Development of a Forest Village Agriculture Farmer Dependence Model on Forest Resources for The Creation of Sustainable Economic Prosperity in The Banyumas Forest Area, Central Java Province, Indonesia

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Abstract. Communities that live close to forests heavily rely on the resources found there. In the KPH Banyumas setting of Central Java, the research aims to determine the likelihood of choosing to work in the forest for income and characterize the elements that impact the decision to work for forest farming and forest village agricultural farmers. The study's findings suggest that, in the forest community, the choice of employment is influenced by the physical ability variable, but not by the risk or reward factors. The factors that impact the household income of Banyumas forest village farmers include age, labor hours, and the amount of land farmed. The number of dependents, education level, own land size, and non-forest family income factors all affect how dependent Banyumas forest village farmers are on forest resources. According to this research, it is also evident that the practice of purchasing and selling land leases that do not adhere to the regulations regarding the management period of forest areas for agricultural farmers' businesses has prevented the forest village community institution from serving as an ideal institution for village farmers.

1 Introduction

One type of social forestry is community forestry, which is defined by the Minister of Environment and Forestry's Regulation P.83 of 2016 on social forestry. According to Article 1, paragraph (1), social forestry is a sustainable system of forest management that is implemented in state or customary forests, with local communities or indigenous people managing the forests as the primary actors. Its goals are to improve socio-cultural dynamics, environmental balance, and welfare through the creation of Village Forests, Community Forests, People's Plantation Forests, Indigenous Forests, and Forest Partnerships.

According to [1] Community Forest is a kind of Sustainable Forest Management that is centered on the community and offers both ecological and economic advantages to the community. The local community gains from forest management efforts in a number of ways, including social and ecological (such as fostering a sense of community or mutual aid),

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ecological (such as providing a water source and preventing erosion), and economic (such as enhancing welfare and regional income). Community forests on Java Island are becoming an amazing environmental, social, and economic phenomenon. Data from the Ministry of Forestry's Directorate General of Land Rehabilitation and Social Forestry (RLPS) show that there is 3,589,343 Ha of community forests in Indonesia overall, with 2,799,181 Ha, or 78%, located on Java Island. According to BPKH Region XI statistics from 2019, the distribution's composition is as follows: 1.2 million Ha in West Java and Banten, 747,000 Ha in Central Java, 111,000 Ha in the Special Region of Yogyakarta, and 641,000 Ha in East Java.

Communities in Indonesian woods are now characterized by underdevelopment, poverty, and reliance. It is challenging for them to find work prospects due to a variety of inequalities, including rural areas far from the center of advancement, gaps in infrastructure, and low-quality human resources brought on by a lack of education. According to [2] generating extra revenue to promote the wellbeing of the local populations, forests need to help lessen economic inequality. Numerous communities surrounding the forest have become heavily dependent on forest resources due to the great value that these resources bring to their life and the difficulties in finding alternative forms of income outside of the forest.

The community's reliance on forest resources indicates that people who live close to the forest use the resources extensively as a source of income. Based on the aforementioned circumstances, this research will examine a number of topics, including (1) forest farmers' significant propensity to assign higher priority to paid employment than to unpaid employment. (2) A significant reliance on forest resources exists. Studying this issue is intriguing since the relationship between forest communities and forest resources affects household income and the need for sustainable forest management to minimize damage to the environment, ecology, and forests [3].

In the context of KPH Banyumas, Central Java, the research aims to: (1) identify opportunities for pursuing livelihoods in the forest; (2) characterize the factors that impact the decision to work in the forest and for village forest farmers; and (3) analyze and measure variables that affect income.

2 Research Method

A population sample from the Banyumas Forest community in the province of Central Java is used in this study. In the Banyumas forest area of Central Java, the research sample is split into four blocks: Semaya Block, Cibun Block, Kejubug Block, Karangtengah Block, Sunyalangu Block, and Walangsanga Block.

2.1 Types and Sources of Data

There are two categories of data used in this study: primary and secondary data with explanation:

1. To find out how the PHBM institution was formed, how successful it is, and how it affects the economy and ecosystem, primary data is collected straight from the field. Questionnaires, in-depth interviews with key informants, Focus Group Discussions (FGD) utilizing the Participatory Rural Appraisal (PRA) technique, and field observations are the methods used to collect this data. Respondent data (gender, age, education, employment, income, and duration of PHBM membership), information on stakeholder interests and influence, information on the household income of forest village farmers, and information on ecological perception make up the study's primary data.
2. Perum Perhutani, LMDH, and other study problem-related materials are the sources of secondary data. The study's secondary data sources include LMDH annual reports,

collaboration agreements between Perhutani and LMDH, PHBM activity reports, and rules pertaining to the PHBM system.

In this study, respondents and informants served as data sources. The households who live closest to the forest region are the respondents for the household income study, and there are fifteen major stakeholders. Four blocks make up the Banyumas forest village blocks: Walangsanga Block, Karangtengah Block, Sunyalangu Block, and Semaya Block. There will be 100 responders in each block, for a total of 400 responses. This study makes use of July through November 2022 data.

2.2 Data Processing and Analysis Method

The predominant qualitative descriptive methodology utilized in this study's research is bolstered by quantitative techniques [4]. Key informants are surveyed using the qualitative technique via qualitative descriptive analysis to learn more about the establishment of the PHBM institution and its efficacy in carrying out Perum Perhutani's joint ventures with the community. The income and institutional, economic, and ecological characteristics of the community taking part in the PHBM program are assessed using the quantitative technique.

The logistic regression equation model estimates the household's decision to pick forest work income as follows: f (reward, R; work risk, RK; household resource physical capability, KF) [5].

Regression models having probabilities ranging from 0 to 1 are called logistic models, or logistic regressions. [6] states that the logit model has the following conditions:

1. Independent variables are a mixture of discrete and continuous variables;
2. The data distribution used is not normal.
3. The advantage of logistic regression over other regression models is that the logit model does not have a normality assumption for the independent variables used in the model. This means that the explanatory variables do not have to have a normal distribution, be linear, or have the same variance in each group.
4. The independent variables in logistic regression can be a mixture of continuous, discrete, and dichotomous variables.
5. The logit model is used when the response distribution for the dependent variable is expected to be nonlinear with one or more independent variables.

The logistic model's interpretation or estimation displays the probability of an occurrence, represented by its percentage; this means that the value of the probability might vary from 0% to 100%. The logistic model displays the equation that follows:

$$Li = ln\ (Pi/(1-Pi)) = \alpha 0 + \alpha 1R + \alpha 2RK + \alpha 3KF + ei \quad (1)$$

P is the likelihood that a person will select a value for the dependent variable. 1. The following formula may be used to compute the value P:

$$Li = ln\ (Pi/(1-Pi)) = \alpha 0 + \alpha 1X1 + ei \quad (2)$$

2.3 Forest Farmer Household Income

The semi-logarithmic model using Ordinary Least Square (OLS) approach is used as the estimate model for the family income of forest farmers. the foundation for changing the equation into semi-logarithmic or semi-log form, in which the independent variable stays the same while the dependent variable is expressed in logarithmic form. This is carried out because to the semi-logarithmic model's ability to yield the most accurate model estimations and its relatively high accuracy [7]. This semi-log model demonstrates that alterations in X

inevitably cause Y to fluctuate proportionately or continuously in percentage. The family income function is in the form of:

Household income is equal to f (age, education, number of workers, kind of job, cultivated land area, social capital, and amount of time spent in forests and non-forests) [8]. The semi-logarithmic (semi-log) equation model that is employed is as follows:

$$LnPRT = \beta 0+\beta 1U+ \beta 2P+ \beta 3JAD+\beta 4CWH+\beta 5CWNH+\beta 6LLO+\beta 7NA+\beta 8MS \quad (3)$$

Note:
PRT : forest farmer household income
U : household head age
P : household head education
JAD : number of adult household members working
CWH : forest farming work time
CWNH : non-forest farming work time
LLO : cultivated land area
NA : asset value
MS : social capital
Ln : natural logarithm
β0, β1……. β8 independent variable coefficient parameters

2.4 Dependence on Forest Resources

Dependency on Forest Resources = f (family assets, income from non-forest sources, place of residence, level of education, number of adult household members not in the workforce, number of dependents, and availability to forest resources).

$$KSH = \gamma o + \gamma 1PNH + \gamma 2NA + \gamma 3LM + \gamma 4P + \gamma 5JT + \gamma 6AH + \gamma 7JR \quad (4)$$

Note:
KSH : dependence on forest resources
PNH : non-forest household income
NA : household asset
LM : own land area
P : education
JT : number of dependents
AH : access to forest resources
JR : distance

3 Result and Discussion

3.1 Economic and Ecological impacts

The contribution of community forest management initiatives to the household income of forest village communities is the economic impact discussed in this study. The following formula was applied in order to calculate the contribution of community forest management to the household income of forest village communities:

$$Pecentage\ Contribution\ Ecological\ Impact = \frac{Income\ Ecological\ Impact}{Total\ Income} x100\%$$

Using the community's perception approach and the Importance Performance examination (IPA) method, an examination of the ecological effect was conducted.

established the Importance Performance Analysis (IPA) approach, commonly referred to as quadrant analysis, to quantify the link between the importance of increasing product/service quality. Quadrant analysis and gap analysis are the two parts of the Importance-Performance Analysis (IPA) approach. Finding each product or service's average significance and performance rating is the first step in the quadrant analysis process [9].

$$\overline{Xi} = \frac{\sum_{i=1}^{k} Xi}{n} \qquad \overline{Yi} = \frac{\sum_{i=1}^{k} Yi}{n}$$

Note:

$\overline{Xi}$ = Average weight of performance rating for service/product i

$\overline{Yi}$ = Average weight of importance rating for service/product i

n = number of respondents

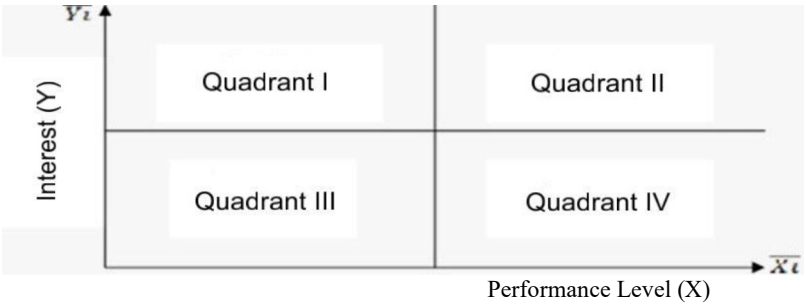

Fig. 1. Importance-Performance Analysis Quadrant

To ascertain each stakeholder's function within the community forest management system, mapping was done. Stakeholder analysis is divided into four quadrants: quadrant A (subject), quadrant B (player), and quadrant C (by stander).

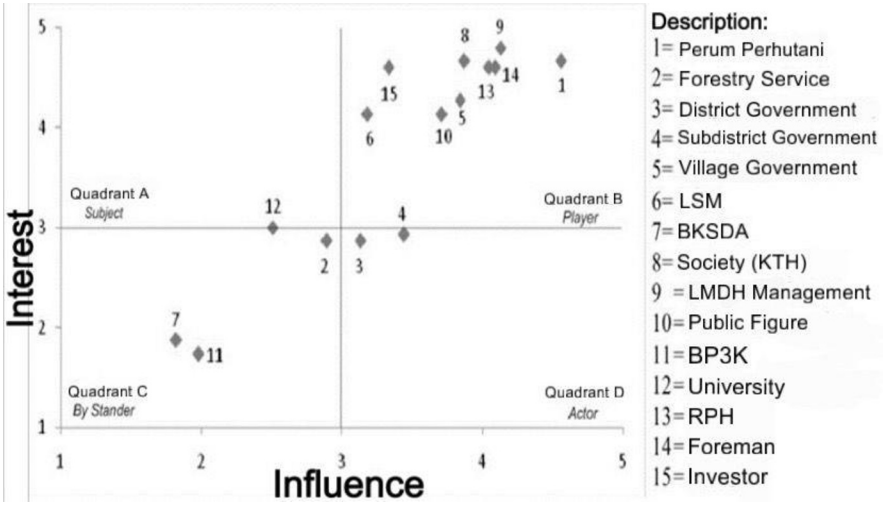

Fig. 2. Mapping each stakeholder of PHBM system in Banyumas

3.2 Estimation of the Dependency Model on Forest Resources

Dependency on forest resources is equal to f (household assets, income from non-forest sources, place of residence, education, number of adult household members who are not

employed, number of dependents, and availability of forest resources). This model's regression equation is as follows:

KSH = 0.73 - 0.00000012 PNH - 0.0000000018 NA - 0.000016 LM - 0.06 P + 0.03 JT - 0.01 AH + 0.00019 JR

With $\bar{R}2 = 0.17$

The outcome of the dependence model estimation on forest resources is as follows:

Table 1. Estimation Model of Dependence on Forest Resources

Variable	Coefficient	t-Statistic	Prob.
PNH	-1.21E-12	-2.2381	0.0452
NA	-1.76E-14	-0.25355	0.7904
LM	-1465E-12	-2.75783	0.0068
P	-0.076732	-2.47862	0.0241
JT	0.03565	2.16367	0.0523
AH	-0.14532	-2.73145	0.0075
JR	1.79E-12	0.49632	0.7133
C	0.845478	8.35673	0.0000
R-squared			0.325724
Adjusted R-squared			0.162412
F-statistic			4.735691
Prob(F-statistic)			0.000126

3.3 Hypothesis Testing

F-Test. This test is conducted to determine whether all independent variables together have a significant effect on the dependent variable. The hypothesis of this test is:

Hypothesis:

Ho: $\beta0 = \beta1 = \beta2 = \beta3 = \beta4 = 0$

H1: others

Ho is rejected if the computed F value > F table (0.05; k-1; n-k) or 4.64 > 2.09, indicating that the independent variables together have a considerable impact on the explained variable. This includes the claim that the following factors collectively have an impact on a family's dependence on forest resources: non-forest household income, asset value, land area held, education of the household head, number of dependents, access to forest resources, and distance.

T-value test. This test is carried out to determine whether the independent variables individually have a significant effect on the dependent variable. Using a two-sided (two tail) test, a confidence level of 95% or a-5%.

Hypothesis:

Ho: $\beta = 0$, independent variable has no effect on the dependent variable

H1: $\beta \neq 0$, independent variable has an effect on the dependent variable

The following is the estimation result on the model.

Ho, which indicates there is no influence on own land area (LM) and non-forest household income (PNH), is known based on the statistical t test. Denied are the education level of the family head (P), the number of dependents (JT), and the ability to utilise forest resources (AH). This is as a result of each of the aforementioned variable's statistical t value being higher than the t table value. Accordingly, the degree of reliance on forest resources is influenced by factors such as non-forest household income, own land area, the head of

household's education, the number of dependents, and access to the usage of forest resources. Out of the five variables that exhibit a partial significant effect, four of them match or correspond with the model's signs. However, one of the inappropriate estimation parameters, access to forest resources (AH), has a positive sign in the model but a negative sign based on empirical data.

Table 2. T-test of the Dependency Equation Model on Forest Resources

No	Variable	t-Statistic	H_o	Conclusion
1	Constant	8,86	Rejected	Significant
2	PNH	-2.1244	Rejected	Significant
3	NAS	-0.234351	**Accepted**	Not Significant
4	LM	-2.65572	Rejected	Significant
5	P	-2.25728	Rejected	Significant
6	JT	2.14325	Rejected	Significant
7	AH	-2.52346	Rejected	Significant
8	JR	0.435321	**Accepted**	Not Significant

t-table ($\alpha = 5\%$) of 1.980

3.3.1 Dependence of Forest Resources

According to research findings, the Banyumas and Banjarnegara districts' forest farmers rely heavily on forest resources. Among the causes of this illness are Poverty, education, a lack of employment options outside the forests, and the significant contribution of forest resources to household income are the first four factors. In this region, the vast majority of forest farmers continue to live in poverty. It makes sense that they would want to make the most of the natural resources that are now available, especially the forest resources. Numerous research on forest communities supports the idea that poverty is a cause of reliance on forest resources [10].

Low levels of education are another aspect that contributes to reliance on forest resources. In this area, elementary school is the primary educational background of forest farmers. Their competence and capacities as human resources (Human Capital) might be expected to be poor given their elementary school education. At the very least, education offers three benefits: Knowledge, values, and talents are the first three. The ability of human resources to find/create employment/business possibilities can be increased by utilizing these provisions. Education will improve household options (chances) to start other operations outside of agriculture and to enhance income/wages from the non-agricultural sector [11].

Additionally, according to [12], education boosts income transformation methods by giving families better access to technological knowledge and market options, allowing them to take advantage of new chances. Taking into account the aforementioned perspectives, it is evident that forest farmers in this region struggle to get chances or generate employment outside of their natural potential (forest). It appears that the low level of education among these forest farmers contributes to their children's lack of investment in human resources. The incapacity of forest farmers to invest in their children's human resources in this way will have an impact on how difficult it will be for their offspring to find employment and business opportunities outside of their community and avoid becoming ensnared in the same line of work as their parents, which is obtaining forest resources.

The scarcity of employment options outside of forests is another factor contributing to reliance on forest resources. The tiny percentage of family income contributions from the forest-to-forest farmers' households illustrates the limited employment alternatives. The significant influence that the forest has on the lives of the nearby forest communities contributes to their dependence on forest resources.

At least two major parties are involved in forest resource management: the people around the forest and forest managers, or the government. Consequently, given their heavy reliance on forest resources, plans for managing forest resources must be able to take forest village inhabitants' interests into account. Forest management policies be implemented in a way that takes the social, economic, and cultural requirements of forest village inhabitants into account.

3.3.2 Work income Choice Decision of Forest Farmers

The constant and physical capacity (KF) possessed by forest farmers is said to have a substantial effect on household decisions on employment for income, according to research findings. Its impact is detrimental, though. This implies that a household's decision to labor in the forest will decline when farmers are highly physically capable. If a household has a strong physical capability, they are more likely to decide against working in the forests. This indicates that, although having considerable physical potential, communities living in forest villages really do not prefer to labor in the forest. Compared to other forms of economic activity, laboring in the forest is really less profitable for them. But since they are limited to that, they will keep using forest resources, so that is what they do [13].

In the meantime, household decision probabilities are unaffected by job risks and rewards. This might mean that farmers don't think about incentives, or that their occupations as forest farmers occasionally pay nothing at all. The hazards associated with farming, especially forest farming, are typically ignored, and when they are, farmers typically don't quit up. It is theoretically possible to transfer risks. Called "insurance." Nevertheless, it appears that no insurance companies are prepared to assume the risks associated with farming operations as of now. Consequently, farmers are now accountable for any hazards that arise, and they often diversify their crop portfolios to lower risk.

The choice to work in the forest is a reflection of the factual fact that for village communities around the forest, forests serve as the primary source of family income, as demonstrated by [14], which indicated that a high participation rate in forest employment. The results of the study appear to be consistent with the economic practices of forest village farmers in the North Kedu KPH region, who often opt to labor in the forest since it provides their primary means of subsistence.

3.3.3 The Relationship of the Forest Income Work Decision Model, Household Income, and Dependency

The physical capacity variable, which is nothing more than land ownership assets, is known to be a variable that impacts the decision to pick income labor in the forest based on the findings of the first regression model estimation. This indicates that the community's propensity to choose to operate in the forest is stronger the more restricted the physical capacity owned. This makes sense given that a community's physical capability provides a source of money [15].

The community's anticipation of receiving revenue from labor in the forest is reflected in the decision to pursue forest income job. Research findings verify this fact, demonstrating that up to 66.81% of forest village farmers' total revenue comes from their labor in the forest. Consequently, choosing to work in the forest for cash is a sensible choice. Additionally, the estimate findings in the second equation model demonstrate that the amount of time spent working in the forest and the extent of forest farming are the variables that impact household income, with positive coefficients for both variables [16]. The first and second models' link is strengthened as a result. In the first model, individuals are more likely to choose to work in forests because they own physical capacity, but in the second model, the amount of time

spent working in forests and in the field of forest farming positively impacts the household income of farmers in forest villages [17].

The results of this study support the first model, which holds that the amount of time spent working in the forest and the processed area of forest farming influence the household income of farmers in forest villages, and both indicate greater choices for forest employment as compared to non-forest job.

Dependant on forest resources might result from working in the forest. Empirical evidence indicates that there is a comparatively high level of reliance on forest resources [18]. The factors of land ownership and non-forest income have a considerable impact on reliance on forest resources, according to the results of the third equation estimation. Both variables' coefficients are negative. This implies that a person's reliance on the forest decreases with increasing non-forest income and property ownership, and vice versa.

4 Conclusion and Suggestions

The study's conclusion is that the choice of job in the forest community is influenced by the physical ability variable. On the other hand, decisions about jobs are unaffected by risk and reward factors. Age, duration of service, and cultivated land size are the factors that affect Banyumas forest village farmers' household income.

Banyumas forest village farmers' reliance on forest resources is impacted by a number of factors, including the number of dependents, education, property ownership, and non-forest household income. Based on this research, it is also evident that land sales and rental practices that do not adhere to the management period rules for forest areas utilized for farmer agriculture have hindered the forest village community institution's ability to function as a village farmer organization.

In actuality, if a community of forest villagers has a strong physical capability, they generally do not prefer to labor in the forest. For them, engaging in other economic pursuits is more lucrative than laboring in the forest. Nevertheless, they persist in their efforts to get forest resources, since that is their only available option. Land ownership as a source of income for forest village farmers is crucial to the association between the first, second, and third models in relation to these three models. Therefore, Perhutani must supply forest agricultural land in order to guarantee the survival of forests and the wellbeing of communities.

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