

Plant and Other Forest Bioresource Utilization by Local Communities of Northern Negros Natural Park, Negros Island, Philippines

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Ethnobotanical data, a vital component of a thorough examination of a protected area that aids in planning for management efforts and strategies for biodiversity conservation, is rarely employed because of its rarity or absence in Northern Negros Natural Park's (NNNP) database. This study aims to [1] determine the plant and other forest bioresource utilization of the local communities in NNNP, [2] assess the threats to the park and its biodiversity due to the utilization of bioresources, and [3] evaluate the Institutional Management Regime for NNNP. The data was gathered using focus groups, key informant interviews, and household surveys. For the secondary data, information was also accessed from the Office of the Protected Area Superintendent and local government units. One hundred thirteen (113) species are used for food (26%), ornamental (24%), herbal or medicinal value (19%), construction (12%), commercial (9%), charcoal and fuel wood (8%), and craft (3%) based on data collected from 643 families in the 11 cities and municipalities that make up the protected area. Housing construction, settlement, and the production of annual and non-perennial timber crops were all noted as major threats identified in the park. According to the review of the Management Effectiveness Tracking Tool (METT), the "context" and "planning" components were the strengths of the protected area employing the management rating of 64 and 53.8%, respectively. The Republic Act No. 11038, commonly known as the Expanded National Integrated Protected Area System (ENIPAS), is the sole unambiguous law that governs bioresource harvesting in protected areas. In addition, policies imposed by cooperatives and villages were used to control the usage and harvesting of bioresources. These findings gave us a crucial socioeconomic and institutional understanding of the landscape, preparing us to make interventions and create management plans to deal with problems involving the use of bioresources in the protected area.

Keywords: ethnobotany, institutional assessment, management effectiveness tracking toll analysis, Northern Negros Natural Park, protected area, socioeconomic assessment

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INTRODUCTION

Due to development and the growing human population, forest resources – one of the natural capitals that are frequently taken and provide food, raw materials, and medicines – have been susceptible to deforestation (Jha and Bawa 2006). Agricultural trade was pointed out to be the main factor of this deterioration (Leblois *et al.* 2017). Supportively, Curtis *et al.* (2018) stipulated that global forest loss can be attributed to deforestation through permanent land use change for commodity production (27%), forestry (26%), shifting agriculture (24%), and wildfire (23%) (Curtis *et al.* 2018). In the Philippines, almost 78% of the 2.1 million ha of forest were removed from 1934–1988 (Liu *et al.* 1993). In Negros Occidental during the 1950s and 1960s, with the increased American subsidy to the sugarcane industry, land use was converted to sugarcane fields reducing forest cover to 8%, and the remnants of the old-growth rain forest below 850-ft elevation were cleared off during the mid-1970s (Denis 2006).

The lack of proper institutional arrangements and comprehensive government policies has been identified as one of the causes of deforestation and non-timber forest products (NTFP) degradation (Pandit and Thapa 2004), resulting in the reduction of forest ecosystem services. Poverty was also found associated with a high level of forest degradation implying that current policies should be changed (Deininger and Minten 1999). When policies in the Philippines were designed to encourage capital, subsidize energy, and support commercial agriculture or international trade employment unintentionally encourage unemployment, as well as migration to the forested area causing the expansion of deforestation (Amacher *et al.* 1998).

One critical watershed that needs to be assessed immediately is the Northern Negros Natural Park (NNNP) in Negros Occidental, Philippines. Its ecological services and bioresources are consumed either directly or indirectly by the neighboring population. As the population increases, the demand for resources also increases. NNNP's biophysical characteristics influence the different bioresource utilization in the protected area. Consequently, the bioresource use pattern can reflect the future of the protected area. Biodiversity assessment, valuation, and scenario projections were utilized to describe the bioresource use, monetize the ecological value, and model scenarios in NNNP in this paper. The results and findings provide critical input into the development of a sustainable contextualized framework for the management of bioresources and policy implications in NNNP.

This study had the following objectives:

- 1) determine the plant and forest bioresource utilization of the local communities in NNNP,

- 2) assess the threats to the park and its native biodiversity due to the utilization of bioresources, and
- 3) evaluate the Institutional Management Regime for NNNP.

MATERIALS AND METHODS

NNNP is located in the northern portion of Negros Island. In the Philippines. It hosts 8,714 households accounting for a total population of 40,599 based on the Survey and Registration of Protected Area Occupants conducted by the Provincial Environment Management Office in 2002. Likewise, the accumulated area occupied by the households, including their farm lots covers 50.24% (40,416.51 hectares) of the PA's total land area. Farm-based activities are the main source of living for most of the occupants depending on the Natural Park's rich natural resources. Some indigenous peoples' group has been also recorded thriving in the area, in which their representative tribal leaders assume respective seats in NNNP Protected Area Management Board (PAMB) (DENR PENRO Negros Occidental 2016).

The data gathering for the plant bioresource utilization of the local communities involved a household survey, focus group discussion (FGD), key informant interview (KII), and the use of secondary data. These data-gathering tools used the National Socio-economic Surveys in Forestry (NSESF) by FAO, CIFOR, IFRI, and World Bank (Bakkegaard *et al.* 2016).

The household survey made use of the second half of the four modules of NSESF, the standard, and extended household questionnaires. These questionnaires cover income, forest resources, food shortage, and forest changes and clearance as separate modules. The survey was conducted in the communities of the six *barangays* – namely, Barangay Minapasok, Calatrava; Barangay Bagong Silang, Don Salvador Benedicto; Barangay Guimbalaon and Barangay Patag of Silay City, communities in the area of Gawahon, Victorias City; and Sitio Hiyang-hiyang, Barangay Celestino Villacin, Cadiz City (Figure 1).

Due to the then-existing community restrictions because of the pandemic, FGD was only conducted in the communities of Sitio Hiyang-hiyang, Barangay Celestino Villacin, Cadiz City, and Gawahon of Victorias City. The KII was performed with very few knowledgeable individuals – including members of the *Bantay Bukid* Brigade (BBB); the eco-park managers of Gawahon Ecopark in Victorias City; the NNNP Protected Area Superintendent (PASu); Silay City Environment and

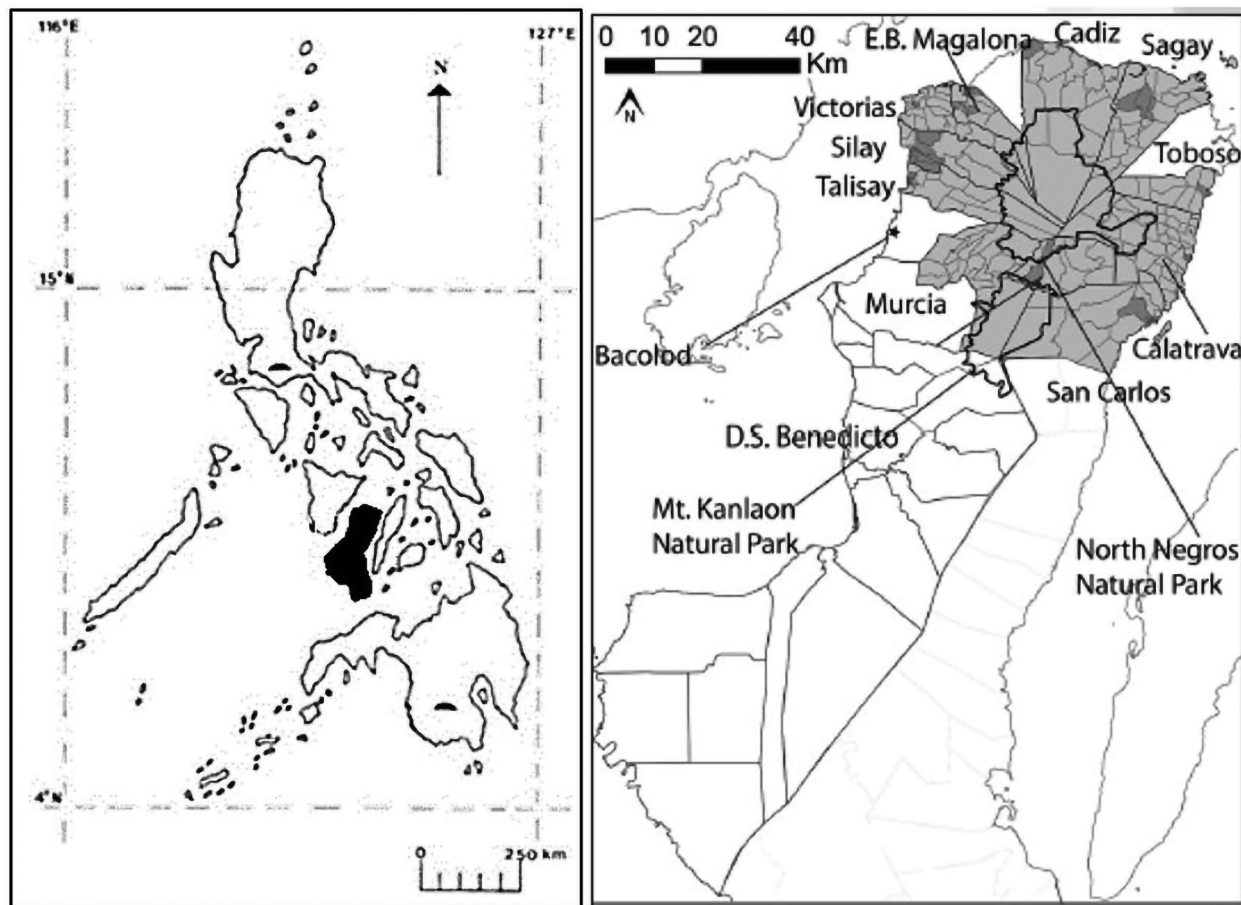


Figure 1. Map of the Philippines showing boundaries of six cities and five municipalities inside the protected area NNNP (Chechina *et al.* 2018) in Negros Island, Philippines.



Figure 2. The rich biota of Gawahon Trail Northern Negros Natural Park in Negros Island, Philippines.

Natural Resources Officer; an elder of the Hiyang-hiyang community in Cadiz City; community leaders of Gawahon of Victorias City, Patag and Guimbalaon of Silay City, and Bagong Silang, Don Salvador Benedicto; and

representatives from local environmental non-government organizations. Both the FGD and KII were guided by the first two sets of modules of NSESF – the standard and extended community questionnaires. The questionnaire covered the seasonal calendar, the most important forest products, the unit pricing, community benefits, governance, and community environmental services.

The institutional management regime of the NNNP characterization was generated through FGD, KII, and METT analysis. Focus group discussion was conducted with a group of BBB members – a community-based forest ranger group supported by the local government through logistics supplies and allowances – a group of village elders, and with the participation of the LGU staff assigned to the area. The KII activities were conducted with the PASu, a City Environment and Natural Resources Officer – an office under the LGU separate from the community ENRO of DENR – and the non-government organizations working in the areas of NNNP.

The topics covered both in the KII and FGD were extracted from the NSESF (Bakkegaard *et al.* 2016). It

was divided into two modules: [a] forest institutions and [b] enforcement and penalties.

The management evaluation tracking tool (METT) report used here was conducted under the B+WISER PROGRAM in 2014. This is the latest pre-pandemic METT analysis conducted for NNNP.

The technical working group was convened by the PASu instead of calling all the members and representatives of the PAMB for NNNP. Other stakeholders from non-government organizations, people's organizations, and private sectors were invited and, together with the PAMB Technical Group, completed the 25 participants.

The two-day METT assessment for NNNP was facilitated by the program's policy and governance specialist, Dr. Maria Zita Toribio, with the assistance of the support staff comprised of a program associate (PA Donceras) and the B+WISER-BRWFR field unit team (FTA Labutap, AFA Cornelio, and Program Driver Laguda).

On the assessment proper, an orientation/leveling off on the METT was given so participants can have a common understanding of the purpose, questions and indicators, rating system, and procedure. Three categories were covered during the assessment that included the identification of threats, the METT assessment itself, and the rapid learning needs assessment. Using a plenary type of discussion, individual questions were read and elaborated by the facilitator to the participants. Respective answers were recorded both on a sheet of paper and the METT questionnaire for validation and documentation reasons. Also, immediately after each question, answers were tallied.

The data from 643 survey respondents were analyzed using frequency counts and percentages. The data were interpreted using the information provided in the categories indicated by the survey questionnaires and guiding questions for the FGD and KII. For the institutional management analysis, the METT analysis was used.

RESULTS AND DISCUSSION

Plant Bioresource Utilization of the Local Communities

Table 1 shows the list of the harvested products from the NNNP in Negros Occidental. The table further shows which localities and how people are using the product. A total of 113 species were collected and harvested for various utilization by the local communities. Food was the leading purpose for the collection (29%), whereas 24% was collected for ornamental, 19% was used as herbal medicine, 12% was utilized in construction, 9% went

directly for sale, 8% for fuelwood and made to charcoal, and 3% were utilized for craft according to 643 households from 11 municipalities and cities covered by the protected area. In addition to other ethnobotanical studies that have recently been undertaken, this paper examines more than just the use of plants (Madjos and Ramos 2021; Cordero *et al.* 2022; Baddu and Ouano 2018) and goes beyond the ethnomedicinal or medicinal uses (Tantengco *et al.* 2018; Dapar *et al.* 2020). Instead, it includes not only plants but also mushrooms and other forest products that are valued highly by the local communities in the park, much like the work of Rosales *et al.* (2018), but is not restricted to solely edible plants and of Lacuna-Richman (2002) that only looked into the non-wood forest products of Leyte, Philippines.

Forest-related income. About 66% of the population claimed that they did not receive a form of forest-related payment or income for the past 12 months (Table 2). The highest percentage of the communities that did not receive any forest-related payments are those from Silay City (97%). It is because only very few are members of the existing cooperatives that served as implementing beneficiaries of any forest-related aid and assistance. More of Cadiz City communities received forest-related payments and incomes (64%), whereas a little more than half (55%) of the communities of Victorias City said otherwise. This is one of the reasons why the local communities are mostly dependent on the NTFP collection and selling of other forest products. This was proven true in the study of Nhem *et al.* (2018). Most of the forest-related income of the local communities who were excluded from the forest-related payments was predominantly derived from cultivated non-timber resources similar to that of the border region of southern China (Hogarth *et al.* 2013).

"Indi man kami tanan makabaton sir. Kalabanan sa amon nga indi myembro indi makabaton eh. Para man lang na sa ila myembro." Not everybody receives (forest-related payments) sir. Most of us who are not members (of the cooperatives/associations) cannot receive. Their projects are for the members only.

Because of these forest-related payments or income sources, in the communities inside NNNP, 73% stopped timber extraction, 23% have reduced timber extraction, and 4% are still doing them. There has been a significant reduction in hunting (75%). However, the fuel wood collection remains the same (86%) because that is their primary source of energy for cooking. Ninety-five (95%) percent indicated that they are still doing their agricultural production.

Table 1. List of plants harvested and their uses in Northern Negros Natural Park in Negros Occidental, Philippines.

Forest product			Communities that collect the bioresource				
Scientific name	Common name	Use(s) in the community	Cadiz	Victorias	Silay	DSB	Calatrava
<i>Agathis philippinensis</i>	<i>Almaciga</i>	The "Badyangao" resin of Almaciga - sold (used to start fire)				x	
<i>Alocasia macrorrhizos</i>	<i>Badyang</i>	Ornamental, herbal – tooth decay			x		
<i>Alocasia zibrina</i>	<i>Tiger plant / Gabi2/ tigre tegre</i>	Ornamental	x			x	
<i>Amomum</i> sp.	<i>Tugis</i>	Herbal – headache (pound shoot alone then rub extract on the head), food – fruit that grows on the ground			x		
<i>Ananas comosus</i>	<i>Pinya</i>	Food, herbal – headache (pound cabbage and apply forehead 1 stem)					x
<i>Artocarpus heterophyllus</i>	<i>Langka/ nangka</i>	Food, construction		x	x		
<i>Caladium bicolor</i>	<i>Gabi-gabi</i>	Ornamental	x		x	x	
<i>Calliandra calothyrsus</i>	<i>Caliandra</i>	Food for the goats, fuelwood			x		
<i>Caryota cumingii</i>	<i>Pugahan/ fish tail palm</i>	Sell, food – soft shoot (<i>ubod</i>), herbal – muscle pain or overfatigue or <i>bughat</i>			x		
<i>Chromolaena odorata</i>	<i>Hagonoy</i>	Herbal – cuts and wounds (crush and apply extract of five leaves)			x		
<i>Cinnamomum mercadoi</i>	<i>Kaningag (cinnamon)/ kalingag</i>	Construction – trunk, herbal - part of tree (tar) used in smoking the body (<i>tuob</i>), seedlings –used in bagging to be sold for tree planting				x	
<i>Dendrocnide platyphylla</i>	<i>Alingatong</i>	Herbal			x	x	
<i>Diplazium esculentum</i>	<i>Pako edible</i>	Food – soft shoot		x	x		
<i>Dracontomelon dao</i>	<i>Dao</i>	Construction		x			
<i>Etlegria pilosa</i>	<i>Utocorn</i>	Food – fruit			x		
					x		
	Wild orchids (<i>Ilahas</i>)	Ornamental	x		x		

Table 2. Communities that received forest-related payments or income in Northern Negros Natural Park, Negros Occidental, Philippines.

Communities	Yes	No
Cadiz City	64%	36%
Victorias City	45%	55%
Silay City	3%	97%
Don Salvador Benedicto	27%	73%
Calatrava	29%	71%

“Nagdyutay man gid sir ah. Sugod sang may mga ubra na kami sa ecotourism, wala na sang mag naga pangayam, talagsa na lng magpabukid kay nag untat man uling. Kay bawal naman abi sir.” It was reduced sir. When we were employed at local resorts/ecotourism, we stopped hunting, our trips to the forest were reduced and we even stopped charcoal making. We were taught that it was illegal.

Table 3. Local community’s responses to forest payment programs in Northern Negros Natural Park, Negros Occidental, Philippines.

Forest activities	Yes, stopped	No, still doing	Yes, reduced	N/A (wasn’t doing [activity])
Timber extraction	73%	4%	23%	–
Fuel wood collection	–	86%	14%	–
Other NTFP collection	–	9%	5%	86%
Hunting	–	7%	75%	18%
Agricultural production	–	95%	5%	–

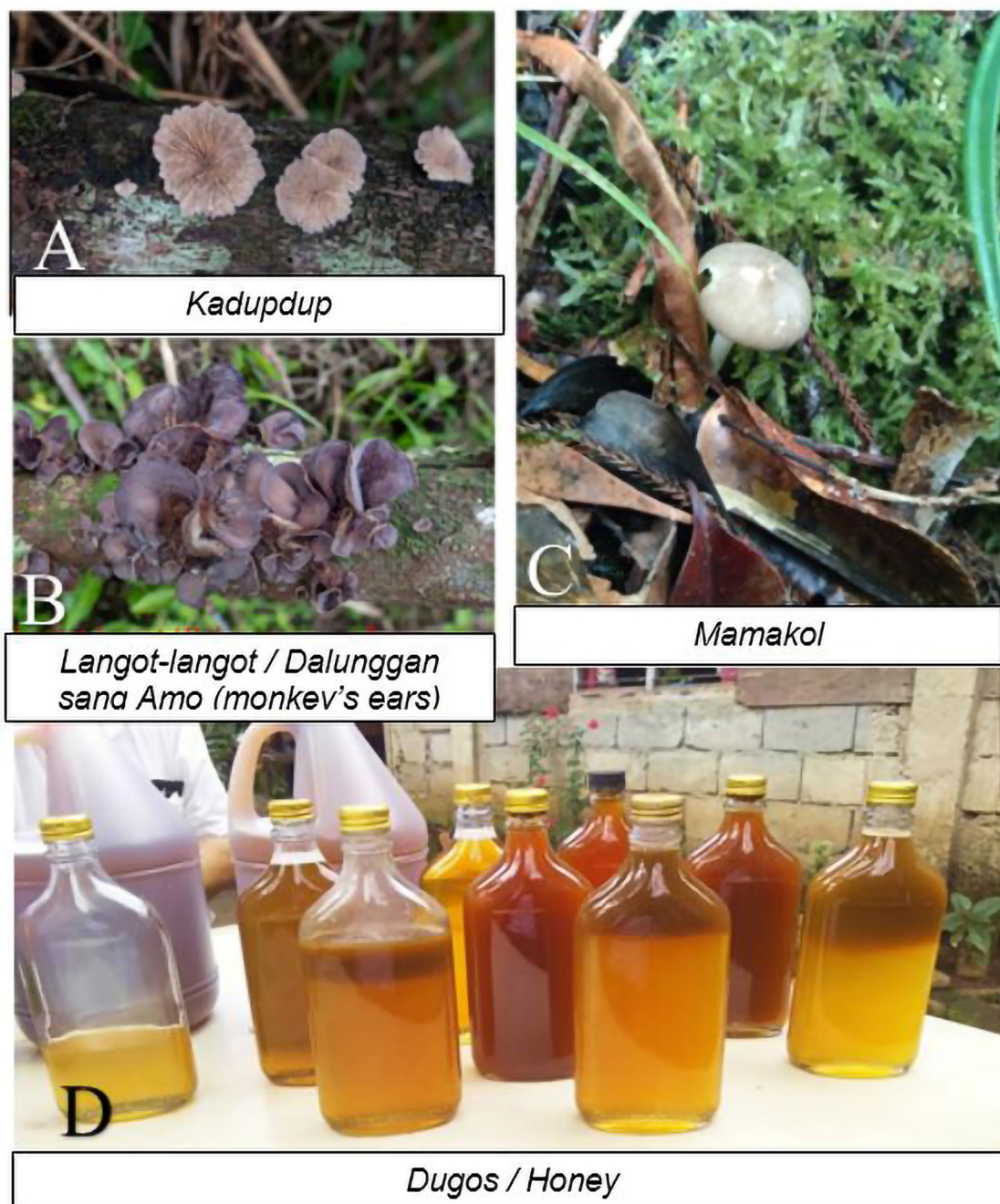


Figure 3. Top harvested forest products inside Northern Negros Natural Park in Negros Occidental, Philippines.

Financial crises have been dubbed detrimental and increased deforestation (Antonarakis *et al.* 2022), and interventions like forest-related income for the local community improve and preserve the forest quality (Kazungu *et al.* 2021; Pham *et al.* 2021).

There were members of the communities that stopped processing charcoal because of employment in ecotourism inside NNNP but later went back to doing them again since the COVID-19 pandemic caused them to lose their jobs.

The effects of payments related to the forest were favorable for preserving forest cover and protecting forest bioresources (Fuwape 2001; Mushi *et al.* 2020). However, the pandemic's impact on ecotourism's revenue and employment levels (Virijević Jovanović *et al.* 2021) led to a rise in the exploitation of forest products (Chirwa *et al.* 2021).



Figure 4. Top harvested flora inside Northern Negros Natural Park in Negros Occidental, Philippines.

Forest resources – energy, health, and construction. The average distance from the communities to the forest is 3.6 km, and the only mode of transportation throughout all the communities is by walking. The average time of travel is 1 h and 14 min. Don Salvador Benedicto communities have the closest distance to the forest (2.17 km) with an average travel time of 24 min, whereas Cadiz City communities had

the farthest (11.69 km) and the longest average travel time (3 h and 25 min). 93% of the communities are using wood and charcoal for cooking plus water sterilization but not for lighting since electricity has already reached their localities. 85% of the communities collected these fuel woods.



Figure 5. Top processed products in Northern Negros Natural Park, Negros Occidental, Philippines.

The human footprints were manifested in protected areas with human settlements close to the forest lines (Lhoest *et al.* 2020; Harbi *et al.* 2021).

Almost all of the members of the communities (99.17%) are using medicinal plants that were mostly collected from communal lands (Table 4). Access to the communal forest was “very easy” in all five communities. The time of collection has decreased for the past five years despite the no change in plant availability in the forest. This is contributed by the communities domesticating

the medicinal plants for easy access and fast utilization. Communities were asked if they preferred therapeutic herbs or contemporary drugs when given the choice between the two. For them, the availability of the medications is the only factor that matters.

Food for food shortage and crises. 85% of the households indicated they have experienced not having enough food for the past 12 months in an average period of 2.5 months. Four (Cadiz City, Victorias City, Silay City, and Calatrava) out of five communities or 87% on average consumed or

Table 4. Use of bioresources medicinal plants in Northern Negros Natural Park, Negros Occidental, Philippines.

	Use of medicinal plants	How was it obtained	Status of land where was it taken	Difficulty of access	Change in time of collection for the past five years	Change in plant availability for the past five years	Preference in treating illness
Cadiz City	Yes	Planted	Private	Very easy	Less	No change	No preference
Victorias City	Yes	Collected	Communal	Very easy	Less	Increased	No preference
Silay City	Yes	Collected	Communal	Very easy	About the same	No change	No preference
Don Salvador Benedicto	Yes	Collected	State-owned	Very easy	About the same	No change	No preference
Calatrava	Yes	Collected	Communal	Very easy	Less	No change	No preference

used forest products to meet their food needs. For Don Salvador Benedicto, only 33% of the households utilized forest products for food needs in times of food shortage. Many of the local communities were forced to turn to the forest for food as a result of crises like the pandemic, which imposed restrictions that led to unemployment and constituted a threat to food security (Giri 2021).

Three communities (Cadiz City, Don Salvador Benedicto, and Calatrava) regarded the forest products as “very important or primarily relied on forest products to overcome food shortage,” whereas Silay City communities indicated that forest products are “somewhat important, but we also rely on other resources to overcome food shortage,” and Victorias City communities regarded forest products as “no more or less important than other resources we rely on to overcome food shortage.”

“Dako gid ya nga bulig ang bukid. Kon tig gulutom ya, basta mapisan ka lang makakaon ka gid ya.” It’s (Forest and its products) a great help for us. In times of food shortage, as long as you are diligent, you will not grow hungry.

As to the severity of the negative effects of shocks and crises, 97% of the households indicated yes to these experiences for the past 12 months. Drought, crop diseases or crop pests, loss of employment with a salary or non-payment of salary, and a large rise in food were among the top list of challenges experienced by the communities inside NNNP. The most severe occurrence was drought, which had several effects on people’s lives and livelihoods in the communities. Crop disease or crop pests ranked second as it directly affects agriculture as one of the primary sources of income for many households. The loss of employment with a salary or non-payment of salary can be directly associated with the occurrence of the COVID-19 pandemic. The pandemic caused the closure of many ecotourism sites that employ most of the members of the community and, thus, resulted in retrenchment or non-payment of salaries. The crisis has been aggravated

by the large rise in the prices of food.

Most harvested plant bioresources. The majority of the sampled population collected forest products (65.26%) for the past 12 months. Among the top harvested products in order of frequency are *uhong*/mushroom, honey, *Ludisia discolor* (jewel orchids), *Alocasia macrorrhizos* (*badyang*), *Caladium bicolor* (*gabi-gabi*), *Thyssonolaena latifolia* (*udiong*), *Pinanga insignis* (*balasyang*), *Alocasia zebrina* (*tigre-tigre*), *Asplenium nidus* (*manan-aw*), *Etlegria pilosa* (*utocorn*), and *Diplazium esculentum* (*pako*) (Table 5). Fathers are among the top collectors of these products (Table 6). *Uhong*, or edible mushrooms, are being collected by all of the households from managed plantations largely for domestic use. They were gathered for an average of 134 min per session during at least 15 wk of the year, four days per week. In certain cases, they are quickly discovered and gathered in under 5 min. Every time a collection activity was conducted, an average of seven pieces of mushrooms were gathered, and the entire collection was consumed by the household. In other circumstances, the price of 10–15 pieces, if sold, is PHP 10. That makes the mushroom to be the topmost collected forest product inside NNNP by its inhabitants. Edible mushroom collection and harvesting for food and other uses is not isolated to NNNP. It is also practiced by communities in different forests in the Philippines (de Leon 2016; Corazon and Licayao 2018; Lazo 2015) and Southeast Asia (Mortimer *et al.* 2012). Edible mushrooms ranked as the top collected bioresource because of their almost all-year-round availability. The nutritive value that the mushroom provides makes it a target for collection and consumption. This was also the same reason why it is collected in tropical forests like Thailand (Sanmee *et al.* 2003) and southern Nigeria (Gbolagade *et al.* 2006). The community’s great knowledge of wild edible mushrooms drives their gathering since wild edible mushroom collection and harvesting are anchored in generational indigenous knowledge (Sitotaw *et al.* 2020; Dijk *et al.* 2003; Ruán-Soto *et al.* 2006).

Table 5. Most important bioresources collected by the local communities in Northern Negros Natural Park in Negros Occidental, Philippines.

Scientific name (according to rank of most- ly harvested)	Common name	Top collectors	Percentage of households collecting	Sources
<i>Lusidia discolor</i>	Jewels	Father	30%	Old-growth natural forest
<i>Alocasia macrorrhizos</i>	<i>Badyang</i>	Mother	14%	Secondary/ regenerating natural forest
<i>Caladium bicolor</i>	<i>Gabi-gabi</i>	Father	67%	Secondary/ regenerating natural forest
<i>Thyisonolaena latifolia</i>	<i>Udiong</i>	Father	27%	Managed plantation forest
<i>Pinanga insignis</i>	<i>Balasyang</i>	Father	8%	Old-growth natural forest
<i>Alocasia zebrina</i>	<i>Tigre-tigre</i>	Father	10%	Old -growth natural forest
<i>Asplenium nidus</i>	<i>Manan-aw</i>	Father	40%	Old-growth natural forest
<i>Etlegria pilosa</i>	<i>Utocorn</i>	Father	80%	Secondary/ regenerating natural forest
<i>Diplazium esculentum</i>	<i>Pako</i>	Mother	100%	Secondary/ regenerating natural forest

Table 6. Frequency and quantity of most important plant bioresources collected by the local communities in Northern Negros Natural Park in Negros Occidental, Philippines.

Scientific name (according to rank of mostly harvested)	Common name	Frequency and quantity of collection					Consumed the product			Distribution of top forest products being sold	
		No. of times in a year (weeks)	No. of times in a week (days)	No. of hours in a day	Total quantity collected	Unit of collection	Yes	No	Portion consumed if yes	Percentage of hh that sold the products	Current/ most recent price per unit
	Edible mushrooms/ <i>uhong</i>	15	4	2.5	6.43	Pieces	100%	0	100%	100%	PHP 10 (USD 0.19) per plastic approx 10 to 15 pieces
	<i>Dugos</i> / honey	16	3	7	5.48	No. of gallons	67%	33%	44%	96%	PHP 1000–1500 (USD 19.09–28.63) per gallon; PHP 150 (USD 2.86) per 200 bottle
<i>Lusidia discolor</i>	Jewels	5	1	5	8.45	No. of pieces	100%	0%	61%	65%	Small – PHP 20 (USD 0.38); medium – PHP 50 (USD 0.95); large – PHP 100 (USD 1.91); extra large – PHP 500 (USD 9.54)
<i>Alocasia macrorrhizos</i>	<i>Badyang</i>	Incidental harvesting and only amid COVID pandemic because there is demand	1	4	1	No. of seedlings	77%	23%	100%	100%	PHP 250 (USD 4.77) per seedling

Table 6. Cont.

<i>Caladium bicolor</i>	<i>Gabi-gabi</i>	2	1	4	3	No. of pieces	100%	0%	100%	100%	PHP 250 (USD 4.77) per seedling
<i>Thysonolaena latifolia</i>	<i>Udiong</i>	1	4	9	37.5	No. of pieces	84%	16%	100%	100%	PHP 60 per bugkos
<i>Pinanga insignis</i>	<i>Balasyang</i>	Incidental harvesting	1	8		No. of pieces	100%	0%	100%	100%	
<i>Alocasia zebrina</i>	<i>Tigre-tigre</i>	48	1	8	8	Seedling (piece) or kinabuhi	100%	0%	100%	100%	PHP 200 (USD 3.82) per seedling
<i>Asplenium nidus</i>	<i>Manan-aw</i>	7	1	6	1	Seedling (piece) or kinabuhi	82%	18%	57%	70%	Small – PHP 100 (USD 1.91), small – PHP 200 (USD 3.82)
<i>Etlegria pilosa</i>	<i>Utocorn</i>	12	1	3	1	Plastic bag	100%	0%	100%		
<i>Diplazium esculentum</i>	<i>Pako</i>	35	2	4	1	Bugkos/ lutuan	100%	0%	100%	100%	PHP 10–20 (USD 0.19–0.38) per bugkos

The second topmost collected product is honey or locally known as *dugos*. The locals call their method of collection *pamuhag* or cause to scatter or disperse. They do this by using smoke to disperse the bees off their hive before collecting the honey. The mode of tracking or locating the hives, however, varies according to their community. The communities in Victorias City, Silay City, and Don Salvador Benedicto locate the hive by noting the tree species where the bees attach their hives. Most of them are endemic tree species to the Philippines like *Dillenia philippinensis*, *Shorea polysperma*, *Parashorea malaanonan*, among others. The communities in Cadiz City, however, look at the areas of the forest where the bees collect nectars and follow them where they stop or disappear to locate the hives. Collecting nectars by the bees is called *paniba* (foraging), and the communities take note of their locations and seasons of the year for effective honey collection. The study further shows that males or fathers dominated the collection of honey in the entire area of NNNP. It is due to the difficulty and danger involved in the honey collection. Only 33.5% of the communities are honey collectors since they are done always in the old-growth forested area. The collection season typically lasts 15 wk in a year, collecting 6 gallons per session or week on average. A portion of their collected honey (44%) is consumed by some (67%) (Table 6), whereas 96% were sold by those who did not consume (33%). Honey costs PHP 1000–1500 per gallon, PHP 150 per Tanduy Jr. Lapad bottle, and PHP 200 per 250-mL bottle. Honey has been widely collected in the islands of the Philippines. In Palawan, Philippines, they were commercialized to address poverty and forest degradation (Matias *et al.* 2018).

The third most collected forest product is *Ludisia discolor* or jewel orchids (Tables 5 and 6). It is one of the forest products that have been collected primarily for aesthetics and has been popularized since the COVID-19 pandemic erupted, which prompted most of the households in and outside NNNP to become fascinated with plants, that they embrace the title “*plantito* and *plantita*.” Due to the sudden popularity of gardening and collecting plants and orchids among a large number of people, demand for these formerly ignored forest products has surged. The increase of 30% from relatively zero households collecting jewels exerted pressure and can impact the ecological processes in the ecosystem. The majority of *L. discolor* collections are made by fathers accidentally or unintentionally while they are gathering honey. Old-growth forests are where *L. discolor* are typically found, and on average, it takes 5 weeks of the collection every year to harvest 9 pieces. All of the collections are brought home and cultivated so that when the demand comes, they have available products to sell. The prices vary according to the sizes. For small, it costs PHP 20, medium at PHP 50, large at PHP 100, and extra-large at PHP 500.

Only 28% of the population collected for the processed forest products (Table 3). The communities in Victorias City recorded to have the most collection for processed forest products (60%) compared to the rest of the sampled communities (Cadiz City – 11%, Silay City – 30%, Don Salvador Benedicto – 9%, and Calatrava – 31%) because of the presence the cooperative BeeGlad that primarily works with the processing of honey collected. Among the processed forest products, these are the top most collected for processing: soap, vapor rub, shampoo, broom, and charcoal.

The soap, vapor rub, and shampoo are products of a single cooperative from the community in Victorias City. They are processed from honey collected which is abundantly provided by the members of its community. Mothers dominate in the processing of these forest products which comprise only 10% of the village population. They were doing the processing the whole year round and or depending on the availability of honey supply. It's taking them 4 d/wk and 2 h/d to produce 5 pieces of soap, 5 small tubs for the vapor rub, and 5 pieces for bar shampoo. These products were not consumed for personal use but purchased from the cooperative in the case of personal or household consumption. The soap costs PHP 40 a piece, the vapor rub at PHP 60 for each small tub, and shampoo at PHP 40 for every bar.

The broom is a finished product of *udiong* (*Thysonolaena latifolia*) collected from the forest, which is processed by the fathers of the household. Only 22% of the households in the communities are involved in broom-making (Table 7). The processing happens 17 wk/yr, 4 d/wk, and an average of 8 h/d to produce 16 pieces of brooms. All of the products were sold for PHP 100–150 for each broom.

Threats to the park and its native biodiversity. Among the existing threats identified within the NNNP, housing settlement, crop cultivation, and logging and wood harvesting were considered the top three problems attributing to an overall score of 73, 70, and 67%, respectively. However, However, in terms of indicative

qualitative rating, only two threats – namely, housing and crop cultivation (Table 8) – were considered high out of the 24 enumerated pressures (8.3%). This amounts to the straightforward inference that the protected area is currently threatened; hence, more time and attention should be devoted to addressing these two risks. The pertinent notes that participants provided concerning the various dangers highlighted were summarized for reference.

Institutional Management Regime

The Republic Act No. 11038, also known as the Expanded National Integrated Protected Area System (ENIPAS), is the only clear rule regulating the harvest and collection of forest products, especially within the strict protection zone. However, crop harvesting is allowed within the farmer's certificate of stewardship contract lot. The regulation was implemented by the village head, BBB, the LGU, and the Philippine National Police.

The ENIPAS and its regulations have influenced the reduction of MIPs harvested according to the informant manifested by the reduced number of apprehensions of charcoal production from 2019 to the first half of 2021, 6 cases in 2019, 5 in 2020, and 1 in the first half of 2021. It was also highly respected by everyone who reduced to halt of its violations. It is highly respected that the once publicly performed violations were now concealed by the perpetrators and that they were also keen on watching out for the regulators.

Table 7. Notable most important products processed collected by the local communities in Northern Negros Natural Park in Negros Occidental, Philippines (USD 1 = PHP 52.39).

	Top processors	Households processing	No. of weeks	No. of days	No. of hours	Quantity	Unit of collection	Current/ most recent price per unit
Soap	Mother	10%	48	4	2	5	Piece	PHP 40 (USD 0.76)
Vapor rub	Mother	10%	48	4	2	5	Small tub	PHP 60 (USD 1.15)
Shampoo	Mother	10%	48	4	2	5	Piece	PHP 60 (USD 1.15)
Paypay	Father	22%	17.3	4	8	15.9	Pieces	PHP 60 (USD 1.15) thin, PHP 90 (USD 1.72) thick
Udiong	Father	19%	15	4	7	50–100 pcs. of sticks or 8 bugkos or 3 finished broom products (paypay)	Sticks or bunch of sticks (bugkos) or finished broom product (paypay)	PHP 60 (USD 1.15) thin, PHP 90 (USD 1.72) thick
Broom stick	Mother	0%	48	3	8	6	Piece	PHP 30 (USD 0.57) per piece
Uling	Father, mother	6%					Sack	PHP 180–250 (USD 3.44–4.77)

Table 8. Top threats identified to exist in Northern Negros Natural Park, as surfaced by the METT analysis.

Threats	Based on overall score (max score: 60)	Indicative qualitative rating
Agricultural and forestry effluents	30 (50%)	Medium
Annual and non-perennial timber crop cultivation	42 (70%)	High
Avalanches/landslides	36 (60%)	Medium
Commercial and industrial areas	29 (48%)	Medium
Droughts	30 (50%)	Medium
earthquakes	25 (42%)	Medium
Erosion and siltation/deposition	33 (55%)	Medium
Fire including arson	29 (48%)	Medium
Garbage and solid waste	26 (43%)	Medium
Gathering terrestrial plants or plant products (non-timber)	27 (45%)	Medium
Household sewage and urban wastewater	32 (53%)	Medium
Housing and settlement	44 (73%)	High
Hunting, killing, and collecting terrestrial animals	32 (53%)	Medium
Livestock farming and grazing	27 (45%)	Medium
Logging and wood harvesting	40 (67%)	Medium
Loss of cultural links, traditional knowledge, and/or management practices	26 (43%)	Medium
Wood and pulp plantations	23 (40%)	Medium

[Low] 0–33%; [medium] 34–67%; [high] 68–100%; illustration of calculation: $(22/60) \times 100 = 37\%$

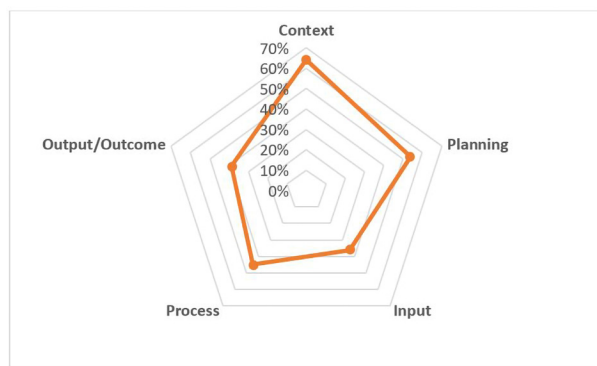


Figure 6. A radar graph showing the distribution of various core elements' weighted percent score based on the METT assessment result for Northern Negros Natural Park, Negros Occidental, Philippines.

In general, the harvest process of these MIPs for cash and subsistence is made without permission to harvest, making the harvest of timber and minor products illegal. A certain amount of fees will be paid when a farmer applies for a permit at the DENR office of PASu and CENRO.

The result of the METT assessment indicates the prevailing performance and condition of the protected area management in terms of five measuring core

elements (context, planning, input, process, and output). Expectedly, the protected area got the lowest score in the aspect of input (36%) – which covers fees, equipment, staff numbers, current budget, security of budget, law enforcement, staff training, and resource inventory (Table 9). On the other hand, the context element in terms of legal status reflected had the highest scores earned (64%), followed by planning with a total score of 54%. An additional score of 6.5% was earned from the context of planning, process, input, and outcome – attributing to an overall METT score of 50.8%. Relatively, the cumulative scores garnered per criterion were based on the 25 respondents subjected to the assessment, which were then equated to percent scores (Table 9; Figure 6).

CONCLUSION

The community has been actively utilizing the protected area's provisioning services provided by its plant bioresources. Plant gathering was done largely for sustenance and income. An indicator that the majority of community members are low-income or relatively impoverished and rely on common property resources (Jodha 1992). This must also be true when the pandemic

Table 9. Summary table of baseline METT assessment result for Northern Negros Natural Park, Negros Occidental, Philippines.

Elements	Criteria	Total scores per		Percent scores per (%)	
		Criterion	Element	Criterion	Element
Context	Legal status	48	48	64%	64%
Planning	PA regulations	34	242	45%	53.8%
	PA objectives	41		55%	
	PA design	38		51%	
	Management plan	45		60%	
	Regular work plan	46		61%	
	Planning for adjacent land and water use	38		51%	
Input	Law enforcement	30	217	40%	36.2%
	Resource inventory	45		60%	
	Staff numbers	25		33%	
	Staff training	33		44%	
	Current budget	27		36%	
	Security of budget	28		37%	
	Equipment	23		31%	
	fees	6		8%	
Process	PA boundary demarcation	49	404	65%	44.9%
	Protection system	31		41%	
	Research	44		59%	
	Resource management	34		45%	
	Management budget	34		45%	
	Maintenance of equipment	19		25%	
	Education and awareness	40		53%	
	State/ commercial neighbors	25		33%	
	Indigenous peoples	37		49%	
	Local communities	41		55%	
	M&E	33		44%	
	Commercial tourism operators	17		23%	
Output/Outcome	Economic benefits	39		52%	38.7%
	Visitor facilities	12		16%	
	Condition of values	36		48%	
Subtotal			998		44.4%
Total score	(Core score + additional points score)				50.80%

puts further strain on every home, forcing the community to rely on these resources as the sole supply of essentials. Some processed forest products frequently supplied to the market were also shown to have supplemented the community's economic needs. Other forest-related revenue streams exist, but not everyone benefits from them since not everyone is a member of the cooperatives participating in those programs. Plant bioresources have also been shown to offer food for the community during

times of crisis and food scarcity.

The METT examination of the protected area's management performance reveals more about the institutional regime that influences conservation attitudes and resource usage patterns. On the other hand, the socioeconomic situations of local populations inside the protected area reflect their attitude toward sustainability as demonstrated in their harvest of bioresources for subsistence and income.

NNNP had a total score of 50.8% in the most recent METT analysis, putting it on the boundary between “fair” and “good” for the instrument. Even though the rating is only halfway to “excellent,” it has had a favorable influence on the community’s attitudes toward wood extraction (73% halted, 23% decreased, and 4% still doing) and hunting (75% reduced and 7% still doing). Because 86% of the population still uses fuel wood, the existing management regime will have to address it. Plant and forest bioresource extraction can still be deemed sustainable because only 9% of the population practices it and just 5% has curtailed collection. This favorable impact suggests that well-managed protected areas contribute to biodiversity conservation and community well-being. However, because 57% of the population earns less than PHP 5,000/mo, there is still a need to strengthen the community benefits program, which has been highlighted as one of the weakest components of protected area management. The assistance offered to the local community’s very high (95%) participation in agricultural output must be viewed as a viable solution to socioeconomic problems. This characterizes ideal, effective biodiversity conservation and successful reserve management.

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