Influence of land area and capital strengthening fund of rural economic enterprises toward corn production in North Sumatera province

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Abstract. Corn is one of the staple food crops. Corn can also be processed into various foods and also as animal feed. The need for corn will continue to increase from year to year so it is necessary to increase production. The government has targeted corn crop self-sufficiency to achieve the corn production standards required by the animal feed industry. The purpose of this study is to analyze the effect of land area and capital strengthening funds to rural economic enterprises on corn production. This study uses secondary data obtained from the Central Statistical Agency of North Sumatra Province. The research method used is panel regression method. The result shows that the area of land has a significant effect on corn production and the capital strengthening fund to the rural economy institution has an insignificant effect on corn production in North Sumatera Province.

1. Introduction

Corn is the second most important food commodity in Indonesia after rice but corn is not a major product in the agricultural sector. Corn is one of the staple crops consumed by most residents other than rice, cassava, sweet potatoes, and sago. In addition, corn can also be processed into various foods that are a source of calories and also as animal feed. As a product between rice cultivation, corn is also produced intensively in some areas in Indonesia which is a corn producer.

The need for corn will continue to increase from year to year in line with the improvement and progress of corn-based industry, so it is necessary to increase production through human resources and natural resources, land availability and yield and technology potential. This condition makes corn cultivation has a very promising prospect, both in terms of demand and selling price. The government has targeted self-sufficiency of corn cultivation to achieve the corn production standards required by the animal feed industry. To realize this, the government made several efforts, among others, to cooperate with private parties engaged in the field of animal feed and food industries that use corn as raw materials. So the government in the effort to develop corn crop will be developed in areas known as corn production center with the district system. These areas include northern Sumatera, southern Sumatera, central Java, eastern Java, and Sulawesi.

The extent of agricultural land cultivation is something that is very important in the production process or farming and agricultural business. In farming, for example, the ownership or control of narrow land is definitely less efficient than the wider land. The narrower the business land, the less efficient the farming is. Unless farming is done in good order and good administration and appropriate
technology. The level of efficiency actually lies in the application of technology. Because of the narrower extent, the application of technology tends to be exaggerated (this is closely related to land-to-hectare conversion) and makes business inefficient.

Farm land is said to be productive if the agricultural land can produce the production in the field of farming is satisfactory. To increase agricultural production, every farmer is increasingly dependent on the resources of his wider environment. Various information on the possibilities of land use and the limitation of the physical environmental factors is very important in discussing land use planning and patterns. In addition, information on social, economic, and community factors in the land itself is also needed as a support for consideration in planning and land use patterns.

In order to cope with the fall in corn prices that often occur during harvest time, the government through the food security agency - the department of agriculture since 2003 has made a policy through the distribution of Bridging Fund, which is also called Capital Strengthening Funds Rural Economic Enterprises (DPM- LUEP) to rural economic enterprises to improve their ability to buy grain from farmers especially at harvest time with reference to government purchasing price (HPP).

The Capital Strengthening (DPM) Funds Channeled to Rural Economic Enterprises (LUEP) in 2016 are APBD funds allocated to maize production centers as interest-free bailouts that can be used repeatedly by LUEP to buy farmers’ grain and the deadline for utilization of DPM- LUEP which is a maximum of 2 (two) years from the date of signing of cooperation in accordance with the established mechanism.

Based on the description above, the problem in this research is how the influence of land area and capital strengthening fund to a rural economy business institution to corn production in North Sumatera Province. The purpose of this study is to analyze the effect of land area and strengthening of capital to rural economic enterprises on corn production in North Sumatera Province.

2. Research Methods

2.1. Data Analysis Method

The free variables in this study are the area of land, capital strengthening funds channeled to rural economic enterprises. The dependent variable in this research is corn production in North Sumatera Province. So the equation model in this research is as follows.

\[ \text{PRD}_i = a_0 + a_1 \text{LH}_i + a_2 \text{DPM}_i + e_i \]  \(1\)

Where:

- \(\text{PRD}_i\): Corn production in North Sumatera Province
- \(\text{LH}_i\): Land corn area
- \(\text{DPM}_i\): Fund strengthening capital to rural economic enterprises
- \(e_i\): Error term
- \(a_0\): Constants
- \(a_1, a_2\): Regression coefficients
- \(i\): 7 cross-section units (Deli Serdang, Serdang Bedagai, Langkat, Karo, Simalungun, Dairi, and Toba samosir)
- \(t\): Time series of 5 (2011-2015)
- \(n \times t\): Number of panel data (7x5 = 35)

3. Results and Discussion

3.1 Selection of Panel Data Estimation Model

To find out whether the PLS or FEM model to be selected for data estimation is done F-test/Chow Test. To be more clear about the model PLS or FEM to be used in the estimation can be tested Chow.
3.1.1 Chow Test

**Table 1.** Chow Test

Redundant Fixed Effects Tests
Pool: POOL01
Test cross-section fixed effects

| Effects Test          | Statistic  | d.f. | Prob.   |
|-----------------------|------------|------|---------|
| Cross-section F       | 16.239793  | (6,26) | 0.0000  |
| Cross-section Chi-square | 54.517702  | 6     | 0.0000  |

Cross-section fixed effects test equation:
Dependent Variable: PRD?
Method: Panel Least Squares
Date: 09/11/17  Time: 14:18
Sample: 2011 2015
Included observations: 5
Cross-sections included: 7
Total pool (balanced) observations: 35

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | -50.25181   | 12.14507   | -4.137632   | 0.0002|
| LH?      | 6.534269    | 0.289414   | 22.57757    | 0.0000|
| DPM?     | 0.040587    | 0.037835   | 1.072751    | 0.2914|

R-squared 0.946913  Mean dependent var 169.8837
Adjusted R-squared 0.943595  S.D. dependent var 165.7939
S.E. of regression 39.37556  Akaike info criterion 10.26598
Sum squared resid 49613.91  Schwarz criterion 10.39930
Log likelihood -176.6547  Hannan-Quinn criter. 10.31200
F-statistic 285.3927  Durbin-Watson stat 0.400502
Prob(F-statistic) 0.000000

H0 : Common Effect Model
H1 : Fixed Effect Model (H1 diterima FEM Model Terbaik)

From the table 1, it can be seen that the value of prob cross section chi-square is 0.000 whose value is smaller than the alpha value of 0.10. This shows that the null hypothesis (H0) is rejected means the appropriate model to be used in this equation is the Fixed effect model (FEM).

3.1.2 Hausman Test. With the result of better estimation between PLS with FEM, the next step is to determine a more efficient model whether to use fixed effect model or random effect model with Hausman test. To be more clear about the FEM or REM model that will be used in the estimation it can be done Hausman Test.
Table 2. Hausman Test

Correlated Random Effects - Hausman Test
Pool: POOL01
Test cross-section random effects

| Test Summary          | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|-----------------------|-------------------|--------------|-------|
| Cross-section random  | 4.820674          | 2            | 0.0898|

Cross-section random effects test comparisons:

| Variable | Fixed     | Random    | Var(Diff.) | Prob. |
|----------|-----------|-----------|------------|-------|
| LH?      | 5.016771  | 5.961076  | 0.269355   | 0.0688|
| DPM?     | -0.008466 | -0.005182 | 0.000009   | 0.2748|

Cross-section random effects test equation:
Dependent Variable: PRD?
Method: Panel Least Squares
Date: 09/11/17  Time: 14:26
Sample: 2011 2015
Included observations: 5
Cross-sections included: 7
Total pool (balanced) observations: 35

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | 8.580397    | 22.86662   | 0.375237    | 0.7105|
| LH?      | 5.016771    | 0.694106   | 7.227674    | 0.0000|
| DPM?     | -0.008466   | 0.022241   | -0.380664   | 0.7065|

Effects Specification

Cross-section fixed (dummy variables)

| R-squared | Adjusted R-squared | S.E. of regression | Sum squared resid | Log likelihood | F-statistic | Prob(F-statistic) |
|-----------|--------------------|--------------------|------------------|----------------|-------------|-------------------|
| 0.988818  | 0.985378           | 20.04823           | 10450.22         | -149.3959     | 287.4026    | 0.000000          |

H0 : Random Effect Model
H1 : Fixed Effect Model (H1 accepted with α 10% FEM as the best model)

From Table 2, it can be seen that the probability of cross section random is 0.0898 whose value is more than the alpha value of 0.10. This shows that the null hypothesis (H0) is accepted that the appropriate model for use in this equation is the fixed effect model (FEM).
This research uses panel data and after done data processing using fixed effect model (FEM), then the result of fixed effect approach can be seen estimation result in the following table.

**Table 3. Fixed Effects Model**

Dependent Variable: PRD?
Method: Pooled Least Squares
Date: 09/11/17   Time: 14:15
Sample: 2011 2015
Included observations: 5
Cross-sections included: 7
Total pool (balanced) observations: 35

| Variable   | Coefficient | Std. Error | t-Statistic | Prob. |
|------------|-------------|------------|-------------|-------|
| C          | 8.580397    | 22.86662   | 0.375237    | 0.7105|
| LH?        | 5.016771    | 0.694106   | 7.227674    | 0.0000|
| DPM?       | 0.008466    | 0.022241   | 0.380664    | 0.7065|

Fixed Effects (Cross)
- _DS—C: -68.62331
- _SB—C: -28.53563
- _LKT—C: -10.99563
- _KR—C: 107.7711
- _SML—C: 33.17984
- _DRI—C: -22.73709
- _TS—C: -10.05926

**Effects Specification**

| R-squared   | 0.988818 | Mean dependent var | 169.8837 |
| Adjusted R-squared | 0.985378 | S.D. dependent var | 165.7939 |
| S.E. of regression | 20.04823 | Akaike info criterion | 9.051193 |
| Sum squared resid | 10450.22 | Schwarz criterion | 9.451139 |
| Log likelihood | -149.3959 | Hannan-Quinn criter. | 9.189254 |
| F-statistic | 287.4026 | Durbin-Watson stat | 1.324508 |
| Prob(F-statistic) | 0.000000 |

3.2 **Coefficient of Determination (R^2)**

Determination Coefficient value (R^2) is used to determine the strength of independent variables (independent variable) describes the variation of the dependent variable (dependent variable). From the estimation result using fixed effect model obtained coefficient of determination R^2 equal to 0.9888 which means that variation of independent variable that is land area and capital strengthening fund to rural economy enterprise able to explain corn production variable in North Sumatera province as dependent variable equal to 98.88 percent and the rest 1.12 percent is explained by other variables not included in the estimation model.
3.3 Test Together/F-Test
Assessment of hypotheses together is done by using test F or with prob. If F-arithmetic > F-table or prob score < alpha (0.10) then the null hypothesis must be rejected and the alternative hypothesis must be accepted. Which means that together independent variables affect the dependent variable. From probability test obtained is equal to 0.000000 < alpha (0.05) then H0 is rejected and Ha accepted so that together independent variable (land area and capital strengthening fund to rural economic enterprise) have a significant effect on the dependent variable of corn production in the province of North Sumatra at a 90 percent confidence level.

3.4 Influence of Land Area to Corn Production in North Sumatera Province
Land area has the positive and significant effect on corn production in North Sumatera Province. From the results of the processed data presented in the table above can be seen that obtained the value of prob 0.000 < α = 0.05 consequently H0 rejected and Ha accepted so that there is a positive and significant influence between the land area of corn production in North Sumatra Province. The value of land area coefficient of 5.016 this explains that if the variable of the land area increased by one hectare then the maize production will increase by 5,0016 tons. In general, the more land (cultivated), the greater the amount of production produced by the land. The effect of the land area not only on the efficiency of farming, but also has an impact on the transfer and application of technology in agricultural development. If land ownership is more plentiful with a narrow mastery area, agricultural development efforts will be difficult. But if the tenure is wide enough, then the process of technology transfer will be easier to do.

3.5 Influence of Capital Strengthening Funds to Rural Economic Enterprises on Corn Production in North Sumatera Province
Capital strengthening funds to rural economic enterprises have a positive and insignificant effect on corn production in North Sumatra Province. From the results of the processed data presented in the table above can be seen that obtained the value of prob 0.706> α = 0.05 consequently H0 accepted and Ha rejected so that there is a positive and insignificant influence between capital strengthening funds to rural economic enterprises on corn production in the Province North Sumatra. The coefficient value of capital strengthening fund to rural economy enterprises amounted to 0.008. This explains that if the variable of capital strengthening fund to rural economy business institution increased by one million rupiahs then corn production will increase by 0,008 ton. Capital is the most important factor in agriculture especially related to production input and labor cost. In other words, the existence of capital very determines the level or kind of technology applied. Lack of capital causes a lack of input given so as to cause a risk of failure or low yields that will be accepted by farmers.

4. Conclusion
Based on the results of research and discussion that has been described, it can be concluded as follows: (a) Partially, the area of land has a positive and significant effect on corn production, and the capital strengthening fund to the rural economic enterprise has a positive and insignificant effect on corn production in North Sumatera Province, (b) Simultaneously, the area of land and capital strengthening funds to rural economic enterprises have a significant effect on corn production in North Sumatra Province.

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