Analysis of rice policy based on presidential instruction on household food security: simultaneous equation model

S A Sembiring
Catholic University of Saint Thomas North Sumatera
sabadi@ymail.com

Abstract. The objective of this research is to analyze the impacts of rice policy on the household food security. The research used cross section data, were collected from 74 respondent as determined by purposive sampling in Sei Rejo villages, the Sub District of Sei Rampah, Serdang Bedagai District in the Province of North Sumatera. Rice policy model specification uses the simultaneous equations consisting of 6 structural equations and 6 identity equations which was estimated using Two Stages Least Squares (2SLS) method. The results show that the effectiveness of government purchase price of dried harvest paddy gave a positive impact on paddy planted area and lead to an increase paddy production and an increase of the rice production gave a positive impact on household rice availability and household rice surplus, and the increase of household rice surplus gave the quantity of Raskin decrease, whereas the increase of fertilizers gave a negative impact on paddy planted area and lead to decrease paddy production and to decrease in rice production was followed by an decrease in household rice availability and household rice surplus, and the decrease of household rice surplus gave the quantity of Raskin increase.

1. Introduction
Through the Timbergen framework, policy instrument is an exogenous variable, while the policy objective is endogenous variables [1]. Based on this framework, food security on Presidential Instruction (Inpres) both No 8/2008 [2] and No7/2009 [3] is endogenous variables. Based on [4] it is shown that to achieve food security if government implemented government purchased on dried harvest paddy.

Although Indonesia has achieved food self-sufficiency, in certain areas are still found food insecurity. Food security at the national and provincial levels does not guarantee food security at the household level because in some provinces it is found that household food security is low [5]. Using BPS data, Susenas 1996-2002, shows that the percentage of households experiencing in Indonesia, the greatest food insecurity in low income groups. In 1999, the percentage of households facing food insecurity reached 34.0 percent in low-income groups. In contrast, food insecurity in high income groups is only 0.4 percent [6]. The lack of access to food, 82 percent famer household in Sukajadi villages facing food insecurity [7]

The challenges facing food security in the future can be approached through supply side and demand side [8] This condition lead the fluctuation food production and food price changes. According to [9] show that the links fluctuation food production or changes in food prise as food insecurity. Once of the objective of government purchase price is to increase paddy production [10], on the other hand Government Purchase Rice is one way to give incentive to farmer [11].
According to [12, 13] used the food security indicators is rice production, community rice stock, Bulog rice stock, domestic rice stock and rice surplus. The limitations of the study [14,15] have included food security and farmer income in his study, although HPP policies effectiveness. The formulation of the research problem is how the impact of government policy through Presidential Instruction on household food security? The purpose of this study is to analyze the impact of government policy through Presidential Instruction on household food security on farmers level.

2. Data and Methods

The research used cross section data were collected from respondent of 74 farmer which was collected in 2012 as determined by purposive sampling in Sei Rejo villages in the Sub District of Sei Rampah, Serdang Bedagai District in the Province of North Sumatera. Rice policy model specification uses the simultaneous equations consisting of 6 structural equations and 6 identity equations. Rice policy model specification using simultaneous equation consists of 6 structural equations and 6 identity equation.

System contains 12 equations (G = total number of equations) with 22 variables (K = number of total variables in the model). An equation paddy production containing 4 variables (M = number of variables, endogenous and exogenous, included in a particular equation ) and the counting rule (K-M) > (G-1) \[16\] gives ( 23 - 4 ) > (12-1), and paddy production equation is over-identified. Therefore other equation is must over-identified. When the all structural equation is over-identified it can be proved by 2SLS (Two Stage Least Squares). Definition of variables is as shown in Table 1.

| Variable | Definition | Variable | Definition | Variable | Definition |
|----------|------------|----------|------------|----------|------------|
| LAIT     | Paddy Planted Area (Ha) | QPIT     | Paddy Production (Kg) | QBIP     | Rice Production (Kg) |
| JUPT     | The Quantity of Urea Fertilizers (Kg) | JPTT     | The Quantity of SP-36 Fertilizers (Kg) | SRHH     | Household Rice Available (Kg) |
| RAST     | Rice for the poor people (Kg) | IFPT     | Farmer Income (Rp) | TRUT     | Total Revenue of Farmer (Rp) |
| TCUT     | Total Cost of Farm (Rp) | EXRH     | Household Rice Surplus (Kg) | HGRT     | Price of Dried Paddy (Rp/Kg) |
| HPUT     | Price of Urea Fertilizers (Rp/Kg) | HPTT     | Price of SP-36 Fertilizers (Rp/Kg) | KHPPE    | The Effectiveness of Government Purchased Price |
| TVCP     | Total Cost for Fertilizers (Rp) | TVCO     | Total Cost for Pesticide (Rp) | TVCW     | Total Cost for wage (Rp) |
| TVCS     | Total Cost for Seed (Rp) | QCRT     | Household Rice for Consumption (Kg) | D        | Dummy; 1= Certificate Seed; 0 = non Certificate Seed |
| Fk       | Factor Conversion: 0.63 |          |            |          |            |

3. Result and Discuss

According to Table 2 show that all the equation has the coefficient of determination R^2 than those for household rice available less than 0,70 (Table 2), Durbin-Watson (DW) value, Variance inflation factor (VIF) and F value. VIF value for all structural equation less than 10, it means there is no multicolenirity between exogenous variables [17]. All the equation has statistic F than those for quantity of SP-36 fertilizer are significant at the 1 per cent. It means that the explanatory variables of each equation together can explain the endogenous variables well.

According to ‘as in equation (1)’ paddy harvested area depend negatively and significantly on HPUT and HPTT but for the KHPPE variable is positive and significant. The estimates of the elasticity of LAIT with respect to the HPUT and HPTT are -4.482 and -1.930, respectively. It means, increasing HPUT by 1 per cent reduce LAIT by more than 4.482 per cent in short run and , increasing HPTT by 1 per cent reduce LAIT by more than 1.930 per cent in short run.

Based on ‘as in equation (2)’ paddy production depend negatively and insignificantly JPUT and JPTT, but for DS is positive not insignificant and LAIT is positive and significant. The coefficients JPUT and JPTT tending to contradict the hypothesis but the coefficients DS and LAIT agree with prior expectations.
Table 2. The estimated econometric model of rice policy on household food security

| The structural and identity equation | EN |
|--------------------------------------|----|
| LAIT = 1.299596 - 0.00133 HPUT* - 0.00051 HPTT*** + 0.01018 KHPPE**, R^2 = 0.16465 | (1) |
| 1. DW = 0.3414, F = 4.60** | |
| QPIT = -268.961 - 268.961 JUPT - 10.4338 JPTT + 17.438 DS + 880749 LAIT*, R^2 = 0.45152 | (2) |
| 3. DW = 1.855, F = 14.20** | |
| JUPT = 549.514 - 0.2268 HUPT** + 51.3570 LAIT*, R^2 = 0.2031, DW = 1.2093; F = 9.05* | (3) |
| 5. JPTT = 94.110 - 0.0236 HPTT + 90.879 LAIT**, R^2 = 1.96; DW = 2.1461; F = 1.96 | (4) |
| SRHH = 502.28 + 0.000142 IFPT*, R^2 = 0.749; DW = 0.7555; F = 215.91* | (5) |
| RAST = 27.129 - 0.00509 EXRH**, R^2 = 0.2031; DW = 2.1081; F = 4.11** | (6) |
| 7. QBIP = 0.63 x QPIT | (7) |
| IFPT = TRUT - TCUT | (8) |
| TRUT = HGRT * QPIT | (9) |
| TCVT = TVCP + TVCO + TVCW + TVCS | (10) |
| SRHH = QBIP + RAST | (11) |
| EXRH = SRHH - QCRT | (12) |

Note: * significant 1%, ** significant 5%, *** significant 10%. The number in parentheses are Variation Inflation Factor (VIF) and short run elasticity, and italic number is short run elasticity. Intriligator [9]; the coefficient of determination R^2, Durbin-Watson statistics are given as DW, and F statistic value. EN = equations numbering.

The increase of quantity Urea fertilizers is to reduce paddy production in Sei Rejo village. The estimates of the elasticity of LAIT with respect to the JPUT and JPTT are -8.265 and -0.259, respectively. It means, increasing JPUT by 1 per cent reduce LAIT by more than 8.265 per cent in short run and increasing JPTT by 1 per cent reduce LAIT by more than 0.259 per cent in short run. This result is consistent with the results of the previous study, where the urea and SP-36 fertilizer relationships were negative with paddy production [15].

On the cases Sei Rejo village, the government policy of raising HET of Urea fertilizer is relevant to the soil conditions in the rice fields. According to [11] suggests that one of the advantages of increasing the price of subsidized urea fertilizer is to encourage farmers to reduce the excessive use of urea fertilizer. In fact, in Sei Rampah sub-district, the economic logic did not occur, due to the increase of urea fertilizer price followed by the decrease paddy production for rice farming activities. Based on [14] show that the implementation of seed current aid, subsidized of fertilizer and irrigation system is not effective whereas government purchased price (HPP) dried harvest paddy and dried paddy are effective.

Although dummy variable is unresponsive to rice production, farmers need to be encouraged to use certified seeds. On the other hand, the seed aid policy continues in the rainy season 2011/2012, which no farmers received seed aid from the government. In contrast, [12] shows that farmers in Sei Rampah sub-district receive certified seeds from the government. All coefficients sign in ‘as in equation (3 and 4) agree with prior expectations. Prices of Urea fertilizers depend negatively and significantly on the JPUT. The negative coefficient of HPUT indicates that the increase of HPUT to decrease JPUT. Prices of SP-36 fertilizers depend negatively and insignificantly on the JPTT. The estimates of the elasticity of JUPT with respect to the HPUT is -3.9532, it indicates that, increasing HPUT by 1 per cent reduce JUPT by more than 3.9532 per cent in short run.
The result of this study is different with [15] that found that where the price of urea fertilizer is positively and insignificantly, although, the amount of urea fertilizer is responsive to the price of urea fertilizer, with its short-run elasticity 3.5465.

The effect of the government raise the highest retail price (HET) of urea fertilizer, lead to decrease the amount of fertilizer used for paddy farming. Whereas, the increase of quantity Urea fertilizers to reduce paddy production in Sei Rejo village. On the cases Sei Rejo villages, the government policy of raising HET of Urea fertilizer is relevant to the soil conditions in the rice fields. Based on [11] suggests that one of the advantages of increasing the price of subsidized urea fertilizer is to encourage farmers to reduce the excessive use of urea fertilizer.

On the other hand, in the mind of farmers is urea fertilizer is the main fertilizer [18]. Therefore, it is necessary to study soil analysis in Sei Rejo villages, since the increase of 1% urea fertilizer causes the decrease of paddy production by 8.2652% in the short run. According to [19] stated that the use of urea fertilizers at the farm level exceeds the dosage. Based on [20], it was found that the use of urea fertilizer in Sei Rampah sub-district has not exceeded the dosage.

According to ‘as in equation (5)’ IFPT variable are statistically significant and IFPT coefficients agree with prior expectations. Income farmer depend positively and significantly on the SRHH. The positive sign of IFPT indicates that it leads to increase SRHH. As in ‘equation (6)’ it is shown EXRH variable are statistically significant and EXRH coefficients agree with prior expectations. The coefficient of EXRH is negative, it means that the increase of EXRH to decrease RAST.

Household rice the availability is derived from the sum of rice production and farmers with rice for the poor (Raskin). However, Raskin's contribution to the availability of household rice for small farmers is due to the fact that the farming families receive Raskin at 7 kg per month. The data of household rice availability in this study is season data, therefore the maximum number of Raskin received by household farmer is 28 kg, and note that not all households receive Raskin. Thus almost certainly, the source of household rice availability of farmers is the production of rice farmers.

Raskin implementation in West Java was not effective [21]. The study recommends that the government increase the control of Raskin programs at the village level and increase the monthly Raskin quota to the poor every month at affordable prices. The poor in the village of Sei Rejo, North Sumatra purchase Raskin for Rp. 2000/kg and receive 10 kg per month in 2010 and in 2011, the number of Raskin received every month is less than in 2010 (7 kg per month).

An increase of HPUT has a negative impact on the LAIT, and decrease of the LAIT an decrease of YPIT. The decrease in YPIT was followed by a decrease in QBIP. Decrease in QBIP leads to decrease. Decrease in SRHH leads EXRH to decrease and follow by increase in RAST. The result of an increase of HPTT is similarly an increase in HPUT. Whereas, an effectiveness of HPUT has a positive impact on the LAIT, and an increase of the LAIT lead to increase of YPIT. An increase in YPIT was followed by an increase in QBIP. An increase in QBIP leads to the SRHH to increase. An increasing in SRHH lead to the EXRH to increase and follow by decrease in RAST.

4. Conclusion
The effectiveness of government purchase price of dried harvest paddy gave a positive impact on paddy planted area, paddy production and rice production. An increase of the rice production gave a positive impact on household rice availability and household rice surplus, and the increase of household rice surplus gave the quantity of Raskin decrease.

An increase of price of Urea and SP-36 fertilizers has a negative impact on the paddy planted area, and a decrease of the paddy planted area and decrease of paddy production and rice production. The decrease in rice production was followed by an decrease in on household rice availability and household rice surplus, and the decrease of household rice surplus gave the quantity of Raskin increase.
4.1 Policy Implication
Government policy instrument to achieve household rice surplus based on output price policy does not based on input price policy

4.2 The Limitation of Study
This model needs to be refined by including the amount of seed use, household income from other farming activities, non-farm income, rainfall data, land conversion, and household expenditure. Therefore it is necessary to add or remove certain variables

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