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Local people's use of non-timber forest products in the Gunung Halimun Salak National Park, West Java

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Abstract

We surveyed local people's collection and use of non-timber forest products (NTFPs) as well as knowledge about the national park regulations and villagers' perception about those regulations, in three villages in the West Java. Kutajaya villagers used five groups of NTFPs, firewood and fodder being most commonly collected and medicinal plants, food, and construction materials less frequently. In Hanjawar, seven groups of NTFPs were used: foliage other than food and household appliances in addition to the above. The most frequently used were fodder plants and firewood. In Majasari, eight groups of NTFPs were used, palm sugar in addition, which was the most frequently collected. Food and firewood were also important NTFPs exploited there. The typical personal characteristics of the interviewed NTFP users were low education level, agricultural employment (except in Kutajaya) and a low rate of agricultural land ownership. Perceptions about national park regulations were similar among the three villages. Their knowledge of the regulations was low, usually limited to such regulations as the prohibitions of cutting trees down, hunting wildlife, opening new land for cultivation, and collecting firewood and cattle feed. They were ready to accept the former three restrictions, but they tended to be against the prohibitions on firewood and cattle feed collection because there was no alternative place to collect such resources. As for the prohibition of tree cutting, the Hanjawar and Majasari villagers hoped that there would be exceptions to the regulations to meet their minimum needs for house construction. They argued that they could not afford to buying non-wood construction materials due to low income levels. In addition they considered that cutting one or two trees would not have significant negative impacts on forests as they each would be certainly replaced by new seedlings growing naturally or by seedlings they would be willing to plant.

Key Words: firewood, food, local wisdom, park regulations, tree cutting

1. Introduction

In Southeast Asia there are many communities that are directly dependent on forest biodiversity-based ecosystem services. These countries have expanded protected areas and, in most cases, have excluded local people from resource use in those protected areas. Such exclusionary approaches have neither been accepted nor supported by local people who are among the key stakeholder in sustainable resource management and conservation. Local people's perceptions regarding national parks have significant influence on the sustainable management of those areas. Sodhi et al. (2009) and Porter-Bolland et al. (2012) argue that the more local people understand national park functions and park regulations, the more likely the park will be successfully protected. These perceptions are influenced by historical context, geographic conditions, as well as

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the roles of stakeholders, particularly national park officers who provide information about national park laws to local people.

The area in and around Gunung Halimun Salak National Park (GHSNP) has a long history of agricultural development. Parts of this area had been deforested due to expansion of agricultural lands because many people derive significant parts of their livelihoods from paddy cultivation and other agricultural activities in and around the national park. The most important challenges for the national park management are to prevent the expansion of agricultural lands driven by population growth and, at the same time, to preserve biodiversity while simultaneously improving local livelihoods. In Indonesian national park management, harvesting natural resources inside park boundaries is prohibited except in limited zones. Local people have harvested forest products, such as firewood, edible plants, bamboo, rattan, sugar from sugar palm as well as herbaceous plants along the forest edges. Historically, they were forest-dependent people and practiced traditional modes of forest management (Kubo and Supriyanto, 2010).

There are 314 settlements within the park area. Around 100,000 mostly poor people rely on the natural resources in the park for their daily livelihoods (Kubo and Supriyanto, 2010), collecting forest products as well as cultivating arable land. On the other hand, the primary objective of the national park is to protect natural ecosystems, keeping human influences to a minimum.

Based on such circumstances we propose the following objectives in this paper: (a) Identify the kinds of NTFPs harvested by local people to understand the species variety utilized in each community, (b) Identify the quantity and temporal patterns of local people collecting NTFPs, (c) Identify local rule and wisdom in their sustainable use of NTFPs, and (d) Explore local people's opinions of the national park.

2. Study Areas and Methods

We conducted surveys in and around three villages in the GHSNP area in 2012; Kutajaya from 09 to 21 September, Hanjawar (sub-village of Malasari) from 10 to 22 September, and Majasari from 12 to 28 October. Hanjawar is located within the national park boundary; i.e. on the shaded portion of the map in Figure 1. Majasari is located outside the park, in enclaves that look like a cutoff portion of the map. People living in villages surrounded by the national park areas are predominantly dependent on farming and thought to be more dependent on the NTFPs collected in the national park than those who live beyond the outer edges of the park.

Kutajaya village has existed since the time of Indonesia independence. During the 1950s, the villagers had left the area on account of terror coming from Darul Islam forces and the Islamic Army of Indonesia, known as DI/TII in West Java, who had fled to the Salak mountain area. After the DI/TII was crushed by the Indonesian Armed Forces in 1962, the community came back to Kutajaya and its population continued to grow. Once the whole area was settled in peace, Perhutani, a government-owned forestry company, decided to manage the forests in the Salak Mountains by planting *Agathis damara* trees in the lower elevation areas near the park boundary, while the upper areas of the Salak were managed as protected forests. At that time, many villagers worked as plantation laborers. In exchange, they were allowed to cultivate the land until the planted trees grew. They were not paid, but allowed to cultivate some farm crops as long as the canopy cover remained open. When the trees became five years old and the tree canopy closed, rice and other crop production became difficult and the villagers spontaneously stopped cultivating the land. Perhutani also planted kaliandra (*Calliandra calothyrsus*) to provide firewood for local people. This was done so that people would not collect agathis trees for firewood. The agathis plantations were cut clear from 1987 to 1990, followed by replanting, when people were employed similarly. The second rotation was not completed because the plantations were transformed from production forest to GHSNP, where tree cutting was prohibited.

Hanjawar village was built by the Nirmala tea plantation workers during the last years of the Dutch colonial period. Most of the villagers were also descendants of Kasepuhan who lived in the GHSNP area. The Hanjawar name was taken from Cihanjawar River, where many hanjawar trees were found. The first residential location was named as Block Cihanjawar inside the forest area. Both the Dutch and Indonesian governments at that time did not perceive the settlements

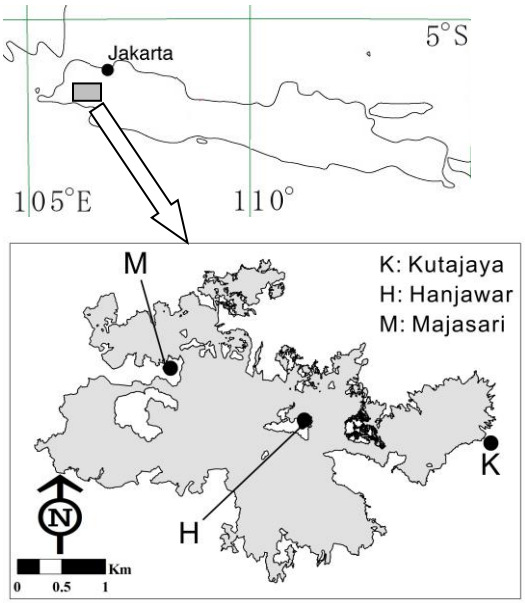

Figure 1. Location of the Gunung Halimun Salak National Park on the Java Island (above) and the three villages (below).

inside forest areas as a problem, and the population of Hanjawar increased and became more widespread. The Hanjawar community was later abandoned in 1958 due to the actions of DI /TII led by SM Kartosoewirjo. The DI/TII threatened the villagers' safety and forced them to move to nearby mountain area, such as Malasari and Cibeber in Curug Bitung, Kampung Parigi and Cihiris in Cisarua, Cianten in Purasari and Bongas in Pangkal Jaya. After the DI/TII was eliminated by the Indonesian National Army in 1963, Hanjawar residents returned.

Majasari village was originally built by the people who worked as laborers in the quinine plantations of the Dutch in the Gunung Endut area. At that time, people were not allowed to cultivate the land. Then the Dutch was replaced by the Japanese army, who brought laborers to convert forests to fields and gardens in order to meet the military needs for food. Some people were allowed to own a plot of land, known as the tanah piketan, enclaves in the present national park. After the independence of Indonesia, the forests were managed by Djawatan Kehutanan (DK: forestry bureau) as a sanctuary or production forest. DK did not allow people to cultivate the forest land. Yet due to lack of human resources in government agencies, cultivation was not controlled and became more widespread as the Majasari population grew. DK then left the land to Perhutani which was oriented towards the economic value of timber. Some officials of Perhutani allowed people to cultivate the land, but in return people had an obligation to provide compensation to the officials of as much as 25% of the agricultural harvest yield including rice, fruits, and other crops. That obligation was considered quite burdensome to the community because the land was not always sufficiently productive to provide such surpluses to the officials. In 2003 the production forests of Gunung Endut and the surrounding area was incorporated into the national park, including all the cultivated lands that had been formally regarded as production forests. However, this expansion was not clearly informed to the villagers until 2007 through the GHSNP officers meetings with local people.

We asked ten local people to cooperate in each village to collect information about their harvest and use of NTFPs. We recorded location, local and scientific name, parts of plant harvested, purpose and frequency of collection and volume harvested each time. Then we arranged the data for each village for comparison. Through several focus group discussions, we collected information about local wisdom on sustainable utilization of the NTFPs and opinions about the national park as well as information on the personal attributes of the interviewees from the village office database.

3. Results and Discussions

3.1 Variety of NTFPs utilized

We classified plant species utilized in the three villages into eight groups based on the use as follows.

A. Firewood: plants used as firewood ropes to bundle the firewood
B. Fodder plant: those used as cattle feed
C. Sugar collection: palm trees used for producing sugar, plants used in the process of making palm sugar through the sap tapping process
D. Medicinal use: plants used as traditional medicine
E. Food
F. Construction materials: plants used for building houses
G. Foliage other than food: plants whose leaves were used to wrap food or other objects
H. Household appliances

Of the three villages, the number of NTFP groups used

was largest in the Majasari village, i.e. eight groups. Hanjawar and Kutajaya villagers collected NTFPs classified into seven and five groups, respectively.

Most of NTFPs collected in Kutajaya were firewood and fodder plants. Firewood was used for cooking at home every day. Although they had free gas stoves subsidized by the government, they did not use it for economic reasons and fear of explosion. Fodder was collected because people had goats as "saving" when a large amount of money is necessary. Bamboo was taken for conditional needs such as building or repairing cattle sheds. The reason why the Kutajaya villagers did not spend much time collecting items other than these may have been because a few non-agricultural industries located near the village employed most of the villagers. In contrast the villagers in the other two had few employment opportunities other than farming.

Of the great many species of NTFPs they collected, only the palm sugar and awis broom, one of household appliance materials, were sold in markets. The amount of production was still of limited scale for both products and all the rest were used to meet daily household needs.

3.2 Description of NTFP groups

3.2.1 Firewood

There were 33 species of plants in total, either trees or shrubs that were used for firewood and ropes to bind it in the three villages (Table 1). In Kutajaya, there were 13 species of plants, while there were 16 and 10 species in Hanjawar and Majasari, respectively. They cut branches and twigs that looked dry enough to be cut by hatchet. Dead trees were utilized as well. The average amount of firewood collected per day was about 1 to 2 bunches, equivalent to 25-50 kg. The activity was carried out as much as 1-7 times a week depending on the stock in the house. Collecting firewood was more intensively conducted in the park area in the dry season because the paths were not slippery and the firewood was drier. All respondents made use of it for cooking at home.

A limited number of species were used to tie up the firewood. They cut a bamboo stem into small pieces with 1-2 cm thickness and 1-2 meters length. They also used rattan root similarly. We thought the reason for this exclusive use of these two species was dependent on their suitability for making a rope and their abundance relative to the other species. Frequency of rope-making was correlated with firewood collection, unless the villagers had extra amounts of rope stock.

3.2.2 Fodder plants

Not only herbaceous plants but also leaves of several species of undergrowth shrubs and trees were used as livestock feed, mainly for goats (Table 2). Kutajaya people used 30 different species of plants, of which herbs such as kirinyuh or capituheur and shrubs such as sasauheun were frequently utilized. Hanjawar people used 16 different species of plants, whereas in Majasari only two plant species were used as livestock feed. They fed livestock almost every day. In one day, they were able to collect one or two bundles of such plants, weighing 25-50 kg each. These species of plants grew throughout a year, and they cut off leaves and leaf stalks with a grass knife.

3.2.3 Palm sugar

We observed sugar palm utilization only in Majasari. Although the palm trees were growing in Hanjawar, people did not use them, while in Kutajaya there were no palm trees. In Majasari, they cut a fruit stalk and collected the sap coming out from it. The container was made from bamboo or so-called "lodong" (Table 3). They collected the sap in a lodong twice every day, in the morning and the evening. A small size lodong was able to contain seven liters and a large size lodong could hold up to a maximum of ten liters. After they removed a lodong for sap collection, they replaced it with an empty one. Out of the seven liters of sap, five sugar shell or one kilogram was normally produced. Palm sugar was sold for IDR12.500-18.000 per kg to a neighbor or to a middleman in the village. In the process of palm sugar making, Majasari people also utilized nine plant species for boiling the sap and cleaning lodong, such as undergrowth, bamboo, rattan, and palm (Table 3).

People attempted to increase sap production by rubbing leaves on the sap producing fruit bunches with undergrowth plants such as golempat, jirak, pakis beunyeur, and sauheun (Table 3). They made a lodong from mayan bamboo. Palm fibers were also used to filter the dirt from the sap, when it went into a lodong. Raru tree bark and bamboo pieces were used to eliminate

Table 1. Plant species of firewood group

Local Name	Scientific Name	Part used	Use	Village
Awi tali	*Gigantochloa apus*	Stem	Fuel[1], Bd[2]	Kt[3] , Hj[4], Mj[5]
Babanjaran	*Eupatorium inulifolium*	Stem, Branch, Twig	Fuel	Hj
Bengang	*Neesia altissima*	Stem, Branch, Twig	Fuel	Mj
Calikangin	*Mallotus paniculatus*	Stem, Branch, Twig	Fuel	Hj, Mj
Harendong beusi	*Astronia macrophylla*	Stem, Branch, Twig	Fuel	Kt
Jambu	*Psidium guajava*	Stem, Branch, Twig	Fuel	Hj
Jengjeng	*Albizia chinensis*	Stem, Branch, Twig	Fuel	Hj, Mj
Jirak	*Symplocos fasciculata*	Stem, Branch, Twig	Fuel	Hj
Kaliandra	*Calliandra calothyrsus*	Stem, Branch, Twig	Fuel	Kt
Karet kebo	*Ficus elastica*	Stem, Branch, Twig	Fuel	Kt
Kaya	*Khaya antoteca*	Stem, Branch, Twig	Fuel	Kt, Hj
Kayu afrika	*Maesopsis eminii*	Stem, Branch, Twig	Fuel	Mj
Kiambon	Leguminoseae	Stem, Branch, Twig	Fuel	Mj
Kiangir	*Ganophyllum falcatum*	Stem, Branch, Twig	Fuel	Hj
Kidamar	*Agathis damara*	Stem, Branch, Twig	Fuel	Kt
Kipiit	*Maesa latifolia*	Stem, Branch, Twig	Fuel	Kt, Hj
Kirinyuh	*Chromolaena ordorata*	Stem, Branch, Twig	Fuel	Kt
Kisampang	*Melicope latifolia*	Stem, Branch, Twig	Fuel	Mj
Kisireum	*Syzygium lineatum*	Stem, Branch, Twig	Fuel	Kt
Kitajam	*Clinacanthus nutans*	Stem, Branch, Twig	Fuel	Mj
Kokopian	*Morinda tomentosa*	Stem, Branch, Twig	Fuel	Kt
Kopi	*Coffea robusta*	Stem, Branch, Twig	Fuel	Hj, Mj
Leungsi	Species unknown	Stem, Branch, Twig	Fuel	Kt
Mahoni	*Swietenia mahagoni*	Stem, Branch, Twig	Fuel	Kt
Mara	*Macaranga tanarius*	Stem, Branch, Twig	Fuel	Hj
Nangka	*Artocarpus heterophyllus*	Stem, Branch, Twig	Fuel	Hj
Parempeng	*Croton argyratus*	Stem, Branch, Twig	Fuel	Hj
Picung	*Pangium edule*	Stem, Branch, Twig	Fuel	Mj
Rambutan	*Nephelium lappaceum*	Stem, Branch, Twig	Fuel	Hj
Saketi	Species unknown	Stem, Branch, Twig	Fuel	Hj
Rotan	*Calamus melanoloma*	Root	Bd	Hj, Mj
Seuseureuhan	*Piper aduncum*	Stem, Branch, Twig	Fuel	Kt, Hj
Takokak	*Solanum torvum*	Stem, Branch, Twig	Fuel	Kt

1: Fuel for cooking, 2: Binding firewood, 3: Village Kutajaya, 4: Hanjawar, 5: Majasari

Table 2. Plant species of fodder group

Local Name	Scientific Name	Village	Local Name	Scientific Name	Village
Amis panon	*Ficus quercifolia*	Kt	Kacang-kacang	Leguminoseae	Mal
Anting-anting	*Acalypha australis*	Kut	Kakacangan	*Centrosema pubescens*	Kut
Babadotan	*Ageratum conyzoides*	Kut	Kaliandra	*Calliandra calothyrsus*	Kut
Beunying	*Ficus fistulosa*	Kut	Kareumbi	*Omalanthus populneus*	Kut
Capituheur	*Mikania scandens*	Kut	Kaso	*Saccharum spontaneum*	Kut
Congkok	*Curculigo cavitulata*	Kut	Katumpang	*Callicarpa longifolia*	Kut
Gedang	*Carica papaya*	Maj	Kekejoan	*Poikilosperma saveolens*	Kut
Gewor	*Commelina benghalensis*	Mal	Ki leho	*Saurauaia bracteosa*	Kut
Goletrak	*Richardia brasiliensis*	Mal	Kidamar	*Agathis damara*	Kut
Hahapaan	*Moghania strobilifera*	Kut	Kingres	Poaceae	Mal
Hamerang	*Ficus padana*	Mal	Kirinyuh	*Chromolaena ordorata*	Kut
Harenong besi	*Melastoma malabathricum*	Kut	Lameta	Species unknown	Mal

Note: Only leaves were used for all the plant species

Table 2. (Continued) Plant species of fodder group

Local Name	Scientific Name	Village	Local Name	Scientific Name	Village
Ilat	*Scleria terestris*	Kut	Mahoni	*Swietenia mahagoni*	Kut
Jajahean	Zingiberaceae*	Mal	Nampong	*Siegesbeckia orientalis*	Mal
Jamang mangung	*Oplismenus compositus*	Mal	Nangsi	*Villebrunea rubescens*	Kut
Jamang payit	Poaceae	Mal	Paku	*Stenochlaena palustris*	Kut
Jamang piit	Poaceae	Mal	Rane	*Selaginella plana*	Kut
Jamarak	*Setaria barbata*	Kut	Sasauheun	*Orophea hexandra*	Kt, Hj
Jonge	*Emilia sonchifolia*	Mal	Seuhang	*Ficus grossularioides*	Mal
Jotang	*Spilanthes iabadicensis*	Mal	Seuseureuhan	*Piper aduncum*	Kut
jukut pait	*Axonopus compressus*	Kt, Mj	Sintrong	*Erechtites valerianifolia*	Kut
Jukut raket	Poaceae	Kut	Sulamjana	*Pennisetum purpureum*	Mal

Table 3. Plant species of palm sugar group

Local Name	Scientific Name	Part used	Use
Aren / kawung	*Arenga pinnata*	Sap	Palm sugar production
Aren	*Arenga pinnata*	Fiber	Filtering sap
Awi mayan	*Asparagus cochinchinensis*	Stem	Lodong (water container)
Awi tali	*Gigantochloa apus*	Stem	Cleaning lodongs
Golempat	Species unkown	Leaves	Directing sap coming out
Hanam (rotan)	*Calamus melanoloma*	Root	Lodong rope
Jirak	*Symplocos fasciculata*	Leaves	Directing sap coming out
Pakis beunyeur	*Diplazium esculentum*	Leaves	Directing sap coming out
Raru	Dipterocarpaceae	Bark	Cleaning lodongs
Sauheun	*Orophea hexandra*	Leaves	Directing sap coming out
Salak	*Salacca zalacca*	leaves	Wrapping palm sugar
Pisang	*Musa* sp.	leaves	Wraping palm sugar

Note: This activity was observed only in Majasari Village

bacteria in a lodong to prevent the sap from becoming lodong as much as possible using raru barks or fumes with carbonized pieces of bamboo.

Hanjawar people did not collect sugar from palm trees likely due to location and transportation factors. Not only it was far from any township outside the park but also there was no road access sufficient for a four wheel drive vehicle to reach Hanjawar.

3.2.4 Medicinal plants

Since modern Western medicine became available in rural areas of West Java, medicinal plants were used only when needed and the amount taken was limited. Nine, five and four species were used in Hanjawar, Majasari and Kutajaya, respectively, suggesting the level of income and remoteness of Hanjawar relative to the others play roles in the level of use of medicinal plants. The plants were used for a variety of purposes but most commonly to treat general ailments and occasionally to treat specific ailments such as fever, headache, diarrhea, etc. (Table 4). A limited part of the plant, such as leaves, roots, or stems were generally used. Medicinal plant species could be found throughout the year without showing definite seasonal variation. We were not able to clarify the reason why each species was used only in one village and not in the others.

3.2.5 Food

We observed a total of 36 plant species used as food (Table 5). Of these, Hanjawar people utilized 21 species and Majasari 16, while in Kutajaya only 5 species were used. They were not used as staple food items but only as an additional dish. The frequency of this NTFP collection was sporadic and of small volume, only to increase the variety of dish or to be consumed when villagers were working farm fields. There was a large difference in the number of species collected among the three villages,

too sour. They removed bacteria from the inner part of a

Table 4. Medicinal plant species group

Local Name	Scientific Name	Part used	Remedy for	Village
Awi mayan	*Asparagus cochinchinensis*	Bud	Diarrhea	Mj
Calingcing	*Oxalis corniculata*	Leaves	Stomach aches, Coughs	Kt
Cangkuang	*Pandanus furcatus*	Leaves	Ailments	Hj
Ki huut	*Glochidion molle*	Flower	Headache	Mj
Kicantung	*Goniothalamus macrophyllus*	Bark	Fever	Hj
Kina	*Cinchona succirubra*	Bark	Ailments	Hj
Kirapet	*Ficus sp*	All	Ailments	Kt
Kiurat	*Omalanthus populneus*	All	Ailments	Kt
Lame	*Alstonia scholaris*	Bark	Cough	Hj
Marasi	Amaryllidaceae	Shoot	Cough	Hj
Pakis	*Diplazium esculentum*	Leaves	Fever	Kt
Pulus	*Dendrocnide sinuata*	Stem sap	Cough	Mj
Pungpurutan	*Triumfetta rhomboidea*	Leaves	Rheumatism	Mj
Sembung	*Blumea balsamifera*	Leaves	Irregular menstruation	Hj
Seuseureuan	*Piper aduncum*	Leaves	Ailments	Hj
Siwurungan	*Mussaenda frondosa*	All	Ailments, Wounds	Mj
Temulawak	*Curcuma xanthorrhiza*	Root	Ailments	Hj

suggesting the highest dependence of food collection Kutajaya, reflecting differences in their economic conditions as well.

3.2.6 Construction materials

Only four species of plants were used as construction materials (Table 6). The stems of tali and mayan bamboo were used for floor, wall, roof frame of houses and cattle sheds. Kirai leaves and palm fibers were used for roofing. The collection frequency of these items was not regular and done only when needed. According to Kutajaya people, manufacturing one unit of goat sheds with a base area of 2 by 6 meters needed about 50 bamboo sticks of 5 meters per stem. In Hanjawar we heard that they built a house of 6 by 8 meters in the base, using 220 pieces of bamboo, each piece measuring 4 meters long. In general, they did not need to replace these materials over the years so that the bamboo harvesting did not seem to be intensive. Cutting the other trees inside the national park was strictly prohibited according to the park regulations. Hanjawar villagers complained against this rule because they used to be able to harvest trees in those areas.

3.2.7 Foliage other than food

Leaves of four plant species were used not for food but for other purposes. In Hanjawar and Hanjawar area, Aren (*Arenga pinnata*), a kind of palm, was used as within the park area in Hanjawar and the lowest in cigarette paper and patat *(Phrynium pubinerve*) was used for wrapping rice. Patat leaves as well as banana leaves were used only occasionally. In Majasari, all ten respondents utilized these species, in Hanjawar three out of ten, while no respondents used foliage for the purposes other than food in Kutajaya.

3.2.8 Household appliances materials

Hanjawar and Majasari people made brooms using five species of plants (Table 6). Flowers of awis were used as the main broom, bamboo or rattan ropes as brooms strap, and calik angin wood for broomsticks. The midribs made of aren palm were tied with a rope made of bamboo or rattan. Awis broom was sold for IDR 10,000 per piece. However, production of awis brooms in Hanjawar and Majasari was relatively few and limited to fulfilling the demand of neighbors in the villages. Within a week at most five awis broom might be sold. Awi tali bamboo was also used as the antenna poles and clothesline prop.

3.3 Personal attributes of the NTFP collectors

The majority of interviewees were between 21 and 60 years old, which suggests that other available jobs were quite limited.

The highest education level was elementary school,

Table 5. Plant species of food group

Local Name	Scientific Name	Part used	Use	Village
Arbei	*Fragaria vesca*	Fruit	Dessert	Hj
Aren	*Arenga pinnata*	Shoot	Soup	Hj, Mj
Boros tepus	Zingiberaceae sp.	Stem	Side dish	Hj
Canar	*Smilax macrocarpa*	Fruit	Sweets	Hj
Cengek	*Capsicum frutescens*	Fruit	Flavor	Hj
Eurih	*Imperata cylindrica*	leaves	Soup	Hj
Genjer	*Limnocharis flava*	leaves	Salad	Hj
Hanjawar	Species unknown	branch	Soup	Hj
Hariang	*Begonia hirtella*	Stem	Soup	Mj
Humut pait	*Ottochloa nodosa*	leaves	Soup	Hj
Humut suweg	*Ammorphophallus paeonifolius*	Stem	Soup	Hj
Jagung	*Zea mays*	Corncobs	Side dish	Mj
Jambu klutuk	*Psidium guajava*	Fruit	Fruits	Kt
Jengkol	*Archidendron pauciflorum*	Fruit	Stew	Mj
labu sieum	*Sechium edule*	Fruit	Vegetable	Mj
Lenca	*Solanum nigrum*	Fruit	Vegetable	Mj
Nangka	*Artocarpus heterophyllus*	Fruit	Vegetable	Mj
Pakis	*Diplazium esculentum*	Leaves	Vegetable	Mj
Pining	*Hornstedtia pinanga*	fruit	Side dish	Hj
Pisang	*Musa sp.*	Fruit	Dessert, Sweets	Mj
Pohpohan	*Pilea melastomoides*	Leaves	Salad	Mj
Rasamala	*Altingia excelsa*	Leaves	Salad	Kt, Mj
Rene	*Selaginella plana*	leaves	Soup	Hj
Rene	*Selaginella plana*	leaves	Salad	Mj
Reundeu	*Staurogyne elongata*	leaves	Salad	Mj
Rotan	*Calamus melanoloma*	Shoot	Soup	Hj
Salada	*Lactuca sativa*	Leaves	Salad	Hj
Salada air	*Nasturtium officinale*	Leaves	Salad	Hj
Saray	*Caryota mitis*	Stem fiber	Soup	Hj
Sembung	*Blumea balsamifera*	Leaves	Soup	Hj
Sintrong	*Erechtites valerianifolia*	Leaves	Salad	Kt
Supa lemer	*Auricularia auricularia*	All	Soup	Mj
Takokak	*Solanum torvum*	Fruit	Vegetable	Kt, Hj, Mj
Tangkil	*Gnetum gnemon*	Fruit	Vegetable	Mj
Terong	*Solanum melongena*	Fruit	Vegetable	Hj
Terubuk endog	*Saccharum edule*	Stems	Salad	Hj

Table 6. Plant species of construction materials (above) and household appliances (below)

Local Name	Scientific Name	Part used	Use	Village
Awi tali	*Gigantochloa apus*	Stem	Construction	Kt, Hj, Mj
Awi mayan	*Asparagus cochinchinensis*	Stem	Construction	Hj
Kirai	*Metroxylon*	Leaves	Roof	Mj
Aren	*Arenga pinnata*	Fiber (ijuk)	Roof	Mj
Aren	*Arenga pinnata*	Leaf stem	Midrib	Mj
Awi tali	*Gigantochloa apus*	Stem	Broomstick, Pole	Hj, Mj
Awis	*Thysanolaena latifolia*	Flower	Broom	Hj, Mj
Calik angin	*Mallotus paniculatus*	Stem	Broomstick	Hj
Rotan	*Calamus melanoloma*	Root	Binding broom	Hj, Mj

and most of the respondents had not completed it. In never went to school. Education level was very closely related to employment opportunities in West Java. The low education level could also encourage them to exploit resources in the national park.

The main job was either agriculture or non-agricultural employment such as a trader, industrial or construction worker. Most of the respondents in Kutajaya were in the non-agricultural sector, while in Hanjawar and Majasari over 90% of them worked in agriculture. Kutajaya had industrial enterprises in the vicinity, easy access to transportation, and it was close to cities. In contrast Hanjawar and Majasari had no industry or cities nearby. Most respondents in the three villages had a family ranging from two to seven with the average of 2, 3 and 3 in Kutajaya, Hanjawar and Majasari, respectively. The dependency on NTFPs appeared to be greater among those with larger families.

Hanjawar was located inside the GHSNP so all the land cultivated was within the park area. In Kutajaya, only two out of ten respondents had a farm outside the park. In Majasari, there was sufficient agricultural area outside the GHSNP area for their use. Fifty percent of the respondents had a farm less than 0.5 ha, one did not own land, and four had a larger area, 0.5 – 1 ha.

3.4 Local people's perception on the national park

3.4.1 Kutajaya

During the period of transition from production forests to national park in 2003, people's activities were not changed, since they did not know of any change in the forest regulations. This happened because there was no information transfer efforts conducted either by the national park officers nor the village government. Later in 2011, some people were invited to join the community-based watershed management training held by LATIN, a non-governmental organization. The activity was motivated by the problem of water shortages that occurred in several villages of Cidahu and Cicurug district. During that training, the villagers were informed that the areas had been changed from production forests managed by a government-owned forestry company, Perhutani, to the national park managed by the GHSNP office. From that time, people knew that rules banning tree felling as well as banning collecting firewood and Hanjawar, there were two of the ten interviewees who other plants had been imposed. As a follow up of the training, the community and village government established a public institution, Working Group of Community Movement on Nature Conservation (Pokja GAMMELAN) of Kutajaya to carry out forest rehabilitation through natural regeneration processes. In addition to this activity, meetings and discussions were held in order to engage the community more widely in the national park management.

As these activities gradually developed, the local society's knowledge about the national park improved. However, lack of sufficient communication between the national park officers and the villagers had resulted in the latter group being confused and not clearly understanding the information properly. Most people, including some members of Pokja GAMMELAN, did not know about the changes in forest regulations and/or the authority managing the forest. Of the ten respondents interviewed, nobody knew that the forest was managed by the national park. Three respondents answered it was Perhutani, while another seven merely knew that it was no longer Perhutani but not about the current authority.

Local people's knowledge of the national park regulations is presented in Table 7. Relatively well known regulations were about the prohibition of cutting trees, collecting firewood, and hunting birds. As to the herbaceous plant collection, three people considered that it was allowed, while two considered that the practice was not allowed. They regarded the prohibition of tree cutting and catching birds as appropriate because they realized these activities could result in destruction of forest ecosystems and depletion of firewood and animal food resources. However, they objected to the prohibition on collecting firewood and cattle feed because only the GHSNP area could provide both of these resources.

Firewood was used as fuel for cooking at home because they still used furnace stoves instead of gas stoves that were prone to explosion. The inability to purchase liquefied petroleum gas for the gas stoves was another reason they collect firewood. The prohibition on collecting cattle feed was deemed to be unacceptable because they had the animals as "savings" in case they needed surplus income. Besides the economic reasons,

Table 7 Local People's Knowledge on the National Park Regulation in Kutajaya

Number of people answered "Yes" or "I know"	Kutajaya	Hanjawar	Majasari
Allowed to collect herbaceous plants	1	–*	–
Allowed to collect fodder plants but not to cut along the branches	2	–	–
Not allowed to collect firewood	3	–	–
Not allowed to collect fallen branches, twigs and decayed wood for firewood	1	–	–
Not allowed to collect herbaceous plants	2	–	–
Do not cut tree	5	10	8
Do not damage forest	1	–	2
Do not hunt bird	2	10	2
Do not hunt bird and other animals	1	10	1
Do not expand cultivated land inside NP	–	10	5
Must plant native species trees in the forest area outside cultivation land	–	–	1
Plant river bank with native species trees	–	–	2
Do not burn forest	–	–	1
No idea nor knowledge	2	–	2

* Question was not given to the respondents

people also argued that collecting firewood and animal feed would not develop negative impacts on the forest productivity and wildlife habitat. They suggested that it was because firewood was taken from branches, twigs and other minor parts of the tree so that collecting firewood would not kill the trees. Stalks and leaves of herb, grass and shrubs turned to be animal feed, so it would not damage the plants seriously.

3.4.2 Hanjawar

The forests were incorporated into the national park since the beginning of the establishment of the Gunung Halimun National Park in 1992. Therefore all Hanjawar villagers knew that the forests they utilized belonged to the national park area (Table 7). Yet they did not know the name of the park, Gunung Halimun Salak nor of any change in the national park regulations. The national park regulations they knew were only some kinds of prohibition such as those given in the table.

The restrictions were regarded as burdensome because most people's daily needs were extracted from the forests. The limited land ownership and population growth appeared also to be factors that had driven people to expand cultivated areas. Prohibition of tree felling was also burdensome because wood had been indispensable for building houses. The location of the villages far from urban areas as well as the low economic level rendered Hanjawar villagers unable to afford construction materials other than wood. Construction of a stilt house of 6 x 8 m^2 in size requires 9 m^3 of wood and 220 pieces of bamboo, a semi-permanent house of 6 x 8 m^2 in size requires 4 m^3 of wood, and a permanent house 6 x 8 m^2 in size requires 5 m^3 of wood. A house could stand for decades and the public record indicated that there were only three houses built in Hanjawar during the past 20 years. With the small amount of demand for timber and a low frequency of building a new house, people believed that it would not damage forest ecosystem functions as a tree would be replaced by hundreds of tree seedlings that grew naturally after cutting.

3.4.3 Majasari

The villagers were aware of the change in the park area in 2007 through a meeting held by the GHSNP officers. They were also informed of a few new rules in the park: (1) prohibition of cutting trees, (2) prohibition of hunting wildlife including wild boar, (3) the villagers were allowed to work on the lands that were already under cultivation, but could not expand it, and (4) the previous levies imposed by the Perhutani officials no longer apply. During the survey, nine of ten respondents knew that the national park managed the forests. Only

one person did not know it.

At the beginning of the transition of forests to the park, the villagers were afraid that the cultivated land and settlements inside the national park would be lost. Despite such change in the situation from the time when Perhutani managed the forests, the villagers' daily activities remained unaffected due to park officers' efforts to remove the fear of being arrested. The negative perceptions about the national park gradually decreased as the GHSNP officers became more closely acquainted with the villagers. They explained that the land inside national park cultivated before the transformation would be allowed to continue to be cultivated land without providing compensation to the park officers. In return, the villagers were obligated to plant native tree species as part of forest rehabilitation efforts.

On the other hand, we observed different perceptions regarding the ban on logging native tree species between the villagers and the GHSNP officers. The former argued that they could not compromise their demand for natural timber for house construction because their low income made it difficult to buy non-wood construction materials. In addition, they assumed that the volume of timber exploited for the house construction was small because the wood could last for decades after construction. They insisted that if tree cutting were permitted, the villagers would be willing to plant one hundred trees of the same species or other native species to replace the cut trees.

Yet through the efforts made by the national park officers, people came to accommodate the prohibition of cutting trees inside the park. For native tree species located inside the forest area, people do not dare to cut them down because the GHSNP officers strictly enforced the illegal logging law. However, for exotic trees planted by villagers such as kayu afrika and jengjeng, on which the villagers rely for long term savings the village chairman made regulations that prohibited clearcutting but allowed the cutting of single trees provided that at least 10 native trees were planted for each tree harvested.

3.5 Local wisdom

Based on the typology, Kutajaya villagers belonged to a migrant community. We were not able to clarify if they used to be tea plantation workers or migrants from other regions. Yet it was clear that their activities in the protected forests were relatively minor, and only a few people hunted birds illegally. No local people was highly dependent on using forest products for housing or food. The typological background and the lack of intensive use of forests appeared to have resulted in unspecific perceptions about the forest. People only knew generally about forest functions such as water reservoir, preventing erosion, and sources of firewood, animal feed and medicinal plants. The customs applied in Kutajaya were common in the Sundanese community. These included asking permission to the "invisible" forest keeper before they take anything in forests, not to speak disrespectful words and not to be careless when staying in forest, and not to cut bamboo on Tuesday and Saturday. In addition, there were some suggestions from Pokja GAMMELAN in utilizing NTFPs such as not to take fallen tree's trunk and to try not to damage plants.

The forest conditions around Hanjawar were relatively good, which had encouraged people take timber and NTFPs more intensively than in the other areas. Hanjawar villagers had local knowledge, wisdom and customs in managing the forest so that their resource utilization would not have significant negative impacts. Activities related to paddy cultivation were not allowed to be done on Sunday. Before planting paddies, they have to follow a certain religious ritual, so-called tanam pungpuhunan or ciri rituals. They were not allowed to do paddy activities such as drying and grinding on Monday. Custom also does not allow speak carelessly when staying in the forest. The traditional ceremony of sedekah bumi (alms for the earth) must be done in the beginning of Hijriyah (Islamic calendar system). Building a house is not permitted in Safar, Mulud, and Hapit (the 2nd, 3rd, 11th month in Hijriyah). Activities related to paddy cultivation were not permitted on Sunday.

In general the Majasari villagers understood the importance of forest functions such as water reservoir, preventing erosion and wildlife habitat. It was a hereditary knowledge passed from the elders, who prohibited villagers to open lands for cultivation in such locations as high mountains, watersheds and bamboo forests. The Gunung Parengrang located in the south of Majasari was the highest mountain and land opening was not allowed. The elders determined a border between the

arable land and the rest. If the ban was violated, landslides would take place that might pose hazards to people and loss of water resources. Outside these areas the villagers were permitted to cultivate land, plant trees for timber and cut trees growing naturally for domestic use.

Based on the interviews we identified 14 local wisdoms in Mjasari, which were common in the Sundanese community. These are: 1) Treat aren tree carefully when collecting palm sugar; 2) Do not go to the paddy field on Friday and Sunday; 3) No work is permitted in the garden or forest on Friday; 4) There must be some alms from harvesting yield given to poor people in the village; 5) It is forbidden to cut bamboo on Wednesday and Saturday; 6) When staying in a forest, do not sit on stones covered with fern leaf because that may invite leopards; 7) It is forbidden to start any cultivation activities in certain times; i.e. Friday in Hapit (the 11th Islamic month), Saturday and Sunday in Haji (the 12th Islamic month), Saturday and Sunday in Muharram (the 1st Islamic month), Saturday and Sunday in Safar (the 2nd Islamic month) - otherwise their work would be hampered. 8) Do not enter the old forest alone; 9) Read a prayer before entering a forest; 10) Do not cut any tree carelessly; 11) Ask permission before take something from a forest; 12) Do not use inappropriate wood in building a house; 13) Do not bring peyem (food made from fermented cassava) when staying in forest because it may invite snakes; and 14) There must be an incantation and ritual before harvesting a paddy.

4. Conclusions

The national parks in Indonesia occupy 60% of the conservation areas (Widyaningrum, 2012), which covers around 10% of the land (Jepson, 2002). Local people have utilized natural resources in the national parks long before the parks were established, employing their own knowledge in sustainable way (Setyowati et al. 2008). We describe such a case in the GHSNP area in this paper. It is difficult to determine if their use of forest resources has been sustainable or not. However, this study indicates that many species were used in a variety of ways and that people were highly dependent on these resources. Because these resources were collected within the park area, communications and discussions between local people and national park officers are essential for solving conflicts between them as well as monitoring the distribution and abundance of these resources for ensuring sustainable use.

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