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Forestry Economics Resources Sustainability Development in Indonesia (Study in Sunyalangu Village, Banyumas District, Central Java)

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ABSTRACT: The Joint Community Forest Resource Development is a forest resource development system on Java Island developed by Perhutani. In Banyumas Regency, the Southern Mount Slamet is included in the Protected Forest and Conservation, which has economic, ecological, and social functions. This study aims to analyze the factors that influence the sustainability of forest resources in the Joint Community Forest Resource Development. It focuses on the economic sector and community participation through the Joint Community Forest Resource Development. The study includes 150 farmers who work with Perhutani in the Sunyalangu Village, Banyumas Regency community. This study shows that the implemented Development Program in Banyumas District did not significantly impact the sustainability of forest resources. The importance of individual forest farmers' characteristics should be the first concern in improving the development of forest resource activities.

Keywords: Forestry Economics, Resources, Sustainability, Farmer, Village

ABSTRAK: *Pengembangan Sumber Daya Hutan Bersama Masyarakat merupakan suatu sistem pengembangan sumber daya hutan di Pulau Jawa yang dikembangkan oleh Perhutani. Di Kabupaten Banyumas, Gunung Slamet Selatan termasuk dalam Hutan Lindung dan Konservasi yang mempunyai fungsi ekonomi, ekologi, dan sosial. Penelitian ini bertujuan untuk menganalisis faktor-faktor yang mempengaruhi keberlanjutan sumber daya hutan dalam Pengembangan Sumber Daya Hutan Bersama Masyarakat. Penelitian ini difokuskan pada sektor ekonomi dan peran serta masyarakat melalui Pengembangan Sumber Daya Hutan Bersama Masyarakat. Penelitian ini melibatkan 150 orang petani yang bekerja sama dengan Perhutani di Desa Sunyalangu, Kabupaten Banyumas. Penelitian ini menunjukkan bahwa Program Pengembangan yang dilaksanakan di Kabupaten Banyumas tidak memberikan dampak yang signifikan terhadap keberlanjutan sumber daya hutan. Pentingnya karakteristik individu petani hutan harus menjadi perhatian utama dalam meningkatkan kegiatan pengembangan sumber daya hutan.*

Kata Kunci: *Ekonomi Kehutanan, Sumber Daya, Keberlanjutan, Petani, Desa*

INTRODUCTION

Forest resource Development in the era of decentralization must now pay attention to the sustainability and preservation of forest resources, be participatory and pay more attention proportionally to the role of communities around the forest. Therefore, forest Development must remain within the framework of the principles of sustainable development, namely by prioritizing the principles of sustainable forestry development (Clinch, 2000). Currently, village communities in forest areas are very dependent on forest resources. In addition, some communities do not understand the importance of maintaining forest resources and planting several plants that damage the main forest plants, such as pine. This sustainable condition includes aspects: economic function, social function, environmental function. As an economic function, the utilization of forest resources must provide as much benefit as possible for the state and the people living around the forest (David et al., 2019). In the social aspect, forest utilization policies must be acceptable and beneficial to society as a whole. In the environmental aspect, forest utilization must continue to maintain the potential of natural resources. Therefore, the balance between production function and protection function must always be considered (Brasselle et al., 2002). Sustainable forest management helps preserve these social functions, ensuring that communities can continue to benefit from forests without depleting the resources (Xu et al., 2014). By integrating these three aspects, sustainable forest management ensures a balanced approach that supports economic growth, social well-being, and environmental health (Laksana et al., 2020).

Joint Forest Resource Development Program with the Community (is a forest resource Development system that only exists in Java Island, developed by Perhutani in 2001. Joint Forest Resource Development with the Community (FRDC) is a forest resource Development system with a collaborative pattern that synergizes between Perhutani and forest village communities or stakeholders in an effort to achieve optimal sustainability of forest resource functions and benefits and increase the Human Development Index (HDI) that is flexible, participatory, and accommodating. FRDC is intended to provide direction for forest resource Development by combining economic, ecological, and social aspects proportionally and professionally (Gao et al 2021). FRDC aims to increase the role and responsibility of Perhutani, forest village communities, and stakeholders towards the sustainability of forest resource functions and benefits through forest resource Development with a partnership model (Xiong et al., 2018). FRDC requires the existence of a legal entity that represents the village community in the binding cooperation with Perhutani. This institution is hereinafter known as the Forest Village Community Institution. Therefore, institutional aspects are an important consideration as one aspect of sustainable forest resource Development.

The Joint Community Forest Resource Development Program (*Pengembangan Sumber Daya Hutan Bersama Masyarakat*) by Perhutani is a collaborative initiative between the state-owned forestry company (Perhutani) and local communities in Indonesia, aimed at promoting sustainable forest management while improving livelihoods. Under this program, communities are granted access to manage and utilize forest resources (e.g., non-timber forest products, agroforestry, and eco-tourism) under agreed-upon rules, fostering shared responsibility for forest conservation

Local communities are the spearhead in forest security, Development and supervision because they are the ones who are closest and interact most directly with the forest and they are also the parties who will experience direct impacts from Development forest (Cao et al., 2014). Community-based forest resource Development should be able to open up better and fairer economic opportunities for indigenous peoples and local communities (Gao et al, 2021).

Several factors influence the sustainability of forest resources, including: (1) Climate Change: Changes in temperature and precipitation patterns can affect forest health and biodiversity. For example, increased temperatures can lead to more frequent and severe wildfires, pest outbreaks, and diseases.(2) Deforestation and Land Use Change: The conversion of forest land to agriculture, urban areas, or other uses reduces forest cover and disrupts ecosystems. (3) Forest Management Practices: Sustainable forest management involves practices that maintain the ecological balance, such as selective logging, reforestation, and maintaining biodiversity (4) Economic Factors: The demand for timber and non-timber forest products can drive unsustainable harvesting practices. Balancing

economic benefits with conservation is crucial (5) Policy and Governance: Effective policies and regulations are essential for protecting forest resources (Guan et al., 2019). This includes enforcing laws against illegal logging and promoting sustainable land use Community Involvement: Engaging local . (6) communities in forest management can lead to better conservation outcomes. Indigenous knowledge and practices often contribute to sustainable forest use.

The economic activities developed do not trap communities into becoming increasingly dependent on external resources such as subsidies or credit, but can encourage communities to be more independent by utilizing forest resources sustainably (Chen et.al., 2018). The hypothesis in this study is that there is a relationship and influence between the individual characteristics of forest farmers and the participation of forest farmers in managing and maintaining the sustainability of forest resources through the development program (Le & Nguyen, 2020). Sunyalangu Village is one of the villages that uses forestry forest resources in Central Java. The level of community participation is still relatively low because communities village face economic pressures that limit their ability to engage in forest management activities and a lack of awareness and education about the benefits of sustainable forest management and the role communities can play Apart from that, the level of poverty and dependency on the profit sharing system from forest management activities is also relatively high. The profit-sharing system can vary based on the type of forest utilization. For example, communities may engage in agroforestry, where they can grow crops alongside trees, or in the harvesting of non-timber forest products and Profits generated from forest activities are distributed according to the agreed-upon terms. This can include income from timber sales, eco-tourism, and other forest-related enterprises This research will be very useful for improving community empowerment programs in the area.

The purpose of this study is to identify factors that influence the sustainability of forest resources in the Joint Community Forest Resource Development, analyze the impact of community participation in forest Development through the Joint Community Forest Resource Development program on the sustainability of forest resources and analyze the level of sustainability of forest resources with the implementation of the Joint Community Forest Resource Development program in economic, social, environmental, and institutional dimensions.

METHODS

The location of this research is in Sunyalangu Village, Banyumas Regency, Central Java Province. Sunyalangu Village is a pine tree production forest village. Cooperation between the community and Perhutani for production forest Development activities is accommodated in a community institution called the Forest Village Community Institution (LMDH) or the Pangkuan Hutan Village Unity Institution. LKDPH in Sunyalangu Village has the name LKDPH "Sustainable Forest". Through this LKDPH, Perhutani and the community make an agreement or cooperation agreement to drive the Joint Forest Resource Development Program with the Community (FRDC).

Data collection was carried out starting in 2024, not including several days before taking care of permits to enter the area of authority of the Perhutani agency and coordinating related to the implementation of research with the guidance of the research activity reference framework starting from the Banyumas KPH, BKPH, RPH and local community leaders as well as the head of the Sustainable Forest LKDPH Sunyalangu Village, Banyumas Regency.

The population of this study is the community of Sunyalangu Village, District, Banyumas Regency who are members of the LKDPH "Sustainable Forest" who are willing to work on Perhutani land or people who work as farmers working on Perhutani land. The number of population members is approximately 150 people (Han et al., 2018).

The selection of respondents in this study was carried out by purposive sampling, where the determination of sampling has a specific purpose and the sampling was done intentionally. This purposive sampling technique is also called judgmental sampling which is used by determining specific criteria for the sample. The specific criteria for the sample taken were farmers who were willing to work on Perhutani land in Sunyalangu Village, Central Java by becoming pine resin tappers and planting

vegetables and secondary crops under the pine trees. The results of field observations or case studies of the implementation of the Development program in Banyumas Regency, Central Java, the variables used in the study are as follows:

1) Independent (Free) Variables; Characteristics of individual forest farmers working on forestry land
2) Dependent Variable; Participation of forest farmers in maintaining the sustainability of economic, social, environmental and institutional aspects.

The indicators of the independent and dependent variables above are detailed in Table 1. The data obtained by the researcher through observation were analyzed in numerical form, by giving a score to each indicator of individual farmer characteristics, forest farmer participation, and the level of sustainability of forest natural resources. The questionnaire assessment in the study used a modified Likert scale with questions accompanied by four action choices that had possible answers. The score in this study used numbers 1 to 4 contained in each answer choice of each question asked. The score will be processed as a data value that will be tested for validity and reliability, then the correlation and regression are also calculated using the correlation and regression hypothesis test analysis with :

$$FRDC = \beta_0 + \beta_1 Eco + \beta_2 Soc + \beta_3 Env + \beta_4 Inst + e$$

Where;

FRDC : is FRDC program
β_{0-4} : the intercept.
Eco : Economics aspect
Soc : *Social Aspect*
Env : *Environmental Aspects*
Inst : *Institutional Aspect*
e : The error term

Individual characteristics, such as age, education, experience, and personal values, play a significant role in forest development (Datta & Sarkar, 2012). These characteristics influence decision-making, management practices, and the overall approach to forest conservation and utilization. Individuals with a strong understanding of economic principles can balance profitability with sustainable practices, ensuring long-term forest health and economic viability (Acheampong et al., 2019). Social forestry involves the management of forests for the benefit of local communities. It includes activities like community-based forest management and participatory forestry, which empower local people and improve their livelihoods (Chen et al., 2020).

Individuals with a strong environmental ethic and knowledge of sustainable practices can significantly contribute to minimizing the negative impacts of forestry activities and promoting ecological balance institutional frameworks, including laws, policies, and regulations, shape forest management practices (Adongo et al., 2019) Individuals who are well-versed in these frameworks can navigate the legal landscape effectively, ensuring compliance and advocating for policies that support sustainable forest development (Min et al., 2017).

Table 1. Research Variable Indicators

Independent Variable Indicators	Dependent Variable Indicator
1. Age	*Economic Aspects:*
2. School level	1. Tapping pine resin
3. Income level	2. Planting long-term crops
4. Number of family dependents	3. Planting short term crops
5. Long experience as a forest farmer	4. Following the thinning
	Social Aspects:
6. Area of cultivated land	5. The relationship between Perhutani employees and forest village communities
7. Participate in community organizations	6. Attend training or counseling

Independent Variable Indicators	Dependent Variable Indicator
8. Participate in training or counseling	7. Joining the arisan
9. Wife understands the role of community forests	8. Following security patrol
10. Dependence on forest resources	*Environmental Aspects:*
	9. Understanding the importance of preserving forest resources
	10. Knowing the techniques for tapping sap that meet conservation standards
	11. Knowing which plants are suitable or appropriate for the land
	12. Maintaining the main crops (pine trees) and intercrops (coffee, vegetables, secondary crops)
	Institutional Aspects:
	13. Have an open and trustworthy leader
	14. Attend coordination meeting invitations
	15. Dare to express opinions or suggestions if there are statements that are not quite right
	16. Comply with or agree to the rules

The type of research approach used is quantitative, namely research that is based on calculations of numbers or statistics. The data collection methods used in this study are surveys or field observations, interviews, and documentation related to aspects that widely appear in forest resource Development, namely economic, social, environmental, and institutional aspects.

RESULTS AND DISCUSSIONS

The results of the validity test of the research instrument of the characteristics of individual forest farmers with a significance level of 0.1 to 150 respondents from 10 questions taken using a questionnaire, there were 7 valid questions.

$$FRDC = 27.66009 - 0.00232\ Eco + 0.017248\ Soc + 0.0245\ Env + 0.0012\ Inst$$

While the results of the validity test of the research instrument of forest farmer participation in the FRDC program with a significance level of 0.1 to 150 respondents from 16 questions taken using a questionnaire, there were 9 valid questions. The results of the reliability test showed that all valid questionnaire items were reliable as calculated using Cronbach's Alpha where r count > r table.

As is known, the Joint Forest Resource Development program is a system that has rules that have been agreed upon together to ensure that forest resources can be utilized sustainably (Dhani Laksana & Shaferi, 2023). Therefore, the main factor that plays a role in it is the influence of the characteristics of local forest farmers on the participation of forest farmers in the FRDC program itself. The character of individual forest farmers is the nature, conditions, and situations that forest farmers have. Meanwhile, the participation of forest farmers is the driving force behind the development program (Ma & Gao, 2021). The participation of forest farmers that includes economic, social, environmental, and cultural aspects in the development program is an opportunity for the Development and utilization of forest resources to be sustainable (Min et al., 2017).

Sustainability of forest resources is influenced by the relationship and influence between individual characteristics of forest farmers on forest farmer participation (Y. J. Wang et al., 2019). Both the individual characteristics of forest farmers and the participation of forest farmers through the Development program in this study consist of a number of questions that are filtered through validity and reliability tests on 150 respondents. The questions that were tested for validity and reliability can be seen in Table 2.

In each question item, rxy or r count will be searched using the Pearson Product Moment formula (H. G. Wang et al., 2020). After the rcount number is known, then the r count number is consulted with the rtable number at a significance level of 0.1 with N = 150, namely the r table number is 0.306. Question items that have a larger rcount number than the rtable number, then the question item is said to be "valid". While question items that have a smaller rcount number than the rtable number, then the question item is said to be "invalid".

Furthermore each Valid variables are tested for reliability. The results of the reliability calculation using the Alpha formula . Then the r11 result number is consulted with the rtable number at a significance level of 0.1 with N = 150 where the rtable number obtained is 0.312. In the calculation reliability.The individual forest characteristic variable (X) obtained an r11 figure of 1.178. While in the calculation of the reliability of the forest farmer participation variable in the Development program (Y), the r11 figure was obtained as 1.1322. From the r11 results obtained for each variable, the r11 value was greater than rtable. Thus, the questionnaire instrument containing valid questions from the individual forest farmer characteristic variable and the forest farmer participation variable in the FRDC program was declared reliable and could be used to collect research data.

The characteristics of individual farmers in this study that met the validity and reliability tests were the number of family members, farming experience, area of cultivated land, participation in community organizations, participation in Development training or extension, wives understanding FRDC program , dependence on forest resources, and understanding the importance of maintaining forest resources. Meanwhile, the participation of forest farmers in this study that met the validity and reliability tests were the number of short-term crops planted, understanding of correct sap tapping techniques, participation in forest security patrols, participation in social gatherings, participation in forest Development training, participation in thinning, participation in coordination meetings, and the courage to express opinions or suggestions.

Table 2 Summary of Percentage of individual forest farmers Indicators (**Percent**)

No	**Valid Indicator of Variable X**	**Score**			
		1	**2**	**3**	**4**
1	Number of family dependents	1	8	60	32
2	Experience as a forest farmer	10	61	20	9
3	Area of agricultural land	2	8	23	67
4	Participate in community organizations	29	66	2	3
5	Attending Perhutani training or counseling	14	2	80	4
6	Wife understands the role of Perhutani	4	2	2	90
7	Dependence on forest resources	4	6	28	62

Table 3. Summary of Percentage of Development program Indicators (Percent)

No	**Aspect**	**Valid Indicator of Y Variable**	**Score**			
			1	**2**	**3**	**4**
1	Economy	Many types of short-term crops are planted	13	28	47	12
2	Economy	Following the thinning	17	26	53	4
3	Social	Attending an invitation to train forest Development activities	22	7	78	3
4	Social	Joining the arisan	12	5	3	82
5	Social	Following security patrol	2	6	88	4

No	Aspect	Valid Indicator of Y Variable	Score			
			1	2	3	4
6	Environment	Understanding the importance of preserving forest resources	1	4	15	80
7	Environment	Knowing the technique of tapping sap according to conservation principles	3	8	150	59
8	Institutional	Attend coordination meeting invitations	4	2	67	26
9	Institutional	Dare to express opinions or suggestions	3	5	88	4

Impact of Community Participation in Forest Resource Development

According to a literature study on the implementation of the Development program, forest farmer participation is influenced by the individual characteristics of forest farmers. Limited individual characteristics of forest farmers can cause limited or less than optimal participation of forest farmers (Le et.al 2020). The relationship between individual characteristics of forest farmers and forest farmer participation in the development program is calculated using a series of correlation hypothesis tests. While the influence between individual characteristics of forest farmers and forest farmer participation in the FRDC program is calculated using a series of regression hypothesis tests (Lowore et al., 2018).

The results of the correlation hypothesis test calculation obtained that the r value was 0.001635, so that the t count value was 0.016917. The error value was determined to be 0.1. The number of respondents was 110 people with df = n-2, so the t table was 1.648083. From the results of the calculation, it was found that t count < t table (0.017216 < 1.658682) so that Ho was rejected and Ha was accepted, but between the characteristics of individual forest farmers (X) and the participation of forest farmers in the FRDC program (Y) there was a negative relationship.

The study found a negative relationship between certain individual characteristics of forest farmers and their participation in forestry programs, suggesting that factors like older age, higher education, larger landholdings, or greater income levels may reduce engagement (Xiong et.al 2018) This could occur because older farmers may resist change, educated individuals might pursue non-farming livelihoods, wealthier landowners may not need incentives, or risk-averse farmers may fear uncertain outcomes.(Wang et,al 2020). Understanding these barriers is crucial for policymakers to tailor outreach strategies, such as offering flexible incentives, involving community leaders, or simplifying program requirements, to encourage broader participation and ensure the success of forest conservation or sustainable agroforestry initiatives (Le & Nguyen, 2020).

The results of the regression hypothesis test calculation obtained the equation Yt = 26.6789 - 0.00229 X, so that the t count was -0.01747. The error value was determined to be 0.1. The number of respondents was 110 people with df = n-2, so the t table was 1.657752. From the results of the calculation, it was found that t count < t table (0.017148 < 1.657752) so that Ho was rejected and Ha was accepted, but between the characteristics of individual forest farmers and the participation of forest farmers in the Development program had a negative influence.

If the relationship or influence between the characteristics of individual forest farmers on the participation of forest farmers are both negative, then it can be interpreted that there is a relationship or influence but it is very small or has almost no influence at all on the sustainability of forest resources, so that the initial hypothesis of this study is rejected (Ho is rejected Thus, the Development program implemented in Sunyalangu Village does not have a significant impact on the sustainability of forest resources. The sustainability of forest resources in Sunyalangu Village is almost unaffected by the existence of PT Perhutani's forest development program, due to the local wisdom of the community

regarding efforts to maintain the sustainability of forest resources which were still well maintained long before this Perhutani program existed.

When the program does not actively involve the local community in planning and implementation, it may fail to address their needs and leverage their traditional knowledge.(Cao,et.al 2014). This can lead to a lack of ownership and commitment to sustainable practices (Heubach et al., 2013). The level of sustainability of forest resources in four dimensions (economic, social, environmental, and institutional) in the implementation of the Development in Sunyalangu Village can be reviewed according to indicators in the individual characteristics of forest farmers and the participation of forest farmers in the implementation of the Development in Sunyalangu

When communities are involved, they are more likely to take ownership of forest conservation efforts. This leads to better protection and sustainable management of forest resources (Dinda et al., 2020). Village which have covered the four aspects. Based on the results of the correlation and regression hypothesis test values, it is known that the level of sustainability of forest resources in Sunyalangu Village as seen from the relationship between the characteristics of individual forest farmers and the level of participation of forest farmers is very small, which is 0.017147.According to the results of field observations, the cause of almost no relationship or influence between the characteristics of individual forest farmers on the participation of forest farmers in Sunyalangu Village is due to the local wisdom of the community regarding efforts to maintain the sustainability of forest resources which are still well maintained long before existed. The people of Sunyalangu Village who live and live in the forest area understand very well that the forest is the only source of livelihood that must be cared for and maintained. Given the limited infrastructure conditions, road access, and capabilities, many people choose to remain in the forest village area to manage forest products while still adhering to the principles of forest sustainability.

CONCLUSION

In this study, Factors that influence the sustainability of forest resources are the relationship and influence between the characteristics of individual forest farmers and the participation of forest farmers in the forestry Perhutani Program.

The development implemented in Banyumas District did not have a significant impact on the sustainability of forest resources. The importance of individual characteristics of forest farmers is the first concern in improving the development of forest resource activities. Although in the guidelines for implementing the Perhutani Forest Development , it has been stated that one of the requirements for the Forest Development Perhutani is that there must be a Participatory Village Assessment, it turns out that the reality of conditions and situations in the field are still obstacles that require tolerance so that the PDP can be implemented while the Perhutani activities is being implemented.

The sustainability of forest resources in Sunyalangu Village is almost unaffected by the existence of PT Perhutani's forest development, due to the local wisdom of the community regarding efforts to maintain the sustainability of forest resources which were still well maintained long before this Perhutani development existed.

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