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MORALITY BEFORE KNOWLEDGE

The economy behind the forest: Understanding the effects of hunting and wildlife trade on the Lives of Tambrauw People

Rifki Alif Mediaanta Madubun[1], Rully Novie Wurarah[1*], Siti Aisah Bauw[1]
[1] *Faculty Economic and Business, Universitas Papua, Manokwari, Province Papua 98314, Indonesia.*
*Correspondence: r.wurarah@unipa.ac.id

ABSTRACT

Backgorund: The objective of this study is to assess the usage and economic significance of non-timber forest products (NTFPs) derived from animal hunting and trading in Warmandi Village and Weyaf Village, located in the Tambrauw Regency of Southwest Papua. **Method:** The research employed a descriptive methodology with a quantitative orientation. The collection of primary data involved the use of observation, interviews, and questionnaires with 13 key respondents who are employed as hunters in the two communities. **Findings:** The findings revealed that the primary commodities consist of four distinct wildlife species, specifically deer, wild boar, Mambruk birds, and tree kangaroos. The annual economic value of non-timber forest products (NTFPs) derived from wildlife amounted to IDR 175,680,000. Wild boar made the highest contribution, accounting for 61% of the total value, followed by deer at 31%, Mambruk birds at 7%, and tree kangaroos at 1%. Non-timber forest product (NTFP) use is conducted through diverse methods, which encompass the trade of unprocessed, processed, and conserved meat. Game products are sold not only in Tambrauw Regency but also in the markets of Manokwari and Sorong Regencies. **Conclusion:** This study emphasizes the significance of sustainable management and government oversight in harnessing the economic potential of wildlife non-timber forest products (NTFPs) for the well-being of local populations. **Novelty/Originality of this article:** By revealing the specific economic value of different wildlife species, this study provides new insights into the importance of sustainable NTFP management in complex socio-ecological contexts.

KEYWORDS: economic value; hunting; non-timber forest products; Tambrauw; trade; wildlife

1. Introduction

The economy of the Tambrauw people, like several indigenous and rural communities globally, is intricately connected to the adjacent forests. These forests serve as both a means of direct sustenance and a source of revenue through hunting and the trade of animals. Studies have demonstrated that the utilization of forests plays a crucial role in supporting the economic well-being of rural households. The majority of their income is derived from activities related to forests, such as hunting and the trade of non-timber forest products (NTFPs) (Gautam, 2010; Perez et al, 2006; Van Uhm & Moreto, 2018). Nevertheless, the consequences of wildlife hunting and trading extend beyond just economic advantages, impacting biodiversity and the long-term viability of these activities. The act of hunting and trading wildlife illegally has been recognized as a significant danger to the variety of life on Earth. Conservation groups emphasize the importance of gaining a more profound comprehension of the reasons behind these activities, which frequently arise from economic hardship and a lack of alternative ways to make a living (German et al., 2014).

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Reboredo (2013) states that hunting in tropical forests is a significant contributor to the decline of biodiversity. However, it continues to be a crucial source of sustenance for millions of individuals, highlighting the intricate connection between subsistence requirements and conservation endeavors. Illegal logging, which is strongly connected to illegal hunting, worsens the depletion of forest resources, impacting the availability of species for hunting and the overall well-being of forest ecosystems. Illegal exploitation of forests is frequently motivated by economic and financial crimes. Enrico (2021) emphasizes the necessity of implementing effective countermeasures to safeguard forests and their inhabitants.

The reliance of indigenous and rural populations on forests for their means of living highlights the significance of implementing sustainable practices and conservation measures that take into account the socioeconomic attributes of these communities. Multiple studies have demonstrated that implementing stringent conservation strategies without providing alternative means of making a living can have negative impacts on the livelihoods of local communities. This highlights the necessity of adopting approaches that strike a balance between conservation efforts and economic development (Sanjay et al., 2008; Anh et al., 2013). Furthermore, the worldwide economic decline and fundamental shifts in the forest industry have demonstrated that income derived from forests, while only a minor factor in overall agricultural prosperity, can serve as a significant supplement to rural households. This highlights the necessity for a comprehensive approach to forest management that promotes both conservation and livelihoods. Philip & Abbott (1983). According to Patrice et al. (2007), the economy of the forest, particularly in relation to wildlife hunting and trading, has a significant impact on the livelihoods of Tambrauw and similar communities. In order to effectively address the issue of poaching and trafficking, sustainable forest management policies should focus on the economic incentives that drive these activities. These policies should also aim to provide alternative livelihood choices that promote biodiversity conservation and improve the well-being of indigenous and rural populations.

This study aims to examine the wildlife trade in Warmandi and Weyaf Villages, Tambrauw Regency, with a specific focus on its legality, economic ramifications, and social effects. According to a study conducted by Nijman et al. (2022), effectively managing wildlife trading necessitates a comprehensive strategy that encompasses community-level education, synchronized international regulations, and increased national funding for on-site law enforcement. Furthermore, a study conducted by Zhang et al. (2008) emphasized that the issues of poaching and smuggling in specific areas are significant concerns that require immediate attention.

Regarding wildlife trade, Nijman et al. (2022) conducted research that reveals legally protected species, although consistently present, constitute only a tiny portion of the available offerings. This highlights the significance of rigorous enforcement of laws in relation to the trading of wildlife. Furthermore, a study conducted by Booth et al. (2020) highlights the importance of implementing wildlife trade regulations that are based on assessing and managing risks in order to attain sustainable development goals in the aftermath of the COVID-19 pandemic.

Regarding economic consequences, a study conducted by Fauzi et al. (2022) showed the noteworthy impact of economic sectors such as services, agriculture, forestry, and cattle on economic expansion, particularly in the context of the COVID-19 pandemic. This highlights the significance of comprehending the economic consequences of wildlife trade within the framework of an evolving economic environment.

At the very least, animal poaching is a problem in the Tambrauw Regency, which is located in Southwest Papua. The deer, the wild boar, the tree kangaroo, the peacock, and the long-snouted porcupine are among the animals and wildlife that are targeted for hunting and are the most traded, according to a number of studies that were conducted in the past. On the other hand, some of these earlier studies are extremely limited, as is the situation with the Tambrauw Regency, which has a minimal amount of data and research results currently available. In fact, research on the potential and economic value of wildlife needs

to be carried out in order to acquire data and knowledge that can serve as a foundation for decision-making in an effort to preserve the equilibrium between wildlife conservation and trade.

In light of the fact that Tambrauw is a Conservation Area/Regency and possesses stunning and well-preserved forests and nature, it is deemed vital to research the animals that may be found in the region. Additionally, Tambrauw is a region that can be reached by both ship and car (by the land route), making it readily accessible from the areas that are located in the surrounding vicinity. This paves the way for significant prospects in the Tambrauw Regency for the trading of wildlife. As a result, this research will mix qualitative and quantitative methods in order to investigate the wildlife trade in Warmandi Village and Weyaf Village, both located in the Tambrauw Regency. The purpose of this investigation is to provide comprehensive insights into the legality of the trade, as well as the economic and social implications that are linked with it. For the purpose of effectively managing the wildlife trade in the region, it is anticipated that this research will provide a firm foundation for the formulation of successful regulations.

2. Methods

The study was carried out in Tambrauw Regency, located in the Southwest Papua Province of Indonesia. Tambrauw Regency was established in 2008, with its administrative center located in Fef District. Tambrauw is situated within the geographical coordinates of 00°15' and 132°00' South latitude and 132°00' and 133°00' East longitude. It covers an area of 11,529.18 km^2. The data collection was carried out in Warmandi Village and Weyaf Village, located in Tambrauw Regency, Southwest Papua Province, over seven days. This study uses a descriptive methodology to elucidate social processes by examining multiple interconnected factors. This form of study does not necessitate a prior hypothesis as the data is directly gathered in the field.

The research participants consisted of individuals employed as hunters in Warmandi Village and Weyaf Village. The determination of respondents was conducted using the approach of accidental probability sampling, which yielded a sample size of 15 individuals. The data collection strategies employed encompass observation and the use of questionnaires. Community activities in the usage of non-timber forest products, particularly animals, were observed by direct observation. Questionnaires were deliberately prepared to elicit responses from respondents according to the several elements under investigation.

Quantitative data analysis was performed utilizing statistical methods as a means of calculating test results in order to derive valid findings. The economic value of wildlife utilization by communities in Warmandi and Weyaf villages was calculated using the Market Data Approach. The economic value can be calculated using the formula NE = P × Q, where NE represents the economic value in Rp/Year, P represents the product selling price in Rp/Month, and Q represents the quantity of acquisition in months.

In order to guarantee precision and uniformity in the utilization of research variables, the operational definitions employed are as stated below: "Benefits" refer to the natural resources that are acquired and utilized to fulfill household requirements. "Economic value" denotes the worth of commodities or services assessed in monetary terms. The "market price approach" is employed to determine the economic value of wildlife utilization by communities in villages. Forest products encompass a wide range of items that can be either directly sold or transformed into objects that hold economic worth. This quantitative technique offers a detailed overview of the usage and economic worth of non-timber forest products derived from wildlife hunting and trading in the designated region. It also aids in determining the economic impact of these activities on the local people.

3. Results and Discussion

3.1 Hunting activities

Tambrauw Regency exhibits diverse topographic features, encompassing both low-lying areas and elevated terrains. The regency contains scattered lowland areas in Sausapor District, Kwor District, and Abun District, as well as hilly and mountainous parts throughout. The soil properties are primarily influenced by a high percentage (84.20%) of fine texture.

In 2022, the population of Tambrauw Regency amounted to 35,742 individuals, resulting in a population density of 31 individuals per square kilometer. The population of Sausapor District is 8,339, making it the most populous district. The investigation was conducted in Warmandi Village and Weyaf Village, both situated in Abun District. Warmandi Village serves as the administrative center of the district and has a population of 71 individuals, whereas Weyaf Village is home to 106 residents. Both settlements possess significant natural resources, particularly in the non-timber forest product (NTFP) industry, encompassing activities such as hunting and trading of wildlife species such as deer, wild boar, Mambruk birds (*Goura cristata*), and tree kangaroos. Accessing Warmandi Village and Weyaf Village poses difficulties, as Weyaf Village can only be reached by sea through the use of boats or speedboats. Both villages possess abundant biodiversity and are included in a conservation area in Tambrauw Regency. This designation makes them significant for researching the use and economic worth of non-timber forest products.

This study identified four wildlife species that serve as the primary targets for hunting in Warmandi Village and Weyaf Village, located in Tambrauw Regency. The species include deer, wild boar, Mambruk bird, and tree kangaroo. The findings indicated that the annual economic value of wildlife hunting amounted to Rp175,680,000. The primary driver of this economic value was wild boar hunting, which accounted for Rp108,000,000 a year or 61% of the whole economic value. Deer is ranked as the second most valuable commodity, contributing Rp54,600,000 per year or 31% of the total economic value. The annual contribution of Mambruk birds amounted to Rp12,000,000, which accounts for 7% of the overall economic value. On the other hand, tree kangaroos produced the most minor contribution of Rp1,080,000 per year, representing only 1% of the total value. It is possible to derive the economic worth of this hunt through a range of purposes, such as the selling of raw meat, processed dishes like rendang, and traditional preservation methods such as roasting or smoking. In addition, the raw material for the production of Papuan Tifa is deerskin or a similar material. Not only is the hunting and trade of non-timber forest products (NTFPs) carried out within the Tambrauw Regency, but it is also sold to marketplaces in the Manokwari and Sorong Regencies.

Warmandi Village and Weyaf Village, both located in the Tambrauw Regency, are the primary focal points of wildlife poaching because of the economic benefit and social utility of hunting and trading wildlife. There are a number of species that are the primary targets of these hunting activities. This is primarily due to the high economic worth of these species, which encompasses not only the exploitation of meat but also other parts such as skin and fur. In particular, hunting is done on species of wildlife that are common in the region, such as wild boar (*Sus scrofa*), deer (*Cervus* spp.), and mambruk (*Goura cristata*). Wild boar are the primary target of hunting because of the high value assigned to their meat, which is consumed locally as well as traded internationally. Similar to wild boar, deer (*Cervus* spp.) are hunted for their flesh. Deer are also known as Cervus species. Additionally, deer are prized for their antelope, which may be traded or utilized in a variety of cultural practices that are specific to the area. Meanwhile, Mambruk (*Goura cristata*): This bird is hunted not only for its flesh but also for its magnificent feathers, which are frequently utilized in traditional ceremonies or as decorative things. Mambruks are also known as goura Cristata feathers.

There are a number of vital responsibilities that wildlife plays in their natural habitats. These roles include delivering ecosystem services such as pollination, insect control, and the maintenance of soil structure and fertility. From a legal and conservation standpoint, wildlife is frequently protected by national and international laws that try to govern its use and protection. This is due to the fact that many species are in danger of extinction as a result

of human activities, such as hunting and the loss of habitat. According to Law No. 5 of 1990 on KSDAHE (Conservation of Living Natural Resources and Ecosystems), wildlife is defined as any animal that lives on land, in water, or in the air and still possesses wild traits. This definition applies to animals that are managed by humans or animals that exist freely. These hunting activities not only have a connection to the preservation of the ecosystem, but they also have a substantial impact on the socioeconomic conditions of the communities that are located nearby. Therefore, another focus of this research is on the ways in which wildlife hunting and trading might be regulated and managed sustainably, so limiting the adverse effects on animal populations and ecosystems while delivering economic advantages to the communities that are directly affected by these activities.

Fig. 2. Mambruk birds (*Goura Cristata*)

On the basis of the aforementioned classifications or classifications of animals, Mambruk Ubiaat (Figure 1), also known as western Mambruk, common Mambruk, or blue-crowned Mambruk, Goura Cristata, is a species of Mambruk or crowned pigeon that is related to the pigeon. Its scientific name is Goura cristata. Other names for this species are blue-crowned Mambruk, common Mambruk, and blue-crowned Mambruk. This bird is pretty giant and has a peculiar crown that resembles lace on top of its head. Additionally, it has dark feathers around its eyes. Its color is grayish-blue. Males and females are nearly identical in terms of size and shape; nevertheless, males are often larger than females. In terms of length, the typical size measures 70 centimeters (28 inches) and weighs 2,100 grams (4.6 pounds). It is closely related to the Victoria Mambruk and the southern Mambruk, all of which are the most significant and prettiest species in the pigeon family (Columbidae). Mambruk Ubiaat is endemic to Papua Indonesia, as it is found only in lowland rainforests in the western part of the Indonesian island of Papua; other species of Mambruk inhabit other parts of the island. The bird's main diet is fruit and seeds. The indigenous people of Tambrauw hunt this bird for daily food and its beautiful blue feathers.

The wild boar is the ancestor of the wild pig that gave rise to the farmed pig (*Sus scrofa Domesticus)* (Figure 2). Their range is in the forests of Central Europe, the Mediterranean (including the Atlas Mountains in Central Africa) and most of Asia to the southernmost parts of Indonesia. Wild boars belong to the Suidae family, which includes African wild pigs and bush pigs in Africa, pygmy pigs in northern India and babirusa in Indonesia. These pigs are large in size, weighing up to 200 kg (400 pounds) for adult males and up to 1.8 m (6 feet) long. Pigs in Indonesia have a body length of up to 1,500 mm, ear length of 200-300 mm, and shoulder height of 600-750 mm.

Wild boar in West Papua, particularly in Tambrau, is a native game species with a wide distribution. Genetic diversity and population structure of wild boar are crucial for the management and conservation of wildlife populations. In terms of population dynamics,

parameters such as mortality, reproduction, and spatial behavior play an important role in understanding and managing wild boar populations. In addition, the habitat selection of wild boars in different regions, influenced by various climates, has an impact on their distribution and behavior. Overall, understanding the genetic diversity, population dynamics, and habitat preferences of wild boars in West Papua, particularly in Tambrau, is crucial for effective conservation and management efforts.

Fig. 3. Wild boar (*Sus scrofa*)

Deer, sambar, or *menjangan* are ruminant mammals belonging to the family Cervidae (Figure 3). One of the distinctive features of deer is the presence of ragga instead of antlers, which are bony growths that develop annually (usually in summer), especially in male deer. There are about 34 species of deer worldwide, which are divided into two major groups: the old world deer group, which includes the subfamilies Muntiacinae and Cervinae, and the new world deer group, Hydropotinae and Odocoilinae.

Fig. 4. Deer (*Cervus* spp.)

Moose weights generally range from 30-250 kilograms (70 to 600 lb), although Northern Poodles average 10 kilograms (20 lb) and Moose average 431 kilograms (1,000 lb). They generally have lithe, compact bodies and long, muscular legs suitable for rough forest terrain. Deer are also excellent jumpers and swimmers. Deer are ruminants, or chewers, and have a four-chambered stomach.

The trade-in Mambruk, Wild Boar and Deer by communities in Warmandi and Weyaf villages, as described in this study, illustrates the complexity of the interaction between

local economic needs and wildlife conservation. Here are the main focuses of the trade of these three species: 1) Economic Aspects: Mambruk, Wild Boar, and Deer bring in a lot of money for the people who live in the area. It is precious to sell meat and other goods like Mambruk fur and deer browse, both in your own area and in more significant markets. This shows that the trade in wildlife can help local communities meet their daily needs by bringing in a lot of money. 2) In addition to being beneficial for business, these animals are also critical to people's culture and way of life. Mambruk feathers are used in many traditional ceremonies, which suggests that hunting and trading wildlife is also closely connected to the culture and habits of the people who live there. 3) Conservation and Long-Term Use: The trade-in Mambruk, Wild Boar, and Deer is good for the economy, but there are big worries about how long these practices will last. Uncontrolled and excessive shooting can put local wildlife populations at risk, destroy biodiversity, and mess up ecosystems. This means that we need to manage natural resources in a way that is more sustainable. For example, we should limit hunting and set tighter quotas. 4) Management and regulation: To stop animal trade and poaching, laws need to be better enforced and regulations need to work better. A balance between economic and conservation goals can be reached by making rules that support conservation while also taking into account the economic needs of local communities.

Overall, the trade in Mambruk, Wild Boar and Deer in Warmandi and Weyaf villages demonstrates how people's economic needs can impact wildlife, and makes clear the importance of finding sustainable approaches that benefit both people and nature. Effective solutions must include community education, raising awareness about sustainability, and active participation of communities in the management and conservation of their natural resources.

Harnessing the economic potential of wildlife NTFPs to improve the welfare of local communities and maintain the sustainability of forest ecosystems in the Tambrau Bay region of West Papua requires sustainable management and government oversight. This is a complex issue and requires a holistic approach. Disease transmission between wildlife and livestock can carry pathogenic bacteria. Research has shown that strict management is needed to prevent disease transmission between wildlife and livestock, as this can jeopardize the health of local communities.

In addition, community-focused reforms in natural resource management in Sub-Saharan Africa have practical consequences in the creation of sustainable natural resource management plans (Nelson & Agrawal, 2008). This suggests that involving local communities in managing the economic potential of Tambrau Bay wildlife NTFPs can be a practical approach to improving their welfare. As was the case in post-colonial Tanzania, wildlife management can serve as a diplomatic and national development tool (Weiskopf, 2015). Global efforts to promote a country through wildlife conservation policies show how important it is for governments to maintain the sustainability of forest ecosystems in the Tambrau Bay region.

Wildlife health should also be included in Environmental Impact Assessments (EIAs) (Aleuy et al., 2023). An EIA is an essential tool for evaluating the future consequences of a project on the environment, human health, and the economic potential of a region. Thus, the sustainability of the Tambrau Bay forest ecosystem can be aided by government oversight of the wildlife health aspect of the EIA. Identifying sustainably managed community conservation areas under the supervision of local stakeholders is essential, according to a case study of human-monkey conflict in Sri Lanka (Cabral et al., 2018). Such methods can be used when managing the wildlife economic potential of Tambrau Bay NTFPs to reduce conflict and maintain ecosystem balance.

Adverse effects of non-consumptive wildlife tourism, such as direct injury to animals, increased stress, and habitat loss, must be considered (Green & Higginbottom, 2000). Therefore, in the context of Tambrau Bay, careful economic and environmental management should be implemented. The critical role of institutions and governance in maintaining ecosystem sustainability has been demonstrated by the shift in African wildlife conservation from traditional state-managed approaches to broader governance approaches involving

multiple stakeholders (Muchapondwa & Stage, 2015). In terms of managing the economic potential of wildlife NTFPs in West Papua, this is relevant.Sangat penting untuk menemukan masalah dan tantangan utama dalam konservasi sumber daya alam karena ancaman terhadap satwa liar di China, seperti perburuan yang tidak terkendali, kehilangan habitat, dan polusi lingkungan (Du et al., 2023). Untuk mencapai kemajuan berkelanjutan, pemerintah harus terlibat aktif dalam mengatasi masalah ini. Selain itu, perlu mempertimbangkan pengembangan strategi konservasi alternatif yang dapat melengkapi manfaat ekonomi dari pariwisata satwa liar (Winterbach et al., 2015). Metode seperti ini dapat membantu meningkatkan potensi ekonomi HHBK satwa liar Teluk Tambrau sambil mempertahankan keberlanjutan ekosistem.

Research conducted on community perspectives about the promotion of trophy hunting tourism in Namibia indicates that although empowerment can lead to social and economic advantages, it can also result in adverse outcomes and management difficulties (Thomsen et al., 2021). Hence, it is imperative to have stringent government supervision in order to safeguard the environment from any potential harm caused by these activities. The increasing quantity of reforms and research carried out in China regarding economic policy instruments to tackle agricultural water pollution highlights the significance of ongoing reforms in terms of governance objectives, public welfare funds, water prices, tradable water rights, and emission rights (Zou et al., 2023). This is crucial when it comes to overseeing the economic viability of non-timber forest products derived from animals in West Papua.

The government plays a crucial role in implementing evidence-based policies to ensure the long-term sustainability of ecosystems. This is evident in the conflicts of interest that occur between economic prosperity and the conservation of wildlife when local decision-making lacks proper governance (Pitman et al., 2016). Efficient governmental supervision can assist in resolving these problems and guarantee the long-term viability of the Tambrau Bay environment. The significant decrease in animal populations in Botswana is causing apprehension regarding the preservation and authenticity of the Kavango-Zambezi Transfrontier Conservation Area (KAZA), as well as the economic viability of a province that is strongly dependent on wildlife tourism (Heermans et al., 2021). This demonstrates the significance of sustainable management for the economic potential of non-timber forest products (NTFPs) in West Papua's biodiversity.

Measures such as fiscal stimulus, tax cuts, monetary easing, and expansionary monetary policy are necessary to address the economic effects of the global economy following the easing of epidemic control measures (Yue, 2023). This is relevant for enhancing the well-being of local communities in Tambrau Bay, particularly in managing the economic potential of non-timber forest products derived from wildlife. The community of Tanjung Belit Village in Riau has actively engaged in environmental protection, as seen by their community empowerment initiatives within the Bukit Rimbang Bukit Baling Wildlife Reserve (Bastianto et al., 2021). This approach can be utilized for effectively managing the economic viability of non-timber forest products (NTFPs) derived from wildlife in West Papua. Its main objective is to ensure that local communities actively engage in the preservation of ecosystem sustainability.

Ecotourism in Sub-Saharan Africa is confronted with numerous challenges and opportunities arising from climate change and desertification. This implies that it is necessary to develop comprehensive policies in order to address the growing complexity of environmental problems (Mullikin, 2024). To ensure the sustainability of the ecosystem, it is crucial to take into account the effects of climate change while managing the economic potential of wildlife non-timber forest products (NTFPs) in Tambrau Bay. The analysis of the decentralization policy's effect on the socio-economic situations of fishermen in Alor Regency demonstrates that the sustainable management of natural resources is crucial for supporting the welfare of local communities (Zainudin, 2022). Effective governance is essential for ensuring the long-term viability of the forest ecosystem in Tambrau Bay.

The disparity between the theory and implementation of wildlife management highlights the challenges in utilizing economic ideas for natural resource management

(Rasker et al., 1992). Integrating theory and practice in the decision-making process is crucial for sustaining ecosystem sustainability while managing the economic potential of wildlife non-timber forest products (NTFPs) in West Papua. Zambia possesses significant potential for the development of wildlife ranching, which serves as evidence that effective natural resource management may be a valuable economic asset (Lindsey et al., 2013). This is significant within the framework of overseeing the economic capacity of wildlife non-timber forest products (NTFPs) in Tambrau Bay. This has the potential to enhance the well-being of local residents while also upholding the sustainability of the ecosystem. Wildlife breeding in China, implemented as part of a "through utilization" conservation strategy, has been proved to have both advantages and problems (Wang et al., 2019). In order to accomplish the objectives of conservation and sustainable development, it is crucial to take into account this approach while managing the economic potential of non-timber forest products (NTFPs) derived from wildlife in Tambrau Bay.

Venezuela's utilization of extensive land areas for animal conservation exemplifies the application of many strategies in the management of natural resources (Hoogesteijn & Chapman, 1997). In order to effectively harness the economic value of wildlife non-timber forest products (NTFPs) in Tambrau Bay, it is essential to carefully assess and implement a range of methods aimed at preserving the long-term viability of the ecosystem. The case of Timaco Hill in the Philippines demonstrates that effective management of natural resources can serve as a long-lasting and environmentally-friendly economic asset, thanks to its potential for company development and ecotourism (Jumao-as, 2023). In order to enhance the well-being of local populations in Tambrau Bay, it is imperative to take into account ecotourism when managing the economic opportunities presented by wildlife non-timber forest products (NTFPs).

The significance of rigorous management in upholding the sustainability of marine resources is exemplified by policies that oversee illicit fishing activities conducted by marine fishing enterprises (Umam, 2023). Government regulation of illicit fishing activities in Tambrau Bay is crucial for the preservation of the local forest ecosystems. The Indonesian government and WWF are collaborating to tackle the illicit pangolin trade with China. This collaboration exemplifies the significance of the partnership between governmental and non-governmental groups in upholding the long-term viability of animal populations (Saragih & Ali, 2021). This type of collaboration has the potential to serve as a blueprint for effectively managing the economic opportunities presented by wildlife non-timber forest products (NTFPs) in Tambrau Bay.

The presence of conflicts and the exertion of control over the Bentayan wildlife reserve in South Sumatra highlight the crucial need for sustainable management in order to effectively reconcile the divergent interests of local residents and environmental conservation (Tahyudin, 2014). Stringent government oversight is essential to ensure the long-term viability of the forest ecosystem in Tambrau Bay. The survival of cheetahs in South African woods, following their relocation from farms, demonstrates the potential for wildlife management to serve as a sustainable economic asset (Marnewick et al., 2009). In order to ensure the long-term viability of the Tambrau Bay ecosystem, it is essential to manage the economic opportunities presented by non-timber forest products (NTFPs) in a way that takes into account conservation efforts and involves local populations.

Research conducted on wildlife diseases and their correlation with agricultural progress in Africa demonstrates the crucial importance of studies that promote sustainable management of natural resources (Roth, 1972). Research conducted at Tambrau Bay has the potential to serve as a foundation for making decisions that ensure the long-term viability of the environment. In order to mitigate the adverse effects of human-wildlife conflict in the Lupande Game Management Area in Zambia, it is necessary to implement sustainable management practices. When managing the economic potential of wildlife non-timber forest products (NTFPs) in Tambrau Bay, it is essential to explore strategies that can reduce conflict and ensure the long-term survival of the environment.

It is imperative for the government to establish policies that promote the long-term viability of natural resources. The influence of governmental regulations on the profitability

of wildlife ranching in Zimbabwe is substantial (Kreuter & Workman, 1994). Robust governmental supervision is necessary to ensure the long-term viability of the forest ecosystem in Tambrau Bay. Effective wildlife conservation necessitates well-defined regulations to protect and preserve natural resources (An, 2021). In order to ensure the long-term viability of the Tambrau Bay ecosystem, it is essential to have a robust legal framework that supports the management of the economic opportunities presented by wildlife non-timber forest products (NTFPs).

Child (2019) argues that wildlife governance should prioritize economic principles to ensure that decisions about natural resource protection take into account the economic implications. In order to accomplish the sustainable development goals in Tambrau Bay, it is necessary to take into account economic principles when managing the economic potential of wildlife non-timber forest products (NTFPs). The commercial viability and exploitation of wildlife in Zimbabwe demonstrates that effective natural resource management can serve as a significant economic asset (Child, 1988). When considering the economic potential of wildlife non-timber forest products (NTFPs) in Tambrau Bay, it is essential to manage them in a way that improves the welfare of local residents and maintains the sustainability of the ecosystem.

4. Conclusions

Overall, animal hunting and trade in Warmandi and Weyaf villages generate significant economic benefits for the local inhabitants. To maintain the survival of these resources, better management practices and enhanced community knowledge of the necessity of conservation are required. This study delves into the use and economic value of non-timber forest products (NTFPs) obtained from wildlife hunting and trade in Warmandi and Weyaf Villages, Tambrauw Regency, Southwest Papua. The entire economic value of wildlife NTFPs reached Rp175,680,000 each year, with wild boar accounting for the majority (61%), followed by deer (31%), mambruk birds (7%), and tree kangaroos (1%).

These data indicate that wildlife hunting is crucial to the livelihoods of local communities. Forest resources should be managed sustainably to strike a balance between economic advantages and environmental conservation. Educating and socializing the community about sustainable hunting practices, as well as creating awareness about the value of wildlife conservation, are critical stages. To preserve the long-term viability of forest ecosystems, rules should be strengthened and unlawful hunting monitored. The creation of environmentally friendly alternative livelihoods, such as ecotourism and NTFP-based handicrafts, can help to alleviate strain on wildlife populations. Non-governmental organizations, such as the World Wildlife Fund, provide critical funding and facilities for conservation research and implementation. Active participation of local communities in forest management and conservation activities. Community participation not only improves the efficiency of conservation initiatives, but it also ensures that the economic benefits of conservation efforts are felt directly by local people.

To protect the forest regions of Warmandi Village, Weyaf Village, and Tambrauw Regency as a whole, several key factors must be considered. These include the responsibility of local governments and affiliated groups to consistently educate the public on the importance of forest and wildlife conservation, highlighting the dangers of over-hunting and the sustainable use of non-timber forest products (NTFPs). Supporting the development of alternative livelihoods, such as sustainable agriculture, ecotourism, and crafts made from non-timber resources, is crucial for local communities. Additionally, stricter regulations and improved surveillance are necessary to combat wildlife poaching and trading, ensuring the strict enforcement of laws against illegal hunting. Establishing or expanding conservation zones with proper management is vital for preserving critical habitats. Local involvement in forest management is essential for the success of conservation projects and to ensure that communities benefit directly from forest preservation. Continuous research and monitoring of forests and wildlife populations are needed to fine-tune conservation efforts and evaluate ongoing initiatives. Promoting and developing ecotourism as a sustainable revenue stream

can generate income for host communities while emphasizing the importance of conservation.

Collaborating with NGOs that focus on environmental preservation can provide logistical, financial, and programmatic support for forest conservation efforts. Utilizing technology, such as satellite monitoring, drones, and GPS devices, enables real-time tracking of hunting activities and land use changes. Finally, conducting extensive environmental awareness campaigns can raise public consciousness about the need to protect South West Papua's forests and wildlife. These combined efforts aim to enhance the well-being of local residents through sustainable practices while preserving the sustainability of the forests in Warmandi Village, Weyaf Village, and the broader Tambrauw Regency area. This study lays the groundwork for future research and the development of more effective policies for managing forest and wildlife resources. It is believed that proper policy implementation and active participation from all stakeholders will ensure the sustainability of forests and wildlife in Tambrauw Regency, while also increasing the welfare of local populations through sustainable and environmentally sound practices.

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Author Contribution

Conceptualization, R.A.M.M. and R.N.W.; Methodology, R.A.M.M.; Software, S.A.B.; Validation, R.A.M.M.; Formal Analysis, R.A.M.M and R.N.W.; Investigation, R.A.M.M.; Resources, R.A.M.M.; Data Curation, S.A.B.. ; Writing - Initial Draft Preparation, R.A.M.M. and R.N.W.; Writing - Review & Editing, S.A.B.; Visualization, R.A.M.M.; Supervision, R.N.W.; Project Administration, S.A.B.; and Funding Acquisition, R.A.M.M.

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Ethical Review Board Statement

This research has received approval from the Faculty of Economics and Business, University of Papua. All research procedures involving human participants were conducted in accordance with applicable research ethics guidelines, to ensure the protection and welfare of the respondents. Before the study began, all participants were given a full explanation of the purpose of the study, the procedures to be carried out, and their rights as respondents, including the right to withdraw from the study at any time without consequences. All data collected was kept confidential and used for academic purposes only. This study is committed to adhering to the ethical principles of research at all stages.

Informed Consent Statement

The authors hereby declare that we have received a full explanation of the objectives, procedures, risks, and benefits of this research entitled "Utilization and Economic Value of Non-Timber Forest Products (NTFPs) from Wildlife Hunting and Trade in Warmandi Village

and Weyaf Village, Tambrauw Regency." We understand that our participation is voluntary and that we have the right to withdraw from this study at any time without facing any consequences. We also understand that the data we provide will be kept confidential and used solely for academic purposes. By signing this statement, we agree to participate in this study.

Data Availability Statement

Data supporting the findings of this study are available upon request. The data includes information collected through observations, interviews and questionnaires from respondents in Warmandi Village and Weyaf Village, Tambrauw Regency. To access this data, please contact the lead author via the email listed in the correspondence section. The data will be provided in a form that complies with the privacy policy and approved ethical approval.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this research. All funding and support received from WWF and related institutions has been transparently disclosed and does not influence the results or interpretation of the research.

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Biographies of Authors

Rifki Alif Mediaanta Madubun, Undergraduate Program, Faculty of Economics and Business, University of Papua

- Email: madubunrifki@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Rully Novie Wurarah, Economics Department, University of Papua, Indonesia

- Email: r.wurarah@unipa.ac.id
- ORCID: 0000-0001-6709-1486
- Web of Science ResearcherID: ADB-4605-2022
- Scopus Author ID: 57222899721
- Homepage: https://sinta.kemdikbud.go.id/authors/profile/6673286

Siti Aisah Bauw, Economics Department, University of Papua, Indonesia

- Email: aisahbauwfebunipa@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: https://sinta.kemdikbud.go.id/authors/profile/6737885