Research Paper

The Analysis of Conversion of Rice Functions and Regional Development of South Tapanuli Regency on the Rice Production

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ABSTRACT

The increase in land needs for the economic sector can converse land use function within the food production sector, particularly rice fields. The objective of this research was to 1) Analyze the percentage of rice field coverage area in Tapanuli Selatan Regency, 2) Analyze the impacts of rice field conversion on the rice production in Tapanuli Selatan Regency, 3) Analyze the effects of rice field conversion on rice self-sufficiency in Tapanuli Selatan Regency, and 4) Analyze what factor influenced the reduction of rice field area in Tapanuli Selatan Regency. It is research conducted in Tapanuli Selatan Regency. It employed Geographic Information System, explanation analysis with a quantitative approach, and multiple regression analysis methods. Land function conversion harmed rice production as it kept on increasing despite area reduction. The production kept growing because the agricultural land in Tapanuli Selatan Regency used an intensification system with a 2 and 3 times planting system in 1 year. The rice field function conversion did not negatively impact rice self-sufficiency because there was an increase in rice productivity. Factors such as population, number of industries, number of houses, road length, and gross regional domestic product simultaneously significantly influenced the rice field area. Partially, several industries and houses had a negative and significant influence on the rice field area. In contrast, road length positively and significantly affected rice field area, population rate, and gross regional domestic productivity positively and significantly influenced rice field area.

INTRODUCTION

Economic transformation is a significant challenge faced by the agricultural sector. The occurrence of economic transformation can have consequences for the increasing need for land for the non-agricultural sector. On the other hand, the land area in an area tends to be fixed so that an increased land demand for a specific economic sector can only be met by transferring land use functions in other sectors, including the food, energy, and forestry production sectors (Harahap et al., 2017; Mahmood et al., 2016). Agricultural land is the land most used for land conversion activities. The land area in the farm sector is relatively more extensive than the land area in other sectors. Agricultural land is considered very potential for land conversion for the non-agricultural sector (Millar & Roots, 2012). The conversion of agricultural land functions has occurred in various provinces in Indonesia, including the South Tapanuli Regency.

Agricultural land is the type of land that has been converted the most, especially paddy fields. It occurs due to farmers' low incentives or income while managing rice fields compared to use for activities for other sectors (Daulay et al., 2016; Demmallino et al., 2018). The high rate of conversion of paddy fields has implications

for decreasing food availability for the population. It will impact reducing food production, especially rice, which can threaten the population's food security. Food security can be achieved if the available food can meet Indonesia's entire population (Law No. 18 of 2012). The population's food needs are expected to increase and increase the population (Prasada & Tia, 2018).

In regional development planning, it will not be separated from regional economic development. Spatial development of the region or a regional spatial plan where economic development is a multidimensional process involves considerable growth in economic structure, social change, reducing or eliminating poverty, reducing inequality, and unemployment (Sirojuzilam, 2016). Regional spatial planning is planning for the use/utilization of restricted space, which is essentially land use planning and scheduling for space's movement (Tarigan, 2016). Likewise, in preparing the RTRW of the South Tapanuli Regency, all economic and social aspects will be considered.

The decline in the agricultural sector's contribution to GDP is related to the more excellent conversion of land functions or converting agricultural land to non-agricultural uses. It indicates that agrarian land utilization is still low in line with increasingly advanced economic growth. Land conversion is defined as the change in a part's function or all the land that harms the environment and the land's potential (Utomo, 1992).

South Tapanuli Regency, with the capital city of Sipirok, is a district in North Sumatra between Medan (the capital of North Sumatra Province) and Padang (the capital of West Sumatra). The development of the South Tapanuli Regency population can be seen from the data of the last ten years, namely, from 2010, there were 264,108 people to 281,933 people in 2019. This increase in population is influenced by three main factors, namely birth, death, and migration. South Tapanuli Regency is one of the North Sumatra Province districts with an excellent agricultural system and fertile soil. Therefore the farm sector is a sector that plays a vital role in regional revenue (RTRW South Tapanuli Regency, 2017).

In 2010, the land used for lowland rice farming was 12,478 ha with 135,284 tons. The largest area is in Batang Angkola District, which is 2,689 ha. Meanwhile, for the year 2010, there was 1,010 ha of upland rice with a total production of 5,460 tonnes (South Tapanuli Regency in Figures, 2011). Factors that cause land-use change include (Sembiring, 2013), namely population factors, land requirements for non-agricultural activities, and economic factors.

Regional development means increasing the value of the benefits of the area for the people of a specific area and being able to accommodate more residents, with an average level of community welfare, many facilities/infrastructure, goods or services available and increased community business activities, either in terms of type, intensity, service, and quality (Sirojuzilam, 2005). Nachrowi and Suhandojo (2001) suggest that three essential factors must be considered in regional development: natural resources, human resources, and technology, which are known as the three pillars of regional development where the goal is to equalize regional growth and reduce gaps between regions (Adisasmita, 2008). Land development is a vital process in changing one land use to another. Land development limitation is extensive because it includes several activities such as converting forest land to intensive agricultural land and settlements (Purwoko, 2005). Exploitation activities that are not environmentally friendly or other forms of land conversion fulfill community needs, such as land for housing, agriculture, plantations, and fishery cultivation. The interactions between people and land that cause land-use changes can have an enormous negative impact on these resources' sustainability. For this reason, it is necessary to monitor land changes so that the negative effects due to land change can

be overcome and future resource management efforts can be planned with more reference to the optimization of the benefits of sustainable resources (Sembiring, 2009).

Particularly in Indonesia, some central problems in the effort to organize land use and the environment include:

1. There is a contradiction between the need to become a broader user on the one hand and severe constraints for the environment.
2. Increasing the necessities of life in rural areas which are not accompanied by an expansion of employment opportunities, and
3. The occurrence of soil damage due to lack of maintenance.

According to Jayadinata (1992), land use in rural areas is carried out carefully and limited by observing conservation rules in all socio-economic activities and must receive protection to be sustainable. Meanwhile, land in urban areas is generally used for industry and services (economic activities), requiring relatively small land. The number of people working on the land area is large (intensive land use).

The increasing demand for land for various activities causes the villagers' inability to control the land more widely. Maybe even release the land they own to gradually change their position from being a farmer who owns the land to become a cultivator, farm laborer, unemployed, or moves to another job (Todaro, 2000). Besides, the existence of land control by people who come from outside the village, due to purchases, especially in industrial and residential areas, causes a narrowing of the village area controlled by local villagers so that land tenure by residents is getting narrower and more unbalanced (Soegijanto, 1997). With the increasing pressure on agricultural land availability due to the increasing demand for land, it is feared that this condition will worsen the structure of agricultural land ownership in rural areas. In general, agricultural land is the most manageable land to be converted. This

agricultural land is also perfect for other interests such as industry, trade/services, and housing (Siahaan, Nasution, and Purwoko, 2014).

Spatial planning is a controlling instrument and a regulatory procedure that must be obtained: supporting community economic development, achieving a reduction of disparities between regions, supporting growth and stability of resources, supporting the sustainability of environmental protection, including human safety. More broadly, spatial planning emphasizes various aspects and views as follows:

a) Spatial planning is carried out to create a land-use territorial organization to balance development demands to protect the environment and achieve socio-economic goals.
b) Spatial planning includes measures to coordinate the spatial impact of other sectoral policies.
c) Efforts are made to achieve a more equitable economic development (not only left to market forces).
d) To regulate land use conversion.

Land use implicitly contains the meaning of space in it because it is related to use, arrangement, or regulation of service, both in the context of space and time. Meanwhile, land use is not emphasized like that. Land use is a form of space in nature about how land use is organized, both naturally and planned. Land use will continue to develop in the planned state by the spatial pattern and structure in the specified period. According to FAO's Framework for Land Evaluation (1993), looking at land use from an intervention perspective provides encouragement and assistance to land use in managing land. According to FAO's Framework for Land Evaluation (1993), land use planning aims to get the best use of land through achieving efficiency, equity, acceptance, and sustainability.

According to the Presidential Regulation of the Republic of Indonesia,

Number 59 of 2019, the change in paddy fields' function is the change of paddy fields to non-rice areas, either permanently or temporarily. According to Nyak (2000), the factors influencing the conversion of paddy fields are: (1). Economic pressure during the financial crisis caused many farmers to sell their assets in rice fields to make ends meet. The impact generally increases the conversion of paddy fields and increases land tenure on the part of capital owners. (2). residential development and the competitiveness of agricultural products are economic factors that determine the conversion of paddy fields. Meanwhile, in the macro context: wetland conversion has a positive correlation with GDP / GDP growth; The transformation of paddy fields negatively correlates with the farmer exchange rate. Both of these are in line with findings in the microscope. (3). Residential development, which is proxied by an increase in population, does not show a positive relationship. It indicates a trend of homeownership not only as a place to live but as an investment.

According to Irawan (2005), two things affect land-use change. First, in line with the construction of a residential or industrial area in a land conversion location, accessibility in that location becomes increasingly conducive to industrial and residential development, which ultimately encourages increased demand for land by other investors or land speculators price of the surrounding land increases. Second, the rise in land prices can further stimulate other farmers in the vicinity to sell land.

Related Research
1. Adetiya Nopa et al. with the title Analysis of the Role of Youth as Agents of Change in Controlling the Change of Function of Agricultural Land in North Labuhanbatu Regency. The results of this study are the influence of the role of youth as agents of change (development of economic resources, increasing community awareness, increasing environmental awareness, youth

leadership, and pioneering) simultaneously has a positive and significant effect on the control of the conversion of agricultural land in North Labuhanbatu Regency. Partially the variables of economic resource development, increased environmental awareness, leadership, and youth leadership have a positive and significant effect on controlling the conversion of agricultural land in North Labuhanbatu Regency. Meanwhile, the variable of increasing public awareness does not have a significant effect on preventing the conversion of agricultural land in the North Labuhanbatu Regency. The role of youth as agents of change in controlling rural land conversion in the North Labuhanbatu Regency is positive.
2. Abror, Said Muhammad, et al. with the title Analysis of the Effect of Road Network Development on Land Use Change in the Aek Kanopan Area. Based on the research results, conclusions can be drawn, namely: The construction of the ring road network in the Aek Kanopan area has brought about significant land-use changes in the study location within five years (2010-2014).

Framework
Following the description of the background of the problem, literature review, and previous research, a conceptual research framework is prepared as follows:

H1: The area of conversion of paddy fields in the South Tapanuli Regency continues to increase every year, and what causes people to change the function of paddy fields.
H2: The change in the function of rice fields has an impact on rice production in South Tapanuli Regency.
H3: The conversion of paddy fields has an impact on rice surpluses in South Tapanuli Regency.
H4: The factors that affect the decline in paddy fields in South Tapanuli Regency are the population, the number of industries, the number of houses, the length of roads, and the GRDP.
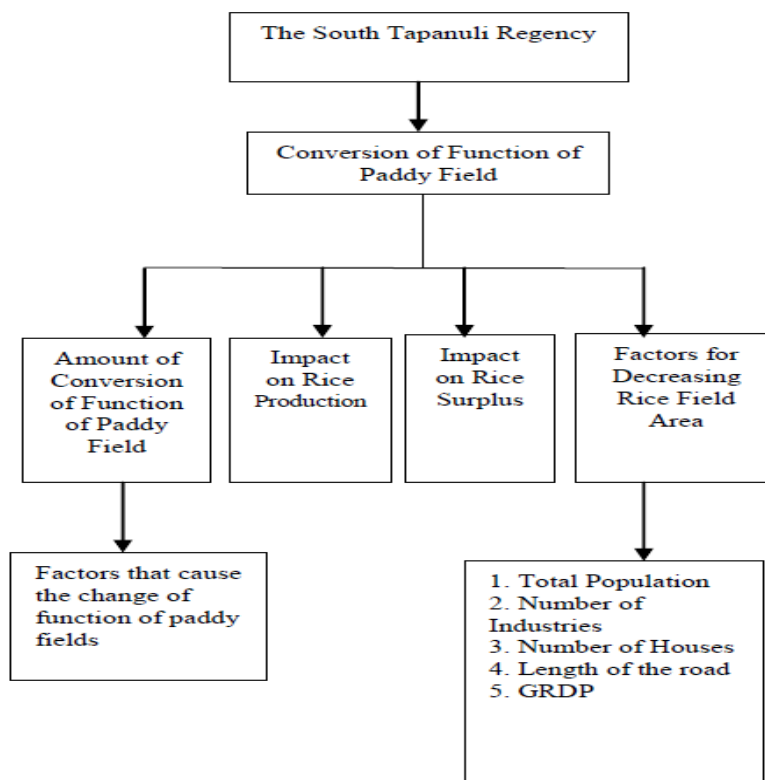
Figure 1. Thinking Framework Diagram

RESEARCH METHODS

The type of research used in this research is explanatory research with a quantitative approach by utilizing Geographic Information Systems (GIS). This study's population was the people who converted the paddy fields in Sipirok and Batang Angkola Districts, South Tapanuli Regency. The sample to be selected is using a multi-stage sampling method. The respondents' sample was determined to follow Roscoe's opinion (Sugiyono, 2003), which states that regardless of the population, in social research, the appropriate sample size is between 30 to 500 people. Based on the above opinion, the researcher determined a sample of 100 farmers who had converted the paddy fields.
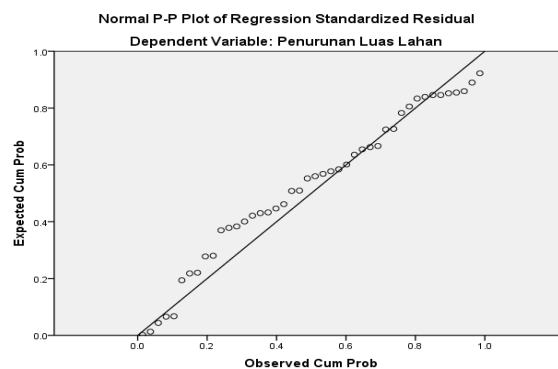
RESULT AND DISCUSSION
Normality test

Figure 2 Normal P-Plot of Standardized Residual Regression
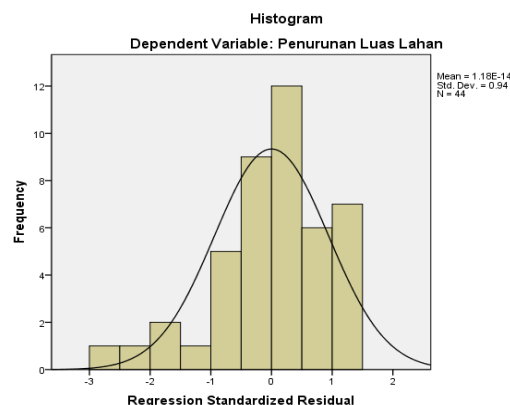*Source: data processed by researchers, 2021*

Figure 3 Histogram
Source: data processed by researchers, 2021

By looking at the normal plot graph display in Figure 2, it can be concluded that the data spread around the diagonal line and follows the direction of the diagonal line. It shows that the residual data is normally distributed. Likewise, the histogram graph results in Figure 3 show that the residual information is normally distributed as seen from the almost perfect (symmetric) bell-shaped image.
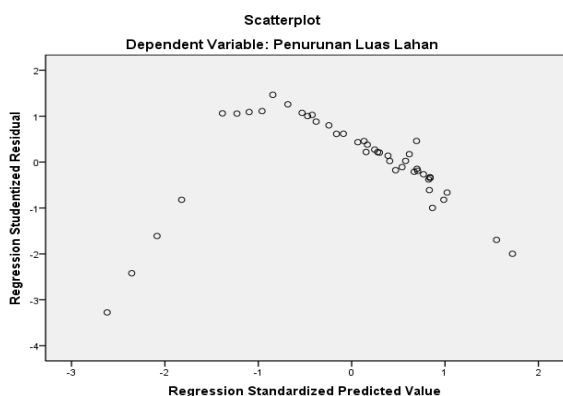
Heteroscedasticity Test

Figure 4 Graph of the Scatterplots
Source: data processed by researchers, 2021

The scatterplots graph in Figure 4 shows that the dots spread randomly and spread both above and below the number 0 on the Y-axis and do not form a specific regular pattern. It can be concluded that there is no heteroscedasticity in the regression model. So it can be supposed overall that the regression model meets the requirements of the classical assumption test.

Hypothesis test
Result of Determination Coefficient Test (R2)

Table 1 Coefficient of Determination (R2)

Model	R	R Square
1	0,809ᵃ	0,654

a. Predictors: (Constant), PDRB, Number of Industry, Length of Road, Number of Population, Number of Houses)
b. Dependent Variable: Rice field area
Source: data processed by researchers, 2021

The result of the calculation of the value of R Square is 0.654. It means that 65.4 percent of the decline in paddy fields can be explained by the independent

variables (total population, number of industries, number of houses, road length, and GRDP) above. In comparison, the remaining 34.6 percent is explained by other variables not included in this research.

Simultaneous Test Results (Test F)

Table 2 Simultaneous Test (Test F)

Model		F	Sig.
1	Regression	14,377	0,000ᵃ
	Residual		
	Total		

a. Predictors: (Constant), PDRB, Number of Industry, Length of Road, Number of Population, Number of Houses)
b. Dependent Variable: Rice field area
Source: data processed by researchers, 2021

Simultaneous statistical test with a probability level of 0.000, it can be concluded that $P = 0.000 < \alpha = 0.05$, which means that Ha is accepted. It means that the independent variables (total population, number of industries, number of houses, road length, and GRDP) together significantly explain the decline in paddy fields.

Hasil Uji Parsial (Uji-t)

Tabel 3 Uji Parsial (Uji t)

Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	11.696.805	5.601.867	2,088	0,044
	Total population	-0,072	0,085	-0,841	0,405
	Number of Industries	-4,049	1,876	-2,159	0,037
	Number of Houses	-1,832	0,523	-3,502	0,001
	Road Length	92,170	16,511	5,582	0,000
	PDRB	0,115	0,134	0,858	0,396

a. Dependent Variable: Land Area Decrease
Source: data processed by researchers, 2021

Based on table 3 above, it can be concluded that the population has a negative and insignificant effect on the decrease in the paddy field area. The number of industries and the number of houses negatively and significantly impact the partial decrease in the rice field area. The length of the road has a positive and significant effect on the decrease in the rice field area, and the GRDP has a positive and insignificant effect on the decrease in the rice field area.

Percentage of Area of Conversion of Rice Functions in South Tapanuli Regency and which is the Cause for Communities to Conversion the Function of The Rice Fields

The function change of paddy fields to non-agriculture in South Tapanuli Regency from 2010-2019 shows a total of 34.72 percent. It can occur as a logical consequence of population growth and economic development, so resource allocation changes, particularly land resources, are difficult to avoid. As a result of not paying attention to the priority scale of land resource use allocation, there is also conflict in allocating land resources for the provision of food sources and the construction of housing facilities and infrastructure. The high conversion rate of paddy fields can be caused by the increasing population, which encourages the growing need for settlements (Gardi et al., 2015; Jiang & Zhang, 2016). Besides, the rising demand for land for non-agricultural activities, including industrial, trade, and other activities, has also contributed to the high conversion rate of paddy fields (Yasar & Siwar, 2016).

Impact of the Conversion of Rice Functions on Rice Production in South Tapanuli Regency

The change in the function of paddy fields in the South Tapanuli Regency has not harmed rice production. It can be seen from the decreasing area of rice fields, but production has increased. Due to rice plantations' management in South Tapanuli Regency using intensification methods, they manage rice cropland with 1 X, 2 X, and 3 X in 1 year. Intensification through increasing IP (cropping index) by rehabilitating village irrigation networks, using superior seeds (blue label). The planting method with the Jarwo system (jajar legowo), the SRI method (rice intensification system), hazton, and others, and organic fertilizers distribute it. On-time, on target, on a dose, and maximizing agricultural machinery. This study's results

are in line with Aminuddin's (2009) research, which states that the area of rice fields that has been changed to non-rice fields has not been able to prove that it affects reducing total rice production in Gowa Regency. The results of this study are not in line with research conducted by Sunartomo (2015) which states that the conversion of agricultural land (rice fields) in Jember Regency during the period 2006–2013 resulted in a reduction in rice production by 4,593.09 Kw with a production reduction rate of 31.92 %.

Impact of the Conversion of Rice Functions on Rice Surplus in South Tapanuli Regency

The change in the function of paddy fields to non-rice fields impacts the decreasing number of land that can be used for food crop cultivation. It directly impacts decreasing the amount of food that can be produced in an area, assuming that land productivity is constant. Of course, this phenomenon can affect the fulfillment of people's food needs. When the community's food needs can be adequately fulfilled, that is, the available food is greater than the amount of food needed. The organization can be said to be food resistant.

On the other hand, when the available food is less than the level of community food demand, it can indicate the community's condition that is not food resistant. The results showed that although there has been a change in the function of paddy fields in the South Tapanuli Regency, food security (rice surplus) in the South Tapanuli Regency has not had a negative impact. It is because rice availability is still more significant than the community's food needs (consumption), or it can be said in the Regency. South Tapanuli still has a surplus of rice even though the rice fields are decreasing.

This study's results are in line with research conducted by Catur et al. (2010), which states that even though there is a process of conversion of agricultural land functions throughout the year, Klaten

Regency can meet the basic food needs (rice) of its population. There is even a surplus that can be exported outside the region in the period 1998-2007.

This study's results are not in line with Karini's (2013) research in Tanggerang Regency, which states that the amount of lowland rice production from 2009-2010 has increased by 57,257 tons of GKG or 14.54%. Due to the use of the right agricultural technology, and is supported by the socialization of acceptable farming methods by the Tangerang Regency agriculture and livestock office. The risk of crop failure (puso) can be avoided. However, between 2010-2011, the amount of lowland rice production decreased by 12,890 tons of GKG or 2.85%.

Factors Affecting the Decrease of Rice Field Area in South Tapanuli Regency

The results showed that the number of industries and the number of house buildings had a negative and significant effect on decreasing the area of paddy fields in the South Tapanuli Regency. This study's results are in line with Mustofa's (2011) research that concluded that land conversion was used for residential areas and factory construction for the industrial sector.

The results showed that the length of the road had a positive and significant effect on paddy fields in South Tapanuli Regency. This study's results are in line with Pujianti's research (2020 which states that Road Length (PJ) has a positive and significant effect on Rice Field areas.

The results showed that the population had a positive and insignificant effect on the decrease in rice field area in South Tapanuli Regency. This study's results are in line with Rahmadani's research (2019), which states that population does not have a significant effect on the area of agricultural land in Central Java Province. This study's results are contrary to Lagarense et al. (2015), which states that the population has a significant effect on the decline in agricultural land in the Southeast Minahasa Regency. The more extensive the

people, the area of agricultural land tends to decrease.

The results showed that the GRDP had a positive and insignificant effect on the rice field area decrease in South Tapanuli Regency. This study's results are in line with the research of Lagarense et al. (2015), which states that the GDP per capita has a positive and insignificant effect on the decrease in agricultural land in Southeast Minahasa Regency.

From the above description, it can be seen that the process of systematic land use change in the long term will remain vulnerable to existing rice fields, especially those that are not irrigated. It is only possible to make regulations/laws that explicitly determine the compensation for the loss of paddy fields due to the process of changing the function of paddy fields to suppress the conversion of paddy fields in a systematic manner,

SUGGESTION

Based on the results of data analysis and research discussion, the following conclusions can be drawn:

1. The South Tapanuli Regency Government needs to regulate a development policy requiring land that needs to be regulated and implemented under applicable regulations.
2. The South Tapanuli Regency Government continues to increase its rice production.
3. Rice self-sufficiency does not threaten South Tapanuli Regency. It is hoped that it will maintain its condition and even increase production.
4. The South Tapanuli Regency government controls the population by making the family planning program a success.
5. The South Tapanuli Regency government controls the number of industries whose development is in rice fields.
6. In the construction of houses not in the red zone, the South Tapanuli Regency Government has determined.

7. So that the government in a program to increase road construction converts land and raises the wheels of the economy.

8. The South Tapanuli Regency government, in increasing economic growth, must pay attention to the conversion of paddy fields that are not following the direction of the Spatial Plan for the South Tapanuli Regency.

9. For further researchers to add related variables.

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