Analysis of Economic Land Value (Land Rent) on Agricultural Land in Deli Serdang Regency

Eka Tresna Permata[*1], *Zulkifli Nasution*[2], *Agus Purwoko*[3]

[*1]*Regional and Rural Planning Study Program, Postgraduate School, Universitas Sumatera Utara, Medan, 20155, Indonesia*
[2]*Department of Agrotechnology, Faculty of Faculty of Agriculture, Universitas Sumatera Utara, Medan, 20155, Indonesia*
[3]*Faculty of Forestry, Universitas Sumatera Utara, Medan, 20155, Indonesia*

Abstract. *Deli Serdang Regency is a district that in its development is experiencing quite rapid development. Changes in agricultural land use from 2009 - 2019 in Deli Serdang Regency are quite significant. The purpose of this study was to analyze changes in the use of agricultural land between 2009 - 2019, analyzing the economic value of the land and factors that affect the economic value of agricultural land in Deli Serdang Regency. The analysis is based on Geographic Information System (GIS), land economic analysis, and multiple linear regression analysis.*

Keywords: Spatial pattern, forest area, Tapanuli Utara Regency, biophysics condition, GIS

Abstrak. Kabupaten Deli Serdang merupakan kabupaten yang dalam pembangunannya sedang mengalami perkembangan yang cukup pesat. Perubahan penggunaan lahan pertanian dari tahun 2009 - tahun 2019 di Kabupaten Deli Serdang cukup signifikan.Tujuan penelitian ini adalah untuk menganalisis perubahan pengunaan lahan pertanian antara tahun 2009 – 2019, menganalisis nilai ekonomi lahan dan faktor-faktor yang mempengaruhi nilai ekonomi lahan pertanian di Kabupaten Deli Serdang. Analisis yang dilakukan merupakan analisis berbasis Geographic Information System (GIS), Analisis ekonomi lahan, dan analisis regresi linier berganda.

Kata Kunci: Pola ruang, kawasan hutan, Kabupaten Tapanuli Utara, kondisi biofisik, SIG.

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1. Introduction

Deli Serdang Regency consists of 22 sub-districts that develop governance its space shows a new pattern of development or extensification. The pattern changes the form of utilization or introduces a new form of utilization, with this pattern it is expected that a new service node will appear that will lead became a city. Based on the map of Rencana Tata Ruang Wilayah (RTRW) Deli Serdang Regency that are more functioned as agricultural land, namely the area

plantations and agricultural areas of food crops. This is due to the the existence of agricultural land provides a very wide range of benefits in a way economic, social, and environmental.

A significant increase in a population where in 2017 the population was 2.114,627 people with a population density of 827 people/km2 and experienced an increase in the number of residents in 2019 as many as 2.195,709 people with a population density of 879 people/km2. This is the main factor that causes Deli Serdang Regency to experience changes in the use of agricultural land. Land use changes in Deli Serdang Regency are very rapid, as seen in the land use chart of Deli Serdang Regency in 2009 and the land use chart in 2019 as follows:
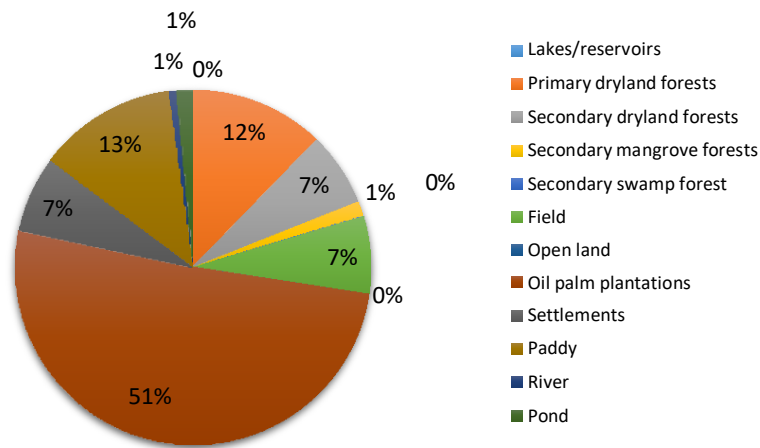

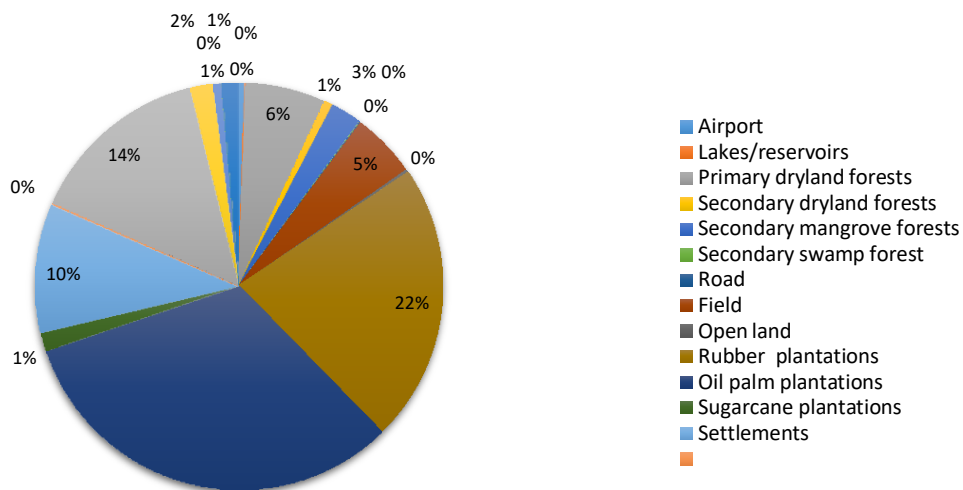**Figure 1.** Land use chart of Deli Serdang Regency in 2009

Figure 2. Land use chart of Deli Serdang Regency in 2019

Based on the background description of the problem, the purpose of this study is to analyze changes in the use of agricultural activities between 2009 - 2019, analysis of the economic value of land rent on agricultural land, and factors that affect the economic value of land rent, so that it

can be seen how the economy of the surrounding community or the added value created by agricultural land processing activities in Deli Serdang Regency.

2. Method

The research location was located in Deli Serdang Regency for 2 months. This research is a quantitative descriptive study. The required data consists of primary data and secondary data. The sampling of this study was 30 respondents who came from agricultural producers or farmers.

2.1 Analysis of changes in agricultural land use

This analysis is an analysis based on Geographic Information Systems (GIS) according to the comparison between land use maps in 2009 and 2019.

2.2 Analysis of land rent economic

The first step in this analysis is to collect data related to land economic analysis. The theory explaining land rent was developed by Dunn and Isard. The range of land lease values at each location can be formulated as follows:

$$pc(t) = N [Pc - C - kc(t)] \tag{1}$$

Where:

pc(t) : Land rent per unit of land at distance from the market N: The number of products produced per unit of land

Pc   : Product price per unit in the market C: Production costs

Kc(t) : The cost of transporting one unit of product at a distance to the market

2.3 Analysis of Factors Affecting the Economic Value of Land Ren

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + \ldots + A_nX_n \tag{1}$$

Where :

Y	=	Land rent of Farmland (Rp/ha/year)
X_1	=	Farming in managing agricultural land
X_2	=	Land Status
X_3	=	Total Receipts (Rp/ha/year)
X_4	=	Operating Expenses (Rp/ha/year))
X_5	=	Earth and Building Tax (PBB) (Rp/ha/year)
X_6	=	Distance to the nearest market (m)
A_n	=	Regression Coefficient
a	=	Constant

2.3.1 Analysis of Determination Coefficient (R^2)

To obtain a R2 value you can use the following equation:

$$R^2 = \frac{A_1 \sum Y_i X_{1i} + A_2 \sum Y_i X_{2i} + A_3 \sum Y_i X_{3i} + \dots + A_n \sum Y_i X_{ni}}{\sum Y_i^2} \tag{3}$$

Where :

R_2	=	Coefficient of determination
A_n	=	Variable regression coefficient
Y_i	=	Non free variable value
X_{ni}	=	Free variable value

2.3.2 Hypothesis Test

The F-test used is:

$$F_{hitung} = \frac{Number\ of\ Regression\ Squares(k-1)}{Number\ of\ Remsining\ Squares(n-k)} \tag{4}$$

Where :

n	=	Number of observations
k	=	Number of parameters

For testing the factors that affect the economic value of land (land rent) are:

H_0: $A_1 = A_2 = A_3 = ... = A_n = 0$

H_1: There is at least one A value that is not equal to zero

The model used the F-test. The statistical tests are:

If: $F_{hitung} > F_{tabel\ (k-1\ ;\ n-k)} \rightarrow H_0$ rejected

3. Result and Discussion

3.1 Changes in Agricultural Land Use

Changes in the use of agricultural land in Deli Serdang Regency for the period 2009 - 2019 reached an area of 75.452.93 ha. Land use change in Deli Serdang Regency consists of changes in several lands uses as shown in Tables 1 and 2 below:

Table 1. Land use change in 2009 in Deli Serdang Regency

No.	Land uses	Land changes (Ha)
1	Primary dryland forests	14.907,09
2	Secondary dryland forests	12.485,21
3	Secondary mangrove forests	183,65
4	Secondary swamp forest	51,29
5	Field	9.803,96
6	Oil palm plantations	34.397,00
7	Paddy	3.624,74
	Total	**75.452,93**

Table 2. Land use change in 2019 in Deli Serdang Regency

No.	Land uses	Land changes (ha)
1	Field	6.956,08
2	Rubber plantations	22.665,49
3	Oil palm plantations	25.083,24
4	Paddy	8.385,15
5	Airport	1.091,44
6	Sugarcane plantations	3.717,44
7	Settlements	7.474,39
8	Shrubs	72.02
9	Farm	7.68
	Total	**75.452,93**

Changes in agricultural land use from 2009 to 2019 in Deli Serdang Regency within 10 years have undergone significant changes. The largest land use change is the land use of oil palm plantations covering an area of 25.083,24 ha and rubber land use covering an area of 22.665,49 ha while the smallest land use change is land use of 7.68 ha. The plantation sector is one of the driving forces for economic growth and also the main potential in the economy of the people of Deli Serdang Regency.

The results of this study are in line with Maruhawa in [1] where land use changed in 2013 and 2019 in Deli Serdang Regency, plantation land use is the most changed land use, namely 24,487.21 ha. Hasibuan's research in [2] stated that land conversion in Deli Serdang Regency from 2009 - 2013 every year has increased and land conversion that varies significantly negatively affects agricultural production in Deli Serdang Regency. The map of changes in agricultural land use in Deli Serdang Regency can be seen in Figure 3 below:
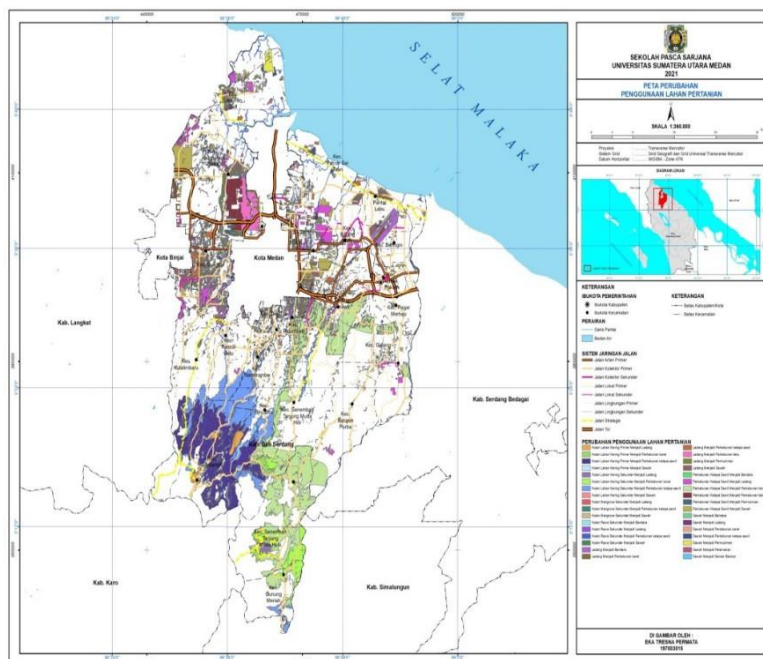

Figure 3. Map of changes in agricultural land use of Deli Serdang Regency

The plantation sector is one of the driving forces for economic growth and also the main potential in the economy of the people of Deli Serdang Regency, this makes most of the land use of Deli Serdang Regency land use is plantations. The results of this study are in line with Hasiholan, et al in [3] where land use changed in 2013 and 2019 in Deli Serdang Regency, plantation land use is the most changed land use, namely 24,487.21 ha. Hasibuan research in [4] states that land conversion in Deli Serdang Regency from 2009 - 2013 every year has increased and land conversion that varies significantly negatively affects agricultural production in Deli Serdang Regency.

3.2 Economic Value of Land (Land Rent)

Land rent is the net income obtained by an economic actor, while the economic value of land in Deli Serdang Regency can be seen in Table 3 below:

Table 3. Land rent value of agricultural land in Deli Serdang Regency

No.	Land Rent Factors	Land changes (ha)
1	Average of total receipts (Rp/ha/year)	34.661.667
2	Average of operating expenses (Rp/ha/year)	10.778.733
3	Average of tax (Rp/ha/year)	240.733
4	Average of land rend (Rp/ha/year)	23.642.200
	Total	**75.452,93**

Based on Table 3, the economic value of agricultural land in Deli Serdang Regency, the average rental value of agricultural land is Rp. 23.642,200 ha/year. Lending the rent of agricultural land in Deli Serdang Regency, the average income earned by farmers in cultivating agricultural land within a period of one year is Rp. 34.661,667 ha/year and the average total operational costs incurred by farmers in cultivating agricultural land is Rp. 10.778,733 ha/year and the average total tax cost is Rp. 240.733 ha/year.

Hasiholan, et al in [3] stated that Deli Serdang Regency is one of the largest districts in North Sumatra Province which has a wide diversity of natural resources with potential investment opportunities. The main commodities in Deli Serdang Regency are food agriculture, community plantations, and large or self-help plantations. Agricultural activities in Deli Serdang Regency consist of food crops, horticulture, and community plantations. Based on the above agricultural activities, the land lease value is classified into 3, namely food cropland, horticultural land, and plantations, as shown in Table 4:

Table 4. Classification of land rent value of agricultural land in Deli Serdang Regency

No.	Land rent classification	Total (ha)
1	Average of food crops land rent (Rp/ha/year)	29.469.733
2	Average of horticulture land rent (Rp/ha/year)	14.408.333
3	Average of plantations land rent (Rp/ha/year)	31.440.000

Table 4 above shows the average land rent for food crops of Rp. 29.469,733 ha/year, the average rent of horticultural land is Rp. 14.408.33 ha/year and for the average plantation land rent of Rp. 31.440,000 ha/year. Based on the classification of the value of agricultural land leases in Deli Serdang Regency, it can be seen how the economy of the surrounding community or the added

value created from agricultural land processing activities in Deli Serdang Regency. The added value created by farmers who cultivate agricultural land for food crops and horticulture, for the time being, is still very low, this is due to the lack of awareness and knowledge of the community.

Based on the value of land leases above the average value of borrowing plantations which is quite high, this makes the plantation sector one of the driving forces of economic growth and also the main potential in the economy of the people of Deli Serdang Regency. There are community plantations and owned plantations spread across Deli Serdang Regency, including PT Nusantara II plantations spread across Labuhan Deli District, Percut Sei Tuan, Pancur Batu, Tanjung Morawa, Batang Kuis, Hamparan Perak, Sunggal, Patumbak, STM Hilir, Pagar Merbau and Labu Beach. Nusantara III plantations are located in Galang District, PT London Sumatra is located in Tanjung Morawa District, and PT Tamiang Sari is located in Bangun Purba District, as shown in Figure 4 below:
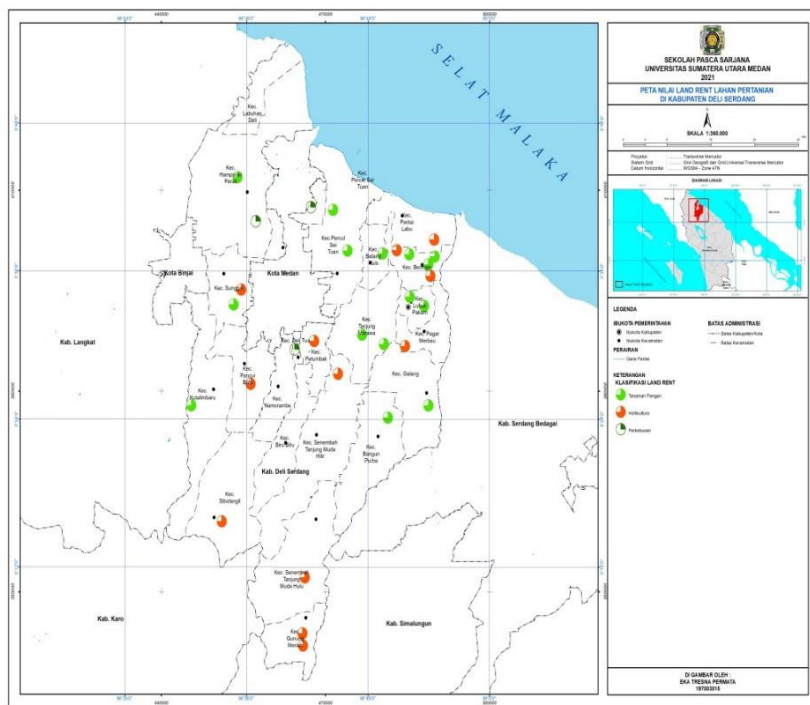

Figure 4. Map of land rent value classification of agricultural land in Deli Serdang Regency

3.3 Factors that Affect the Economic Value of Land Rent on Agricultural Land

The analysis method used to analyze factors that affect the economic value of land (land rent) on agricultural land in Deli Serdang Regency uses multiple regression analysis.

3.3.1 Coefficient of Determination (R2) Test

The suitability of the model is said to be better if the value of the coefficient of compound determination (R2) is closer to one, the value of R2 between zero and one, if R2 is equal to one, meaning that the adjusted regression line or free variable explains the 100 percent variation in non-free variables as seen in Table 5 below:

Table 5. Coefficient of determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,990[a]	0,980	0,975	2019,74819

a. Predictors: (Constant), Distance to Market, Farm Business, Land Status, Operating Expenses, TotalRevenue, Taxes
b. Dependent Variable: Land rent

The calculation of the value of R Square is 0.980, meaning that 98% of land rent can be explained by the distance to the market, farm business, land status, operating costs, taxes, and total income above, while the remaining 2% is explained by other variables that are not observed in the analysis model. Mihaela in [5] studied the relationship between rent prices and agricultural and prices obtained a value of R2 0.95, which means that the relationship between land prices and rent is significant.

3.3.2 Simultaneous Test (F test)

Simultaneous influence tests are used to find out whether independent variables are jointly or simultaneously affecting dependent variables, as seen in Table 6:

Table 6. Simultaneous test results (Test F)

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	4673879637,883	6	778979939,647	190,955	,000[b]
Residual	93825803,358	23	4079382,755		
Total	4767705441,242	29			

Simultaneous statistical tests show a probability of 0.000, so it can be concluded, $P = 0.000 < = 0.05$ which means Ha is received, meaning that the independent variables distance to market, farm business, land status, operating costs, taxes, and total income simultaneously have a significant effect on farmland rent.

3.3.3 Partial Test (t Test)

The t test is used to partially test each variable, to test the partial regression coefficients individually of each free variable as seen in Table 7 below:

Table 7. Partial test results (t)

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-3496,743	1301,681		-2,686	0,013
Farm business	1284,460	972,274	0,041	1,321	0,199
Land status	2085,524	850,708	0,073	2,452	0,022*
Total revenue	0,001	0,000	1,019	30,743	0,000*
Operatingexpenses	-0,128	0,062	-0,073	-2,064	0,049*
Taxes	-0,008	0,002	-0,113	-3,331	0,003*
Distance to market	-455,041	276,662	-0,051	-1,645	0,114

a. Dependent variable: land rent

1. Farm business variable (X_1) with a probability level of 0.199 can be concluded P =0.199> α = 0.05, reject the Ha hypothesis and accept the Ho hypothesis which states the Farmer's Business has no significant positive effect on land rent.

2. Land status variable (X_2) with a probability level of 0.022 can be concluded P = 0.022< α = 0.05, reject the Ho hypothesis, and accept the Ha hypothesis which states the status of land has a significant positive effect on land rent.

3. Total revenue variable (X_3) with a probability level of 0.000 it can be concluded P = 0.000 < α = 0.05, reject the Ho hypothesis and accept the Ha hypothesis which states the total acceptance of significantly positive effect on land rent.

4. Operating expenses variable (X_4) with a probability level of 0.049 it can be concluded P = 0.049< α = 0.05, reject the Ho hypothesis and accept the Ha hypothesis which states the total operational significant positive effect on land rent.

5. Taxes variable (X_5) with a probability level of 0.003 it can be concluded P = 0.003 < α = 0.05, reject the Ho hypothesis and accept hypothesis Ha which states the total operational significant positive effect on land rent.

6. Distance to market variable (X_6) with a probability level of 0.114 can be concluded P = 0.114 > α = 0.05, reject the Hypothesis Ha and accept the Ho hypothesis which states the Farming Business has no significant positive effect on land rent.

Based on Table 7, the results of the analysis of the multiple regression equation models lend rent of agricultural land as follows:

$$Y = -3496{,}743 + 1284{,}460X_1 + 2085{,}524X_2 + 0{,}001X_3 - 0{,}128X_4 - 0{,}008X_5 - 455{,}041X_6$$

The results of this regression show factors that have a real influence on the economic value of agricultural land (land rent) in Deli Serdang Regency, namely X_2 (land status), X_3 (total income), X_4 (operating costs), and X_5 (taxes) while other variables have no real effect. Variables that have no real effect on the model mean that the influence of explanatory variables on land lease changes is very small, namely X_1 (farm business) and X_6 (distance to market).

Significant land status factors affect the rent of agricultural land, based on the results of research by farmers who are landowners who have greater benefits than farmers who are land tenants. This is because farmers who are not landowners must increase inputs by incurring land rental costs. The results of this study are in line with Pasaribu's research in [4] which states that this condition is caused by additional obligations for rent farmers in the form of rental costs or profit sharing. In addition, in some other Countries also apply land rent with a certain period of time, where Pavel, et al in [6] lease contracts as is the case in France, Ireland, and Italy, which need to be certified by a notary, such as long-term (over 12 years).

The total acceptance factor can describe the level of productivity of agricultural land and prices. The tax factor significantly affects the rent of land on farmsteads. From the results of the study, the price of agricultural land tax is different, if the farmland tax is high, the higher the cost in the

village and cause the land rent value to fall. This is in accordance with the Pramana in [7] which states that agricultural land and land values are interrelated, the value of agricultural land is far from the facilities and infrastructure of land tax settlements is higher, and this leads to changes in the use of agricultural land.

4. Conclusions

Based on the results of research on the analysis of the economic value of land (land rent) on agricultural land in Deli Serdang Regency, it came to the following conclusions:

1. Changes in the use of agricultural land in Deli Serdang Regency for the period 2009 - 2019 which reached an area of 75.452,93 ha.

2. The economic value of agricultural land in Deli Serdang Regency is the average rental value of agricultural land was Rp 23.642.200 ha/year.

3. The factors influencing land rent on farmland are land status, total income, operating costs, and taxes at a real rate of five percent, while the variables of farm enterprise and distance to the market have no real effect.

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