Willingness to Pay for Critical Land

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Abstract: The purpose of this research is to analyze the farmers', and to identify the factors influencing the farmers' Willingness to Pay (WTP) in reducing the impact of critical land. The research method used to calculate the farmers' willingness to pay the land restoration is the Willingness to Pay (WTP) Method, and The Ordinal Logistic Regression Method was used to analyze WTP's influencing factors. The result showed that the farmers' Average of Maximum Willingness to Pay is Rp. 21.196.-. This means that the farmers' Average of Maximum Willingness to Pay is lower than the average cost incurred by the farmers for the land restoration activity, which is Rp. 58.000.-. This indicated that the farmers' awareness of the efforts to do critical land restoration is low. The independent variable with the significant influence is the OWN (the Status of the Land Ownership) variable. The other variables that the logit coefficient is positive are income, age, education, long stay, family numbers, and status of land ownership. Then the variables that the logit coefficient is negative are marital status, occupation, and land restoration activity.

1 INTRODUCTION

Changes in land use and management reflect the dynamic activities of the society so that the more rapidly the dynamics take place, the faster the changes in land use and management (Sandy, 1992). The higher the economic activities of society will increase land use. Unfortunately, this is not followed by the land cultivation as the provider of environmental services. Thus, the increased use of the environmental service is not proportional to the maintenance of the environmental quality, and the benefits got from the environmental goods and services are limited because there is some limitation in environmental goods and services value (Bonnieux and Goffe, 1997). The decrease of productivities perceived because of the productive field narrower as the effect of the overland function i.e., rice field, moreover global issues about the increasing of the degraded land that potentially turns into a critical land. One of the causal factors of the process of the critical land is the increase of population that using the land as farm cultivation by giving no interest for the principal of the critical land management for land and water (Mulyani and Las, 2008).

The increasing of the degraded land can occur because of the characteristic of the land, which is susceptible to any harm, whether due to wildfire, pests, shifting cultivation, encroachment, overgrazing, or mistakes in cultivating. The critical land is occurred due to the change in the land use in Indonesia from farm or forest areas to be the non-farm or built-up areas, so the water-absorbing areas are reduced that causing degraded land, drought, or critical clean water in the dry season, landslide, and flood in the rainy season (Haryanto et al., 2007; Acharya A and Kafle N 2009). The combination of the market failure, the policy and management, such as the ambiguous of the ownership rights, the market price distorted, non-competition, and the adverse incentive that affect the farmers' perception of the cost and the benefits of the controlling degraded land, cause the critical land to be more severe (Coxhead, 1996).

Some researches show the increasing of the overland function that causing the degraded land (Ramayanti et al., 2015; Mirzabaev et al. 2016; Tadesse et al., 2017). The population increase and the economic activities cause an increase in the overland function. Then the inefficiency cost of the degraded land as the provider of the environmental services

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(Yesuf et al. 2007; Deng & Li 2016). Taking for example, estimating the annual cost of the degraded land in the Mid Asia's villages, due to the land use and the change of the field in between 2001 and 2009 is about 6 billion USD, largely due to the desert degradation (4.6 billion USD), followed by the desertification (0.8 billion USD), deforestation (0.3 billion USD) and the abandon farm field (0.1 billion USD) (Mirzabaev et al 2016).

There have been several attempts to measure the cost of soil degradation, and several other studies have undertaken the valuation of the environmental services, by measuring direct and indirect use values (Cho et al., 2005; Cho et al., 2008; Prasmatiwi et al, 2011; Suwarto et al, 2012). Each research showed the society's participation in reducing the impact of the critical land or the degraded land.

This research is conducted to find out how much the farmers' interest, and to identify the influencing factors of how much the farmers' willingness to pay (WTP) in reducing the impact of the critical land.

2 RESEARCH METHODS

The research method used was CVM (*contingent valuation method*). *Contingent Valuation Method* (CVM) is a direct survey method to the samples that are suitable with a *willingness to pay* (WTP) and *willingness to accept* (WTA). CVM has two benefits comparing to the indirect method. First, CVM can take two values at once. Use value as a non-use value. Second, the answers from CVM's questions related to WTP or WTA can be directly corrected by the theory with the monetary measure on it is level changes (Lee, 1999).

CVM was used to measure the total values of individual consumer willingness to pay public goods under several market hypothesis scenarios (Miller et al., 2011). This method was used because it can (1) estimating individual WTP on the changes of hypothesis related to the quality of economic activities; (2) evaluating a trip with many destinations; (3) judging the convenience of using the environmental resources by the direct or indirect users; (4) estimating goods valued too low.

The WTP measurement is usually related to the environmental quality and degradation by calculating the cost that an individual spent to reduce the negative impact on the environment due to restoration activities (Hoevenagel, 1996; Tanrivermis, 1998; Veisten et al. 2004). The synergy between society and stakeholders is needed to elevate the environmental quality. Besides, improving knowledge of environmental effects is also necessary. Thus, it is a need to know the factors affecting farmers' willingness to pay in order to restore the quality of the environment due to the critical land.

This method assisted when doing economic valuation analysis of critical land in the dried farm field in Sempayang Village Malinau Barat District, Malinau Regency, North Kalimantan Province. The economic valuation was conducted through WTP (Willingness to Pay) approach. The value amount of WTP was obtained from the bidding game method.

Selecting the samples was done when collecting data through interviews and questionnaires. The sample target in this research is farmers who have farming activities, whether as the landowners, as both the landowners and the workers, or as the tenants.

This research location to take the samples was decided based on the landowners that have the largest critical land with width land 541,08ha, 77% of the width total of the critical land in North Kalimantan Province.

Analyzing the factors affecting how big the farmers' willingness to pay was done using ordinal logistic analysis, with the following formula:

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

Where: WTP is the respondent's WTP value (Rp); β0 isIntersep; β1,..., β6 is regression coefficient;

D1....D4 is Dummy; INC is Income (Rupiah); AGE is age (year); EDUC is Education length (year); LONG is long stay (year); FAM is number of family members (people); WORK is kind of occupation (activity); MAR is Marital status (D= married and D=0 others); OWN is Landowner status (D=1 is own and D=0 other); PROCS is land restoration activities (D=1 yes and D=0 no); ε is *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 that can be 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 economy and environmental value. The average of maximum farmers' WTP (Average of Maximum Willingness to Pay) was Rp. 21.196,- . This meant that the price was lower than the average price the farmers spent on the land restoration activities, that was Rp.58.000,-. This could be concluded that the farmers' interest in the restoration efforts due to the critical land still lacks.

3.2 The Farmers' WTP and The Influencing Factors

To estimate the WTP function, the researcher used the ordinal logistic regression model because the dependent variables had the ordinal scale. This method was used to examine how far the log odds' change from some cases when the change of the independent variables happened. The dependent variables used in this regression were WTP (Willingness to Pay), which had seven levels where each with 1, 2, … and 7. The use of the logistic regression method was meant to examine the influence of the independent variable on the probability of farmers' willingness to pay the WTP on a certain relative scale compared to another scale. This method was considered relevant enough to describe the valuation pattern of farmer economic value in the Malinau Regency.

In the estimation processing of the logistic method, the iterative-reweight least square algorithm process was used to get the parameter estimation through maximum likelihood estimation. If the dependent variable of the WTP method is an ordinal variable, then the independent variables consisted of covariant (continuous variable) and factor (nominal variable). The estimation result of this method can be seen in table 3, and the descriptive statistic value for the method variables can be seen in table 1.

Tabel 1. The Description of Reseach Variable Statistic

Variable	Mean	Std. Dev	Minimum	Maximum
WTP	5.431373	1.688252	0	50000
Income (INC)	15.13195	0.7345967	2500000	8000000
Age (AGE)	37.31373	10.51568	19	60
Education (EDU)	8.705882	3.015255	0	12
Marital Status (MAR)	0.8627451	0.3475404	0	1
Long Stay (LONG)	6.705882	6.435197	1	30
Land Ownership Status (OWN)	0.5294118	0.5041008	0	1
Number of Family Member (FM)	3.647059	1.764353	1	8
Occupation (Activity)	1.019608	0.140028	1	2
Land Restoration Activity (PROC)	0.7058824	0.460179	0	1

Source: Processed Data, 2018.

Table 1 explains that the standard deviation value of each variable was fewer than the average value of each variable. This indicates that the spread data about respondent answers for each variable was good.

Tabel 2. The Estimated Result of the Ordinal Logistic Regression Method on WTP Method

No.	Independent Variable	Coefficient	Z	P > | z |	Odds Ratio (OR)
1	Income (INC)	0.2355	0.63	0.528	1.26
2	Age (AGE)	0.0050	0.14	0.890	1.00
3	Education (EDU)	0.0883	0.93	0.351	1.09
4	Marital Status (MAR)	-1.7105	-1.48	0.139	0.18
5	Long Stay (LONG)	0.1085	1.40	0.162	1.11
6	Land Ownership Status (OWN)	2.1164	2.85	0.004	8.30
7	Number of Family Member (FAM)	0.1327	0.55	0.585	1.14
8	Occupation (WORK)	-61.0827	-0.00	1.000	1.97
9	Land Restoration Activity (PROC)	-0.57886	-0.94	0.346	0.56

Source: Processed Data, 2018.

Based on the estimated result, the value of the prob<chi2 was 0,0000. This indicated that the independent variables of the WTP method overall significance influencing the dependent variables. On

table 3, there can be seen that only one independent variable significantly influencing the WTP method, which is the land ownership status (OWN). That is shown by the p-value, which was under α (5%). Meanwhile, the other variable p-value shows that almost all of the variables have P >|z| value above α (0,05). It means that the variables had no significant effect on the WTP method.

By resulting in the variant value of the samples, the OWN variable was also the most influential variable of farmers' WTP value because it had the biggest z characteristic i.e., 2,85. The pseudo value of R2 was 0.1760. That means the influence of the independent variable on the WTP method is 17,6%. The influencing variables were shown on the OR value that equal to 1. The OR value greater than 1 indicated that the independent variable had a negative effect.

The regression coefficient value for the INC variable of 0.2355 with the p-value = 0.528 indicated that the INC variable had no significant effect because the p-value was greater than α (0,05). The regression coefficient value was 0.2355, and this means that any change of the INC variable unit will increase the logit value or the WTP log odds as much 0.2355 units. The OR value of the INC variable was 1.26. This can be concluded that any change of 1 INC variable unit, ceteris paribus, will result in an increase of 26%WTP odds.

The coefficient of the AGE variable of 0.0050 with the p-value = 0.890 indicated that the AGE variable had no significant effect on the WTP. The 0.0050 coefficient value with the OR value equal to 1 indicated that the AGE variable had no effect on the WTP. This means that both older and younger farmers did not differ in paying WTP.

The EDU variable had no significant effect indicated by the p-value of 0.351. It had a positive effect on education, only 9%, shown by the OR value of 1.09. This means that high education will improve insight and knowledge about the importance of environmental restoration. Then a good environment will be created.

The coefficient of marital status variable (dummy) of -1.7105 indicated that the average WTP to the married farmers was fewer than to the unmarried farmers of 1.7105. However, the variable had no significant effect on the WTP value. If it is based on the OR value of 0.18, this figure indicated that the odds of WTP was paid by the married farmers of (0.18-1) 100% = -82% compared with the unmarried farmers. The negative sign on the odds difference indicated that WTP paid by the married farmers tend to be lower than that of the unmarried farmers.

The LONG variable coefficient of 0.1085 with p-value = 0.162 indicated that the LONG variable had no significant effect on the WTP. The OR value of 1.11 means that the LONG variable had a positive effect and increased the WTP by 11%. The positive effect means that the longer the peasant farmers occupy their occupancy, the higher the value of the farmers' WTP. The length of stay in the dwelling place caused the farmers to be more familiar with the condition of the surrounding land. It is because the farmers commonly lived near their farm fields. The length of stay variable had a significant effect on the amount of WTP.

The OR value of positive OWN variable (dummy) showed the OR value greater than 1 and had a significant effect (p-value > α 5%). This means that the average of farmers' WTP with the landowner status was greater than those of the farmers with the tenant status. The farmers who own the land tend to pay more attention to the land. They will seek to restore and prevent the damage of the land.

The coefficient of FAM variable of 0.1327 with p-value = 0.585 indicated that the FAM variable had no significant effect on the WTP. The OR value of 1.14 indicated that the FAM variable had a positive effect. This means that the addition of family members can lower the WTP value. The greater number of the family member, it will reduce the willingness to pay the effort of the environmental restoration due to the finance allocation of the family income.

The coefficient of the WORK variable of -61.0827 with the p-value > α (0,05) indicated that the WORK variable had no significant effect. The coefficient of the WORK variable had a negative logit coefficient. This means that if a farmer had various occupations, then his WTP will reduce. The various occupations the farmers did besides doing farming will distract the farmers' focus from the land restoration efforts.

The coefficient of the negative land restoration activity variable (dummy) indicated that the average WTP of the farmers' that doing the land restoration activities was greater than that of the farmers' doing no land restoration activity. The farmers doing the land restoration activities were more aware of the impact felt, so they tend to make the prevention efforts.

4 CONCLUSION

The survey with contingent valuation (CV) method as one of the economic valuation methods of

environmental effect, in general, can be applied well in estimating farmers' WTP in the role reducing the critical land with the land restoration activities. The farmers' Average of Maximum Willingness to Pay of Rp. 21.196,-, was lower than the average cost the farmers spent in the land restoration activities i.e., Rp.58.000,-. This indicated that the farmers' awareness of the restoration efforts to the critical land was lack.

The independent variable having some significant effect is the OWN variable (the land ownership status). Meanwhile, the variables with positive logit coefficients are the income, the age, the education, the length of stay, the number of family members, and the land ownership status variables. The marital status, occupation, and land restoration activity variable have negative effects.

The Average of Maximum Willingness to Pay is shown lower than the cost the farmers spent. This indicates the low participation of the farmers in doing the environment restoration to the critical land. Thus, improving knowledge and insight into the critical land impact is needed so the farmers' WTP can increase. Besides the knowledge of the impact, the information about land restoration aspects is also important. As a result, the farmers are expected to do the restoration of the environmental quality independently.

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REFERENCES

Acharya A and Kafle N 2009 Land degradation issues in Nepal and is management through agroforestry The journal of agriculture and environment 10 pp115-123

Bonnieux F and Goffe P L 1997 Valuing the benefit of landscape restoration: A case study of the cotentin in Lower-Normandy France Journal of environmental management 50

Cho S-H, Newman D H and Bowker J M 2005 Measuring rural homeowners' willingness to pay for land conservation easements Forest Economics and Policy 7 pp757-770

Cho S-H, Yen S, Bowker J M and Newman D H 2008 Modeling willingness to pay for land conservation easements: treatment of zero and protest bids and application and policy implications, Journal of agricultural and applied economics 40 pp267-285

Coxhead I 1996 Economic modeling of land degradation in developing countries Agricultural and applied economics staff paper series (USA: University of Wisconsin-Madison)

Deng X and Li Z 2016 Economics of land degradation in China Economics of land degradation and improvement – a global assessment for sustainable development Springer International Publishing pp385-399

Haryanto E T Herwanto T dan Kendarto D R 2007 Perubahan bentuk penggunaan tanah dan implikasinya terhadap koefisien air larian DAS Citarum Hulu Jawa-Barat Jurnal Bionatura 9 pp1-15

Hoevenagel R 1996 The validity of the contingent valuation method: perfect and regular embedding Environ. Resour. Econ. 7 pp57-78

Lee J A 1999 Natural resources and environmental economic 2nd Edition (London: Pearson Education Limited)

Miller K M, Hofstetter R, Krohmer H and Zhang Z J 2011 How should consumers' willingness to pay be measured? an empirical comparison of state-of-the-art approaches Journal of Marketing Research 48 pp172-184

Mirzabaev A et al 2016 Economics of land degradation in Central Asia Economics of land degradation and improvement – a global assessment for sustainable development Springer International Publishing pp261-290

Mirzabaev A et al 2016 Economics of land degradation in Central Asia Economics of land degradation and improvement – a global assessment for sustainable development Springer International Publishing pp261-290.

Mulyani A dan Las I 2008 Potensi sumber daya lahan dan optimalisasi pengembangan komoditas penghasil bioenergi di Indonesia. Jurnal Litbang Pertanian 27 pp31-41

Prasmatiwi F E, Irham, Suryantini A and Jamhari 2011 Ketersediaan membayar petani kopi untuk perbaikan lingkungan Jurnal Ekonomi Pembangunan 12 pp187-199

Ramayanti L A, Yuwono B D, Awaluddin M 2015 Pemetaan tingkat lahan kritis dengan menggunakan penginderaan jauh dan sistem informasi geografi (studi kasus: Kabupaten Blora) Jurnal geodesi 4 pp200-208

Suwarto, Suwarto, Anantanyu S 2012 Model partisipasi petani lahan kering dalam konservasi lahan Jurnal Ekonomi Pembangunan 13 pp218-234.

Tadesse L, Suryabhagavan K V, Sridhar G, Legesse G 2017 Land use and land cover changes and soil erosion in Yezat Watershed, North Western Ethiopia International soil and water conservation research 5 pp85-94.

Tanrivermis H 1998 The willingness to pay (WTP) and willingness to accept (WTA) measures in Turkey: may the WTP and WTA indicators to share the environmental damage burdens: case Sandy I M 1992

Watersheds, ecosystems and land use Integrated watershed management workshop in Indonesia (Bogor; IPB)

Veisten K, Hoen H F, Navrud S and Strand J 2004 Scope insensitivity in contingent valuation of complex environmental amenities J. Environ Manage 73 pp317-331

Yesuf M, Mekonnen A, Kassie M and Pender J 2007 Cost of land degradation in Ethiopia: a critical review of past studies (Ethiopia: Environmental economics policy forum for Ehtiopia/ EEPFE) tudy Journal of Economic Coorperation Among Islamic Countries 19 pp67-93