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Effects of Different Land Status on Conservation Land and Income of Upland Rice Farming in Mausambi Village, Maurole Subdistrict, Ende Regency

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Abstract

The objectives of this study were to: (1) analyze the effects of different land tenure status on soil conservation level and (2) analyze the soil conservation level on production and income of upland rice farming. This research was conducted in Mausambi Village, Maurole Subdistrict, Ende Regency. Considerations in choosing a research village were seen from: a) the number of farmers who pawned agricultural land b) the extent of dry land and critical land c) the high percentage of poor farmers d) centers of food crop production and e) areas vulnerable to erosion. The population of upland rice farmers in Mausambi village was 214 people and consisted of 36 sharecroppers, 32 mortgagors and 146 owners. The method of sampling is cluster sampling, where this technique is a technique of selecting a sample from groups, small units or clusters. The sample size was calculated using Parrel formula. The sample size of land ownership status was 92 owners, 34 sharecroppers and 21 mortgagors. The analysis method used was multiple linear regression by including dummy variable of land tenure status and quantitative descriptive analysis. The result of the analysis shows that the farmers on land tenure status of owner are better in doing soil conservation efforts when compared to farmers on land tenure status of sharecropper and mortgagor. Owner dummy variable significantly affected the soil conservation level at 99% significant level. The positive sign means that the soil conservation level score on owner land tenure status is higher than the owner land tenure status of sharecropper and mortgagor. This is because in the owner farmers, the responsibility of soil conservation is higher than the farmers on other land tenure status. The well-done soil conservation efforts provide effect on the production and income of upland rice farming. The result of the research also shows that the land in the research site has not experienced severe erosion and soil conservation has been conducted but not maximized yet, especially on the aspect of contour farming, terrace treatment, terrace-strengthening plants, and tillage.

Keywords: land tenure status, conservation, income

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INTRODUCTION

An interesting phenomenon found in the Mausambi village, Ende regency, East Nusa Tenggara Province is the existence of three different land tenure status, land tenure status sharecropper, mortgagor and owner. Sharecropping is an agricultural system where a landowner allows other people (sharecropper) to use the land in return for a share of the agricultural products. Mortgage is a transfer of rights from the landowner to another party that acts more as a collateral of the money borrowed by the landowner to the money owner. The land is used as collateral for the amount of borrowed funds to be returned. During the mortgage term, the

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mortgaged farmland is used by the money owner for farming activities. In this case, the money owner acts as mortgagor and landowner as mortgagee.

Theoretically, different land tenure status will determine the farmer behavior in doing soil conservation, and the level of farming diversity. Farming by considering soil conservation will ensure the stability of production and income. The above conception is in line with Holden et al. (2009) opinion that land tenure right may increase farmer participation in land conservation. Recognition of land tenure (certificate) is a useful evidence to secure ownership. Land tenure security has increased land investment, such as annual crop planting, land conservation management improvement and land productivity increase. Land certification can increase the use of production inputs such as organic and inorganic fertilizer, and others. In line with Holden et al. (2009), a study conducted by Mustadjab (1994) provides further explanation that different tenure status significantly affects farmer behavior in soil conservation on dryland farming.

The importance of the study on soil conservation is due to the data found in the research site such as Mausambi village area that has a relatively low annual rainfall but with high intensity, has slope of 8-15%, shallow soil solum and coarse soil texture. In such area, erosion of dryland agro-ecosystems may occur. Morgan (2005) explains that if the land is dry and the rainfall intensity is high, the soil aggregate will break rapidly, soil infiltration will decrease, the surface becomes slippery, and surface flow is large enough even though rainfall is only a few mm only. In slopes, the risk of erosion is quite significant, however providing shelter to the soil in the form of terracing, contour farming, and the utilization of organic fertilizers by in situ are wise actions in saving the environment particularly in overcoming land degradation (de Neergaard et al., 2008; Gardner and Gerrard, 2003; Nyssen et al., 2009).

According to Tiwari et al. (2008), in addition to the availability of various conservation technologies that can be selected and applied, if the conservation, adoption rate is low, then the decline in soil fertility will continue. This condition will cause soil erosion, decreased soil fertility, and in the long run will affect the productivity of agricultural products (Wudianto, 2009). From a study conducted by (Stocking, 2004), the effect of erosion on productivity is very dependent on the profile of the land. The effects of erosion on crop production vary greatly depending on plant species, land type, micro climate, topography and agricultural management systems (Lal and Moldenhauer, 1987). The same thing has been proven by Bishop and Allen (1989).

Research on the effects of erosion on land productivity in Indonesia is found in the results of research conducted by Abas et al. (2003). By applying several conservation technologies according to the land condition on dryland farming, land productivity can be increased, and it as can be seen from the erosion rate decreasing from 21.80 t/ha to 11.10 - 20 t/ha where the soil becomes fertile. Pande et al. (2011) explain that land degradation and erosion problems have attracted the attention of policy makers for a long time. The average annual loss of nutrients from land caused by erosion is estimated at 5.37-8.4 million tons.

Regarding the upland rice farming in Mausambi village, it is necessary to apply conservation farming system. This is because if the sloping land is used in farming, it will easily suffer from erosion. Conservation farming is a technology that aims to overcome the problem of environmental damage and agroecosystem (Pranadji, 2004). Conservation farming can prevent excessive erosion on sloping agricultural land and maintain soil fertility to protect land resource and environmental sustainability.

The farmer problems of upland rice farming in Mausambi village is they have not fully implemented the conservation farming properly that actually can increase the production and productivity of farming land, which ultimately increase the farmer income. Although the farmers want sustainable high productivity and income in upland rice farming, they have not completely believed that conservation farming can improve crop productivity. The farmers will easily implement conservation farming if they already know the results and benefits first. This encourages the researcher to conduct a research by looking at it from different land tenure status.

Referring to the background and problems faced, the research problem is as follows: "How far the Different Land Tenure Status Affects the Soil Conservation Level and Upland Rice Farming Income. The objectives of this study are to: (1) analyze the effects of different land tenure

status on the soil conservation level and (2) analyze the soil conservation level on production and income of upland rice farming.

MATERIALS AND METHOD

This research was conducted in Mausambi Village, Maurole Subdistrict, Ende Regency, from October to December 2014. Considerations in choosing a research village were seen from: a) the number of farmers who pawned agricultural land b) the extent of dry land and critical land c) the high percentage of poor farmers d) centers of food crop production and e) areas vulnerable to erosion.

The population of upland rice farmers in Mausambi village was 214 people and consisted of 36 sharecroppers, 32 mortgagors and 146 owners. The method of sampling is cluster sampling, where this technique is a technique of selecting a sample from groups, small units or clusters. The sample size is calculated using a formula (Parel et al., 1973).

$$n = \frac{N Z^2 \sigma^2}{Nd^2 + Z^2 \sigma^2}$$

Information:
- n = sample size
- N = population size
- D = minimum deviation = 0.05
- Z = confidence level 95% = 1.96 according to distribution table Z
- σ^2 = variance in the population of farmland rice field

If the expected maximum deviation of 5% of the population variance is estimated from the variance of the sample of the farmland rice field area, then the sample size in each land tenure status is as follows in Table 1.

Table 1. Population Size and Sample Size Per Land Mastery Status

No.	Land Mastey Status	Population Size	Sample Varians	Sample Size
1.	Owner	146	0, 16092	92
2.	Sharecropper	36	0, 45069	34
3.	Mortgagor	32	0, 04207	21
	Total	214		147

First, the analysis of soil conservation level on different land tenure status used quantitative descriptive analysis. Measurement of soil conservation level was conducted by scoring. The application of soil conservation technology was measured from 7 variables used to indicate the level of soil conservation farming application. The selection of 7 conservation technologies was in accordance with the land condition at the research site. This is in line with the idea of Lichtenberg and Smith-Ramírez (2011), that farmers manage different lands from the lands managed by other farmers in terms of productivity level and erosion resistance, so that the options for types of land conservation are varied. Similarly, farmer participation in land conservation may differ across regions according to the land type, land area, off farm and non-farm availability, and the presence of government programs (Chang and Boisvert, 2009). The 7 conservation technologies applied in this study included: 1) terrace treatment, 2) planting of terrace strengthening plants, 3) tillage, 4) contour farming, 5) crop rotation, 6) drainage construction, and 7) the use of manure. Each research variable was assigned different weight based on the importance level of the variable applied. The farmers were given 7 questions, the answer of each question was given a value in integer of 1, 2, 3, 4, 5. The final score obtained from the measurement of soil conservation level was the result of weight multiplication by value. To analyze the second objective, multiple linear regression analysis was used by including dummy variable of land tenure status. The mathematical formula of multiple linear regression was as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + EjDj + U$$

Description:
- Y = Soil conservation level
- X_1 = Household income variable
- X_2 = Farming period variable
- X_3 = Total family member variable
- Dj = Dummy variable of land tenure status (D1= 1 for owner status, D1= 0 for other land tenure status; D2= 1 for land tenure status of sharecropper, D2= 0 for land tenure status of mortgagor).

Ej = Dummy variable coefficient
βi = Regression coefficient (i = 1,2,3)
U = Error disturbance

Prior to the multiple regression model estimation, the data used must be ensured to be free from classical assumptions deviations for normality, multicollinearity and heteroscedasticity. When the classical assumptions were met, the OLS estimator of the regression coefficient was BLUE (Best Linear Unbiased Estimator). The third objective was analyzed using descriptive analysis.

RESULT AND DISCUSSION

Analysis of the effect of different land tenure status on the level of land conservation

The component of soil conservation technology used to see the level of conservation implementation carried out by farmers consists of 7 components including; 1) terrace treatment, 2) planting of terrace strengthening plants, 3) tillage, 4) contour farming, 5) crop rotation, 6) drainage construction, and 7) the use of manure.

For the components of the terrace treatment, tillage, and contour farming, if the farmer applies it perfectly, then the score obtained are 20, and vice versa if it approaches the value 4 then this shows the more imperfect application of soil conservation. The components of terrace strengthening plant, drainage construction, and using manure, if applied perfectly the score obtained are 15, and vice versa is close to 3, while for the crop rotation if it is applied perfectly the score obtained are 10, and vice versa approaches 2. The data in Table 2. shows the different levels of soil conservation application to the three land tenure status, from excellent to bad category.

Table 2. Average Level of Soil Conservation Application in the Three Land Tenure Statuses of Owner, Sharecropper, and Mortgagor.

Component of Soil Conservation Technology	Land Tenure Status					
	Owner		Sharecropper		Mortgagor	
	Average Score	Category	Average Score	Category	Average Score	Category
Terrace Treatment	13.7	B	11	J	13.3	B
Terrace Strengthening Plant	10	B	6.75	J	8.85	B
Tillage	15.9	B	8.67	J	11.4	J
Contour Farming	16.5	SB	16.7	SB	17.5	SB
Crop Rotation	3.98	SJ	3.67	J	3.62	J
Drainage Construction	10.2	B	7.38	J	8.57	J
Use of Organic and Inorganic Fertilizer	11.6	B	3.5	SJ	6.14	J
Total Score	82.01	Good	56.14	Bad	69.47	Bad

Description: SB = Excellent, B = Good, J = Bad, SJ = Worst.

The results show that the total score on land ownership status is in good category, while the land tenure status of sharecropper and mortgagor are in bad category.

1. Terrace Treatment

The research site has a slope of 8 - 15%, so the attention to the conservation technology of terrace making becomes very important. The terrace quality on land tenure status was 50 percent more than the perfect terrace quality, and on the land tenure status of mortgagor it can be categorized as good. It was different from the terrace quality on the land tenure status of sharecropper that was in bad category. Differences in terrace treatment are due to farmer knowledge on the importance of conservation, and the level of formal education. Owner farmers have a wider land and a higher level of formal education than the sharecroppers and mortgagors. This is in line with the opinion of Tiwari et al. (2008); Chang and Boisvert (2009); Lichtenberg and Smith-Ramírez (2011); Pande et al. (2011); and Asafu-Adjaye (2008), that farmer participation partially increases in the soil conservation with high number of land area owned. Mugniesyah and Mizuno (2001), also explained that the

education level affects farming work in determining the production input in connection with the use of organic and inorganic fertilizers.

2. Terrace Strengthening Plants

Terrace strengthening plants specifically serve to strengthen the terrace building in order to prevent landslides during the rainy season. In addition, the terrace strengthening plants serves to improve the chemical and physical properties of the soil. The greater the terrace percentage on farmer land planted with the strengthening plants, the higher the conservation score or the more complete the application of technology components (Hidayat, 2007). In the three land tenure statuses, the highest score for terrace strengthening plants components was on land tenure status of owner. The average difference in scores was due to differences in knowledge about the importance of terrace strengthening plants.

3. Tillage

The tillage quality from the conservation aspect on the three land tenure statuses illustrates that land tenure status of owner was in good category whereas the farmers in the land tenure status of sharecropper and mortgagor were in bad category. This is due to differences in knowledge aspects about soil conservation, environmental awareness, soil and water, and the ability to obtain organic materials, especially organic and inorganic fertilizers.

4. Contour Farming

Contour farming has been practiced long enough by the community in the research site, because the topography of the research area is hilly. In the research site, the average score for the component of contour farming on the three land tenure statuses did not have striking difference, the three are in very good category.

5. Crop Rotation

In recent years, most of the farmers in the research site on the three land tenure statuses did not run the crop rotation system, due to the total rainy days and months that are uncertain and very short. As a result, the average score for the crop rotation component was in worst and bad category.

6. Drainage Construction

Farmers on land tenure status of owner pay more attention to the drainage quality when compared with farmers on land tenure status of sharecropper and mortgagor. This is due to differences in knowledge and skills as well as non-formal education received specifically on conservation technology.

7. Use of Organic and Inorganic Fertilizer

In the use of organic and inorganic fertilizers, the farmers on land tenure status of owner were in good category due to their ability to buy inorganic fertilizer. The results of the study found that most owner farmers raise cattle and the manure is used for organic fertilizer. Moreover, there are only a few sharecroppers and mortgagors who raise cattle, so the organic fertilizer used by the sharecroppers and mortgagors is obtained from the family or neighbors.

From the explanation regarding the application of soil conservation technology, it can be concluded that the farmers have not applied it maximally. Therefore, they need awareness to apply conservation farming according to the rules applicable for sustainability of productivity and increase in upland rice farming income.

Analysis of the relationship between the level of soil conservation with production and income of field rice farming.

The analysis result of the effects of land tenure status on the soil conservation level using multiple linear regression analysis is presented in Table 3. The classical assumption deviation test shows that the data is normally distributed, the multicollinearity symptoms are not serious, and there is no heteroscedasticity symptoms.

Table 3. Regression Analysis of Land Status Effect on Soil Conversation Level

Variabel Regression	Coefficient	T count	P Value
Household Income	4.437E-7$^{***)}$	4.69	0.002
Farming Period	-0.722$^{***)}$	-2.75	0.011
Total Family Members	3.251$^{***)}$	4.01	0.000
D1 Owner	8.296$^{***)}$	3.19	0.002
D2 Sharecropper	-11.879$^{***)}$	-4.90	0.000

F_{count} = 55.490
R^2 = 0.66
Description
1. Dependent variabel of soil conservation level.
2. F_{table} (α = 0.01, df1 = 5, df2 = 141) = 3.149
3. T_{table} α 0.01 = (0.01, df 99) = 2.35
   T_{table} α 0.05 = (0.05, df 95) = 1.66
   T_{table} α 0.10 = (0.10, df 90) = 1.32
4. $^{***)}$ real on α by 1 %
   $^{**)}$ real on α by 5 %
   $^{*)}$ real on α by 10 %

The sig value in the owner dummy variable was 0.002, the sig value was smaller than the probability value of 0.01. T_{count} value 3.19> T_{table} value 2.35. It can be interpreted that the owner dummy variable significantly affected soil conservation level at significant level of 99%. The positive sign means that the soil conservation level score on land tenure status of owner was higher than the land tenure status of sharecropper and mortgagor. This is because in owner farmers, the responsibility for soil conservation was higher than the farmers on the land tenure status of sharecropper and mortgagor. The land is a gift of God that must be preserved for the present and future life.

The sig value in the dummy variable was 0.000, the sig value was greater than the probability value of 0.01. T_{count} value 4.90>T_{table} value 2.35. This shows that the sharecropper dummy variable provides significant effect on soil conservation level. The negative sign on the dummy variable indicates that the soil conservation level score on the land tenure status of sharecropper is lower than the land tenure status of mortgagor, while the soil conservation level score on the land tenure status of mortgagor is lower than the land tenure status of owner. This is probably because the farmers on the land tenure status of sharecropper and mortgagor are immigrants, not native people in Mausambi village, so the responsibility for nature/land conservation is lower. The sense of belonging to nature/land is not as large as the owner farmers, so the orientation is more likely to produce production/income in short term.

Data in Table 4 shows the relationship between the levels of soil conservation application by farmers with the average production of upland rice farming in each category of worst, bad, good and excellent. Here, the production level in each category can be found.

Table 4. Average Production of Upland Rice Farming in Four Categories of Level of Soil Conservation Application

Category of Soil Total (People)	Conservation Application	Average Production (Kg/ha/year)
Worst	-	-
Bad	57	1570
Good	89	2475
Excellent	1	2850

The results show that no upland rice that was found to be worst in applying conservation technology. In the bad category conservation level there were 57 farmers with an average production of 1570 kg/ha/year. In good conservation level category, there were 89 farmers with average production of 2475 kg/ha/year, while in excellent category there was 1 farmer with production achievement of 2850. This data shows that the higher level of soil conservation, the higher the production achievement of upland rice farming. This empirical fact should be the concern of the community and the government with respect to the policy that must be taken as an effort to maintain the availability of food in each farmer household. According to Lynch and Musser (2001), productivity issues, food security, and peace value are very important in determining policy and research in securing agricultural land. Furthermore, Gardner (Lynch & Musser, 2001) suggests four benefits that can be gained from maintaining agricultural land productivity: (1) food security at local and national level, (2)

employment in agro-industries sector, (3) efficient use of rural land and urban areas, and (4) protection or preservation of environment and rural security. In this case, Chouinard et al. (2008) also state that the United States Government plays an active role in implementing land conservation programs. It was reported that the United States Government agricultural budget since 2002 reached more than $ 38 billion for conservation programs. The financing cooperation or financing sharing in the land conservation program is carried out between the government and the landowner. Bastos and Lichtenberg (2001) also suggest that promising land conservation activities will increase the production and income of farmers.

The data in Table 5 shows that the upland rice farmers is in excellent category in applying the soil conservation and the average income is higher than the upland rice farmers in good and bad category. The production level obtained by farmers in each category is also very different. This indicates that the production level obtained by farmers determines the difference in upland rice income in each category of soil conservation level. The production cost of upland rice farming for farmers who are categorized excellent is greater than good and bad category. Although the production cost is large, the income is also greater, meaning that the additional revenue of upland rice farming of the farmers in excellent category is still greater than the additional production cost.

Table 5. Average Revenue, Total Cost and Revenue of Paddy Farming Category of Soil Conservation Level Application of Excellent, Good, Bad and Worst.

Description	Category of Soil Conservation Level Application			
	Excellent	Good	Bad	Worst
Revenue (IDR/ha)	13.252.500	11.436.168	7.202.453	-
Total Cost (IDR/ha)	7.921.125	7.055.654	5.157.837	-
Income (IDR/ha)	5.331.375	4.380.514	2.044.616	-

Income differences in each category in accordance with the general idea shows that if farmers practice conservation farming in the long term, it will affect the farming income. This idea is in line with a research by Katharina (2007) on potato commodities indicating that farming with the application of conservation technology in a long term will earn higher income than farmers who do not pay attention to conservation efforts. Similarly, a research conducted by Sinukaban (2010) shows that the use of conservation farming has been able to reduce the rate of erosion and increase farmer income.

Darmadi et al. (2014) conducted a study to analyze the effect of the level of implementation of conservation farming on the costs, production, and income of vegetable farming. This research was conducted in Jurang Kuali Hamlet, Sumber Brantas Village and Junggo Hamlet, Tulungrejo Village, Bumiaji District, Batu City, East Java Province. By using scoring analysis and simple and multiple linear regression analysis, the results show that the higher the implementation of conservation farming in vegetables will increase farmers' income. Research conducted by Fahriyah et al. (2013) shows the same explanation that by implementing good conservation farming, farm income can increase. Research conducted by Olarinde et al. (2011), in Africa also explained that the application of soil and water conservation technology can increase the total value of production by 17-24% per farm household.

Some researches to obtain information about the factors that influence farmers in implementing soil conservation efforts are carried out by Asafu-Adjaye (2008) in Fiji. The results showed that the factors that significantly influence aging, education, ethnicity, net income, land size and land type. According to Mazvimavi and Twomlow (2009) in 2004, the International Crops Research Institute for the Semi Arid Tropics (ICRISAT) conducted a study that aimed to determine the factors that influence the implementation of conservation farming in Zimbabwe, the results showed that institutional support and agroecological location have a strong influence on the intensity of the implementation of conservation farming. Hettiarachchi and Gunatilake (2000) in the research in Walawe Hulu Srilanka watershed, illustrating the size of agricultural land and asset levels significantly influence the decision of farmers in implementing soil conservation. Some of these non-technical factors may be considered by farmers in applying

conservation farming on dry land with a certain slope

The interesting finding of this research is that the farmers are generally reluctant to practice soil conservation farming due to the high cost if the land is not owned by them. Soil conservation efforts are still carried out at the research sites because traditional values are still maintained until now, particularly the values of harmony between nature, human and the Creator as well as the value of community work. In local people thinking, nature is a place where people put their hope in life, so that the existence of nature is not to be dominated, exploited/destroyed, and by community work the labor cost becomes cheaper. This is in line with what Chouinard et al. (2008) think that the farmer motive for land conservation can be varied, such as economic motive in order to increase land productivity and farm income or social and cultural reasons of local communities.

CONCLUSIONS AND SUGGESTION

Conclusions

There are differences in the application of the 7 soil conservation technologies by farmers of the three tenure statuses. In applying soil conservation technology, the farmers with tenure status of land owner are in the good category, whereas farmers with land tenure status of sharecropper and mortgagor are in bad category. The well-done soil conservation efforts bring effect on the production and income of upland rice farming. Farmers who carry out conservation farming well, get higher farming production and income than do farmers who run poor conservation farming.

Suggestion

Suggestions that can be given to farmers in the research site is they need to conduct technical coaching in a planned and sustainable way in connection with the application of conservation technology, specifically in making a good terrace, planting strengthening plants, proper tillage, drainage construction, and manure use.

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