The Effect of Population Growth and Economic Factor to Conversion Function of Agricultural Land Supply Chain in North Aceh District

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***Abstract*- Population growth and economic factors are the causes of changes agricultural land supply chain use in North Aceh District. The regional development requires land for housing, industry, trade and other purposes while land availability was constant, resulting in land conversion from the function of agricultural land supply chain to non-agricultural. The shifting of land use from 2012 to 2015 was significant in the reduced farm forestry 7,138 ha, agricultural estate 6,465 ha and Wetland area of 227 ha. The purpose of this study was to determine the significance of the effect of population growth and economic factors on the conversion of agricultural land supply chain into non-agricultural land supply chain. The method used was Quantitative Method by using Structural Equation Model (SEM). The results showed that population growth and economic factors affect the conversion of land from agricultural land supply chain to non-agricultural land supply chain, especially in urban areas. The shift in the dominant production area for housing, store shops because it is more profitable as a place of business in increasing people's income but this causes the reduction of agricultural land supply chain as a support food support**

Keyword: *Population Growth, Economic Factor, Land Conversion*, Supply Chain.

1. Introduction

North Aceh District has 27 sub-districts with a total population of 2015 of 583,892 people. In line with the Indonesian economy on the integration of the Asian Free Trade Area (AFTA), there will be a flow of trade in goods and services, investment and labor migration between Asean countries. This condition has resulted in special opportunities and challenges for economic development, especially demanding the impact of shifting land functions for housing, industry. Relating to the need to improve people's living standards and create jobs for investors or communities and governments in the implementation of increasing land demand [1].

The land is a strategic natural resource for development. Almost all development sectors require lands, such as agriculture, forestry, housing, industry, mining, and transportation. In agriculture, the land is a very important resource, both for farmers and for agricultural development. This is based on the fact that in Indonesia agricultural activities are still land-based. In addition, the increase in land demand is also driven by an increase in population growth, while land availability is constant, causing land use change from less profitable activities to be more profitable. Land use activities that are always threatened are agricultural activities that are considered less profitable than other economic activities. The specific change of agricultural land supply chain use for non-agricultural use is land conversion. Uncontrolled diversion of farmland can threaten the food supply capacity, and even in the long term can cause social harm to comprehend the process of land-use intensification, it is necessary to be responsible for the natural conditions of agricultural land supply chain between different regions and between different regions of a particular village. If increased population density makes it necessary to change land use patterns in a particular area, changes can be made in a way that considers the state of being in a natural state. The purpose of this study is to determine the effect of population growth and economic factors on the conversion of agricultural land supply chain into non-agricultural both individual and collective variables. The results of the research will be input for the government in formulating regulations on land use. The method used is Quantitative Method by using Structural Equation Model (SEM) with questionnaire data [2].

2. Materials and Methods

North Aceh district has a total area of 329 686 hectares consisting of 9 types of land, namely: wetland, House Copounsand surrounds, Dry land/garden, field for crop/cultivation, Meadows, Temporarily fallow land, Farm Forestry, Agricultural Estate, Others lands. The area of each land is shown4 in Table 1.

Table 1: Land use in North Aceh District

Land Utilization	2012 (Ha)	2013 (Ha)	2014 (Ha)	2015 (Ha)
Wetland	45,766	45,714	45,485	45,487
House Copounsand surrounds	92,725	93,232	92,465	93,334
Dry land/garden	38,410	38,509	45,655	43,118
field for crop/cultivation	21,803	21,991	24,217	23,564
Meadows	5,456	5,526	6,464	6,549
Temporarily fallow land	8,425	8,036	9,968	9,918
Farm Forestry	33,362	32,792	26,770	26,224
Agricultural Estate	55,698	55,902	49,560	49,233
Others	28,093	27,932	29,102	32,259
Total	**329,686**	**329,686**	**329,686**	**329,686**

The location of research in 6 sub-districts are Nisam Antara, Simpang Kramat, Seuneudon, Baktiya Barat, Lapang and Muara Batu where the land function is indicated by the decreasing of wetland from 2011 to 2015 in Table 2.

Table 2: Conversion function wetland at sub-district

No	Sub-District	2011	2012	2013	2014	2015
1	Nisam Antara	21	-	-	-	-
2	Simpang Kramat	702	964	964	702	702
3	Seunuddon	2,915	2,540	2,540	2,540	2,533
4	Baktiya Barat	2,572	2,572	2,572	2,563	2,563
5	Lapang	596	596	596	572	572
6	Muara Batu	1,522	1,500	1,500	1,500	1,499

The population in a research is the entire psychological object that is limited by certain criteria can be a tangible or intangible object. The number of psychological objects in the population is called the population size which is usually a parameter N. The size of this population can be counted (countable), may also be uncountable. If the population size can be calculated then the population is called the finite population. If the population size is so large that it can not be counted then it is called an infinite population. The population is a group of objects of infinite size, whose characteristics are examined or tested by sampling, is a set of people/subjects and objects that must be observed and studied its specific characteristics [3].

The populations in this study were homogeneous and have the same characteristics as the individual population in the household. Homogeneous populations are populations whose elements have the same properties or circumstances so that sampling does not need to quantitatively quantify quantities as long as they meet the minimum samples required for analysis of research data. The population until 2015 was 583,892 people with an average population growth 2%. The population in this study is a community-based in 6 districts from 2011 to 2015 and population growth as shown in Table 3.

Table 3: Population growth at 6 sub-district

No	Sub-District	2011	2012	2013	2014	2015	Population Growth
1	Nisam Antara	12,277	12,447	12,610	12,981	13,229	1.87
2	Simpang Kramat	8,824	8,946	9,063	9,330	9,508	1.83
3	Seunuddon	23,476	23,800	24,112	24,822	25,295	1.74
4	Baktiya Barat	17,334	17,574	17,804	18,328	18,678	2.05
5	Lapang	8,075	8,187	8,294	8,538	8,701	2.00
6	Muara Batu	25,179	25,527	25,861	26,623	27,131	2.25
	Total	95,165	96,481	97,744	100,622	102,542	

The sample size should be as much as possible, the larger the samples taken will be more representative of the population and the results of the study can be accurate. From the purpose of sampling that is to get the right population representation, then sample size need to take into account the population characteristics and

estimation capability. Consideration of the characteristics of the population will determine the sampling technique, it is intended to reduce or eliminate the bias, while the estimation capability relates to the accuracy in estimating the sample population and how the sample can be generalized to the population, efforts to achieve better accuracy require the addition of samples, and the addition will depending on group variation, tolerable error rate and level of confidence.

In terms of samples, the criteria can be said to be good if it meets 2 precision criteria and accuracy. The sample is expected to have a high precision sample that has a low sampling error rate. The sampling error is how large the sample differs from that described by the population. Precision can be increased by increasing the number of samples. The larger the sample the smaller the estimated standard error. To obtain the homogeneity of the sample, this random sample was taken where each element of the population had equal opportunity to be selected as the research sample. The sample size is determined based on the Slovin equation where the sample size (n) can be known directly only by knowing the population size (N) as follows:

$$n = \frac{N}{N.d^2 + 1} \quad \ldots\ldots\ldots\ldots \quad (1)$$

Where n is the sample size, N is the population size and d is the estimation error

In this study population size 102,542 with an estimated error of 10% then the sample size is:

$$n = \frac{102{,}542}{102{,}542.0{,}1^2 + 1} = 100$$

The sample size size proportionally by using tabulation as shown in Table 4:

Table 4: Samples size

Sub-District	Sample Size	Population Size	Error
	n	N	d
Nisam Antara	15	13,229	0,1
Simpang Kramat	10	9,508	0,1
Seunuddon	25	25,295	0,1
Baktiya Barat	20	18,678	0,1
Lapang	10	8,701	0,1
Muara Batu	30	27,131	
Total	**110**	102,542	

The variables were analyzed with Structural Equation Model (SEM) using AMOS software and latent variables. The measurement of latent variables is represented by several indicators in the form of real variables. There are two types of latent variables: endogenous latent variables denoted by eta (η) and exogenous latent variables ksi (ξ). Endogenous latent variables are latent variables that are not free and exogenous latent variables are independent latent variables. The operational definition of the variables is based on two exogenous latent variables, namely population growth and economic factor and 1 endogenous latent variable, ie Function of Land. It is not possible to perfect predictions, therefore the Structural Equation Model (SEM) includes structural errors with the zeta symbol (ζ). These structural errors are correlated with endogenous latent variables. The value that connects latent variables to their measurements is given the lambda (λ) symbol [4]. The research variables are given operational definitions so that there is one perception about the variables being analyzed. In this study the variables are defined as follows:

1. Population growth is defined as a population increase from year to year that requires land as a mobile medium. The variable of population growth is latent variable with an indicator of landowner population which is not a farmer, rent value of land and regeneration of farmer in a family.
2. Economic factors are defined as the financial capacity of the community to meet family needs. The variable of economic factor is latent variable with indicator of dependent amount, family income level and business capital requirement.
3. Land Function Conversion is defined as the conversion of agricultural land supply chain into non-agricultural land supply chain. Land Function Distribution Variable is latent variable with indicator Land Area, Land Revenue, and Agricultural land supply chain Condition [5].

The collected data is done by observation through the questionnaire distributed at the research location. Data analysis of respondent questionnaires with models in accordance with empirical conditions then tested the validity and reliability test data. The validity test is performed to check the accuracy of the measuring instrument used to perform the measurement function. The instrument has high validity when it meets the purpose of measurement and it can be said that the data does not deviate from the research variables. The validity test is used to find out whether there is a statement on the questionnaire to be removed or replaced because it is not relevant. The technique of measuring the validity of the questionnaire is

calculating the data between each with a total score, using the formula correlation product moment, as follows:

$$r = \frac{n(\sum XY) - \sum X \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)_2]}} \quad .. (2)$$

The instrument is if value r > 0.3 or can also compared with r table. If r arithmetic > r table then valid. Reliability test to determine whether the questionnaire instrument can be used more than once, at least by the same respondent will produce consistent data. In other words, the reliability of the instrument characterizes the degree of consistency. To measure the reliability used Spearman-Brown formula as follows:

$$r_i = \frac{2.r_b}{1 + r_b} \quad ..... \quad (3)$$

where r_i is Reliability value and r_b is the value of correlation coefficient. A reasonable reliability value if greater than 0.6 (good enough), or greater than 0.8 (good). Questionnaire data were analyzed using Structural Equation Modeling (SEM) to a hypothesis. The path diagram is used to describe or make the model more clearly and easily defined and describe the path diagram of the equation appropriately. The relationships among the models are set out in structural equation models and measurement models [6]. Variables in Structural Equation Modeling consisting of latent variables are abstract concepts that can only be observed indirectly and imperfectly through their effect on the observed variables. Latent variables that are distinguished are exogenous and endogenous variables. The exogenous variable is the same as the independent variable, while the endogenous variable is equivalent to the dependent variable. Observable variables or measured variables are those that can be observed or can be measured empirically as indicators. This variable is the effect or size of the latent variable.

Data analysis was done by mathematical equation model as follows:

1. Population Growth Affects Land Function Conversion:

$$\eta_1 = \gamma_{21}\xi_1 + \zeta_1 \quad ..... \quad (4)$$

The model of mathematical equations becomes:

$$\eta_1 = -0{,}02\xi_1 + 0{,}07$$

Where η1 is the conversion of land function; γ21 is the coefficient of regression of construct of population growth to the conversion of Land Function; ξ1 is population growth and ζ1 is Error of measurement to land function conversion

2. Economic Factors to Land Function Transfer:
3.

$$\eta_1 = \gamma_{22}\xi_2 + \zeta_1 \quad .....(5)$$

The model of mathematical equations becomes:

$$\eta_1 = 0{,}27\xi_2 + 0{,}07$$

Where η1 is the conversion of land functions; γ22 is the regression coefficient of economic factor development on the conversion of land functions; ξ2 is an economic factor; ζ1 is a measurement error (error) conversion function Land

4. Population Growth and Economic factors together affect Land Conversion Functions

$$\eta_1 = \gamma_{21}\xi_1 + \gamma_{22}\xi_2 + \zeta_1 \quad ..... \quad (6)$$

The model of mathematical equations becomes:

$$\eta_1 = -0{,}026\xi_1 + 0{,}27\xi_2 + 0{,}06$$

Where η1 is the Transfer of Land Function; γ21 is the Coefficient of Construction Regression Population Growth to Land Function conversion; ξ1 is Population growth; γ22 is the Economic Factor's Construct Regression Coefficient to the conversion of Land Function; ξ2 is Economic Factor and ζ1 is Error of measurement (error) conversion of Land Function.

3. Results and Discussion

The result of analysis by using Structural Equation Modeling (SEM) based on path diagram, determine the model to describe the equation path diagram appropriately. The relationship between the models is set to the model of structural equations and measurement models. The research model and the results of the analysis are shown in Figure 1.

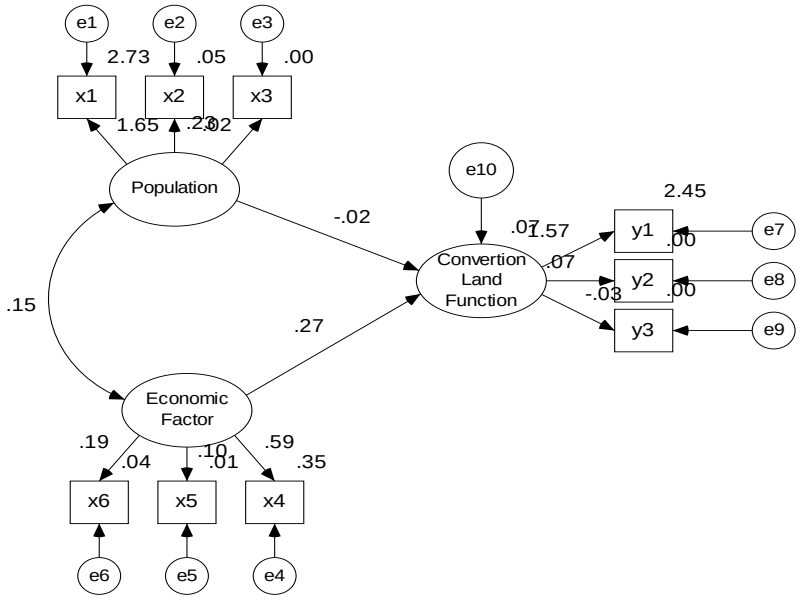

Figure 1: Result of research model

To measure the validity of data is done by calculating the correlation coefficient between each question item with the total value of all variables. The correlation coefficient is called corrected item-total correlation with absolute value compared with the critical value of correlation (r-table) with level α = 5% and n-2 free rate, where n is the number of samples. The variable is declared valid if the total value of the corrected item is greater than r table significant the research questionnaire can precisely measure the question items. The result of validity test as shown in Table 5 shows that Corrected Item-Total Correlation value is greater than r table value (0.128) so that all variables can be declared valid and it can be concluded that the instrument of this research questionnaire can be used to accurately measure the required data [7], [8].

Table 5: Result of validity data test

Variable	Notes	Corrected Item-Total Correlation	Conclusion
Non Farmers	X1	0,342	Valid
The land price	X2	0,236	Valid
Regeneration of Farmers	X3	0,253	Valid
Amount of dependents	X4	0,930	Valid
Income Level	X5	0,205	Valid
Capital Farming	X6	0,202	Valid
Land area	Y1	0,380	Valid
Price of Land	Y2	0,480	Valid
Land Condition	Y3	0,282	Valid
r table = 0,128; The variable is declared valid if the value CITC > r table			

Reliability is the suitability of the measuring instrument by measured so that the measuring device is reliable or reliable. Designing a reliable research instrument is the goal to be achieved. The research instrument serves as a research representative in the field, then its reliable nature remains the main requirement, therefore the measuring tools used must have high sensitivity to the data. If an instrument is used twice to measure the same symptoms and the measured results are relatively consistent, then the measuring instrument is reliable. Reliability test is done based on Cronbach Alpha value. Instruments are said to be reliable if the Cronbach Alpha value is greater than or equal to 0.6. it shows credible and non-contradictory results. From Table 6 the results of reliability test data to the questionnaire note that all research variables have a value of Cronbach alpha greater than 0.6 this shows that all items of question in the questionnaire reliable and consistent in the measurement [9].

Table 6: Result of reliabilities data test

Variable	Cronbach's Alpha	Conclusion
Non Farmers	0,699	Reliable
The land price	0,684	Reliable
Regeneration of Farmers	0,692	Reliable
Amount of dependents	0,685	Reliable
Income Level	0,693	Reliable
Capital Farming	0,692	Reliable
Land area	0,700	Reliable
Price of Land	0,685	Reliable
Land Condition	0,698	Reliable

Testing the consistency of the research model is used to test how well the conformity of the research model. Based on the test results shown in Table 7 that all the criteria are in the goodness of fit, overall it showed that the research model has a good match rate

Table 7: Result of model Good of Fit Test

Size Index Criteria	Reference Value	The Result	Conclusion
Chi Square	Approaching 0	12,7	Marginal
P-Value	≥ 0,05	0,132	Good
CMIN/df	≤ 2,00	0,528	Good
RMSEA	≤ 0,08	0,000	Good
GFI	≥ 0,90	0,962	Good
AGFI	≥ 0,90	0,948	Good
TLI	≥ 0,90	0,974	Good
CFI	≥ 0,90	0,978	Good

The process of accelerating urbanization has increased the level of fragmentation and structural complexity of the landscape to simulate land use change. Population growth in the study sites from 2011 to 2015 has increased significantly with an average population growth of 2% per year as shown in Figure 2.

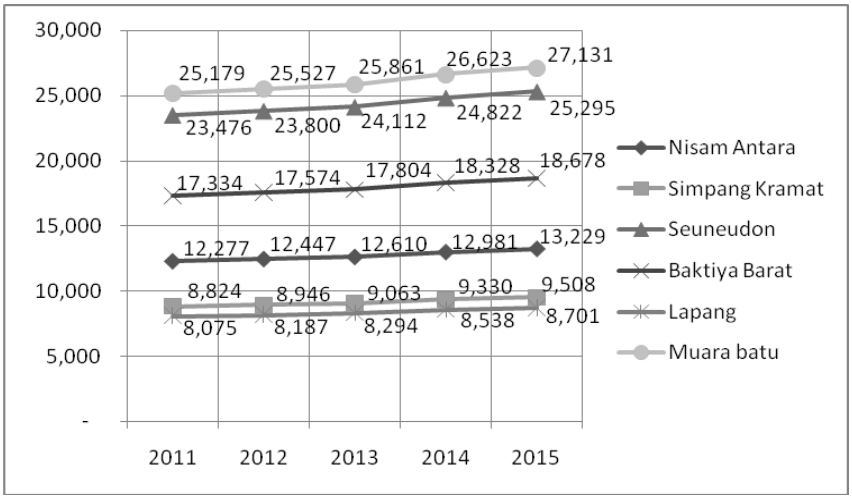

Figure 2: Population increase

Besides with the increasing amount of residents, the needs of residential land or settlements in northern Aceh each year increases in accordance with the needs of the community. To meet these needs, people sometimes change the function of paddy fields into houses or store shop. This change is done in addition to meet the needs of residents as well as to increase the added value of land to the sale price, especially on paddy fields located on the roadside. Preservation of land conservation has come to the conservation of increasingly popular agricultural land supply chain. Liquidity often involves the purchase of future development rights, but the assessment of development rights by standard valuation methods is complicated by a number of factors. The

results showed that the influence of individual variables of population growth factor significantly influenced 2% in influencing land conversion where indicator of non-farmers ownership contributed with the biggest loading factor of 165% while the land price indicator contributed 0202 and the regeneration indicator of farmers was not very influential, that land conversion occurs on land where the owner does not work as a farmer. This condition is caused by the value of the land that will be higher if its function becomes a house or building as the loading factor on the indicator of land income by 8%.

For developing countries, better representation of urbanization and its impacts on land use change on rural-urban interface, transport infrastructure, and market changes will be needed. Economic Factors had a significant effect of 27% in which the indicator of dependents contributed with loading factor of 59%, while the income indicator of farmers contributed with 10% loading factor and the capital indicator in farming contributed with loading factor of 19%. This condition illustrates that the large number of family dependents in meeting their daily needs triggers land use functions. In addition, the amount of capital for agricultural activities also give a big influence for farmers to change land functions and still low levels of income farmers forced to change land functions to meet the needs of his life. The conversion of wetlands, generally the most common in urban areas, is due to the rapid population growth and the development of centers of economic activities such as industry/service high. This activity requires the availability of land, where individuals and investors then buy land. After the transition of paddy field ownership from farmers to non-farmers, what happens is that rice fields around the urban areas are converted into buildings or buildings. Population growth variable and economic factor together give a significant influence of 15%; it indicates that land transfer function is strongly influenced by a factor of population growth and economic factor [10], [11].

Conversion of agricultural land supply chain is basically due to competition in land use between agriculture and non-agricultural sectors whereas competition in the land use comes as a result of three economic and social phenomena, namely limited land resources, population growth, and economic growth. Most land conversion for non-agricultural activities is intended for housing construction and public facilities development. The conversion of land function, especially agricultural land supply chain causes changes in the socio-economic conditions of the community. From the conversion of the land, it is possible to change the livelihood of the people, from being a farmer, not a farmer, or even unemployment. If allowed to continue, it can threaten the sustainability of the livelihood system of peri-urban societies, especially farmers. The conversion of agricultural land supply chain occurs progressively to development areas such as those near the center of the city, in the education area, and in the corridor that is the entrance. For farmers who lost their rice fields the majority of the income decreased protected areas around the world are key to conserving biodiversity, and land use is the key to providing food, fiber, and other ecosystem services that are essential to human needs. Because land use change isolates protected areas from surrounding landscapes, the challenge is to identify management opportunities that maintain ecological function while minimizing restrictions on human land use. Factors that encourage conversion of agricultural land supply chain to non-agriculture are population factor, economic factor (land rent), socio-cultural factor (inheritance law), environmental degradation, regional autonomy, and weakness of law system and law enforcement of existing regulations [14]. Three land conversion control strategies: minimize the chances of conversion, control land conversion activities, land conversion control instruments. On a global scale, land becomes a scarce resource, asserting the need for more efficient land allocation and innovation in agriculture. The shifting of production area is dominant enough for plantation land as a result of investment in plantation area opening for oil and rubber commodities [12], [13].

4. Conclusion

Conversion of agricultural land supply chain is one of the most frequent phenomenons of land change in some areas. The community's decision to convert agricultural land supply chain into non-agricultural functions is heavily influenced by family economic factors in meeting the needs of life due to the large number of family dependents while the income level is low and also triggered by the high capital in the agricultural business while the farmer's financial family is unable to fulfill it. In addition, the increase in population also affects land conversion where some landowners assume that their land will be more profitable if transferred to non-agricultural land supply chain such as housing or shops for business and can increase family income [15].

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