Impact of Increasing Input and Output Prices on Chili Production and Farmer Income in Banten Province

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Abstract. In 2019, chili production in Banten province amounted to 12,122.9 tons with a harvest area of 1,395 ha or productivity of 8.7 tons/ha. The objectives of this study are: 1) Analyzing the factors affecting the cultivated land area and chili production in Banten Province, 2) Analyzing the impact of increasing input and output prices on chili production in Banten Province. This study method used a survey method with 80 respondents. The analysis method uses the Simultaneous Equation Model. The results of the study were 1) The factors that significantly influence the cultivated land area of Rainy Season (RS) 2015/2016 were the number of: manure, solid organic fertilizers, other fertilizers, solid leaf fertilizers, and the total land area. The factors that significantly influence chili production in Banten Province are the number of: KCL fertilizer, liquid leaf fertilizer, and liquid growth stimulant. 2) From the policy simulation results, it is known that an increase in chili prices by 25%, Urea fertilizer by 25%, and NPK by 25% simultaneously will reduce production by 2.8% and chili farming income by 16.2%, but increase the area land 5.8% and farmer household income 0.06%. The government needs to stabilize the chili price and maintain the subsidized fertilizer price.

1. Introduction

The harvested area of chili (large chili and cayenne pepper) in 2015 was 1,209 ha with a production of 11,259.7 tons or productivity of 9.3 tons/ha. When compared with the harvested area in 2014 which was 1,171 ha, there was an increase in the harvested area of 3.2%. This is presumably due to the relatively good price of chili. Based on the type of chili, cayenne pepper with a harvested area of 489 ha in 2014 resulted in the production of 4,880.2 tons with a productivity of 9.98 tons/ha. For curly chili, the harvested area is 682 ha with a production of 6,792.7 tons [1,2].

Based on the regency, the largest production was in Pandeglang Regency, namely 1,764.6 tons (41.7%), the second in Serang Regency 1,638.6 tons (38.7%) with a harvested area of 173 ha, the third in Lebak Regency with 502.5 tons (11.9%), the fourth in South Tangerang City, namely 287.6 tons...
The Production and Income Equation Model of Chili Farmers in the 2015/2016 Rainy Season (RS) were conducted with RS. The Production and Income Equation Model of Chili Farmers in the 2015/2016 Rainy Season (RS) consisted of eleven structural equations and {math} \sum \beta_i \end{equation} identity equations. The structural equations are:

\begin{align}
\mathbf{X} &= \mathbf{A} \mathbf{X} + \mathbf{B} \mathbf{Y} + \mathbf{E} \\
\mathbf{Y} &= \mathbf{C} \mathbf{X} + \mathbf{D} \mathbf{Y} + \mathbf{F}
\end{align}

An increase in chili prices will affect the production and income of farmers. Likewise, the increase in the price of chili inputs such as seeds, fertilizers, pesticides, labor wages will affect the area and production of chili peppers.

To find out the production factors that affect the area of land cultivated and chili production as well as the impact if input and output prices increase or decrease, a study is needed to become input for agricultural policymakers, especially in Banten Province.

2. Method

2.1. Data Collection Method, Location and Time of Study

The method used in this study is the survey method. The survey method was conducted for primary data collection. Primary data were collected by interview using a structured questionnaire to chili farmer respondents. Interviews were also conducted with policymakers (officers from the Agriculture and Livestock Services of Banten Province, Regency Agriculture Office officials in Banten Province), heads of Regional Technical Implementation Units (UPTD), heads of Agricultural Extension Centers, and Field Agricultural Extension Officers (FAEO).

In addition to the survey method, secondary data is also collected in related agencies, namely: Agriculture and Livestock Services of Banten Province, Regency/City Agriculture Office, Provincial/District Trade Office and Provincial and Regency Central Statistics Agency. Secondary data from the desk study are expected to include planting area, harvested area, rice production and productivity, the intensity of pest and disease attacks, grain and rice prices, input prices, irrigation area and irrigation development policies, and availability of fertilizers and other inputs.

Primary data collection at the farm level using a simple random sampling method for Pandeglang Regency and purposive sampling for Lebak Regency. Simple random sampling is done if the sample is homogeneous, namely chili farmers [8]. Two sample sub-districts were selected that were dominant as chili producers, namely Pandeglang and Lebak Regency. From the sample regency, the dominant districts were chosen to be chili producers. Furthermore, from the selected districts. From Pandeglang Regency selected 55 respondents and Lebak Regency selected 25 respondents. A total of 80 respondents were chili farmers.

2.2. Analysis Method and Equation Model

The Production and Income Equation Model of Chili Farmers in the 2015/2016 Rainy Season (RS) consists of eleven structural equations and nine identity equations. The structural equations are:

\begin{align}
\mathbf{X} &= \mathbf{A} \mathbf{X} + \mathbf{B} \mathbf{Y} + \mathbf{E} \\
\mathbf{Y} &= \mathbf{C} \mathbf{X} + \mathbf{D} \mathbf{Y} + \mathbf{F}
\end{align}
Equation of Use of Certified Seed in 2015/2016 RS:

\[ J_{BES1} = a_0 + a_1 H_{BES1} + a_2 H_{SP361} + a_3 H_{NPK1} + a_4 H_{PUDDP1} + a_5 H_{ZA1} + a_6 H_{MULSA1} + a_7 H_{HTKMSW1} + a_8 J_{LAK} + a_9 L_{HTNTT} + a_{10} U_{MR} + a_{11} P_{DDK} + a_{12} I_{NCPETN} + U_1 \]

(1)

Where:

- \( J_{BES1} \) = Total Use of SP36 Fertilizer (kg).
- \( H_{BES1} \) = Price of Certified Seed per kg (IDR).
- \( H_{SP361} \) = Price of SP36 Fertilizer per kg (IDR).
- \( H_{NPK1} \) = Price of NPK Fertilizer per kg (IDR).
- \( H_{PUDDP1} \) = Solid Leaf Fertilizer Price per liter (IDR).
- \( H_{ZA1} \) = Price of ZA Fertilizer per kg (IDR).
- \( H_{MULSA1} \) = Price of Mulsa per kg (IDR).
- \( H_{HTKMSW1} \) = Price of Rent Human Labour per WMD (IDR).
- \( J_{LAK} \) = Number of Family Work Forec (person).
- \( L_{HTNTT} \) = Total Land Area (Ha).
- \( U_{MR} \) = Age of the head of the family/respondent (years).
- \( P_{DDK} \) = Length of respondent's formal education (years).
- \( I_{NCPETN} \) = Income of farmer household (IDR).
- \( U_1 \) = Confounding Variable.

Expected parameter sign: \( c_1, c_2, c_3, c_4, c_5, c_6, c_7 < 0; c_8, c_9, c_{10}, c_{11}, c_{12} > 0 \)

Equation of Use of Urea Fertilizer in 2015/2016 RS:

\[ J_{URE1} = b_0 + b_1 H_{URE1} + b_2 H_{BES1} + b_3 H_{SP361} + b_4 H_{KCL1} + b_5 H_{KG1} + b_6 H_{PUUL1} + b_7 H_{PUDDP1} + b_8 H_{ZA1} + b_9 H_{PESC1} + b_{10} L_{HTNTT} + b_{11} P_{DDK} + b_{12} P_{ROD1} + U_2 \]

(2)

Where:

- \( J_{URE1} \) = Total Use of Urea Fertilizer (kg).
- \( H_{URE1} \) = Price of Urea Fertilizer (IDR).
- \( H_{KCL1} \) = Price of KCL Fertilizer per kg (IDR).
- \( H_{KG1} \) = Manure Price per kg (IDR).
- \( H_{PUUL1} \) = Price of Other Fertilizers per kg (IDR).
- \( H_{PESC1} \) = Liquid Pesticide Price per liter (IDR).
- \( P_{ROD1} \) = Gross Chili Production (kg).
- \( U_2 \) = Confounding Variable.

Expected parameter sign: \( b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8, b_9, < 0; b_{10}, b_{11}, b_{12} > 0 \)

Equation of Use of SP36 Fertilizer on 2015/2016 RS:

\[ J_{SP361} = c_0 + c_1 H_{SP361} + c_2 H_{URE1} + c_3 H_{NPK1} + c_4 H_{PUDDC1} + c_5 H_{ORG1} + c_6 H_{PESC1} + c_7 H_{PUDDP1} + c_8 U_{MR} + c_9 P_{DDK} + c_{10} P_{ROD1} + U_3 \]

(3)

Where:

- \( J_{SP361} \) = Total Use of SP36 Fertilizer (kg).
- \( H_{PUDDC1} \) = Liquid Leaf Fertilizer Price per liter (IDR).
- \( H_{ORG1} \) = Price of Solid Organic Fertilizer per kg (IDR).
- \( P_{ROD1} \) = Gross Chili Production (kg).
- \( U_3 \) = Confounding Variable.

Expected parameter sign: \( c_1, c_2, < 0; c_3, c_4, c_5, c_6 > 0 \)
Equation of Total Use of NPK Fertilizer in 2015/2016 RS:
\[
J_{NPK1} = d_0 + d_{1NPK1} + 2HURE1 + 3HKCL1 + 4HPUORG1 + 5HHRC1
+ 6HKDG1 + 7HMULSA1 + 8LHNTT + 9PDDK + 10INCUST1
+ 11INPPETN + U4
\]  
Where:  
\(J_{NPK1}\) = Total Use of NPK Fertilizer (kg).  
\(LGRP1\) = Cultivated Land Area in 2015/2016 RS (Ha)  
\(U4\) = Confounding Variable.  
Expected parameter sign: \(d_1, < 0; d_2, d_3, d_4, d_5, d_6, > 0\)

Equation of Total Use of KCL Fertilizer in 2015/2016 RS:
\[
J_{KCL1} = e_0 + e_{1HKCL1} + 2HBE1 + 3HNPK1 + 4HZA1 + 5HPUORG1 + 6HPUL1
+ 7HPUDP1 + 8HPESC1 + 9HMULSA1 + 10PDDK + 11LGRP1
+ 12INPPETN + U5
\]  
Where:  
\(J_{KCL1}\) = Total Use of KCL Fertilizer (kg)  
\(INCPETN\) = Farmer Household Income (IDR/year)  
\(U5\) = Confounding Variable.  
Expected parameter sign: \(f_1, f_2, f_3, f_4, f_5 < 0; f_6, f_7, f_8, f_9, f_{10} > 0\)

Equation of Total Use of Solid Organic Fertilizer in 2015/2016 RS:
\[
J_{PUORG1} = f_0 + f_{1HPUORG1} + 2HKCL1 + 3HKDG1 + 4HBE1 + 5HNPK1 + 6HPUL1
+ 7HPUDP1 + 8HPUDP1 + 9HPUDP1 + 10INCPETN + U6
\]  
Where:  
\(J_{PUORG1}\) = Total Use of Solid Organic Fertilizer (kg)  
\(U6\) = Confounding Variable.  
Expected parameter sign: \(f_1, f_2, f_3, f_4, f_5 < 0; f_6, f_7, f_8, f_9, f_{10} > 0\)

Equation of the Amount of Use of Other Fertilizers in 2015/2016 RS:
\[
J_{PUL1} = g + g_{1HPUL1} + 2HURE1 + 3HBE1 + 4HNPK1 + 5HKCL1 + 6HZA1
+ 7HPUORG1 + 8HPUDP1 + 9HPUDP1 + 10PDDK + 11LGRP1
+ 12INCETN + U7
\]  
Where:  
\(J_{PUL1}\) = Total use of other fertilizers (kg)  
\(U7\) = Confounding Variable.  
Expected parameter sign: \(g_1, g_2, g_3, g_4, g_5, g_6, g_7, g_8, g_9 < 0; g_{10}, g_{11}, g_{12} > 0\)

Equation of Amount of Use of Solid Leaf Fertilizer in 2015/2016 RS:
\[
J_{PUDP1} = h_0 + h_{1HPUDP1} + 2HPUDP1 + 3HPULD1 + 4HPUORG1 + 5HNPK1 + 6HPESP1
+ 7HPESC1 + 8LGRP1 + 9PRODKT1 + U8
\]  
Where:  
\(J_{PUDP1}\) = Total Use of Solid Leaf Fertilizer (kg)  
\(U8\) = Confounding Variable.  
Expected parameter sign: \(h_1, h_2, h_3, h_4, h_5, h_6 < 0; h_7, h_8 > 0\).

Equation of the Amount of Liquid Pesticide Use in 2015/2016 RS:
\[ \text{JPESC1} = i_0 + i_1\text{HPESC1} + i_2\text{HBES1} + i_3\text{HURE1} + i_4\text{HKCL1} + i_5\text{HPUDC1} + i_6\text{HPUDP1} + i_7\text{HZPTC1} + i_8\text{LGRP1} + i_9\text{INCPETN} + U9 \]  

(9)

Where:

- \( \text{JPESC1} \) = Total Liquid Pesticide Use (ltr).
- \( \text{HZPTC1} \) = Price of Liquid ZPT per liter (IDR)
- \( U9 \) = Confounding variable.

Expected parameter sign: \( i_1, i_2, i_3, i_4, i_5, i_6, i_7 < 0; \ i_8, i_9 > 0 \)

Equation of Cultivated Land Area:

\[ \text{LGRP1} = j_0 + j_1\text{JTKMSW1} + j_2\text{JKDG1} + j_3\text{JPUORG1} + j_4\text{JPUL1} + j_5\text{JPESC1} + j_6\text{JESP1} + j_7\text{JPPD1} + j_8\text{BLHNTT1} + j_9\text{LAK10PRODKT1} + j_{11}\text{INCPETN} + U10 \]  

(10)

Where:

- \( \text{LGRP1} \) = Cultivated Land Area 2015/2016 RS (Ha).
- \( \text{JTKMSW1} \) = Total Use of Hire Human Labor (WMD)
- \( \text{JKDG1} \) = Amount of Manure Use (kg).
- \( \text{JPESP1} \) = Total Solid Pesticide Use (kg).
- \( U10 \) = Confounding variable.

Expected parameter sign: \( k_1, k_2, k_3, k_4, k_5, k_6, k_7, k_8, k_9, k_{10}, k_{11} > 0 \)

Chili Production Equation:

\[ \text{PRODKT1} = i_0 + i_1\text{JBE S1} + i_2\text{JBE N1} + i_3\text{JURE1} + i_4\text{JSP361} + i_5\text{JNPK1} + i_6\text{JPPD1} + i_7\text{JZPTP1} + i_8\text{JESP1} + i_9\text{JHER BC1} + i_{10}\text{JTKSW1} + i_{11}\text{LGRP1} + i_{12}\text{INCPETN} + U9 \]  

(12)

Where:

- \( \text{PRODKT1} \) = Gross production of harvested dry unhulled rice (kg).
- \( \text{IZPTP1} \) = Total Use of Growth Stimulating Substances (kg)
- \( \text{JESP1} \) = Amount of Pesticide Use (kg).
- \( \text{JHERBC1} \) = Total Use of Liquid Herbicides (ltr)
- \( \text{JTKSW1} \) = Total Employment of Hire Labor (WMD)
- \( \text{LGRP1} \) = Cultivated Land Area (Ha).
- \( \text{INCPETN} \) = Farmer’s Household Income (IDR)
- \( U9 \) = Confounding Variable.

Expected parameter sign: \( i_1, i_2, i_3, i_4, i_5, i_6, i_7, i_8, i_9, i_{10}, i_{11}, i_{12} > 0; \)

There are nine identity equations, and three of them are as follows:

1. \( \text{INCOFARM} = \text{INCBRNTN} + \text{INCLAIN} \)
   Where:
   - \( \text{INCOFARM} \) = Income from off-farming.
   - \( \text{INCBRNTN} \) = Income from non-farm labor
   - \( \text{INCLAIN} \) = Income from others

2. \( \text{INCCABAI} = \text{INCUST1} + \text{INCUST2} \)
   Where:
   - \( \text{INCCABAI} \) = Income from chili farming per year (IDR)
   - \( \text{INCUST1} \) = Income from chili farming on Rainy Season (IDR)
   - \( \text{INCUST2} \) = Income from chili farming on Dry Season (IDR)
3. \( I_{NCPETN} = I_{NONFARM} + I_{INCOFARM} + I_{INCCABAI} \)

Where:
- \( I_{NCPETN} \) = Income of household farmer per year (IDR)
- \( I_{NONFARM} \) = Income from farming beside chili farm per year (IDR)
- \( I_{INCOFARM} \) = Income from off-farming.
- \( I_{INCCABAI} \) = Income from chili farming per year (IDR)

2.3. Model Identification and Estimation

Identification of the structural equation model is needed to determine the method used to estimate the model equation. Identify the structural model according to the order condition \([9,10]\), namely if:
- \( (K - M) = (G - 1) \) is called exactly identified
- \( (K - M) > (G - 1) \) is called over identified
- \( (K - M) < (G - 1) \) is called under identified

Where:
- \( K \) = Number of variables in the model
- \( M \) = Number of endogenous and exogenous variables in an equation (the largest number of variable in equation)
- \( G \) = Number of endogenous variables in the model.

Overall, it consists of 20 equations, namely 11 structural equations and nine identity equations. The number of \( K \) is 78 variables, the number of \( M \) is 12 variables (found in the PRODKT1 equation) and \( G \) is 12 variables, so \( (K - M) > (G - 1) \) is \( (78 - 12) > (20 - 1) = 66 > 19 \), thus the above equation is over identified. So is used 2 SLS method (Two Stage Least Squares).

According to \([11]\), the simulation aims to determine the direction and size change of one or more endogenous variables by making changes to one or more exogenous variables within the model. Labys (1973) also described policy simulations are conducted at certain sample periods to help explain the behavior of commodity markets if new policies are implemented \([12]\). Before the simulation required validation model, its usefulness to determine whether a model is valid enough to be done simulation. The commonly used statistical criteria for model validation are:

a. Root Mean Squares Error (RMSE):

\[
RMSE = \left\{ \frac{1}{T} \sum_{t=1}^{T} (Y_{ts} - Y_{ta})^2 \right\}^{0.5}
\]

RMSE is a measure of the simulated pathway deviation from the previous pathway period. The smaller the RMSE value the higher the level of accuracy of the simulation.

b. Root Mean Squares Percent Error (RMSPE):

\[
RMSPE = 100 \ast \left\{ \frac{1}{T} \sum_{t=1}^{T} \left( \frac{Y_{ts} - Y_{ta}}{Y_{ta}} \right)^2 \right\}^{0.5}
\]

RMSPE value is getting smaller than the better level of simulation accuracy. Existing data is processed computerized, for tabular analysis and B/C ratio processed by Excel program, while for multiple linear regression analysis processed by SAS version 9.1 program.

3. Result and Discussion

3.1. Characteristics of Example Farmers and Farming Systems in Banten Province

From the results of the enumeration, the average age of the respondents is 46.0 years with a range of 21–63 years. The average education level of respondents is 8.7 years with a range of 0-18 years. The average length of education is equivalent to the ninth grade or third grade of Junior High School (SLTP).
Meanwhile, the average number of family members including the head of the family is 4.4 people. With the largest number of family members is 10 people and the smallest is 1 person.

For technically irrigated rice fields, the average area of ownership in Banten is 0.19 ha/family with a range of 0 - 2 ha, and the area of non-owned technical irrigated rice fields is 0.06 ha with a range of 0–2.5 ha/family. The area of land belonging to irrigated rice fields is 0.16 ha and non-owned is 0.09 ha/family. The area of land belonging to simple irrigated rice fields is 0.01 ha/family and non-owned is 0.02 ha/family. The average area of land owned by rainfed irrigated rice fields is 0.08 ha/family and non-owned 0.08 ha/family. So the total land owned by rice fields is 0.44 ha and non-owned land is 0.25 ha/family. The average area of land owned by the moor is 0.11 ha/head of land and that of non-owned is 0.11 ha/family. Some farmers also cultivate chili plants on dry land. The total land area is 1.16 ha/family on average, with the average owned land is 0.79 ha/family and non-owned is 0.37 ha/family. The area of arable land for 2015/2016 RS averages 0.39 ha/family.

3.2. Land Cultivated Area Equation

The estimated results of the Equation of Cultivated Land are listed in table 1. The explanatory variables that significantly affect the area of arable land are the number of leased tractor use (JTRSW1), number of rental workers (JTKMSW1), number of manure fertilizer (JKDG1), Number of organic fertilizer (JPUORG), Number of other fertilizer (JPUORG1), Number of Solid leaf fertilizer (JPUDP1), and Total land area (LHNTT).

| Variable | Symbol | Guess Parameter | t-counted | Level of significant | Elasticity |
|----------|--------|-----------------|-----------|----------------------|------------|
| Intercept | $a_0$  | -0.05866        | -0.84     | 0.426                |            |
| Number of Rent Human Labour | JTKMSW1 | 0.039909         | 3.00      | 0.0034***            | 0.187265   |
| Number of manure fertilizer | JKDGI | 0.000013         | 3.04      | 0.0034***            | 0.119221   |
| Number of organic Fertilizer | JPUORG1 | 0.000044        | 2.75      | 0.0077***            | 0.077437   |
| Number of other fertilizer | JPUL1 | 0.000120         | 4.24      | <0.001***            | 0.077751   |
| Number of liquid pesticides | JPESC1 | 0.017405         | 1.04      | 0.3027               |            |
| Number of solid pesticides | JPESP1 | 0.041100         | 0.88      | 0.3842               |            |
| Number of Solid Leaf fertilizer | JPUDP1 | 0.087050        | 3.14      | 0.0025***            | 0.091514   |
| Total Land Area | LHNTT | 0.070321         | 2.31      | 0.0241**             | 0.20916    |
| Number of Workforce | JLAK | 0.006452         | 0.46      | 0.6463               |            |
| Gross production | PRODKT1 | 0.000023        | 1.26      | 0.2126               |            |
| Income of household | INCPETN | 9.27E-10         | 0.84      | 0.4061               |            |
| $R^2$ |        | 0.93924         |           |                      |            |
| F Counted |     | 188.94          |           |                      |            |

Source: Primary data processed, 2014

*** = parameters statistically significant at 1 %.
** = parameter statistically significant at 5 %.
* = parameter statistically significant at 10%

The Variable Number of Rent Human Labour (JTKMSW1) differs significantly at the 1 percent level of significance, with a relatively small regression coefficient value of 0.039909, meaning that an increase in the number of rent human labor by 1 WMD will significantly increase Cultivated Land cultivated area of 0.04 Ha in 1% significant level. Based on the elasticity coefficient value of LGRP1 to JTKMSW1 (ELGRP1, JTKMSW1) is 0.19 (inelastic), in other words, The change of land cultivated area (LGRP1) is less responsive to changes in the number of rent human labor uses. This is also supported by research by Siagian (2005) which found that the Variable Number of Use of Non-Family/Leased Labor (JRLK) was positively correlated with Cultivated Land Area and was statistically different at the 1 percent level of significance. The value of the estimated parameter coefficient is relatively small, namely 0.00288.
The elasticity coefficient value of LGRP1 to JKDGI (ELGRP1, JKDGI) is 0.12 (inelastic), it’s mean, the change of land cultivated area (LGRP1) is less responsive to changes in the number of manure fertilizer uses. Based on the value of the elasticity coefficient of LGRP1 to JPUORGI (ELGRP1, JPUORGI), it is also inelastic, namely 0.08, so the area of cultivated land is less responsive to changes in the number of organic fertilizer use of labor.

The value of the coefficient of elasticity LGRP1 to JPUUL (ELGRP1, JPUUL) is inelastic, namely 0.08. So the Cultivated Land Area is less responsive to the changes of the number of other fertilizer use. The value of the elasticity coefficient LGRP1 to JPUUDP (ELGRP1, JPUUDP) is 0.09 (inelastic), meaning that the area of cultivated land is less responsive to changes in the number of solid leaf fertilizer use. The value of the elasticity coefficient LGRP1 to LHNTT (ELGRP1, LHNTT) is 0.21 (inelastic), meaning that the area of cultivated land is less responsive to changes in Total land area.

### 3.3. Chili Production Equation
The alleged results of the 2015/2016 RS Chili Production equation (PRODKT1) are described in detail in table 2. The explanatory variables that have a significant effect on chili production in 2015/2016 RS are the Number of KCL fertilizer (JKCL1), Number of Liquid leaf fertilizers (JPUDC1), and Number of Liquid growing stimulants (JZPTC1). According to Sativa et al. (2017) the variables that significantly influenced was the harvest area, the real price of manufacturers level, the real price of subsidized fertilizer, dummy rain bulk and dummy reference price [13].

The variable Number of KCL fertilizer has the value of the elasticity coefficient of rice production to the number of KCL fertilizer (EPRODKT1, JKCL1) is 0.2, meaning that every 1% increase in the number of KCL will increase rice production by 0.2%, meaning that Rice Paddy Production is not responsive to changes in the number of KCL fertilizer.

The variable number of liquid leaf fertilizers (JPUDC1) SP-36 has a regression coefficient value of 308.8742, meaning that every 1 liter increase in the amount of liquid leaf fertilizer will increase rice production by 308.9 kg/ha at a 5% significant level. The value of the elasticity coefficient of rice production to the number of liquid leaf fertilizer (EPRODKT1, JPUDC1) is 0.16 (inelastic) meaning that every 1% increase in the number of liquid leaf fertilizer will increase rice production by 0.16%, meaning that Rice Paddy Production is not responsive to changes in the number of liquid leaf fertilizer.

The variable number of liquid growing stimulants (JZPTC1) has a regression coefficient of 618.6222, meaning that every 1 liter increase in the amount of liquid growing stimulant will increase rice production by 618.2 kg/ha at a 10% significant level. The value of the elasticity coefficient of rice production to the number of liquid growing stimulants (EPRODKT1, JZPTC1) is 0.14, meaning that every 1% increase in the number of liquid growing stimulants will increase production paddy by 0.14%, meaning that paddy production is not responsive to changes of liquid growing stimulant.

### Table 2. Predicted Results of Chili Production Equation.

| Variable                          | Symbol  | Guess Parameter | t-counted | Level of significant | Elasticity |
|-----------------------------------|---------|-----------------|-----------|----------------------|------------|
| Intercept                         | i₀      | 398.2648        | 0.58      | 0.5635               |            |
| Number of Certified Seed          | JBES1   | -53708.9        | -1.06     | 0.2924               |            |
| Number of NPK fertilizer          | JNPK1   | -5.63762        | -1.68     | 0.0539**             | 0.20382    |
| Number of KCL fertilizer          | JKCL1   | 21.894444       | 1.96      | 0.4923               |            |
| Number of Urea fertilizer         | JURE1   | 24420.86        | 0.77      | 0.4430               |            |
| Number of Solid leaf fertilizer   | JPUDP1  | 205.8411        | 0.69      | 0.0499***            | 0.1616     |
| Number of Liquid leaf fertilizer  | JPUDC1  | 308.8742        | 2.00      | 0.0581*              | 0.13789    |
| Number of Liquid growing stimulant| JZPTC1  | 618.6222        | 1.93      | 0.0164               |            |
| Number of Liquid pesticides       | JPESC1  | -498.591        | -2.47     |                      |            |
Policy simulation aims to analyze the impact on endogenous variables by changing exogenous variables (policy). The policy simulation of the Production and Income Model of Chili Farmers in Banten Province is described in detail below. The simulation results of an increase in the price of chili by 25%, Urea Fertilizer Price by 25%, and NPK Fertilizer by 25% simultaneously are presented in table 3.

The table 3 is described impact the increase in the price of chili by 25%, Urea 25% and NPK fertilizer 25% simultaneously stimulated farmers to increase the chili planting area. The addition of 5.8% planting area increased the use of SP36 fertilizer by 14.4%, KCl by 5.5%, organic fertilizer by 5% and solid leaf fertilizer by 6.4% and liquid pesticides by 6.2%. an increase in Urea and NPK fertilizers by 25% each reduced the amount of urea used by 25.5%, NPK by 9.2% and other fertilizers by 6.5%, also decreasing production by 276%. But the income of chili farming 2015/2016 increased by 200% and the household income of farmers increased by 6.5%.

| Variable                        | Symbol | Guess Parameter | t-counted | Level of significant | Elasticity |
|---------------------------------|--------|-----------------|-----------|----------------------|------------|
| Number of solid pesticides      | JPESP1 | 480.5131        | 0.97      | 0.3358               |            |
| Number of Liquid Herbicide      | JHERBC1| -242.055        | -0.61     | 0.5426               |            |
| Number of Rent human labor      | JTKMSW1| 4.581066        | 0.54      | 0.5945               |            |
| Cultivated land area            | LGRP1  | -1306.69        | -1.02     | 0.3122               |            |
| Source                          |        |                 |           |                      |            |

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Table 3. Simulation Results of 25 Percent Increase in Chili Prices, Urea Fertilizer Prices Harga 25% and NPK Fertilizer Price is 25%.

| No. | Endogen Variable | Value of Base Simulation | Value of Policy Simulation | Unit Change | Presentation (%) |
|-----|------------------|--------------------------|----------------------------|-------------|------------------|
| 1   | JRES1            | 0.00487                  | 0.00487                    | 0           | 0                |
| 2   | JURE1            | -0.0964                  | -0.1210                    | -0.2124     | -25.5            |
| 3   | JSP36l           | 1.1460                   | 1.3111                     | 0.1651      | 14.4             |
| 4   | INPK1            | 96.4065                  | 87.5742                    | 8.8323      | -9.2             |
| 5   | JKCl             | 301.6                    | 318.1                      | 16.5        | 5.5              |
| 6   | JPOUG1           | 10946.6                  | 11520.1                    | 573.5       | 5.2              |
| 7   | JPUL1            | 173.0                    | 161.7                      | -11.3       | -6.5             |
| 8   | JPOUDP1          | 77.1935                  | 82.1781                    | 4.98        | 6.4              |
| 9   | JPEC1            | 7.9374                   | 8.4153                     | 0.48        | 6.2              |
| 10  | LGRP1            | 8.5195                   | 9.0154                     | 0.4959      | 5.8              |
| 11  | PROD1            | 15.0131                  | -26.4329                   | -41.446     | -276.1           |
| 12  | BTINPUT1         | -2.752E7                 | -2.647E7                   | 0.105E7     | 3.8              |
| 13  | BTUSTAN1         | 2.654E7                  | -2.549E7                   | 0.105E7     | 4.0              |
| 14  | PNR1             | 14287181                 | 13122505                   | -1.164E7    | -8.1             |
| 15  | INCUST1          | 1.226E7                  | -1.237E7                   | -2.463E7    | 200.9            |
| 16  | INCUST2          | 5395639                  | 5395639                    | 0           | 0                |
| 17  | INONFARM1        | 3707728                  | 3707728                    | 0           | 0                |
| 18  | INCOFARM1        | 1439241                  | 1439241                    | 0           | 1.6              |
| 19  | INCCABAI         | -6861352                 | -6972561                   | -111.209    | 6.5              |

Source: Primary data processed, 2021.

4. Conclusion
The factors that significantly affected the cultivated land area of Rainy Season (RS) 2015/2016 of chili were: the amount of manure, the amount of solid organic fertilizers, the number of other fertilizers, the
number of solid leaf fertilizers, and the total land area. The factors that significantly influence chili production in Banten Province are: the amount of KCL fertilizer, the amount of liquid leaf fertilizer, and the amount of liquid growth stimulant.

From the policy simulation results, it is known that an increase in chili prices by 25%, Urea fertilizer by 25%, and NPK by 25% simultaneously will reduce the number of Urea use 25.5% and the number of NPK use 9.2% that reduce production by 200.9%, and the other hand, increase cultivated land area namely 5.8%, chili farming income at 2015/2016 RS by 200.9% and household income. farmers 6.5%. The government needs to stabilize the chili price and maintain the subsidized fertilizer price. It is necessary for the government needs to stabilize the chili price and maintain the subsidized fertilizer price.

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