THE IMPACT OF PRICE POLICY SUPPORT ON INDONESIAN CASSAVA FARMERS

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Abstract

Cassava is a carbohydrate-producing plant that can replace other crops such as rice and corn which are widely consumed by the community. The price policy of cassava farmers in the last five years has decreased very significantly, so it is necessary to conduct research on the impact of policies issued by the government. Factors in producing cassava also need to be improved, one of which is increasing productivity through fertilizer subsidies so that the output produced is positive from upstream to downstream, especially in the economy of Indonesian cassava farmers. This study aims to see the impact of the price policy of cassava farmers and production supporting factors in the form of fertilizer subsidy policies so that farmers' welfare levels. This study uses data from 2000 to 2019, the simultaneous equation model consists of 20 equations which are estimated using the Two Stage Least Square (2SLS) method.

Keywords: Cassava, Fertilizer subsidy policy, Price policy, 2SLS

INTRODUCTION

Cassava is a tropical and subtropical annual plant from the Euphorboaceae family, known as a staple food producing carbohydrates other than rice and corn. Cassava plants originated from Africa and Latin America which had a tropical climate around 1558 and spread throughout other tropical locations through Portuguese traders during the colonial period (IITA, 2021 and USDA, 1987). The development of the world's largest cassava plantations is owned by Nigeria, Brazil, Thailand, Indonesia and the Democratic Republic of the Congo. These countries have had an increasing proportion of production in the last three decades (FAO, 1997; Saleh & Widodo, 2007).

Cassava is the fourth largest staple food cultivated in the tropics and has been well studied in Indonesia. In connection with improving the standard of living of cassava farmers, bioprocesses were introduced to increase the economic value of cassava, including an example of converting cassava into microprotein. Compared with commercial products, the results show that cassava characteristics are comparable to other staple crops (Sukara, et al., 2020). The locations of cassava planting centers in Indonesia are in nine provinces; Lampung, West Java, Banten, Central Java, Special Region of Yogyakarta (DIY), East Java, East Nusa Tenggara, South Sulawesi and North Sumatra (Ministry of Agriculture of the Republic of Indonesia, 2017). The largest cassava production centers in Indonesia which have a production capacity of 20% of the total production are Lampung, East Java, Central Java and Banten, in this case Lampung Province has the largest production contributor capacity. The increase in production in Lampung Province is followed by the level of domestic and international market demand, market share in industries with processed materials from cassava (BPBD, 2017).

However, according to the United State Department of Agriculture-Global Agricultural Information Network (USDA-GAIN) there are impacts from government policies regarding increasing corn prices which reduce farmers' interest in planting cassava in Lampung. Changes in cassava prices at the beginning of 2020 had a downward trend of 50% from the previous year. In 2019 the price of cassava at the farm level was at 2,000 rupiah per kilogram, decreasing to 1,000 rupiah per kilogram, not comparable to

2018 which had an increase of 33% or from Rp. 1,200 per kilogram to Rp. 1,600 per kilogram in 2019. These price changes are issued without transparent information to cassava farmers, in other words, changes in farmer-level prices do not have a consistent benchmark (Kartika, 2020). The Central Statistics Agency in 2021 stated that the farmer's exchange rate rose by 0.01% from the previous year. The Indonesian Cassava Society (MSI) stated that the cassava industry has the potential to support economic growth through domestic and export demand that supplies the cassava plant-based product industry. The cassava industry has problems in getting raw materials for the industry because cassava productivity has not been maximized (Kontan, 2018).

In the 2005 agricultural development planning meeting, it was formulated that agricultural development activities would be carried out through three programs; increasing food security, developing agribusiness and improving farmers' welfare. Cassava is one of the main commodities of food crops that can be an indicative target for the development of the food crop sub-sector. This is because Indonesia in the period 1961 to 2004 was a net exporter of processed cassava products, which contributed an average of US$ 31.6 million per year from 10.45% of domestic production. The need for exports continues to increase at a growth rate of 6.5% per year, although cassava starch is still imported. Another part of the cassava production turned out to be able to provide the needs for other industrial raw materials. However, the national cassava production in the period 1961 to 2005 showed an increase with a relatively slow growth rate, 1.2% per year. The increase in production turned out to be a contribution from efforts to increase productivity that had been carried out so far because the harvested area of cassava in that period decreased with a growth rate of -0.48% per year, especially in Java.

In addition, the problem of increasing production at the farm level in the face of the problem of low selling prices which resulted in a decrease in the level of farmer profits is shown by the ratio with a decrease of 2.4% per year in that period. Judging from the mutually supportive strategic conditions, government policies are needed that can strengthen the increase in cassava production while increasing the income and welfare of farmers and increasing exports and substituting imports of cassava starch.

The policy of increasing production needs to be carried out through efforts to expand the potential area for cassava planting outside Java and supported by research that produces high-productivity types of cassava (Darwanto & Ratnaningtyas, 2017). Increasing the productivity of corn and cassava should be done immediately considering the positive impact on diversification and food security. The policy of reducing fertilizer subsidies is not yet time to do if the government still targets to achieve rice self-sufficiency because various combinations of policies carried out show indicators of deteriorating food security and the welfare of both producers and consumers is decreasing (Setiawan, 2017). In 2019 USDA report that the biggest Indonesian cassava producers area which is Lampung province the farmers switch cassava over corn due to higher margin (McDonald & Meylinah, 2019).

Based on this background, there are still complex problems in the Indonesian cassava industry. The Indonesian government responded to this problem by issuing a series of policies that were still contradictory through external and internal factors in the Indonesian agricultural environment. Therefore, this study aims to analyze the impact resulting from the price policy of cassava farmers and production supporting factors in the form of fertilizer subsidy policies.

RESEARCH METHOD

This research was conducted using quantitative descriptive research methods (Sugiono, 2017). The model used is an econometric model with simultaneous equations. The data used is time series data with a time span of twenty years, 2000 to 2019. Time series data can be developed in models to forecast, interpret, and hypothesize economic data (Enders, 2004). All data related to the research were obtained from agencies, institutions and formal organizations such as the Central Statistics Agency (BPS), Ministry of Industry, Ministry of Agriculture, Ministry of Trade, Director General of Plantations, Center for Socio-Economic Affairs of the Republic of Indonesia and Agricultural Policy (PSEKP) United States Development of Agricultural (USDA), World Bank, Food Agricultural Organization (FAO), Organization for Economic Co-operation and Development (OECD), Global Agricultural Information Network (GAIN), United Nations Department of Economic and Social Affairs (UN Comtrade), International Energy Statistics (EIA), the World Trade Organization (WTO) and the International Monetary Fund (IMF). Data processing using SAS/ETS (Statistical Analysis System/Econometric Time Series) software on Microsoft Windows operating system.

Cassava Industry Model Specification

The specification of the econometric model for the cassava industry is based on economic theory and various empirical experiences that are relevant to previous studies. The theoretical framework related to the phenomena related to this research is specified in the form of a system of simultaneous equations. The specification of the model is based on economic theory and empirical experience related to phenomena that occur in real life.

1. Cassava harvest area ($APCV_t$)

$APCV_t = a_o + a_1\ RCVCF_t + a_2\ PCVF_t + a_3\ PCRF_t + a_4\ PRFRZ_t + a_5\ T_t + a_6\ IRRIBI_t + a_7\ LAPCV_{t-1} + U_1$

hypothesis: $a_1,a_2,a_5 > 0$; $a_3,a_6 <0$; and $0 < a_7 <1$

2. Cassava productivity (YCV_t)

$YCV_t = b_o + b_1\ APCV_t + b_2\ LWFA_{t-1} + b_3\ RF_t + b_4\ T_t + b_5\ YCV_{t-1} + U_2$

hypothesis: $b_1,b_2,b_4 > 0$; $b_3, <0$; and $0 < b_5 <1$

3. Cassava production (QCV_t)

$QCV_t = APCV_t * YCV_t$

4. Cassava supply (SCV_t)

$SCV_t = QCV_t + STKCV_t – XCV_t$

5. Cassava demand (DCV_t)

$DCV_t = CCVHH_t + CCVIE_t$

6. Cassava consumption by household ($CCVHH_t$)

$CCVHH_t = c_0 + c_1\ DPCV_t + c_2\ LPCR_t + c_3\ PFLOUR_t + c_4\ GDPIN_t + c_5\ T_t + c_6\ CCVHH_{t-1} + U_3$

hypothesis: $c_2, c_4, c_5 > 0$; $c_1, c_3 <0$, and $0 < c_6 <1$

7. Cassava producer price ($PPCV_t$)

$PPCV_t = d_0 + d_1\ DPCCV_t + d_2\ T_t + d_3\ PPCV_{t-1} + U_4$

hypothesis: d_1, $d_2 > 0$; and $0 < d_3 <1$

8. Cassava consumer price ($PCCV_t$)
$PCCV_t = e_0 + e_1\ DSCV_t + e_2\ SCV_t + e_3\ PCCVt\text{-}1 + U_5$
hypothesis: $e_1 > 0$; $e_2 < 0$; and $0 < e_3 <1$

Variable description :

$RCVCF_t$	=	Ratio of the price of cassava to corn year – t
$PCVF_t$	=	Price of cassava at farmer level year – t
$PCRF_t$	=	Price of Corn Farmer level – t
$PRFRZ_t$	=	Fertilizer price year – t
$LWFA_{t-1}$	=	Lag of cassava farmer wages in year t – 1
RF_t	=	Indonesia's rainfall year – t
T_t	=	Trend year – t
QCV_t	=	Cassava production year – t
SCV_t	=	Cassava supply year – t
$STKCV_t$	=	Cassava stock year – t
XCV_t	=	Cassava export year – t
DCV_t	=	Cassava demand year – t
$CCVIE_t$	=	Cassava consumption by processing industry year – t
$DPCV_t$	=	Delta cassava consumer price year – t
$LPCR_t$	=	Lag corn price year t – 1
$PFLOUR_t$	=	Flour consumer price year – t
$GDPIN_t$	=	Indonesia's GDP per capita year – t
$DPCCV_t$	=	Delta cassava producer price year t – 1

Model Identification and Estimation

Cassava industrial model consist of 20 equations which are divided into 14 structural equations and 6 identity equations. The identification of the structural equation model is based on the order condition (Koutsoyiannis, 1977) with the formula; (K-M) (G – 1), where G is the number of equations (current endogenous variables), K is the total variables in the model (current endogenous and predetermined variables) and M is the number of variables in an equation (endogenous and exogenous variables). If (KM) > (G – 1) then the equation is more identified (over identified), (KM) = (G – 1) then the equation is identified correctly, and if (KM) < (G – 1) then the equation is said to be unidentified. The formulated model consists of 10 endogenous variables (G) and 39 predetermined variables consisting of 8 lag endogenous variables, so that the total variable (K) in the model is 47 variables. The highest number of variables used in an equation is 6 (M) and (47-6) > (10-1), then all equations in the model are over identified.

Cassava industrial models are over identified, so the model is estimated using the 2SLS (Two Stage Least Squares) method. This method is said to be less sensitive to model specification errors and provides consistent parameter estimation results (Sinaga, 1989). The cassava industry model estimation program uses the 2SLS method and the SYSLIN procedure with the SAS/ETS 9.4 program.

Model Validation

The criteria used in the validation stage of the Cassava industrial model are RMSPE (Root Mean Squares Percent Error) and U or Theil's Inequality Coefficient (Pindyck & Rubinfield, 1998). RMSPE is used to measure the percentage deviation of the predicted value from the actual value of the endogenous variable during the observation period. The smaller the RMSPE value, the better the prediction of endogenous variables in the study. The statistical value of U is between 0 and 1, if the value of U = 0 then the prediction of the endogenous variable is perfect or close to the actual value and if U = 1 then the prediction of the endogenous variable is not close to reality. The smaller the value of RMSPE and U, the better the prediction of endogenous variables (Sitepu & Sinaga, 2006). The formula for RMSPE and U is formulated as follows:

$$\text{RMSPE} = \sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\frac{Y_t^b - Y_t^a}{Y_t^a}\right)^2} \times 100\ \%$$

$$U = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(Y_t^b - Y_t^a\right)^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(Y_t^b\right)^2} + \sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(Y_t^a\right)^2}}$$

T is the number of observation periods in the simulation, Y_t^b is the predicted value of the endogenous variable, Y_t^a is the actual value of the endogenous variable, RMSPE is the *Root Mean Squares Percent Error*, and U. The cassava industrial model validation program use the Newton method and the SIMNLIN procedure with the SAS/ETS 9.4 program.

Model Simulation

The post-validation stage is a simulation of the model used to see the impact of price policy and fertilizer subsidies on the historical data period related to the Indonesian cassava economy and industry. The simulations carried out in this study are farmers' price policies and fertilizer subsidies in Indonesia. Fertilizer policy simulation is carried out based on the Regulation of the Minister of Agriculture no. 32 of 2010 which is also stated in the Regulation of the Minister of Agriculture No. 47/Permentan/SR.310/12/2014 regarding the allocation of the highest retail price (HET) for subsidized fertilizers (Rachman, 2019).

RESULTS AND DISCUSSION

Estimation and Evaluation of The Impact of Price and Fertilizer Subsidy Policy

The model has gone through a re-specification process based on economic criteria with the suitability of the parameter estimation results with the hypothesis. In the validity test, the RSMPE value was 81.3% where there were variable values below 35% and 9.2% which had a percentage above 100%. The U-Thail value based on the validation indicators in all equations is 0.35 where in the equation above the U-Theil value remains <1 so that the diversity of explanatory variables in each equation can explain the diversity of endogenous variables well. The cassava planting area is influenced by factors, namely changes in the price ratio, competitor plant prices, real cassava prices, fertilizer prices, technology, investment interest rates and the lag of cassava planting area. The results of the estimation of the Indonesian cassava planting area respond to the inelastic price ratio of cassava and corn in the short and long term of 0.032 and 0.065%, respectively. Fertilizer prices have a positive effect on the increase in cassava planting area.

The price of corn at the farm level will have a negative impact on increasing the planted area of cassava with an increase of 1% which will reduce the planted area by 1.87% in the short term and 5.07% in the long term. The effect of investment interest rates on cassava planting area is negative and technological improvements represented by trends can increase acreage both in the short and long term. Cassava productivity is influenced by factors such as area area, real wages of plantation sector workers, Indonesian rainfall, trends and lags in cassava productivity. The results of the estimation of productivity show the inelasticity of the planted area to increase productivity.1% change in farmer's wages will reduce productivity by 0.48% in the long run. The level of household cassava consumption is influenced by demand factors, producer prices, tapioca flour prices, Indonesia's GDP, trends, and the lag of household cassava consumption. Changes in the price of tapioca flour have a significant effect on the long-term elasticity level of 0.65%. The price of cassava producers also significantly affects where if there is an increase in producer prices, it will reduce the consumption of cassava by Indonesian households. Changes in producer and consumer prices of Indonesian cassava are influenced by the delta of consumer prices and demand for cassava as well as the lag of consumer and producer prices.

Table 1. The historical simulation results recapitulation of the impact of Indonesia’s price and fertilizer subsidy policy for the period 2000 - 2019

Variable	Base Value	Δ% (*)			
		SH1	SH2	SH3	SH4
Cassava harvested area (Ha)	156743	0.087	-0.078	-0.763	0.099
Cassava productivity (Ton/Ha)	1.2267	1.001	-0.412	-0.198	0.057
Production (Ton)	218142	0.118	-0.038	-0.656	0.498
Supply (Ton)	244738	0.182	-0.067	-0.987	0.868
Demand (Ton)	237895	0.094	0.009	-0.078	0.646
Consumption by household (Ton)	769887	-0.008	0.043	-0.244	0.435
Producer price level (Rp/Kg)	2303.4	25.000	-25.000	-0.000	0.011
Consumer price level (Rp/Kg)	3218.6	0.003	-0.075	-0.005	0.021

Description :
SH1 : Simulation of the impact of the policy of increasing the price of Indonesian cassava producers 25%
SH2 : Simulation of the impact of the policy of decreasing the price of Indonesian cassava producers 25%
SH3 : Simulation of the impact of Indonesia's fertilizer subsidy reduction policy 40%
SH4 : Simulation of the impact of Indonesia's fertilizer subsidy addition policy 40%
(*) impact value at three decimal places is still 0.000 %

The results of the historical validation of the observation period in the study show that the number of endogenous variables has an RMSPE value of less than 30% of 8 and an average U-Theil value of 0.15 so that the model built has good predictions and is valid for use in the simulation of policy factor changes. The table recapitulating the historical simulation results of the impact of Indonesia's fertilizer price and subsidies policy for the period 2000 to 2020 shows that the SH1 simulation in the form of an increase in the price of cassava producers can increase the area to cassava production. The SH2 simulation in the form of a decrease in the price of cassava producers can result in a decrease from the area of 0.072% to production of 0.412%. The third simulation in the SH3 research in the form of reducing fertilizer subsidies can reduce the cassava planting area by 0.763% which has implications for a decrease in production of 0.565%. The SH4 simulation in the form of increasing fertilizer subsidies will apply the opposite of SH3 where the implementation of the policy will increase the area to Indonesian cassava production. Where in the S4 simulation will increase production by 0.099% and increase cassava consumption by households by 0.435%.

CONCLUSION AND SUGGESTION

Conclusion

The cassava or cassava industry can support the economy through value added exports and can even achieve Indonesia's food security goals. The government's policy in the form of increasing the price of cassava at the farmer level can increase productivity which is supported by the high interest of farmers to continue to plant cassava. The policy of reducing fertilizer subsidies to support modern independent agriculture has not been implemented by reducing productivity but even increasing the trade balance deficit of Indonesia's cassava products.

Suggestion

The government's policy to support the cassava through increasing the price of cassava at the farmer level requires consistency and price certainty so that farmers will continue to plant cassava. This price policy can also be followed by extensification of planting land and technological improvements. This can facilitate the processing of cassava plants which can be used as an added value to the economy through fulfilling industrial demands made from cassava.

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