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Abstract. The agricultural sector is affected by climate change along with intensive farming. This thing causes land degradation and land productivity decline. This study aims to measure the level of willingness to pay (WTP) of farmer community for environmental improvements due to land degradation and to analyze the factors influencing the WTP. The research was conducted at Sempayang Village, Malinau District, North Kalimantan in March 2018. This location was chosen because it has the most critical land with an area 541.08ha, 77% of the total area of degraded land at North Kalimantan. By considering the limitation of time, cost and human resources, then in conducting the primary data collection it was only on 51 respondents using random sampling method. Contingent valuation method (CVM) used to determine the farmers' willingness to pay (WTP), while ordinary least square analysis used to analyze the factors affecting the WTP. To suppress the damaging effects of the critical land, farmers of the farmer community willing to pay IDR.21,296 per one production period, where the highest WTP was IDR.50,000. The factors affecting the WTP are the age, education, length of stay, status of land ownership and plan to move. Meanwhile the income, marital status, number of family members, main profession and soil conservation had the negative effects on WTP.

1. Introduction

The continuing increase in population and decrease in the area are becoming a challenge for planners in planning land use patterns such as optimal land management by still considering the economic, ecology and sustainability functions. The land development will be very important when it related to the change of the land function. The decreased of forested areas caused the decrease in carbon dioxide (CO_2) sequestration and lead to the increase of atmospheric CO_2 and climate change.

The Indonesian land resource has enormous potential and spread throughout Indonesia. In the Decree of the Ministry of Forestry No. 52/KptsII/2001, the guidelines for the implementation of watershed management are about the critical area which is an area that has damaged so that the land cannot be properly functioned as a production medium and a water system medium. From 2005 to 2013, the critical land area has decreased from 23,306,233 to 19,564,911 ha (during 2009-2013 period 61%) [1].

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Even though the critical lands in the recent years have decreased, the nature of the land resources are vulnerable to some varieties of damage whether caused by the fires, pests and diseases, shifting cultivation, encroachment, excessive grazing (*overgrassing*), as well as mismanagement. Thus, the critical land has a potential increase. The critical land caused by the change in land usage from the agricultural and forest land into the non-agricultural and building. It caused the decreasing of water absorbent areas, leading to the land degradation, drought or clean water shortages in the dry season, landslides and floods in the rainy season.

One of critical land occurred in the province of North Kalimantan. North Kalimantan has critical land of 702.46 ha spread throughout the district [2]. Without the rehabilitation program, their land will remain critical and a decrease in soil quality will increase, their land will remain critical and a decrease in soil quality will increase. The critical land condition data illustrated that these issues were still happening. Efforts made to deal with critical land produce several results, but it seems that the results are not comparable with the increase in the area of critical land that occurs.

One of the factors causing the critical land is the need for an agricultural practise, this practise usually not paying attention to the management principle of critical land and water resources [3].

In the previous studies, in rural areas the Blue Ridge Mountains, North Carolina Macon County, they used analytical methods that are a *willingness to pay* (WTP) of household communities for improving the environmental quality of the land use. The value of WTP households to participate in the improvement of the environmental quality has ranged from $ 10.97 to $ 21.79 per year per household [4]. Factors with positive and significant impacts were the income and knowledge, but the distance from the house to the location of the land with low quality and the length of stay lowered the value of WTP significantly [5].

Prasmatiwi et al used analysis method of Willingness to Pay (WTP) and the ordinal logit regression to analyze the factors affecting the value of WTP on coffee farmers to restore the environmental damage. The factors that may increase the willingness to pay (WTP) they are the areas of farming land, land productivities and the farmers' income [6].

Darwati and Suryanto used the same method for the mitigation of agricultural land against flooding. The average willingness to pay to the mitigation of flood-prone agricultural land was between IDR 51,000 - IDR 100,000. The results of multiple linear regression analysis showed that the variables of education, employment, family dependents, land prices and land areas affected the willingness to pay or willingness to pay (WTP) mitigation of flood-prone agricultural land in Purworejo [7].

In contrast, Suwarto et al used dryland farmers' participation in a land conservation as the model. This research model was analyzed using Activity Index Conservation and ordinary least squares (OLS). Factors that significantly affect farmers' participation in the land conservation were the number of family members who work, farmers' formal educations, ruminants, and extensive land holding. In this case the age of the farmer and the number of the family members had no significant effects on farmers' participation in the land conservation [8].

2. Research methods

Subjects in this study were the dryland farmer community whose land is critical and potentially critical. The location of this study was in The Sempayang Village, West Malinau Subdistrict, Malinau District of North Kalimantan Province. This location was chosen because it has the most critical land with 541.08 ha area, 77% of the total critical land in the province of North Kalimantan [2]. The constraints of time, cost, and effort, then the primary data collection conducted on 51 respondents. Data retrieval time is March 2018.

This study was conducted to determine how much the dryland farmer community's ability to pay for the restoration of the environmental quality, which was degraded, using the Contingent Valuation Method (CVM).

The Contingent Valuation Method (CVM) is a direct method on the sample survey with an appropriate population of willingness to pay (WTP) and willingness to accept (WTA) [9]. CVM is

used to measure the total value of individual consumers' willingness to pay for public goods under several hypothetical scenarios of the market [10]. This method can be used to (1) estimate the individual's WTP to hypothetical changes in the quality of economic activity; (2) assess trips with multiple destinations; (3) assess the pleasure of enjoying the environment for the resources user and non-resources users; (4) assess the undervalued goods.

WTP calculation usually associated with the increase of the quality and degradation environment by calculating the individual incurred a cost to reduce the negative impact on the environment as a result of development activities [11]. The synergy between the community and stakeholders is necessary besides improving knowledge of the environmental impact to improve the environmental quality. Therefore, it is important to know the factors affecting the farmers' willingness to pay in order to improve the quality of the environment due to the degraded land.

Analysis of the factors that affect the amount of the farmers' willingness to pay (WTP) in The Sempayang Village had been done using multiple linear regression analysis with the following equation:

$$WTP = \beta_0 + \beta_1 INC + \beta_2 AGE + \beta_3 EDUC + \beta_4 LS + \beta_5 FAM + \beta_6 WORK + D_1 MAR + D_2 OWN + D_3 CON + \varepsilon \quad (1)$$

Where: WTP is for respondent WTP Value (Rp); β_0 is for intercept; β_1,..., β_6 is the Regression Coefficient; D_1... D_4 is for Dummy; INC is for Income (Rupiah); AGE is for Age (years); EDUC is for Period of Study (years); LS is for Length of Stay (Year); FAM is for number of family members (person); WORK is for Type Work (Force); MAR is for Marital Status (married D = 1 and D = 0 Other); OWN is the Status of Land Ownership (D = 1 is proprietary and D = 0 otherwise); MOVE is for Moving Plan (D = 1 plans to relocate and D = 0 otherwise); Procs is for Soil Conservation Activities (D = 1 and D = 0 no-no); ε is for error term.

3. Results and discussion

3.1 Farmers' willingness to pay (WTP) as the environmental restoration efforts

The identified WTP data can be analyzed to get a maximum average of WTP and total economic value. The maximum average of WTP used as a new price for the environmental restoration efforts, due to the critical land. The new price is at least higher than the current set price because the respondents have understood the importance of the economy and environmental value.

The average of maximum farmers' WTP (*Average of Maximum Willingness to Pay*) was IDR 21,196. This meant that the price was lower than the average price the farmers spent for the land restoration activities, that was IDR 58,000. This could be concluded that the farmers' interest in the restoration efforts due to the critical land still lack.

3.2 The Result of Regression Analysis

A classical assumption Test used normality, heteroscedasticity and multicollinearity. The autocorrelation test was eliminated because the model used was not the time series model. The linearity test was also eliminated because the assumptions used on the model make a linear relationship in each independent and dependent variables. The research model has passed the classical assumption test. Where the value of adjusted R2 is 0.52, shows that this equation is good; F is statistic value that is 0.0004, it could be concluded that the estimated regression model could be used to explain the effects of independent variables on the dependent variables.

The regression results revealed that in general, the independent variable has no significant effect. Only Occupation coefficient and Land Ownership Status coefficient has significant to improve the land quality and prevent the land degradation. This is the same as previous research conducted by Suwarto et al (2012) [8].

The coefficient of Occupation was negative. This meant if the farmers have more types of occupation, the farmers WTP will lower. The occupation variables had significant effects on the changes of the WTP value. The farmers who have a side job would not focus on the land restoration.

The coefficient of Land Ownership Status (dummy) is positive. The average WTP of farmers who owned the land ownership status is greater than the farmers whose didn't has. Farmers with land ownership status are more concerned with land than farmers who rent land. Farmers with land ownership status will make several efforts to improve land quality and prevent land degradation.

Table 1. Regression Results

Variable	Coefficient	P> | t |	Description
Income	-0.007	0.424	No Significant
Age	1.812	0.786	No Significant
Education	27.554	0.152	No Significant
Length of Stay	4.436	0.447	No Significant
Number of Family Members	- 0.705	0.960	No Significant
Work	-397.997	0.000	Significant
Marital Status	- 16.296	0.403	No Significant
Status Land Ownership	33.015	0.006	Significant
Plan to Move	20.107	0.328	No Significant
Soil Conservation	- 8.391	0.405	No Significant

Source: Processed Data, 2018.

4. Conclusion

Land resources have a major role in supporting the development of agriculture. The land is a habitat and food source provider of various vegetation. It is very important to do a conservation in order to reduce disasters such as flood, erosion, and drought. The results showed that the value of the farmers' willingness to do the land conservation is high, this means that the level of public awareness in mitigating the impacts of climate change has been increased.

Acknowledgments

We thank the Ministry of Research, Technology and Higher Education for the funding for this research. And many thanks to the community of Sempayang Village, especially to Mr. Alfius and Mr. Nurgianto as the coordinator of the farmer. Also to my team survey for collecting the data.

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by Evi Gravitiani

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LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : ***PROSIDING*** *

Judul Karya Ilmiah (paper)	:	Farmers Willingness to Pay for the Environmental Restoration of the Critical Land at North Kalimantan		
Jumlah Penulis	:	4 Orang (SR Pratiwi, E. Purnomo, S. Usman, **Evi Gravitiani**)		
Status Pengusul	:	~~Penulis pertama~~ / penulis ke 4 / ~~penulis korespondasi~~**		
Identitas Prosiding	:	a. Nama Prosiding	:	**International Conference on Climate Change 2018**
		b. ISBN/ISSN	:	-
		c. Tahun Terbit,Tempat Pelaksanaan	:	**Solo, 27 - 28 November 2018**
		d. Penerbit/organiser	:	**IOP Publishing**
		e. Alamat repository PT/web prosiding	:	https://iopscience.iop.org/article/10.1088/1755-1315/200/1/012015/pdf
		f. Terindeks di (jika ada)	:	

Kategori Publikasi Makalah (beri ˇ pada kategori yang tepat) : ☒ Prosiding Forum Ilmiah Internasional .....
☐ Prosiding Forum Ilmiah Nasional .....

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b.	Ruang lingkup dan kedalaman pembahasan (30%)	4.5		4.5
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b. Ruang lingkup dan kedalaman pembahasan :
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Surakarta, 9 Desember 2020

Reviewer 1 **

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*Dinilai oleh dua Reviewer secara terpisah
**Coret yang tidak perlu

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LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : ***PROSIDING** **

Judul Karya Ilmiah (paper)	:	Farmers Willingness to Pay for the Environmental Restoration of the Critical Land at North Kalimantan		
Jumlah Penulis	:	4 Orang (SR Pratiwi, E. Purnomo, S. Usman, **Evi Gravitiani**)		
Status Pengusul	:	~~Penulis pertama~~ / penulis ke 4 / ~~penulis korespondasi**~~		
Identitas Prosiding	:	a. Nama Prosiding	:	**International Conference on Climate Change 2018**
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		e. Alamat repository PT/web prosiding	:	https://iopscience.iop.org/article/10.1088/1755-1315/200/1/012015/pdf
		f. Terindeks di (jika ada)	:	

Kategori Publikasi Makalah (beri ˇ pada kategori yang tepat)
: ☒ Prosiding Forum Ilmiah Internasional .....
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Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai		Nilai Maksimal **Prosiding 15**		Nilai Akhir Yang Diperoleh
		Internasional ☒	Nasional ☐	
a.	Kelengkapan unsur isi paper (10%)	1.5		1
b.	Ruang lingkup dan kedalaman pembahasan (30%)	4.5		4
c.	Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	4.5		4
d.	Kelengkapan unsur dan kualitas terbitan/prosiding (30%)	4.5		3
Total = (100%)		**15**		**12**
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b. Ruang lingkup dan kedalaman pembahasan: Studi ini bertujuan untuk menghitung kesediaan membayar (WTP) komunitas petani untuk perbaikan lingkungan sebagai akibat degradasi lahan yang dilakukan di Desa Sempayang, Kabupaten Manilau, Kalimantan Utara. Hasil penelitian WTP menunjukkan petani mau membayar Rp 21.296 per periode produksi dimana tertinggi Rp 50.000 (skor=4)

c. Kecukupan dan pemutakhiran data/informasi dan metodologi : Data yang dipergunakan dalam penelitian ini cukup mendalam yakni data primer dengan metode penilaian valuasi dan ekonometri (skor =4)

d. Kelengkapan unsur dan kualitas terbitan : Konferensi yang diikuti cukup bermutu yang dilaksanakan setiap tahun yang dilakukan oleh IOP (skor=3)

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f. Kesesuaian bidang ilmu: Sangat sesuai bidang ekonomi terutama dalam bidang ekonomi pembangunan

Surakarta, ..04 DEC 2020.....

Reviewer 2*

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