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ECONOMIC VALUE OF CRITICAL LAND IN SEMPAYANG VILLAGE, NORTH KALIMANTAN

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Abstract

Land resources play an important role in supporting agricultural development. Land is a habitat of the growth of various kinds of vegetation as the provider for various food sources, so it is very important to do conservation for some critical land. Therefore some disasters such as floods, erosion and drought can be suppressed. One of negative impacts of the critical land disaster is a productivity decrease in farm. This study aims to identify the location of vulnerable areas of critical land and to examine the economic value of mitigation of vulnerable agricultural land in critical lands. Based on the results of the GIS analysis, the largest critical land area is in Malinau District. Almost all regions in Malinau Regency are vulnerable area of the critical land. The majority of respondents could pay between 26,000 - 30,000 IDR, which is 33.3%. Consumer surplus value is 2,520,000 IDR per person per year where farmers can produce 1-2 times a month or approximately 18 times a year. While the total economic value of farmers whose land is not critical land is 45,360,000 IDR.

Keywords: *Mitigation, dry land agriculture, contingent valuation method, agroeconomiec, border area.*

JEL classification: Q56

1. INTRODUCTION

The population continues to increase while the land area does not increase is a challenge for planners in planning optimal land use patterns and land management which of course still pays attention to economic, ecological, and sustainability functions (Turok & McGranahan, 2013; Mpanga, Tronstad, Guo, LeBauer, & Idowu, 2021). Land development will be very important when the function of the land will change to other functions. The higher the community's economic activity, the more land use will increase. Unfortunately, this is not followed by land cultivation as a provider of environmental services. Thus, the increase in the use of environmental services is not proportional to the maintenance of environmental quality, the benefits derived from environmental goods and services are limited because there are some limitations in the value of environmental goods and services (Geng, Tian, Sarkis, & Ulgiati, 2017; Freire-González, Decker, & Hall, 2017). The decline in productivity is felt because productive land is getting narrower due to land conversion, namely rice fields, and the global issue of increasing degraded land which has the potential to turn into critical land. One of the causes of the process of critical land is the increase in population using land as agricultural land by not paying attention to the principles of management of critical land for soil and water (Fang, et al.,

2022; Mulyani & Las, 2008). The increase in degraded land can occur due to the characteristics of the land that are vulnerable to any hazards, whether due to fire, pests, shifting cultivation, encroachment, overgrazing, or cultivation errors. Critical land occurs due to changes in land use from agricultural or forest land to non-agricultural or built-up areas so that the water absorption area is reduced which causes degraded land, drought, or critical clean water in the dry season, landslides, and floods in the rainy season (Gurgel, Reilly, & Blanc, 2021; Fang, et al., 2022). A combination of market, policy, and management failures, such as ambiguous property rights, distorted market prices, non-competition, and negative incentives that influence farmers' perceptions of the costs and benefits of controlling degraded land, is causing critical land to worsening (Tesfahunegn, 2018; Hermans & McLeman, 2021; Adenle, Boillat, & Speranza, 2022).

Several studies have shown an increase in the function of land which causes land degradation (Mirzabaev, Goedecke, Dubovyk, Djanibekov, Le, & Aw-Hassan, 2016; Indrihastuti, Murtilaksono, & Tjahjono, 2016; Tadesse, Suryabhagavan, Sridhar, & Legesse, 2017). The increase in population and economic activity has led to an increase in the function of land conversion. Then the cost of the inefficiency of degraded land as a provider of environmental services (Börner, et al., 2017; Pratiwi, Purnomo, Usman, & Gravitiani, 2018; Santoso & Ma'ruf , 2020). For example, estimating the annual cost of degraded land in Central Asian villages, due to land use and field changes between 2001 and 2009 is about 6 billion USD, mostly due to desert degradation (4.6 billion USD), deforestation (0.3 billion USD) USD) and abandoned agricultural land (0.1 billion USD) (Mirzabaev, Goedecke, Dubovyk, Djanibekov, Le, & Aw-Hassan, 2016).

There have been several attempts to quantify the costs of land degradation and several other studies have undertaken the valuation of environmental services, by measuring direct and indirect use values (Pratiwi, Purnomo, Usman, & Gravitiani, 2018; Admasu W. , Passel, Minale, Tsegaye, Azadi, & Nyssen, 2019; Arata, Diluiso, Guastella, Pareglio, & Sckokai, 2021). Every research shows community participation in reducing critical or degraded land's impact.

2. RESEARCH METHOD

Respondents in this study are dry land farming communities who are affected and or have potentially critical land, who have farming activities, both as landowners, both as landowners and workers, or as tenants. The number of respondents was 51 people (households/families) using the purposive sampling method. This sampling method is used with several considerations, namely providing criteria for the intended respondent (Sonnenberg, Riediger, Wrzus, & Wagner, 2012). Data collection was carried out by interviewing through a questionnaire. Information on the distribution of critical land uses Geographic Information System (GIS) analysis. While the estimation of total economic value uses the contingent valuation method (CVM) with a non-demand curve approach.

In the non-demand curve approach, there is a contingency valuation method. This method determines consumer preferences for the utilization of natural resources and the environment by expressing the willingness to pay (WTP) which is expressed in terms of money. The measurement of WTP is usually related to environmental quality and degradation by calculating the costs incurred by individuals to reduce the negative impact

on the environment due to restoration activities (Ebert, 2008; Sørensen, 2011; Feng, Liu, Zhang, & Casazza, 2021). Critical land disasters have a negative impact on farmers. The amount of loss to farmers is known from changes in agricultural productivity (Sarr, Ayele, Kimani, & Ruhinduka, 2021). The loss uses the following formula (Soeparmoko, 2006; Kolapo, Didunyemi, Aniyi, & Obembe, 2022):

$$\Delta Q_x = f(A \times \Delta P_t) \quad (1)$$

Description:
Δ : symbol of change
Qx : agricultural production
A : critical area
Pt : agricultural land productivity per hectare

The steps taken to determine the level of loss per farmer include: (1) Calculating the decline in agricultural production. (2) Calculating the area of agricultural land for each farmer. (3) Calculating the average loss of agricultural production.

3. RESULTS AND DISCUSSION

3.1 Identification of Distribution of Critical Land

Spatial analysis of the distribution of critical land in North Kalimantan Province was carried out by conducting secondary data. This data is the main data to see the critical level of land in North Kalimantan Province. In the data, there are 5 (five) classes of land criticality levels: Not Critical, Somewhat Critical, Potentially Critical, Critical and Very Critical.

From this class, 2 (two) criticality level classes (critical and very critical) were extracted to be used as data on the distribution of critical land in North Kalimantan Province. A preliminary spatial analysis was carried out with the aim of providing an overview of the spatial distribution of critical land spread over each district/city in North Kalimantan Province. Other spatial data used in this initial analysis are as follows:

1. Administrative Map of North Kalimantan Province
2. Road Network Map of North Kalimantan Province
3. Map of the North Kalimantan Province River Network
4. Topographic Map of North Kalimantan Province

The analysis results of the distribution of critical land areas on dry land are presented in the following table.

Table 1.
Recapitulation of the Distribution of Critical Land Areas

Location	Wide (Ha)
Bulungan	41,39
Malinau	541,08
Nunukan	119,99
Tana Tidung	0,00
Tarakan	0,00
Total	**702,46**

Source: BPS Kalimantan Utara, 2022

Based on the spatial analysis results, the total area of critical dry land agriculture in North Kalimantan Province is 702.46 Ha. Dry land farming belongs to the class of agricultural land use. The data in table 1 shows that the largest area of dry land agricultural land affected by critical land is in Malinau District with a total area of 541.08 hectares. Based on these data, detailed distribution was carried out in each sub-district in Malinau Regency for the area of use of dryland agricultural land affected by land criticality (Table 2).

Table 2.
Distribution of Critical Land per District

District	Wide(Ha)
Bahau Hulu	0,00
Kayan Hilir	17,98
Kayan Hulu	172,06
Kayan	19,64
Malinau	42,47
Malinau Kota	0,00
Malinau	0,00
Malinau	15,20
Mentarang	27,99
Mentarang	0,00
Pujungan	107,65
Sungai Boh	138,09
Total	**541,08**

Source: Data Processed, 2022

The areas that are affected and prone to critical land as a whole are due to a lack of nutrients. The majority of soil types in the area are loam/clay soils which are difficult to cultivate. In addition, former agricultural activities left by farmers just like that. The lack of information related to critical land mitigation and soil improvement efforts also contributes to the occurrence of critical land (Xu, et al., 2019; Löbmann, et al., 2022).

3.2 Estimation of the Economic Value of Critically Affected Agricultural Land

Data of identified PAPs can be analyzed to obtain the maximum average of PAPs and total economic value. Maximum average PAP that can be used as a new price for environmental recovery efforts due to critical land (Faccioli, Czajkowski, Glenk, & Martin-Ortega, 2020). The new price is at least higher than the current price, because respondents have understood the importance of economic and environmental values (Pratiwi, Purnomo, Usman, & Gravitiani, 2018; Admasu W. , Passel, Nyssen, Minale, & Tsegaye, 2021). The recapitulation of the PAPs selected by the respondents can be seen in table 3.

Table 3.
Willingness To Pay Farmers' Community

WTP (Rp)	Sum Res.	Percentage Res.
0	1	1,9%
Rp.5.000 - Rp.10.000	8	15,7%
Rp.11.000 - Rp.15.000	5	9,8%
Rp.16.000 - Rp.20.000	4	7,8%
Rp.21.000 - Rp.25.000	15	29,4%
Rp.26.000 - Rp.30.000	17	33,3%
>Rp.31.000	1	1,9%
Total	**51**	**100%**

Source: Data Primary, 2022

Most farmers have WTP values ranging from Rp.26.000 to Rp.30.000, which is 33.3%. Of the total respondents, there were those who had a WTP score of 0 (not willing to pay for land improvement efforts). This is because the costs incurred are considered expensive, respondents chose to donate their energy in efforts to mitigate critical land (Lerner & Rottman, 2021; Tyllianakis & Ferrini, 2021). So far, farmers have assumed that mitigating critical land is only the government's job (Ghanian, Ghoochani, Dehghanpour, Taqipour, Taheri, & Cotton, 2020).

Land resources have a big role in supporting agricultural development. The land is a habitat for the growth and development of various vegetation as a provider of various food sources so it is very important to do conservation, this is done in order to reduce disasters, be it floods, erosion, and drought (Snapp, 2017). One of the negative impacts of the critical land disaster is a decrease in farmer productivity (Zhu, Yang, & Zhang, 2021; Sarr, Ayele, Kimani, & Ruhinduka, 2021). The majority of farmers experienced a decrease in production in the range of Rp.0 - Rp.1.000.000, which was 39.2%. Followed by a decrease in production value between Rp.4.100.000 - Rp.5.000.000 by 25.5%. The rate of decline in production of more than IDR 5.000.000 was only 3 respondents.

Table 4.
Recapitulation of Decrease in Land Production

Production Decline	Sum Res.	Percentage Res.
Rp.0 - Rp.1.000.000	20	39,2%
Rp.1.100.000 - Rp.2.000.000	5	9,8%
Rp.2.100.000 - Rp.3.000.000	10	19,6%

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Production Decline	Sum Res.	Percentage Res.
Rp.4.100.000 - Rp.5.000.000	13	25,5%
>Rp.5.100.000	3	5,9%
Total	**51**	**100%**

Source: Data Primary, 2022

The level of loss to farmers due to critical land is the majority of 11-15% with a percentage of 31.4% of respondents. Then, as much as 29.4% of farmers suffered losses of 0-5%. As many as 19.6% of farmers suffered losses of 6-10% and 16-20%. The maximum loss suffered by farmers for now is 20%.

Table 5.
Farmer Loss Rate

Product derivation (%)	Sum Res.	Percentage Res.
0 -5	15	29,4%
6 - 10	10	19,6%
11 - 15	16	31,4%
16 - 20	10	19,6%
Total	**51**	**100%**

Source: Data Primary, 2022

From the calculation results obtained a consumer surplus value of Rp. 2.520.000 per individual per year or a consumer surplus per individual per production time of Rp. 210.000, - where farmers can produce 1-2 times a month or approximately 18 times a year. a year. The surplus obtained by farmers shows that the profits obtained by farmers in one harvest/production. This means that the Malinau District's agricultural sector provides greater and greater benefits than the costs they have to incur to enjoy the harvest. (Akinyi, Ng'ang'a, Ngigi, Mathenge, & Girvetz, 2022).

To obtain total economic value (Economic Total/ET), the surplus value per individual per year is:

ET = CS x Harvest

= 2.520.000 x 18

= Rp.45.360.000,-

So that the total economic value of the dry land agriculture sector in Malinau Regency is obtained Rp.45.360.000,-, with a total harvest period of 18 times a year. While the total expenditure (Total Expenditure / TE):

TE = Rp.350.450 x 18

= Rp.6.308.100,-

Total expenditure at one harvest / production of Rp.6.308.100,-.

4. CONCLUSIONS

Based on the results of the GIS analysis, the area with the largest critical land area is Malinau District. Almost all areas in Malinau District are vulnerable to being affected by critical land. The majority of respondents were able to pay between Rp. 26.000 - Rp. 30.000, which was 33.3%. The total economic value of farmers on their land that is not critically affected is Rp 45.360.000.

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