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Traditional forest-related knowledge for ecosystem services in Sundanese ethnic of Sukabumi District, West Java Province, Indonesia

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Abstract

Indonesia is inhabited by more than 550 ethnic groups with estimated population around 255.46 million, which spread over 78,609 villages. Direct interactions between forest and surrounding villages are obvious. Nevertheless, the villages outside forests may get benefits of forest ecosystem services. Development of cities and villages has made more people live in urban areas and not get direct benefits from the forest. This condition might reduce peoples' awareness on the importance of forest as an ecosystem service provider that lead to the extinction of traditional knowledge on forest sustainable utilization. The objective of this study was to understand the changes of forest ecosystem services experienced by local communities by assessing the forest ecosystem services in a certain period of time. Sundanese ethnic group was selected because of their well-known direct interactions with forest. The study was conducted using semi-structured questionnaire to communities residing adjacent to Gunung Walat University Forest (GWUF) in Sukabumi District of West Java Province, from August to December 2014. Interview data were analyzed to see the changes occurred in and around the utilized forest since Indonesian independence (1945) up to the present (2014). The selected respondents showed positive perceptions on the four groups of ecosystem services, even though the degree of perceptions fluctuated over periods. Communities have acknowledged GWUF as a man-made state forest which is managed as a university forest. By respecting and obeying the rules and regulation, they can utilize non-timber forest products and other ecosystem services from GWUF. This study also found that the traditional forest-related knowledge for ecosystem services could be managed and conserved by eliminating the intervention from outside and the benefits for outsiders. Moreover, forests could provide benefits to communities, because the knowledge and the ecosystem services were used for subsistence.

Keywords: forest, ecosystem service, knowledge, Sundanese, Indonesia

Introduction, scope and main objectives

Indonesia has been known as a rich country in terms of biodiversity, ecosystems, social, cultural, and history. It is consisted of 17,504 islands covering a total land area of 1.9 million km² and inhabited by more than 550 ethnic groups (Hidayah, 1997) with a total population of 237.6 million in 2010 and estimated to be 248.8 million in 2013 (Statistics Indonesia, 2015). The whole population is spread over 78,609 villages. Based on data from the Indonesian Village Potential Statistics 2011, there are 2,902 villages located in the forest and 15,816 villages directly adjacent to the forest (on the fringe of forest), while the rest are outside the forest/not directly adjacent to the forest. Although only 18,718 villages which have direct interactions and get certain benefits from the nearby forests, it is also possible for the villages outside the forest/not directly adjacent to the forest (including the urban areas) to get benefits from the forest ecosystem services. With more than 550 ethnic groups, Indonesia certainly has an invaluable wealth of local/traditional knowledge, including the knowledge about the benefits of the forest ecosystem services.

Along with the pace of development of cities and villages, more people live in urban areas and do not get the direct benefits of the forest ecosystem services. This condition reduces the peoples' insight/awareness of the importance of forest as an ecosystem service provider. In addition, there is a concern on the extinction of local/traditional knowledge about the benefits and utilization of forests in sustainable way. Understanding the changes of the forest ecosystem services experienced by the local

communities by assessing/evaluating the forest ecosystem services in a certain period of time can provide valuable insights in formulating the sustainable forest management strategies and policies. Therefore, fundamental researches on the social and cultural aspects of community are needed significantly and still opened widely in Indonesia.

Gunung Walat University Forest (GWUF) is a plantation forest with an area of 359 ha that was built since 1951 and consisted of *Agathis* (*Agathis loranthifolia*) stand and mixed (*Pinus merkusii*, *Pinus oocarpa*, *Schima wallichii*, etc.) stand. GWUF is currently managed by the Faculty of Forestry, Bogor Agricultural University as a forest designed to accommodate the implementation of sustainable forest management theories. As a university forest, GWUF has been studied by Bogor Agricultural University students and researchers. The studies topics are very specific and cover almost all of physical, biological, social, economic, and environmental aspects. However, studies on the use of GWUF by surrounding communities and local/traditional knowledge based forest ecosystem services are still limited to medicinal plants, *Agathis* resin, and agroforestry.

Hegarmanah Village is located in the southern of Gunung Walat University Forest (**Fig. 1**) and administratively belongs to the Cicantayan Sub-district, Sukabumi District. Located not far from district capital city (Sukabumi), Hegarmanah Village can be classified as a semi-urban village which has the characteristics of rural and urban areas, including main sources of livelihood from agriculture and industry, direct accessibility with a good road from the main road, public transportation that can reach the village, adequate health facilities, and easy access to fuels such as kerosene and gas even though firewood is still used.



Fig. 1: Hegarmanah Village at southern part of Gunung Walat University Forest, Sukabumi.

This research aimed to document the traditional forest-related knowledge on ecosystem services among Sundanese ethnic community in Hegarmanah Village, Cicantayan Sub-district, Sukabumi District, West Java Province of Indonesia.

Methodology

Research was conducted from August to December 2014 at Hegarmanah Village, which is located near urban area, the capital city of Sukabumi District. The village was selected because of the unique characteristics and the changes of forest status affected the forest utilizations and functions, including in supporting the livelihood of surrounding communities. Sundanese ethnic group which was purposively selected for this research is the second most populous ethnic group native to the western part of Java Island with population number approximately 40 million. This ethnic group is well

known for their direct interactions with forest, including the use of forest ecosystem services in their daily lives. Primary data were collected through interviews with respondents. Twenty respondents with minimum age of 65 years were selected using stratified random sampling method. Local/traditional knowledge expected to be gathered from the respondents were about forests ecosystem services, which are grouped into (1) *Provisioning services*, (2) *Regulating services*, (3) *Cultural services*, and (4) *Supporting services*.

Time span that were used to see the changes occurred in and around the utilized forests was since Indonesian independence (1945) up to the present (2014). The time span was then divided into several periods, namely: (1) before 1945 (Independence War), (2) 1945 – 1966 (Old Order), (3) 1966 – 1998 (New Order), and (4) 1998 – 2014 (Reformation). This division is based on the development periods of Indonesia as a nation, which is related to political situation, state leadership, legislation, and regulation.

Results

Gunung Walat University Forest (GWUF) was initiated since 1951 from an almost barren land to now forming a relatively dense-complex man-made forest ecosystem. GWUF now can provide ecosystem services as other forest does. Non-timber forest products which have been collected from GWUF, such as pine and Agathis resin, firewood from dead and fallen tree branches, grasses for livestock feed, etc. have showed the forest ecosystem provisioning services. Various ecosystem regulating services such as maintenance of air quality, climate regulation, water management, flood control, regulation of human diseases, etc. have also been acknowledged by the GWUF management. While there has never been cultural/religious ritual performed in GWUF, education, aesthetic, and social relation are among ecosystem cultural services could be found in GWUF. At last, the success of transforming Gunung Walat from an open-degraded area into a forest ecosystem and then providing provisioning, regulating, and cultural (mainly education) services has proven the existence of ecosystem supporting services in GWUF. Acknowledgement from the management, partner and academic institutions alone cannot immediately proof that GWUF has such ecosystem services. The nearest stakeholder to GWUF, that is surrounding communities, have their own perception on the ecosystem services that they acknowledged coming from GWUF.

Provisioning services

Interview to respondents resulted 8 kinds of provisioning services have been used from GWUF, namely material for energy, food and feed, resin, construction material, medicinal plants, toxic material/poisonous plants, stimulant, and wildlife (for hunting). Among these provisioning services, at least 17 species of materials for energy (firewood) have been collected by 15 respondents throughout all periods. Six mushroom species, 2 fruit species, 2 spices species, 2 vegetable species, and honey were kinds of food that have been collected by 9 respondents from GWUF. Meanwhile, 4 respondents collected 8 species of grass for feeder. Six species of medicinal plants, 3 species of construction material, three species of stimulant, 1 species of toxic material, and Agathis resin have also been utilized from inside GWUF. Hunting wildlife is forbidden inside GWUF, but respondent admitted to hunt wild boar that destroy their agricultural crops. **Fig. 2** shows data collected for medicinal plants and sample of medicinal plant species from GWUF.

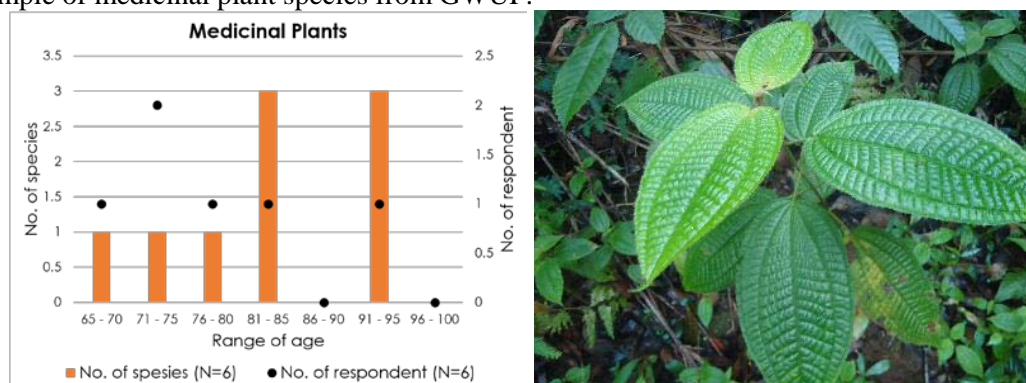


Fig. 2: Profile of respondents who collecting medicinal plant (left) and *Clidemia hirta* (right) (Damayanti, *et al.* 2015)

Regulating services

Regulating services recorded from respondents' interview were hydrological function, erosion and flood control function, windbreaker function, air and climate regulating function, pest and disease prevention, and use of fire for agricultural activities (Fig. 3). GWUF has been considered to always keep and provide clean water for surrounding communities. About 40-70% respondents have this perception, while 5-10% of respondents were not agreed. Water from the forests have been used for watering the wet-paddy field and for household consumption. There has been no natural disaster in Hegarmanah Village, such as erosion, flood, or hurricane/typhoon. Respondents believe that the mountain (Gunung Walat) and the forests always keep the water regulated and block the wind.

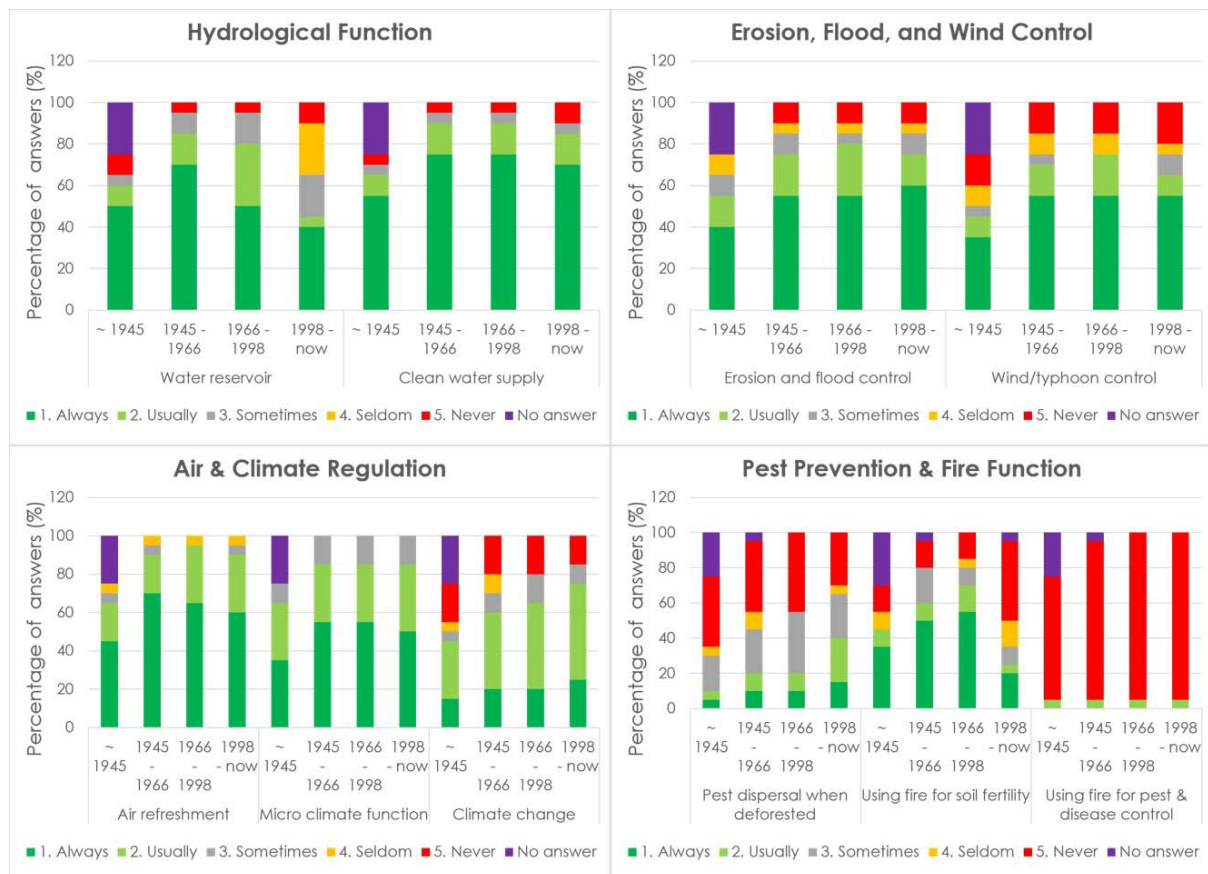


Fig. 3: Results of respondents' interview on GWUF regulating services (Damayanti, et al. 2015).

Respondents have their own perception on GWUF related to air and climate. Firstly, the fresh and clean air that respondents feel was because of the existence of the mountain with the forest. Secondly, the trees can regulate the micro climate, and thirdly, the existence of trees that formed a forest has a relation to climate change. Communities residing surrounding GWUF experienced some time when they could cultivate inside GWUF area. In the past, fire was used for land clearing, but never used fire for pest and diseases control.

Cultural services

Cultural services explored in this research have included cultural/religious ritual performed in the forest, utilization of the forest for educational activities, and perception on the GWUF visitors. Respondents were asked whether they have the same experience or perception as what GWUF have recorded on the similar subjects. Only one respondent who mentioned that there was a ritual conducted at Cipeureu Cave, located at south-western border inside of GWUF. GWUF management have no formal record. Respondents were also aware of the function of GWUF as educational forest. Various types of visitors have been visiting GWUF for various activities too, including learning many things about the forest (Fig. 4).

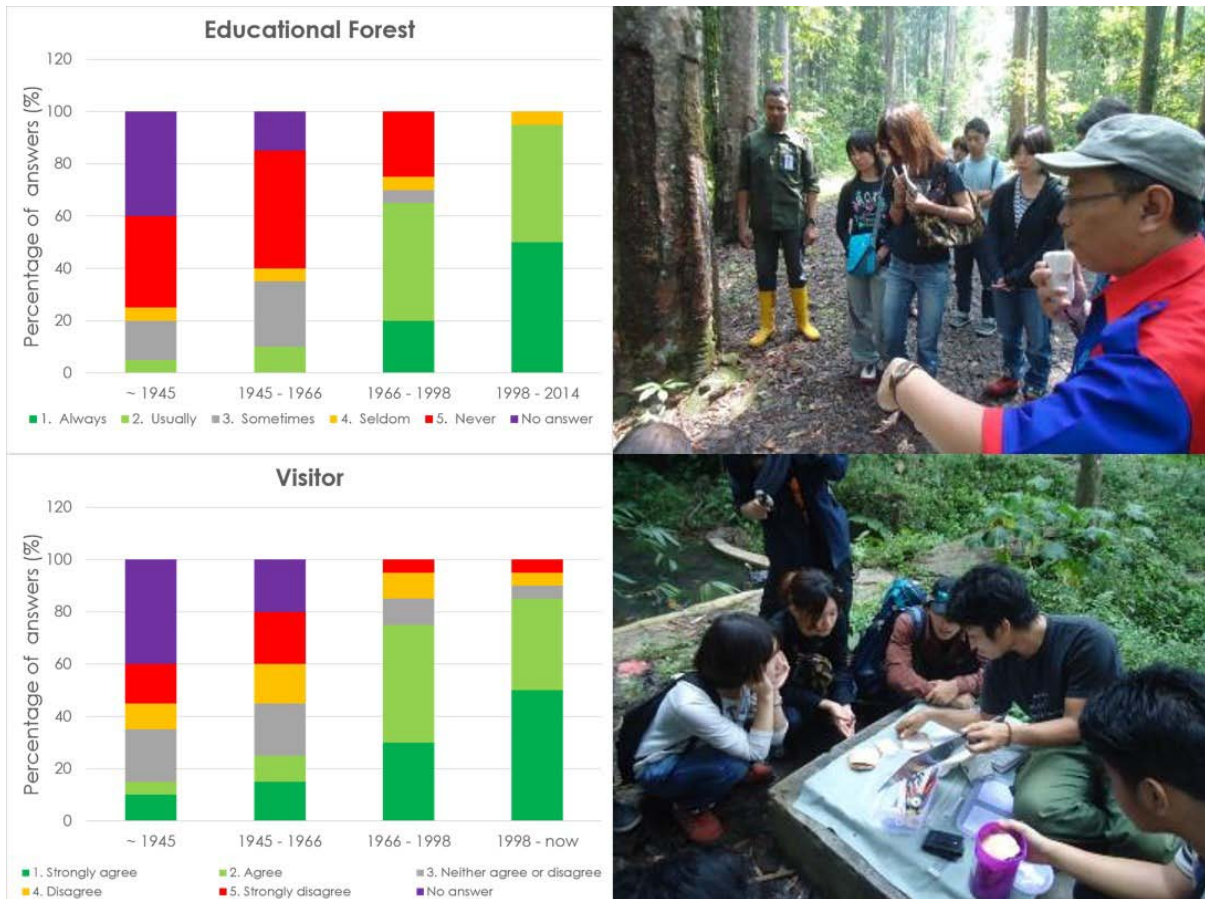


Fig. 4: GWUF as educational forest and the visitors who learn many things about the forest (Damayanti, et al. 2015).

Supporting services

Supporting services are services that support the three previously mentioned services, namely provisioning, regulating, and cultural services. GWUF was also considered to provide supporting services for the community. Among the supporting services from GWUF (Fig. 5), respondents ranked number 1 on forest for farming, because it has a good nutrient cycle for the plants. Forest is also a good place for raising livestock. However, forest is forbidden for livestock grazing, so grasses from the forest have been collected for feeding.

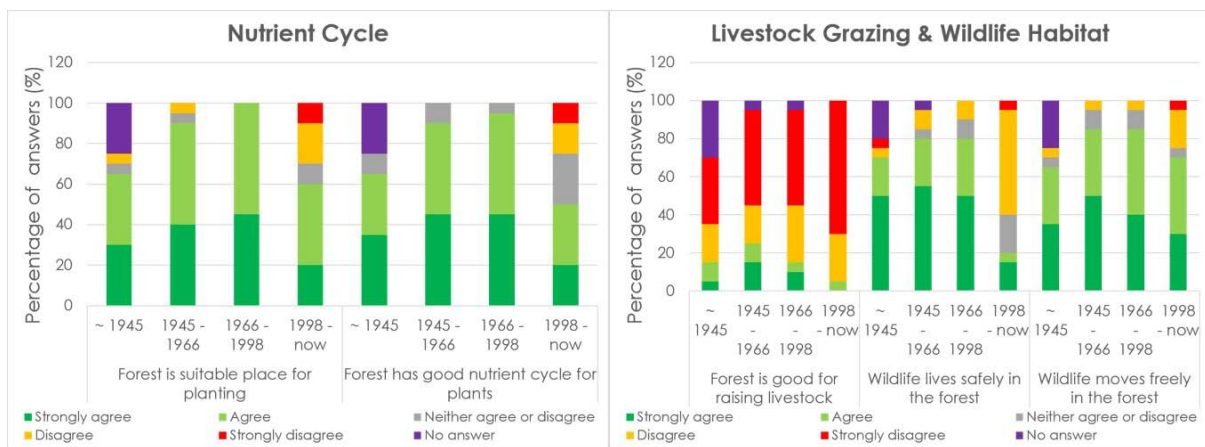


Fig. 5: Respondents' opinion on the supporting services from GWUF (Damayanti, et al. 2015).

Discussion

Development phases which shift people from rural to urban areas or bring the urban livelihood to rural areas and eliminate their chances to obtain direct benefits from the forest have been a growing concern. Such condition could make people's awareness on the importance of forest decline and local/traditional knowledge will be forgotten. Although living near urban area, Sundanese ethnic community in Hegarmanah Village, Sukabumi District, West Java Province has close relation with the nearby forest and obtains benefits from ecosystem services provided by the forest. Benefits from ecosystem services have been accessible to the communities, though the amount and degree of perceptions on the services show different trends throughout the period of analysis.

Communities' knowledge on forest ecosystem services depend on the prescribed condition of the forest from the initial period they knew the forest, where Gunung Walat University Forest (GWUF) is a State Forest and managed for educational purposes, thus has certain rules and regulations. Furthermore, communities' knowledge and perception will change upon the type of ecosystem services utilized. Intensity and frequency of interaction between communities and GWUF (management and visitors) will also influence the perception.

Conclusions

The selected respondents showed positive perceptions on the four groups of ecosystem services, even though the degree of perceptions fluctuated over periods. Communities have acknowledged GWUF as a man-made state forest which is managed as a university forest. By respecting and obeying the rules and regulation, they can utilize non-timber forest products and other ecosystem services from GWUF. This study also found that the traditional forest-related knowledge for ecosystem services could be managed and conserved by eliminating the intervention from outside and the benefit of outsider. Moreover, forests could provide benefits to communities, because the knowledge and the ecosystem services were used for subsistence.

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