2). It is around 3 interviews per day, about 30-60 minutes per interview section. We ask them for permission before recording the interviews.

Table 2. Socioeconomic background of respondents in Tangkahan.

Background	Category	Number of respondents
Gender	Male	9
	Female	7
Age	Youth (12-25 years old)	6
	Adult (26-45 years old)	8
	Elder (46-65 years old)	2
Ethnicity	Batak Karo	15
	Jawa	1
Religion	Christianity	8
	Islam	8
Education	No Education	2
	Primary School (SD)	2

Origin	Junior High School (SMP)	5
	High School (SMA)	5
	Diploma/Degree (D1/S1)	2
	Locals	14
	Migrants	2
Occupation	Tour Guide	5
	Mahout	3
	Farmer	7
	Student	1
Orchards commodity	None	6
	Durian	5
	Oil Palm	2
	Lime	3

We employed directed content analysis for data analysis [24]. Microsoft Excel facilitated the analysis, we began with an extensive literature review to identify theories and generate hypotheses for code creation. Relevant research findings also contributed to code development. The analysis involved interview transcription, editing, categorization of statements into codes, organizing codes into thematic groups, calculating code frequencies, and interpreting themes related to human-orangutan conflict mitigation methods and conservation awareness. Our findings were presented using an interpretative descriptive framework [14].

### 3. Result and Discussion

#### 3.1 Conflict mitigation strategies

All respondents explained that they would do something to prevent orangutans' crop-raiding behaviour. Of them, 25% mentioned driving away the orangutan from the durian orchards without explaining the methods. Another 31% stated that they would use firecrackers to scare the orangutan away. Similarly, the other 31% mentioned anticipating the raiding behaviour by keeping watch of the orchards to deter the crop raiders. The remaining 33% explained other methods, such as shouting, tapping the tree trunks, wrapping the tree trunks with metal, creating smoke, throwing dirt, or reporting to forestry officers (Figure 2). Note that these percentages overlap each other.

Additionally, 31% of them also argue that the mitigation methods are already effective, while another 31% believe that the methods still need improvement. One person also explained further that the orangutan is the most disturbing pest because of its protected status, including elephant and tiger.

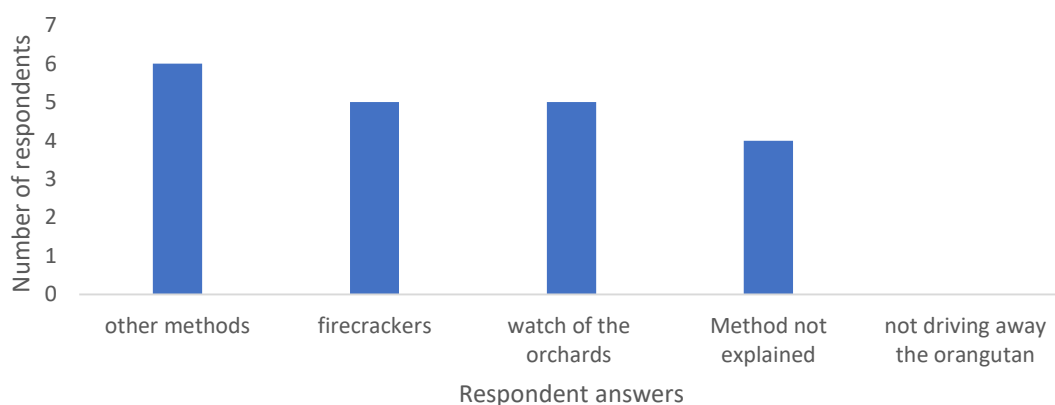


Figure 2. Number of respondents who argue about orangutan conflict mitigation.

The consensus among the respondents was clear: orangutans should be driven away. Nonetheless, a quarter of the respondents refrained from offering explanations for the methods, suggesting that they were not directly involved in driving away the orangutans. It appears that those respondents who own durian orchards tend to provide more comprehensive explanations of orangutan conflict mitigation methods. As per the previous study, women tend to exhibit fear of orangutans, leading them to avoid direct encounters and, instead, entrust the deterrent methods to men [2].

The most common human-orangutan conflict mitigation methods they explained are the use of firecrackers and traditional guarding techniques. Firecrackers are employed to startle the orangutans with a loud noise. This method is one of the novel methods introduced by previous applied ecological studies alongside the tree nets methods [5]. Surprisingly, no respondents elaborated on the tree net method, even though it has been proven to be the most effective strategy [5]. The effectiveness of firecrackers appears to diminish in some cases, as orangutans might become habituated to the noise and no longer startled [5].

On the other hand, orchard guarding represents a traditional approach [5]. Farmers spend extended periods in the orchards, particularly during the nearing harvest seasons. Although this method may seem cost-effective, it can have indirect consequences, including reduced psychosocial well-being, livelihood disruptions, and heightened food insecurity, which can be challenging to quantify [12]. When orangutans persist in their presence, respondents mentioned additional tactics, such as shouting, tapping tree trunks, and generating smoke, all of which have been noted in previous studies [1][5].

Interestingly, certain respondents described techniques not previously covered in prior studies, such as throwing dirt at orangutans when they descend to chase them away. Generally, orangutans tend to avoid contact with humans, and this aggressive behaviour appears to result from intensive habituation due to nearby orangutan tourism that permits close proximity between tourists and orangutans [25][26]. Additional deterrent methods, such as wrapping tree trunks with metal, as previously documented [1], were also mentioned by some respondents. However, they expressed a reluctance to use this method because it requires cutting branches from surrounding protected crops, potentially reducing the overall productivity of their crop fields. For example, durian trees are frequently intermingled with other crops like rubber trees. Nevertheless, similar to the use of firecrackers, this method is supported by local conservation agents, such as the Orangutan Information Center (OIC).

All methods discussed in this study are non-lethal, aligning with wildlife conservation goals [12]. However, just one participant mentioned the importance of reporting trespassing orangutans to local forest officers. Improved collaboration between the local community and conservation agents is needed to foster trust and enhance conservation [14][27]. Additionally, 31% of participants expressed dissatisfaction with current conflict mitigation methods, highlighting the need for ongoing research and adaptive strategies to address their concerns.

### 3.2 Conservation awareness

All respondents are aware of the protected status of orangutans, though not all can explain its basis. Among them, 88% recognize orangutan rarity, 75% grasp their endangered status, 56% understand the population decline, 25% are aware of habitat degradation, and just 19% mentions orangutans as an endemic species. Interestingly, there is also 19% of them who believe in orangutans' invulnerability to extinction (Figure 3).

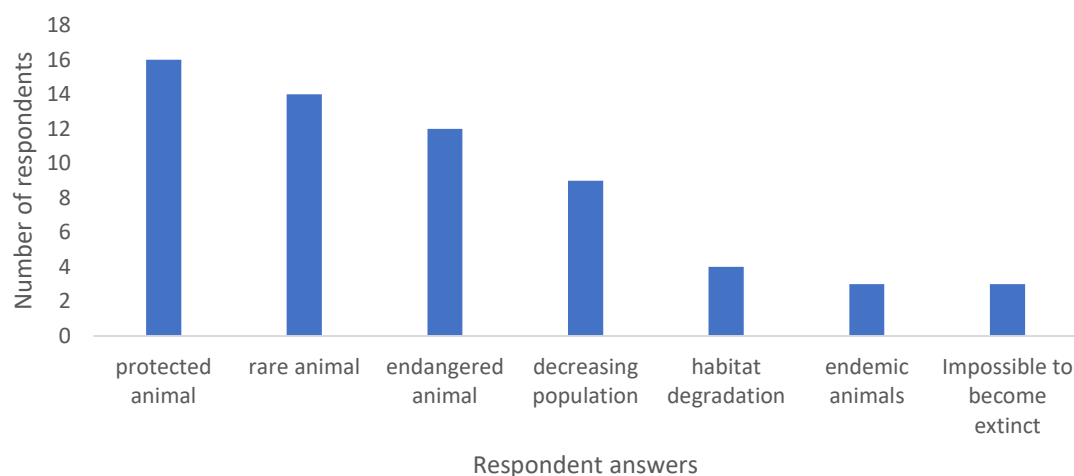


Figure 3. Number of respondents who argue about orangutan conservation.

The CRU's presence in the Tangkahan ecotourism area, particularly within the village, likely contributes to the heightened awareness of orangutans as protected species. Local organizations like the Tangkahan Tourism Institute (LPT) also demonstrate a strong commitment to preserving biodiversity and environmental sustainability [18]. Individuals who acknowledge the rarity of orangutans often possess the ability to compare them to more abundant species, like long-tailed macaques (*Macaca fascicularis*). Certain professions, such as tourist guides and mahouts, maintain a close connection with the forest, which enhances their familiarity with wildlife. Some even grasp the declining orangutan population and habitat degradation, knowledge likely obtained through interactions with researchers and conservation agents rather than just local sources. Involving the local community in conservation initiatives proves to be the most effective approach for garnering support and fostering positive attitudes toward both the species and the program itself [14][27].

Some individuals recognize the Sumatran orangutan's unique endemic status. This is in line with the other 38% of respondents serendipitously elaborating more by expressing their pride in having these orangutans in their villages, viewing it as a matter of national pride. The incorporation of nationalistic elements into conservation has been proven to be an effective campaign, especially when applied to flagship species like the Sumatran orangutan [28]. This national pride-driven campaign proved could increase conservation awareness among the local community [29]. Additionally, by volunteering in ecotourism, the local community could enhance their sense of belonging and responsibility towards biodiversity. [30], especially when international tourists express their excitement about observing orangutans in their natural habitat.

While some grasp the potential for orangutans to face extinction, this perspective is not uniformly shared. Certain respondents remain sceptical about the plausibility of orangutan extinction, one of them argues: “Well, for animals like monkeys or orangutans, it doesn't really seem likely that they'll go extinct, right? There are plenty of them in the forest” (Anon, 25, Kwala Buluh). This misunderstanding arises from the belief that orangutans face limited natural predators, and their protected legal status discourages harm from humans. This perspective highlights a failure to fully grasp the critically endangered status of the Sumatran orangutan [11]. Although some orangutans still venture into their area, the overall Sumatran orangutan population is in decline [11]. To foster a more comprehensive understanding, environmental education programs and campaigns should incorporate a broader perspective on orangutan conservation status for the local community.

The local community's conservation awareness regarding the orangutans appears to shape their approach to addressing human-orangutan conflicts. They report exclusively employing non-lethal mitigation methods to deter orangutans from foraging on crops. Nevertheless, some individuals elaborate on a troubling past, where conflicts with local farmers resulted in the death of numerous orangutans. To conceal the orangutan bodies, they resorted to burying or drowning them in the river. This situation began to evolve with the gradual establishment of the CRU and LPT. It becomes evident that mere knowledge of orangutans being a protected species is insufficient to halt the killings. However, a profound understanding of conservation principles and involving the local community in conservation programs can alter their preference for conflict mitigation methods.

#### 4. Conclusion

In Tangkahan, the local community predominantly employs non-lethal methods to mitigate human-orangutan conflicts. These methods include the use of firecrackers to deter trespassing orangutans and traditional guarding of orchards. However, there are some individuals who express dissatisfaction with the current conflict mitigation strategies, which makes the need for further improvement. The conservation awareness among the local community in Tangkahan appears to be notably high. They are universally aware of orangutans as protected animals, and a substantial portion of them also possess knowledge about orangutan rarity, declining populations, habitat degradation, and their endemic status. This heightened conservation awareness aligns with their preference for non-lethal conflict mitigation methods. Furthermore, the promotion of ecotourism as part of conservation campaigns has played a significant role in fostering positive practices among the local community toward orangutans.

#### Acknowledgement

We are grateful to the LPDP scholarship for supporting the first author's academic finances and also to the CRU Tangkahan to support the accommodation during the field study.

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