









Tenurial Mapping and Agroforestry Model Development Based on Socio- Cultural Dynamic on Muria Forest Production Area

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Abstract

The utilization of production forest resources is still oriented towards timber production and land use conflicts, often causing conflicts of interest between local communities and Perhutani as the manager of state-owned forests. The existing environmental conditions are less conducive. This phenomenon also occurs in the Muria Forest Area, so an appropriate management strategy is needed through tenure mapping and an understanding of the socio-cultural dynamics of the local community. Data is based on the results of observations, documentation, interviews, and FGDs. Data and information are analyzed using GIS and SWOT.

Data processing and tenure mapping results show a trend of fluctuating decline in the Muria Forest area, especially in the outermost areas of the Muria Forest Area, which are close to settlements. Changes in land use that vary each year can provide an overview of the dynamics of community conditions and the discretion of implementing regulations. Based on the IFAS and EFAS weight and ranking analysis, the internal factor value is positive 0.75, and the external factor is positive 0.58. The results of IFAS and EFAS show that the right strategy is the aggressive type in quadrant 1 (growth-oriented strategy). This study found eleven strategies with two main approaches: first, a strategy with an approach to associative human resources in forest management to accommodate various conflicts that arise; second, an innovative strategy that focuses on the sustainability of forest resources.

KEYWORDS *Social dynamics, forest resources, empowerment, tenure*

Introduction

Forests are a collection of trees, so everyone knows that the main product of the forest as a resource, in the form of wood and non-wood, has high economic value and environmental services. The government has carried out efforts to manage forest resources by involving the community through various programs, including the Development of Forest Village Communities (PMDH), Integrated Forest Village Community Development (PMDHT), and Joint Forest Management with the Community (PHBM). The study results showed that it was not optimal; the people around the forest were generally poor and had low education, land occupation or land use without calculation because the minimum physical needs and decent living needs had not been met. The PHBM program on a national scale showed various encouraging successes but still left legendary problems, namely conflicts between communities (immigrants) who carried out agricultural activities in the area. While the local community was not yet prosperous, cooperation between stakeholders was not optimal, and forest degradation of around 1.8 million

Ha/year, and discretion in implementing regulations.¹ The focus of forest resource development aims to improve community welfare and social equality while reducing the risk of environmental damage due to access to forest resources.

The utilization of production forest resources is still oriented towards wood production and land use, and the suitability of its use needs to be addressed. This condition often causes conflicts of interest between local communities, immigrant communities that also use it, and Perhutani, who is the manager of state-owned forests. The *Critical Mass Strategy study* found that there are nine primary resources that are forest products.² Various forest resources for the sustainability of nature and society are depicted in a diagram where the forms of forest resources include sustainable wood products, various forest services, traditional medicine, natural laboratories, tourism, habitat and species protection, improvement of forest land degradation, local energy sources, agroforestry products, animal protein. Forests in the Muria Area function as production forests and protective functions aimed at protecting life support systems. The primary resources are optimal forest products that function as life supports that can improve the quality of human life because of food sufficiency livelihoods, supported by a healthy environment because forests can function as oxygen producers (O₂), contribute to the formation of a microclimate that is suitable for farming activities and easy access to clean water. In addition, non-timber forest resources include *agroforestry activities*, which are forest land utilization activities in areas designated by the manager (Perhutani) to be planted with rice and secondary crops, in the form of cassava (*Manihot esculenta*), corn (*Zea mays*), peanuts (*Arachis hypogaea*) both as energy sources and as raw materials for industry. Forest resources utilized as agroforestry locations

¹ Kementerian Lingkungan Hidup Dan Kehutanan, "Pengelolaan Hutan Berbasis Masyarakat (Phbm) Instrumen Pembangunan Masyarakat Desa Sekitar Hutan"; Mutisari, Mustadjab, And Koestiono, "Program Pengelolaan Hutan Bersama Masyarakat (Phbm) Dan Tingkat Ketahanan Pangan Rumah Tangga Petani Di Desa Pondokagung Kecamatan Kasembon Kabupaten Malang."

² Banowati And Prajanti, "Developing The Under Stand Cropping System (Pldt) For Sustainable Livelihood"; Muul, "' Use Them Or Lose Them'. A Recipe For Sustainable Use Of Tropical Forests."

are characterized by their role as producers of food and non-food materials while maintaining/preventing erosion and increasing labour absorption in rural areas.

Healthy forest conditions can regulate and increase water discharge during the dry season and prevent excessive water discharge during the rainy season. However, if degraded, it can cause flooding, such as those that hit the Pati and Kudus Regencies. Among other things, this is due to weak collaboration between parties in managing natural resources and the environment in the Muria Area³. Along with the implementation of the sustainable development paradigm, collaborative management is needed to accommodate various aspects of community dynamics based on a *green economy* that aims to improve the welfare and social equality of the community while reducing the risk of environmental damage and considering that the Muria Forest Area is the headwaters of several rivers⁴, including Balong, Gelis, Juwana, Gadu, as well as rivers that have the potential to cause flooding during the rainy season, including the Suqngai Logung flow, Piji River, Dawe River and other small rivers that flow into the Juana River and Serang Wulan Drainase (SWD)-I leading to the southern part of Kudus Regency and Pati City.

Collaborative forest management with the community is an alternative to reduce forest damage, building inclusive institutions at the local level. The promotion of collaborative forest management *or* PHBM is based on the assumption that management is effective if the parties in making decisions regarding forests and their benefits are carried out in a participatory manner⁵, making adaptive, dynamic management of various existing variants as an innovation in natural resource development based

³ Widjanarko, "Modal Sosial Masyarakat Desa Rahtawu: Studi Kasus Pelestarian Hutan Muria."

⁴ Sridjono And Sudjianto, "Rehabilitasi Sub Das Kritis Di Kawasan Pegunungan Muria Menggunakan Model Desa Koservasi Dengan Memakai Pendekatan Sistem Agroforestri Berbasis Masyarakat."

⁵ Widjanarko, "Modal Sosial Masyarakat Desa Rahtawu: Studi Kasus Pelestarian Hutan Muria."

on empowerment and partnership.⁶ Non-stagnant demographics play a role in the utilization of natural resources and must be accompanied by a renewal of optimal forest resource spatial data information using Landsat 8 OLI imagery⁷, as a means of identifying environmental services⁸ so that sustainability can be managed collaboratively.

PHBM in Central Java is implemented based on the Decree of the Governor of Central Java Number 24 of 2001. Its implementation needs to be improved by conflicts with the community⁹ It is necessary to refer to Law Number 6 of 2023 concerning the Stipulation of perpu Number 2 of 2022 concerning Job Creation into Law so that there is no miscommunication¹⁰, reducing encroachment that triggers damage to animal habitat¹¹, although in low quantities, household food security for farmers has been realized.¹²The forest area in Central Java is 635,764.79 hectares¹³ which is the principal capital in economic development because it can provide employment, sources of income for the community, and sources of foreign exchange without neglecting its sustainability. Ideally,

⁶ Sridjono And Sudjianto, "Rehabilitasi Sub Das Kritis Di Kawasan Pegunungan Muria Menggunakan Model Desa Koservasi Dengan Memakai Pendekatan Sistem Agroforestri Berbasis Masyarakat."

⁷ Rahman, Utami, And Sutaryono, "Pendekatan Interpretasi Visual Dan Digital Citra Pleiades Untuk Klasifikasi Penutup Lahan"; Li Et Al., "Automated Detection Of Buildings From Heterogeneous Vhr Satellite Images For Rapid Response To Natural Disasters."

⁸ Supriyanto, Sudarmo, And Seryowati, "Implementasi Perhutanan Sosial Di Wilayah Kerja Perum Perhutani Kph Telawa"; Antaranews.Com, "Di Kawasan Pegunungan Muria, Jateng, Tujuh Sub-Das Kritis."

⁹ Pambudi, Maryudi, And Purwanto, "Implementasi Dialog Otentik Dalam Pengelolaan Hutan Di Bkph Ngarengan Kph Pati Perum Perhutani Divisi Regional Jawa Tengah."

¹⁰ Santoso And Hidayat, "Implementasi Program Pengelolaan Hutan Bersama Masyarakat Hutan Potorono Desa Sambak Bkph Magelang Kph Kedu Utara Divisi Regional Jawa Tengah."

¹¹ (Peraturan Pemerintah Republik Indonesia Nomor 23 Tahun 2021; Wahanisa & Prihastuty, 2016)

¹² Mutisari, Mustadjab, And Koestiono, "Program Pengelolaan Hutan Bersama Masyarakat (Phbm) Dan Tingkat Ketahanan Pangan Rumah Tangga Petani Di Desa Pondokagung Kecamatan Kasembon Kabupaten Malang."

¹³ Perhutani, "Divisi Regional Jawa Tengah."

collaborative management of forest resources by implementing the green economy concept built on the results of the Muria Forest tenure mapping covers an area of 69,812.08 hectares, covering three administrative areas of Jepara, Pati, and Kudus regencies.¹⁴ The area functions as a conservation, protected, and production forest. The Muria Forest area is a priority for reforestation¹⁵ because the upstream area triggers flooding in Pati Regency (the source is sought). The conversion of forest functions into economic function areas (agriculture) is a dilemma.¹⁶

On the other hand, external communities need various environmental products and services from forest resources. This condition triggers a conflict of interest between the community around the forest and the government regarding management.¹⁷ Based on the above phenomena, this study aims to map tenure in the Muria Forest Area production forest areas and determine development strategies that are expected to minimize tenure.

A study was conducted in Gerit Village, District Cluwak, Pati, includes area forest production in the Muria Forestry Unit (BKPH). Data will be gathered through observation, documentation, interviews, and FGD. Secondary data from Indicative Map Groups in the Forestry Process Social in Forest Areas in Pati Regency - Central Java Province and information from the mass media. Data analysis using qualitative and quantitative methods. GIS analysis in aerial photo image interpretation is carried out for tenure mapping, SWOT analysis to formulate development strategies and descriptive analysis to describe the form of interdependence and various interests in forest management. In tenure mapping, visual interpretation analysis is conducted from remote sensing image data using Landsat 8 OLI imagery for optimal land cover mapping. One scene of this image can record an area of up to 185 x 185 km; this is effective for

¹⁴ Muriastudies, "Sekilas Tentang Kawasan Muria."

¹⁵ Cowasjp, "Hutan Muria Kritis, Jadi Prioritas Reboisasi."

¹⁶ Banowati, "Pembangunan Sumberdaya Hutan Kawasan Muria Berbasis Masyarakat"; Wahanisa And Prihastuty, "Strategies For Sustainable Development Planning For Lawful Protection Of Forest Areas Based On Community Self-Regulation (Case Study: Muria, Central Java)."

¹⁷ Supriyanto, Sudarmo, And Seryowati, "Implementasi Perhutanan Sosial Di Wilayah Kerja Perum Perhutani Kph Telawa."

recording a study area of 69,000 hectares. The image interpretation method uses visual on-screen to produce a tentative land cover map. The land cover map is then used as input for modelling forest land cover dynamics using the LandTrendR (*Landsat-based Detection of Trends in Disturbance and Recovery*) pada *Google Earth Engine* (GEE).

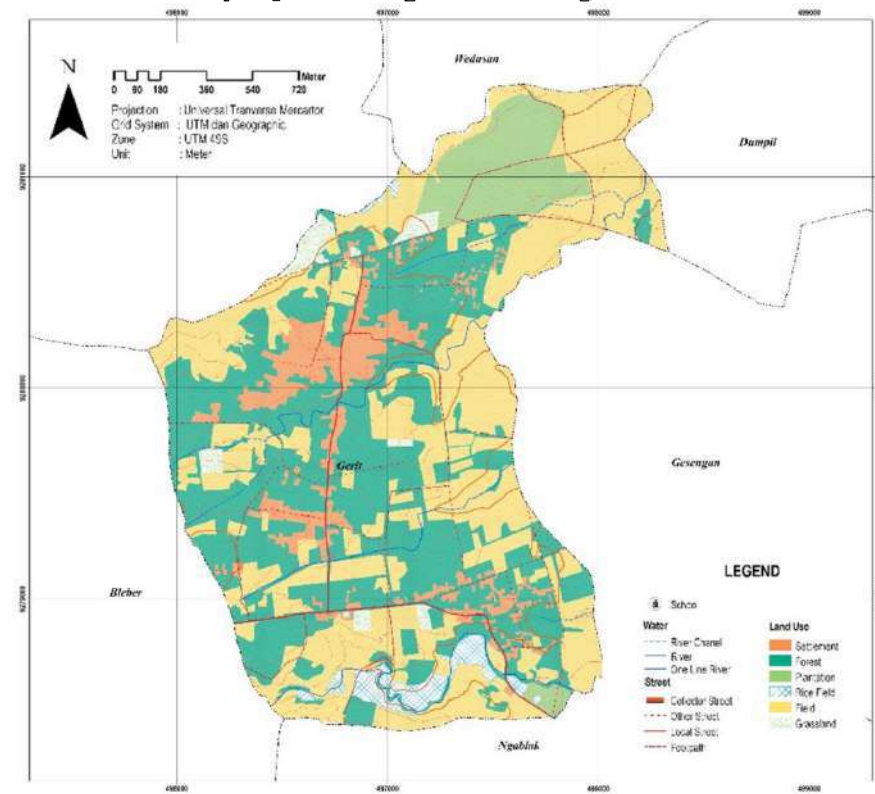


FIGURE 1. Maps of Field Location

Source: Authors, 2024

Processing is done at *GEE* by using the Landtrendr algorithm.¹⁸ The calculation algorithm is used because it can detect changes in land cover, especially in forest land cover. The data used are Landsat 5 TM (*Thematic Mapper*), Landsat 7 ETM+ (*Enhanced Thematic Mapper*), Landsat 8 OLI (*Operational Land Imager*), and Landsat 9 OLI. The image channels used are *Near Infrared* (NIR) and *Short Wave Infrared* (SWIR2) to calculate the

¹⁸ Kennedy, Yang, And Cohen, "Detecting Trends In Forest Disturbance And Recovery Using Yearly Landsat Time Series: 1. Landtrendr - Temporal Segmentation Algorithms."

Normalized Burn Index (NBR) using the following formula ($NBR = \frac{NIR-SWIR2}{NIR+SWIR2}$)¹⁹ to identify changes in land use, especially in forest areas.

A. Production Forest Tenure Mapping in Muria Area

Tenure mapping is a mapping activity obtained from survey results through a series of activity processes to record land ownership in the form of forest land in the Muria Area, identify subjects, objects and types of land rights, and identify land tenure security to reduce or resolve land disputes. Data on the area of forest land cover for the last five years (2015–2019) shows a decrease of 0.34% per year. The leading cause of this decrease is land conversion to other uses due to regional economic development. Along with this phenomenon, degradation has also occurred, resulting in the deforestation of land resources. On the other hand, the area of cassava agricultural land in Pati Regency continues to increase by 1.25% per year from 2010 to 2020. These two figures show that there has been an increase in the ratio of land to population, thus raising challenges on how to formulate land resource policies for proper use. Although it cannot be denied that population growth affects the increase in human needs and sufficiency from natural forest resources, it is inevitable.

The area of Interest is around 69,000 hectares, covering the forest management area and surrounding settlements. Forest observation uses image data interpretation. Remote sensing imagery can provide spectral reflectance information that describes the appearance of vegetation and forests so that it can be used to monitor forest management areas, especially in calculating the forest management area.²⁰ Specific algorithms support the use of remote sensing imagery to facilitate forest monitoring

¹⁹ García And Caselles, “Mapping Burns And Natural Reforestation Using Thematic Mapper Data.”

²⁰ Lechner, Foody, And Boyd, “Applications In Remote Sensing To Forest Ecology And Management.”

activities especially LandTrendR Algorithm.²¹ This algorithm utilizes Landsat imagery to monitor land use and detect changes in land use per year. Landsat is used in this algorithm because it has many channels that can then be used to calculate *Normalized Burn Ratio* (NBR).²²

Based on annual calculations with the LandTrendR algorithm model on GEE is the loss and addition of forest areas.²³ Loss of forest areas is marked by a decrease in spectral value, while additions occur if there is an increase in spectral value. The mapping unit used is a minimum change in 6 adjacent pixels on Landsat, which is adjusted to the algorithm parameters. The process results are in the form of the change made each year.

Data processing shows that the decline trend of forest areas tends to fluctuate. The trend from 2017 to 2020 shows that forest decline is getting smaller and then increases in 2021. The most significant forest loss occurred in 2017, around 1,576 hectares. The area that tends to experience changes is in the outermost area of the Muria Forest Area. Protected forest areas in the Muria Forest Core Zone tend not to experience forest loss. The spatial pattern of forest loss tends to be around residential areas. This is because the closer to the settlement, the easier it is to change the forest area, especially since this change can be suspected that communities utilize forest areas for living and livelihood purposes, such as by creating plantations or other agricultural cultivation areas. Areas in the core or middle zone of protected forests tend to stay the same because they are far from populated areas.

²¹ Kennedy Et Al., "Spatial And Temporal Patterns Of Forest Disturbance And Regrowth Within The Area Of The Northwest Forest Plan."

²² Chen Et Al., "Mapping A Burned Forest Area From Landsat Tm Data By Multiple Methods"; Mugiraneza, Nascetti, And Ban, "Continuous Monitoring Of Urban Land Cover Change Trajectories With Landsat Time Series And Landtrendr-Google Earth Engine Cloud Computing"; García And Caselles, "Mapping Burns And Natural Reforestation Using Thematic Mapper Data."

²³ Kennedy Et Al., "Spatial And Temporal Patterns Of Forest Disturbance And Regrowth Within The Area Of The Northwest Forest Plan"; Mugiraneza, Nascetti, And Ban, "Continuous Monitoring Of Urban Land Cover Change Trajectories With Landsat Time Series And Landtrendr-Google Earth Engine Cloud Computing."

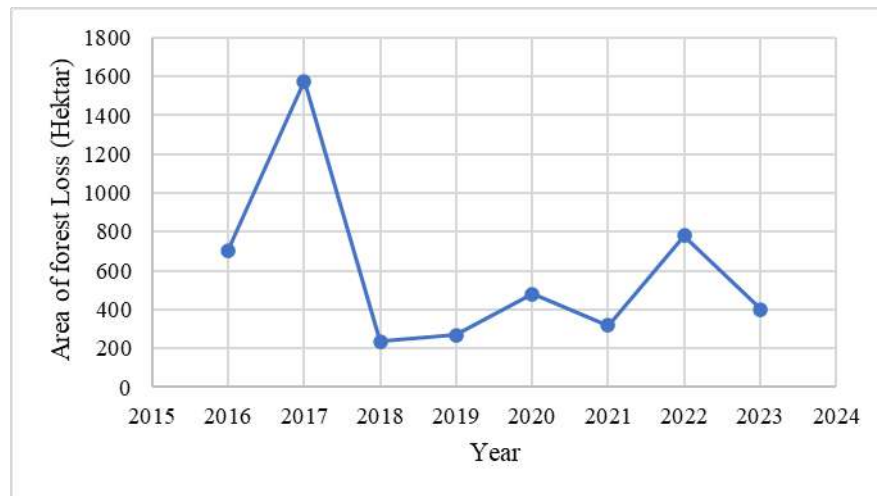


FIGURE 2. Graph of Forest Area Loss in the Muria Forest Region

Source: Authors, 2024

Observations were conducted using imagery from 2017-2021 in the Muria Area with an area of 69,000 hectares covering three districts, namely Pati, Kudus and Jepara Regencies, with a sample observation area in Gerit Village, Pati Regency, which has an area of around 443.53 hectares. The identification of additional forest areas was carried out using the Landtrendr algorithm on *Google Earth Engine (GEE)*. An increase in spectral values detected the addition of forest area. Observations were conducted from 2017-2021. Calculation of forest area loss and gain is needed to conduct an inventory of forest areas in the study area. Forest inventory is needed to determine the conditions that occur in the Muria Forest.

The analysis results show that the most significant increase in forest area occurred in 2018, covering an area of 0.472 hectares. Meanwhile, in 2020 and 2021, there was no increase in forest area in Gerit Village. Compared to the figure for a reduction in forest area (loss), the figure for an increase in forest area (gain) in Gerit Village each year is relatively lower. This shows that in Gerit Village, there has been more reduction in forest area than in addition. The following is data on the increase in forest area in the sample area of Gerit Village.

TABLE 1. Forest Areas Dynamic in Gerit Village Forest

Year	Forest Area (Ha)	
	Area of Gain	Area of Loss
2017	0.224	19.43
2018	0.472	0.72
2019	0.118	1.08
2020	-	4.65
2021	-	10.2
2022	-	8.3
2023	-	2.4
Total	0.814	46.78

Sources: Authors, 2024 (edited)

Changes in land use vary from year to year, providing an overview of the conditions of society at that time and the implementation of existing regulations. It needs to be reviewed to return its dynamics. Similar to the social dynamics of changes in forest areas, the year 2017 experienced the most significant decrease in area, and the year that tended not to experience a decrease was 2018. The condition in 2018 could be caused by the existence of social forestry regulations related to the development of social forestry businesses and the formation of forest farmer groups issued by the Ministry of Environment and Forestry (Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor P.83/MENLHK/SETJEN/KUM.1/10/2016 dan Peraturan Menteri LHK Nomor P.89/MENLHK/SETJEN/KUM.1/8/2018). The existence of regulations regarding social forestry makes the Gerit Community and its surroundings feel the benefits of maintaining the forests they own. The decrease in forest area then showed an increase after 2018; this could indicate that the Ministry of Environment and Forestry regulations were not running well, and Perhutani was very careful in enforcing the rules. This condition was also conveyed by the community members who were met.²⁴

²⁴ Banowati, "Pemetaan Tenurial Untuk Pengelolaan Kolaboratif Sumberdaya Hutan Optimal Di Kawasan Muria."

The decrease in forest area that occurred from 2020 to 2022 was not as large as the decrease that occurred in 2017. The COVID-19 pandemic from 2020 to 2022 caused forests and agricultural land to become the main source of livelihood, so the function has remained the same. At the research location, flashback information was obtained from the community that the forest as a resource is *a safety net* used as a source of food and a source of fuel for cooking. It can provide various commodities, especially non-timber, which are used as one of the main food ingredients and animal feed.²⁵

Spatially, forest loss in Gerit Village is on the north side. The surrounding community is called the northern area of Sempu. The north side borders Gesengan, Dumpil, and Wedusan Villages. In terms of forest control on the north side of the Gerit Village area, it was the location of the Social Forestry area from 1980 to 1998. Forest control is now owned by a Holding between BUMN Perhutani and PTPN, which is used for plantations, with the main crop being rubber. (*Hevea brasiliensis*). The loss of stands indicates a tendency to experience a reduction in land area in managed forest areas.



FIGURE 3. Lost forest stands in the Forest Area

²⁵ Pierce And Emery, "The Use Of Forests In Times Of Crisis: Ecological Literacy As A Safety Net"; Angelsen Et Al., "Environmental Income And Rural Livelihoods: A Global-Comparative Analysis"; Banowati, "Pembangunan Sumberdaya Hutan Kawasan Muria Berbasis Masyarakat."

Source: Authors, 2024

Subtraction Teak Forest stands (*Tectona grandis*) in the forest area that occurred on the North Side of Gerit Village can be caused by horizontal conflicts in neighbouring village communities, which are suspected to have been carried out by people from outside the village. Enforcement of social forestry regulations is needed to anticipate forest loss and is also an important part of integrating tourism activities (in pioneering). Forests are one of the important resources that can improve the economy through their utilization, including tourism ²⁶. The distribution of reduced stands tends to be associated with settlements. Forest land is used for seasonal farming. The dynamics of the spatial distribution of the addition and reduction of forest area or forest stand density in Gerit Village can be seen in the following figure.

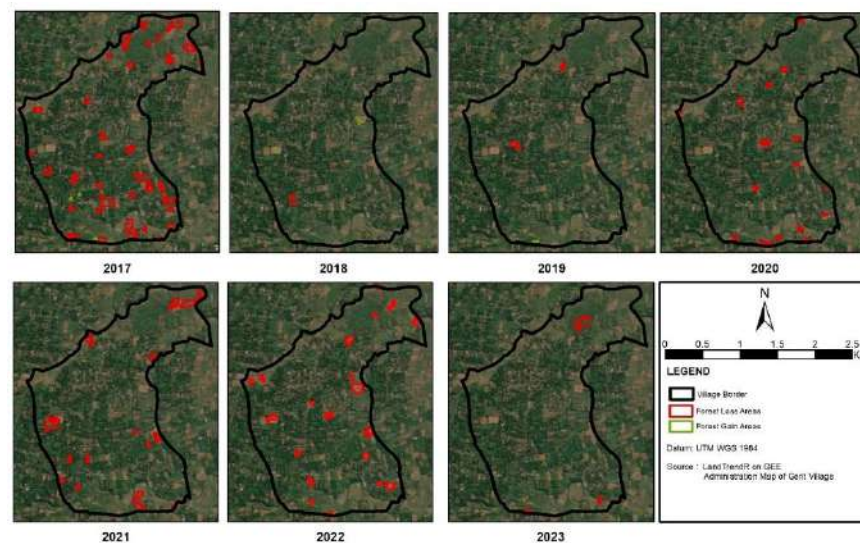


FIGURE 4. Map of Forest Area Change in Gerit Village, Cluwak Subdistrict, Pati District 2017 – 2023

Source: Authors, 2024

²⁶ Hall, "Seeing The Forest For The Trees: Tourism And The International Year Of Forests."

B. Aspirations of Forest Management Communities

Exploration the information about the public's perception using the base method evaluation condition of the village in a fast way, or *Rapid Rural Appraisal* (RRA) with a fast-gathering aspiration community in the FGD forum attended element representative various elements. The implementation technique begins with information on the material being discussed, continues to the field together, and then returns to the discussion. The focus of the discussion material indicates the wishes and hopes of the community for the establishment of the best solution. Literature review, secondary data and field observation results are used as provisions for researchers to start *the appraisal*. Furthermore, it is assessed using a score (Table 2). It evaluates information about rural conditions at the research location and local knowledge of the Gerit Village community - Cluwak District in Pati Regency based on community involvement that can be used in implementing Social Forestry, which refers to the indicative map.

Armed with data and information from respondents using the *Participatory Rural method Appraisal* (PRA) for the development of *agroforestry* models, pays attention to/study community aspirations/involvement related to the goals to be achieved in the future, which are consulted/controlled with capabilities, entitlements, ownership, and partnerships. *Capability* in this study is the ability to manage forest land controlled or cultivated according to one's potential, studied from the aspects of reasoning, and the ability to solve problems/find solutions. *Entitlements* are defined as the authority possessed to do something absolute. *Ownership* or control is the power that is socially supported to hold control over something owned based on supporting evidence. A *partnership* is a business collaboration accompanied by coaching and development that pays attention to the principles of mutual need, mutual strengthening, mutual benefit, and preserving and conserving the environment.

TABLE 2. Aspirations of the Gerit Village Community in Forest Resources Management in the Muria Area

Aspiration	Indicator	Score Range 1 – 5			Total
		Low (1 – 2)	Currently (3)	Tall (4 – 5)	
Capability	Reasoning	-	-	4	4
	Solution	-	3	-	3
Entitlement	Absolute	-	3	-	3
	Relatively	-	3	-	3
Mastery	Rent/ Work on	-	-	5	5
	Owned by	2	-	-	2
Partnership	5 - 10-year term	-	-	-	-
	>10 years term	-	-	5	5
Total		2	9	14	25
Aspiration Score Value			25:8	3,125	

Sources: Authors, 2024

The data in Table 2 shows mark aspiration 3.125 of the total score highest 5, with notice draft resource optimal ²⁷ Hence, the aspiration society, at the stage beginning with Social Forestry (PS) in Forest Areas with Management Special (KHDPK), is carrying out efforts socialization to understand the return environment and trees annually to lands agriculture (formerly / is a forest with right work by pesanggem or farmer member Forest Farmer Group (KTH).

The forest in Gerit Village has a production function, with the main stand being teak (*tectona grandis*), including the Bulungan Forest Management Resort (RPH) with an area of 667.84 Ha - Part of the Ngarengan Forest Management Unit (BKPH) with a land area of 4,975.54 Hectares. The forest area in the Gerit Village area is managed by the Pati Forest Management Unit (KPH), which will be allocated to be managed by the people called the Village Management Forest. Based on the provisions, the minimum area is around 0.25 ha, with at least 50% covered by woody plants and other plants.²⁸ The type of superior

²⁷ Banowati And Prajanti, "Developing The Under Stand Cropping System (Pldt) For Sustainable Livelihood."

²⁸ Pambudi, Maryudi, And Purwanto, "Implementasi Dialog Orentik Dalam Pengelolaan Hutan Di Bkph Ngarengan Kph Pati Perum Perhutani Divisi Regional Jawa Tengah."

agriculture in the form of cassava at the research location is oriented as a *raw material* for the tapioca industry in the area.²⁹

C. Dynamics of Tenure Area

Dynamics of tenure changes in forest areas during the 2017-2019 reform period; the reduction reached 21.23 hectares. Over more than 5 years, it has been known that several locations have experienced loss /reduction. Forest stands where in Figure 3; this location is marked with a yellow circle. The reduction is almost evenly distributed in all places with a clustered pattern on the village border (Table 1) until now (2023-2024), leaving damage of 2.4 hectares. Location The decrease in stands tends to be on the village border. This can indicate that the border tends to be prone to horizontal conflicts between communities accusing each other—especially between bordering village communities, which accuse each other of being thieves or teak destroyers. The limited variety of livelihoods that lead to economic motives cause certain community members to carry out often logging teak stands without considering the cycle. Due to these conditions, the community uses empty land as agricultural land. The area of forest owned by Perhutani, managed by the community, is 35 hectares. As seen in Figure 5, reforestation failed when the forest area/footprint had no trees. Based on the story of the pesanggem, in 2000 (after looting), the condition of the forest land was bare. Then reforested/planted with teak. In addition, the community was allowed to plant corn, pineapple, etc. If the plants that year had not been stolen, they would have been 20 years old. The empty land after looting had returned to being forest, but it was not forest but agricultural fields.

²⁹ Banowati Et Al., “Increasing The Competency Of Cassava Farmers As A Revitalization Efforts Of Tapioca Industries For Food Private Realization.”



FIGURE 5. Agricultural Area on Former Illegal Logging Land
Sources: Authors, 2024

The cut teak poles indicate they were cut down prematurely (optimal cycle 40 years). The remaining teak trees/stands are rare and far away. This is done intentionally so that crops can expand and are not shaded (enough sunlight). Corrective actions were taken in 2017 and 2018, indicating that there was replanting (marked with a red circle in Figure 3). Teak stands with a diameter of 10 cm - 40 cm were planted in 2020 and 2011 using the *shoot-cutting method*, which has a shorter growing time, making it easier for reforestation.³⁰

The accuracy test of interpretation is described through spatial analysis using GIS data processing with related attribute data to provide information/alternative solutions to spatial problems or spatial symptoms, including Social Forestry (*Perhutanan Sosial/PS*) efforts that provide legal access for communities to obtain assets/capital (*equity*), a community forest model initiated by the village to improve the community's economy. Column 5, At the same time, in the same land area, several parties could have the right to control the land simultaneously but with different rights. At the research location, information was obtained that the Government (Perhutani) had given land management rights using land to the

³⁰ Adinugraha And Mahfudz, "Pengembangan Teknik Perbanyakan Vegetatif Tanaman Jati Pada Hutan Rakyat."

community with management rights for 35 years. The implementation of this program is planned/carried out in stages in each region.

TABLE 3. Forest Tenurial in Muria Area

Code	Location	Objects	Subject	Land Rights	Security Land Ownership	Solution to Dispute
(1)	(2)	(3)	(4)	(5)	(6)	(7)
S1	X= 497891 Y= 9281210	Forest	Forestry	HGL	PS by cluster	Village Managed
S2	X= 496013 Y= 9280176	Dry Field	Individual	Private property	Land Certificate	not any dispute
S3	X= 497337 Y= 9278615	Dry Field	Individual	Private property	Land Certificate	not any dispute
S4	X= 497437 Y= 9280961	Forest	Forestry	HGL	PS by cluster	Village Managed

Sources: Authors, 2024

Solution to dispute completed by the Village Government to be used as location pioneer ecotourism (Figure 6) as earth Camping The beautiful bendho of Gerit Village is quite for 1300 participants jamboree sungai. In this area, it is still possible to utilize the land under the teak stands to plant cassava.



FIGURE 6. Teak Tree Plantation in Gerit Village
Sources: Authors, 2024

Both plants grow at the end of the rainy season; cassava plants do not/have not grown optimally, considering that cassava tubers can be harvested in the dry season and end in September. This effort indicates the awakening of community concern in the harmonious use of land in actions to realize optimal forest resources that have the potential to minimize horizontal conflict.

D. Agroforestry Strategy and Implementation

The designed agroforestry model is a land management system combining woody plants and fruit-producing perennial plants with a plantation concept that has yet to be widely developed. Plantation management on forest land has not been widely in demand and is still constrained by the unavailability of data and information on the types of plants being cultivated, access/permits/partnership area per individual being very narrow/minor, and limited capital in development, maintenance, and marketing. Based on primary data and data in the KHDPK document, the development of an agroforestry model innovation is conceptualized as a combination of forestry - plantations - and agriculture. Gradually, a new forest was formed, which was enriched with various fruit-producing trees and jengkol (*Pithecellobim Jiringa*) while maintaining superior commodities, namely arrowroot/lerut/kerut (*Maranta Arundinacea L*) and ganyong (*Canna Discolor*) plants which are tolerant to growing optimally under the shade with minimum sunlight levels.³¹ as well as seasonal crops according to community aspirations and local potential that has been cultivated so far. The solution offered in this study is the innovation and engineering of agroforestry-based land use to build optimal forest resources, including food sources, various harvests with frequent periodicity, and various environmental services. Furthermore, an optimization design analysis is carried out to calculate income. Pesanggem is based on agricultural and plantation crop harvests. The visual design for developing the agroforestry model in the Muria

³¹ Banowati, "Pemetaan Tenurial Untuk Pengelolaan Kolaboratif Sumberdaya Hutan Optimal Di Kawasan Muria."

Forest Area, which accommodates the community's socio-cultural dynamics, is innovative.

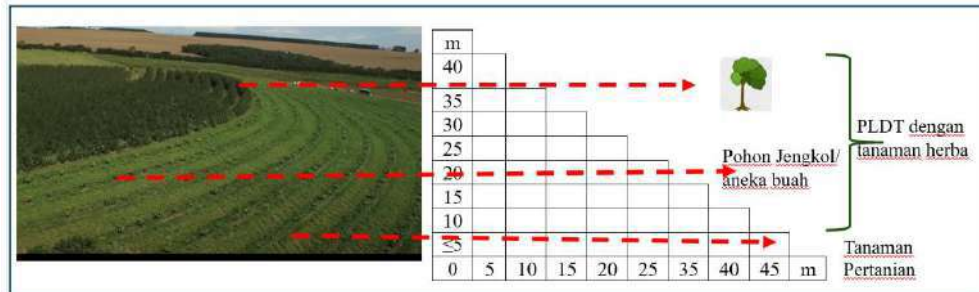


FIGURE 7. Visual design of Agroforestry Model Innovation in the Muria Forest Area³²

Sources: Banowati, 2024

Innovation of an agroforestry model or intercropping is formed by a planting mixture involving two types or more plants on one land area at the same time or simultaneously. Form This developed To optimize results a form use land forest in a way sustainable, including Land Utilization Below Stand (PLDT), more efficient throughout recycled plant forestry with customized farming season.³³ During this agrisilviculture model, the utilization of land forest became the main reason for the conflict between public member Forest Farmer Groups (KTH) and managers, namely Forestry.³⁴ More specifically is utilized as land agriculture with results primary raw material for tapioca industry House many stairs be around the area, so no only as producer food that is subsistence, condition This indicates the taller need human beings whose sufficiency is based on availability land agriculture.

The right innovation strategy must be chosen to implement the planned agroforestry model. The right strategy needs to be prepared by looking at the existing situation and conditions, one of which is with the SWOT analysis tool. The strategy implemented is not only to achieve the objectives of the agroforestry model innovation but can also predict

³² Banowati, (2024)

³³ Banowati And Prajanti, "Developing The Under Stand Cropping System (Pldt) For Sustainable Livelihood."

³⁴ Banowati, "Pembangunan Sumberdaya Hutan Kawasan Muria Berbasis Masyarakat."

possible risks. Strategy development is carried out by obtaining primary data from Focus Group Discussions conducted with various stakeholders, forest managers and local communities.

First, strength consists of 4 internal factors, namely the Gerit Village residents willing to become pesanggem to work on land owned by Perhutani, who are also members of the Forest Farmer Group (KTH) formed by Perhutani. This builds good coordination between the pasenggam (village community) and Perhutani as the forest manager. The third factor is that the pasenggam are experienced with a minimum experience of 10 years (has repeated the contract for 2 periods) and the existence of PLDT, which the local community has long implemented. *The second component* is a weakness with 4 four factors, namely: competition with pesanggem from outside Gerit Village, passive pesanggem membership in farmer groups, forest stands in the form of teak trees are less dense (rare) and the cultivated floor plants are still dominated by one type, namely cassava. *Third*, opportunities as external factors consist of 5 factors: Perhutani opens a forest village community empowerment program through the Social Forestry (PS) organization, where this program is expected to be an actual forum for farmer empowerment. The next opportunity is the young forest stands (the forest canopy is not yet dense) so that sunlight can still penetrate the forest floor. The existence of market demand for products (PLDT) such as horticultural plants, support from the village government and the high agricultural potential in Gerit Village are great opportunities to develop strategies based on agroforestry models innovated in the Gerit Village Production Forest Area. In the *fourth component*, two threat factors were found, namely, the trend of theft of stands is still symptomatic. There is concern that the pesanggem who is currently working on the land for the Social Forestry program that is about to be formed are being worked by new arrivals, not by people who in 2000 were reforestation actors. In the field, several factors from each SWOT component are interrelated.

After the FGD was conducted, the questionnaire that had been prepared was distributed back to the FGD participants to find out the weight and rating of each factor. From the data processing results, the IFAS (*Internal Strategic Factor Analysis Summary*) and EFAS (*Internal*

Strategic Factor Analysis Summary) matrix tables were prepared. The results of the analysis are presented in table 4.

TABLE 4. IFAS and EFAS Matrix

Factors	Weight	Rating	Score
<i>Internal Factors</i>			
Strength			
1. The willingness of Pesanggem (Village Residents) to work on state-owned forest land (Perhutani)	0.35	3.25	1.14
2. Pesanggem becomes a member of KTH (Forest Farmers Group)	0.30	2.75	0.83
3. Repetition as a messenger more than 2 times	0.20	3.25	0.65
4. PLDT (Use of Land Under Standing)	0.15	3.50	0.53
Total	1.00		3.14
Weakness			
1. Message from outside village	0.30	2.50	0.75
2. Membership passive	0.25	2.00	0.50
3. Stand forest seldom	0.25	1.75	0.44
4. Domination plant cassava tree	0.20	3.50	0.70
Total	1.00		2.39
Total IFAS			0.75
<i>External Factors</i>			
Opportunity			
1. Open Social Forestry (PS) program	0.25	3.25	0.81
2. Young forest stands (empty space for farming)	0.22	3.75	0.83
3. There is market demand for PLDT products	0.15	3.25	0.49
4. Support from village government and community leaders	0.18	3.50	0.61
5. The large agricultural potential in village areas	0.20	4.00	0.80
Total	1.00		3.54
Threat			
1. Theft trends stand	0.30	3.50	1.05
2. The social forestry formed is managed by new members/not the old members	0.70	2.75	1.93
Total	1.00		2.98
Total EFAS			0.56

Sources: Authors, 2024

From the calculation weight and ranking above, the strengths of the aspects are as follows: The IFAS value is 3.14, and the weakness is 2.39, so the internal value of the obtained factors is positive 0.75. As for external components, opportunities score 3.54 and threats 2.98. External factors are also favourable because opportunities are more significant than threats and score 0.56. The results of IFAS and EFAS showed that the right strategy is aggressive in quadrant 1. This aggressive strategy is supported by considerable strengths and opportunities to be oriented towards growth (growth-oriented *strategy*) in policy.

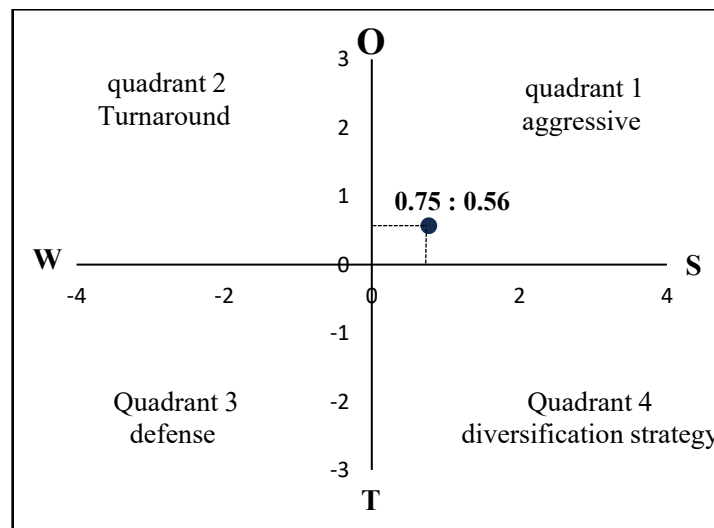


FIGURE 8. SWOT Matrix quadrant results
Sources: Authors, 2024

Formulation of strategy using SWOT by considering factors in each component. The strategy needed is to optimize strengths and opportunities and reduce risks caused by weaknesses and threats. This study found eleven strategies that can be applied based on facts and field conditions. Three are based on strengths-opportunities, and the next four are based on opportunities-weaknesses and strengths-threats and weaknesses-threats, with two strategies each. The strategy consists of several approaches. The strategy with *the main approach* to the village community, village government and organizations within it as human resources involved in forest management. The following strategies are built to accommodate various conflicts that exist both between village communities and with various other parties. The strategies built include

conducting socialization and cooperation between village communities, one of which is by building BUMDESMA (Badan Usaha Milik Desa Bersama/ Joint Village-Owned Enterprises) to accommodate cooperation with communities outside the village to reduce the occurrence of conflicts related to the use of Muria Forest resources. The existence of conflict between new couples and old couples (who have repeated contracts) is done by restructuring membership without ignoring existing cultivators/pesanggem, affirming the rights and obligations of pesanggem resulting from the restructuring, and involving old couples in decision-making. Another strategy is to involve the Village Consultative Body (BPD), which is expected to be accommodating, reinforcing the Mantri Lurah Management Program between villages, and mediation to integrate the objectives of various parties while still prioritizing improving community welfare and rehabilitating forests and land together with the community and for the sustainability of the KHDPK resource function.

The second approach is a strategy that focuses on forest resources, including the development of shade-tolerant commodities such as pouring with the technique of planting pouring seeds from tuber seeds because harvesting pouring is 7 months old from the planting period³⁵, the use of superior and short-cycle cassava varieties, and directions for choosing short-cycle horticultural plants. A summary of the strategy can be explained in the table below.

³⁵ Dinas Pertanian Tulangbawang, "Budidaya Porang."

TABLE 5. SWOT Matrix for Agraforestry Model Development Strategy in the Muria Mountain Production Forest Area

<div> <div>Internal Factors</div> <div>External Factors</div> </div>	Strength (S) 1. The willingness of Pesanggem (Village Residents) to work on state-owned forest land (Perhutani) 2. Message become LMDH members 3. Repetition as a messenger more than 2 times 4. PLDT (Use of Land Under Standing)	Weakness (W) 1. Message from outside village 2. Membership passive 3. Stand forest seldom 4. Domination plant cassava tree
	Opportunity (O) 1. Open Social Forestry (PS) program 2. Young forest stands (empty space for farming) 3. There is market demand for PLDT products 4. Support from village government and community leaders 5. The large agricultural potential in village areas	Strategy (WO) 1. Arrangement return membership without ignore the cultivator / the builder who has There is 2. Affirming Rights and Obligations message results arrangement 3. Use of superior and short-cycle cassava varieties 4. Guidelines for selecting short cycle horticultural crops
	Threat (T) 1. Theft trends stand 2. The social forestry formed is managed by new members/not the old members	Strategy (WT) 1. Mediation to integrate the goals of various parties 2. Accommodating the aspirations of various parties while still prioritizing the sustainability of resource functions.

Sources: Authors, 2024

Conclusion

The results of data processing and tenure mapping show that the trend of forest area decline tends to fluctuate. Areas that tend to experience changes are in the outermost areas of the forest boundary. The spatial pattern of forest loss tends to be around residential areas because the closer to the settlement, the easier it is to change utilization. There are indications of gardens or other utilization purposes. Changes in land use that vary each year can provide an overview of the condition of the community at that

time and the discretion of implementing regulations. This is similar to the reduction in forest area. Gerit Village is much higher than the additional forest area. From 2017 to 2023, there was a reduction in forest area of 0.814 (Figure 4). The innovation of agroforestry or intercropping models is a form of mixed planting that involves two or more types of plants in one planting area at the same time or somewhat simultaneously. From the calculation of weight and ranking, the internal factor value obtained is positive at 0.75, and the external factor is also positive at 0.56. The results of IFAS and EFAS showed that the right strategy is aggressive in quadrant 1. This aggressive strategy is supported by enormous strength and opportunities so policy-making can be oriented towards growth (growth-oriented strategy).

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DECLARATION OF CONFLICTING INTERESTS

The authors state that there is no conflict of interest in the publication of this article.

ACKNOWLEDGMENT

This research was done by help from village chief and many people from Gerit, Pati. This Research is funded by Universitas Negeri Semarang (UNNES) through scheme Applied Research Expertise Funding Source from Institute of Research and Community Service, UNNES 2024.

FUNDING INFORMATION

This Research is funded by Universitas Negeri Semarang (UNNES) through scheme Applied Research Expertise Funding Source from Institute of Research and Community Service, UNNES 2024.

HISTORY OF ARTICLE

Submitted : March 12, 2025

Revised : June 17, 2025

Accepted : July 16, 2025

Published : July 21, 2025