ECONOMIC POLICIES ON RICE COMMODITY AND WELFARE

Muhammad Asaad
Fakulas Pertanian, Universitas Islam Sumatera Utara
e-mail: muhammad.asaad62@gmail.com

Abstract

This study aims at determining the impacts of economic policies on rice and welfare in Indonesia. It estimates a simultaneous equation model with two-stage least squares method, using secondary data from 1979 until 2008. The simulation of partial policy will be a trade-off for the producers and consumers of rice. The policy of the floor grain price is still needed to respond to the increased production of rice. The paper suggests that if the input subsidy is taken out, it should be preferably followed by the increase in output, and at least, the rising percentage should be in the same number so that the policy will be better off.

Keywords: Welfare, trade-off, better-off, simultaneous equation model
JEL classification numbers: Q13, Q18

INTRODUCTION

Rice constitutes the staple food of Indonesian society. This makes rice as the most important food commodity in the national development. The importance of rice can be seen from two sides. First, as the staple food, rice should be available in sufficient quantity to meet the needs of the society. Second, it is as a source of income and employment for the majority of Indonesian people, especially for rural communities.

In terms of availability, if the supply of rice is less, it can cause the rising prices and social insecurity. As the consequence, the government should intervene in regulating and ensuring the availability of food for the society. It is very important because the great population potentially creates the national instability, if there is a lack of food. The rice plant is so familiar in the most parts of Indonesian region, and many people work on it as a source of income. Besides, farming rice becomes the employment for the majority of rural labors. Therefore, the effort to foster and develop it is of paramount importance to increase the income and to create employment for the society.

Based on the significance of the rice mentioned above, the social role of government in creating stabilization is absolutely needed. Government should pursue a variety of program development and production improvement, adequate facilities and infrastructure which are sufficient for farmers, supporting price regulation, market availability and organization for either farmers or government that can support the operational activities of farmers.

The ssubsequent development shows that government intervention has so far not fully solved the problem of national rice. The domestic rice production continues to decrease, the price increases both on the rice and inputs used. Rice is sometimes nowhere to be found in the market and it causes prices to rise. Besides, there is often a surplus of grain at harvest which causes grain prices decreased, and it makes the farmers difficult to repay their loans. The problems above indicate that the market aspects require attention. Rice market conditions will affect the perpetrators to take good decisions on production, consumption, and demand for fertilizer, labor, and their income. Market changes will signifi-

cantly change the reallocation of the perpetrators' decisions.

One of the indicators of success development in the agricultural sector is that the achievement of national self-sufficiency in rice in 1984. The success rate is partly caused by the advances in technology, such as superior seed varieties, fertilizers, plant disease and pest control, irrigation development, agricultural extension activities, provision of credit and it is also caused by the government intervention through various policies of the rice industry in Indonesia. The government policies include the policy of input subsidies, the grain floor price policy, the highest selling price, which is supported by the system of procurement, storage and domestic rice market operations or some type of buffer stock of government implemented through logistic agency. The policy is distortion of the free market mechanism (Sudaryanto, 2000), but it positively effects on production and farmer income (Simatupang, 2000) and the availability of rice with a relatively cheap price.

In the last few years, rice production has decreased. Many issues arise regarding the decline, and it can be seen from two sides, namely from the supply side and the demand one. The problems of the supply side include: Firstly, the rate of paddy production has been stagnant (leveling-off) due to the excess use of fertilizers. Second, there is lack of provision of investment funds for agri-food sectors namely credit, research, extension, maintenance, and infrastructure development that can encourage the increased food production. Third, the government reduces the input subsidies for the fertilizer and pesticide which are deemed to affect the decrease of production. Fourth, there is the increased conversion of fertile rice lands into industrial zones, housing, and non-agricultural land, particularly in Java. Fifth, there is the rising price of production factors due to the economic and monetary crisis that hit Indonesia since 1997. And sixth, the natural disturbance factor is drought, flood, and pest attack. Meanwhile, the problems of demand side include: Firstly, the population continues to grow, people's income increases so that the intensity of demand continues to rise. Second, the policy of cheap rice price causes food diversification program ineffective and the problems of imported rice.

Problems and changes mentioned above will affect the implementation of various variables related to the supply and demand of in Indonesia in the future. Therefore, the developing phenomena on the domestic rice supply and demand, the impact of measures taken by both the market and the welfare of producers and consumers need to be studied continuously. This study generally aims to study and analyze the impacts of economic policies undertaken by the government on the supply and demand of rice in Indonesia. Specifically the purposes of this paper are (1) To evaluate the impacts of economic policies on Indonesian rice supply and demand, and (2) To evaluate the impacts of economic policies to the changes of welfare in that of producer and consumer, as well as revenue/expenditure of government.

Economic welfare is a branch of economics that studies what should happen, and it is known as a normative approach. Economic welfare studies about how scarce resources should be allocated to achieve the maximum prosperity for individual economic actors in a society as a whole. Economic welfare is the foundation of economic science branches, such as: economic resources, public finance, the analysis of benefit cost, and the economy of government policies in many areas of science including international trade, industry and welfare (Daryanto, 1989).

Just et al. (1982) distinguishes welfare economics into two parts, namely: old welfare economics and new welfare economics. Some economic thinkers who belong to the old economic welfare are David

Ricardo, Alfred Marshall and Dupuit. Meanwhile, some economic thinkers who belong in the new welfare economics are Paul Samuelson, Vilfredo Pareto, Kaldor and Hicks, Scitovscky, Gormand, Lipsey and Lancaster, and John V. Krutilla.

David Ricardo made the analysis on the welfare of society by introducing the concept of economic rent (1829) in discussing the effects of Corn Law in England. The concept of economic rent is using the approach of producer surplus and consumer surplus. Dupuit, a French scientist, used the notation of consumer surplus (1844) to analyze the effect of building bridge towards the welfare of society. Furthermore, Alfred Marshall created the more complete concept of economic rent at the beginning of the 20th century and has since become the basis for important studies of economic welfare.

Just et al. state that there are three basic principles used in the old welfare economics, namely: First, the social gains are maximized through competitive markets with interference in noncompetitive markets; Second, by using the technique of partial equilibrium analysis in recommending development policies. Partial equilibrium analysis sees the impact of welfare changes in one market by assuming that the effects in other markets give no effect, so that it can be ignored. And third, empirically, old economic welfare determines that the triangle-like area to the left of the demand curve and above the price of money can be used as a measure of the consumer utility market, and that the triangle-like area left of the supply curve and below price is equal to the amount of money from the welfare of producers in the market. The changes in the region can be used to measure the changes of welfare in the community.

These three principles later get criticism from the economic thinkers who are later known as the new welfare economics. Paul Samuelson at the beginning of 1942 stated that the old welfare economics does not properly define the consumer surplus. In general, the consumer surplus is not unique use of money measures of utility, and uniqueness can give different implications depending on the empirical data used. Vilfredo Pareto in 1896 stated that a number of policies that make someone worse do not match the expected goals. Then Vilfredo Pareto developed a theory known as Pareto optimal.

Furthermore, Kaldor and Hicks (1939) state that the weight of each individual's welfare is not necessarily the same. Besides, the change in consumer surplus and producer surplus among individuals is not sufficient as a basis for evaluating changes. Kaldor and Hicks introduced the concept of compensation principle; that changes should be done if there are potential gains, so as to create better conditions through the redistribution of output or income in accordance with the changes. Hicks insisted on alternative measures of money from welfare. At the time of welfare is not directly related to the utility gains and losses, it can be interpreted with willingness to pay. This concept is known as compensating variation and equivalent variation.

The concept proposed by Kaldor and Hicks gets criticism from Scitovsky in 1941, who claims that there is reversal paradox which illustrates the inconsistency of compensation principle in the analysis policy. Next Gorman in 1955 stated that there is the problem of intransitivity on the compensation principle; that is the inconsistent ranking of three or more situations.

Further the criticism on the old welfare economics comes from Lipsey and Lancaster (1956-1957) who state that the partial analysis approach in welfare economics is not appropriate. By using the Pareto principle, they argue that the control of distortion of the single market or sector of the economy implies that the existence

of other sectors may make everyone equally good, or even better.

In the midst of opposition thinking about the accuracy of the concept of economic welfare, John V. Krutilla argued the thinking that can be said as a go-between. John V. Krutilla stated that the various alternative range can be used, because, the result of the analysis is however determined by the value judgments rather than by legislative mandate.

METHODS

Model Specification

A model is an explanation of the actual phenomena as a system or process (Koutsoyiannis, 1977). An econometric model is a special pattern of the algebraic model, namely an element that is stochastic which covers one or more confounding variables (Intriligator, 1978).

Econometric model is a description of the relationship of each explanatory variables on the endogenous variables (dependent variables), especially that which concerns with the sign and magnitude of the parameter estimator in accordance with a priori theoretical expectations. Good model must meet the criteria of economic theory (theoretically meaningful), the criterion statistics viewed from a degree of accuracy (goodness of fit), known as the coefficient of determination (R^2) and statistically significant, while the criteria econometric determines whether an estimate has the required properties such as unbiasedness, consistency, sufficiency, efficiency. D_w statistic is one of the statistical criteria used to test the econometric estimation, that is to test the validity of the assumption Autocorrelation (Koutsoyiannis, 1977).

Specification model which is formulated in this study is very relevant because the purpose of this study is to formulate a model of supply and demand of rice in Indonesia in the context of an open economy. The model is a simultaneous equation model.

Response of Rice Harvest Area

$$RLAP_t = a_0 + a_1 HGTT_t + a_2 HJTP_t + a_3 HFU_t + a_4 CH_t + a_5 KUT_t + a_6 RLAP_{t-1} + U_1. \quad (1)$$

Hypothesis: $a_1, a_4, a_5 > 0$; $a_2, a_3 < 0$; $a_6 < 1$.

Response of Paddy Production

$$YPP_t = b_0 + b_1 (HGTT_t/HFU_t) + b_2 JPFU_t + b_3 AI_t + b_4 GASI_t + b_5 DE_t + b_6 YPP_{t-1} + U_2. \quad (2)$$

Hypothesis $b_1, b_2, b_3, b_4, > 0$; $b_5 < 0$ and $0 < b_6 < 1$.

Fertilizer Use

$$JPFU_t = c_0 + c_1 HFU_t + c_2 HGTT_t + c_3 RLAP_t + c_4 DK_t + c_5 JPF_{t-1} + U_3. \quad (3)$$

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

Paddy Production and Rice Production

$$PPIN_t = RLAP_t * YPP_t. \quad (4)$$

$$PBIN_t = PPIN_t * k_t. \quad (5)$$

The proportion of seed losses and runoff

$$BSPL_t = PRO_t * PBIN_t. \quad (6)$$

Rice Stock at Year-End

$$STBI_t = d_0 + d_1 HBER_t + d_2 PGST_t + d_3 PLST_t + d_4 SKBR_t + d_5 IBIN_t + d_6 STBI_{t-1} + U_4. \quad (7)$$

Hypothesis: $d_2, d_5 > 0$; $d_1, d_3, d_4 < 0$; and $0 < d_5 < 1$.

Indonesian Rice Import

$$IBIN_t = e_0 + e_1 (HIIN_t * ERINA_t) + e_2 PBIN_t + e_3 STBI_{t-1} + e_4 PDKIN_t + e_5 GDPIN_t + e_6 TW_t + e_7 IBIN_{t-1} + U_5. \quad (8)$$

Rice Import Price

$$HIIN_t = f_0 + f_1 HBW_t + f_2 TARIF_t + f_3 HIIN_{t-1} + U_6. \quad (9)$$

Hypothesis: e_4, e_5, f_1, $f_2 > 0$; e_1, e_2, e_3, $e_6 < 0$, and $0 < e_7, f_3 < 0$.

Total of Indonesian Rice Offer

$$QSBI_t = PBIN_t - BSPL_t + STBI_{t-1} + IBIN_t - EXSPOR_t. \quad (10)$$

Rice Domestic Demand

$$DBIN_t = g_0 + g_1 HBER_t + g_2 HJTP_t + g_3 PDKIN_t + g_4 GDPIN_{t-1} + g_5 DBIN_{t-1} + U_7. \quad (11)$$

Hypothesis: $g_1, g_4 < 0$; g_2, $g_3 > 0$; and $0 < g_5 < 1$.

Indonesian Rice Export

$$\text{Export} = PBIN_t - BSPL_t + STBI_{t-1} + IBIN_t - DBIN_t - STBI_t. \quad (12)$$

Procurement of Rice Stock

$$PGST_t = h_0 + h_1 (HGTT_t/HDG_t) + h_2 TAPB_t + h_3 PBIN_t + h_4 INF_t + h_5 TW_t + h_6 PGST_{t-1} + U_8 \quad (13)$$

Hypothesis: h_1, h_4, $h_5 < 0$; h_2, $h_3 > 0$; and $0 < h_6 < 1$.

Disposal of Rice Stock:

$$PLST_t = i_0 + i_1 (DBIN_t/PBIN_t) + i_2 STBI_{t-1} + i_3 PGST_t + i_4 IBIN_t + i_5 INF_t + i_6 TW_t + i_7 PLST_{t-1} + U_9. \quad (14)$$

Hypothesis: i_1, i_2, i_3, i_4, i_5, $i_6 > 0$; and $0 < i_7 < 1$.

Indonesian Rice Marketing Margin

$$MPBI_t = HBER_t - HGTT_t/K_t. \quad (15)$$

Retailing Rice Price

$$HBER_t = j_0 + j_1 (HIIN_t * ERINA_t) + j_2 HGTT_t + j_3 PBIN_t + j_4 TW_t + j_5 HBER_{t-1} + U_{10}. \quad (16)$$

Hypothesis: j_1, j_2, $j_4 > 0$; $j_3 < 0$; and $0 < j_5 < 1$.

Grain Price on Farmer Level

$$HGTT_t = k_0 + k_1 (HIIN_t * ERINA_t) + k_2 HDG_t + k_3 MPBI_t + k_4 PPIN_t + k_5 TW_t + k_6 HGTT_{t-1} + U_{11}. \quad (17)$$

Hypothesis: k_1, k_2, $k_5 > 0$; k_3, k_4, < 0; and $0 < k_6 < 1$.

Farm Income of Indonesian Farmer

$$PUPP_t = (HGTT_t * PPIN_t) - (HFU_t * JPFU_t) - (JPPS_t * HPS_t) - BPLN_t. \quad (18)$$

Variable Details:

$RLAP_t$ is response of rice harvest area (1000 ha).

$HGTT_t$ is grain price in the farmer lever (Rp/Kg), deflated with index of wholesaler's price in Indonesia in the basic year (1995is100).

$HJTP_t$ is corn price (Rp/Kg), deflated with index of wholesaler's price in Indonesia in the basic year (1995is100).

HFU_t is urea fertilizer price (Rp/Kg), deflated with index of consumer's price in Indonesia.

CH_t is rainfall (mm/year).

KUT_t is farm credit (Rp.million), deflated with index of wholesaler's price in Indonesia.

$RLAP_{t-1}$ is timing differences lag of harvest area response.

U_t is confounding variables.

YPP_t is paddy productivity (ton/ha).

$JPFU_t$ is the number of fertilizer use (kg/ha).

AI_t is intensification area (1000 ha).

$GASI_t$ is irrigation area (1000 ha).

DE_t is dummy *El-nino*, Value 1is occurring symptom *El-nino* and 0 is no occurring symptom *El-nino*.

YPP_{t-1} is year paddy productivity last year

$JPFU_t$ is the number of fertilizer use (kg/ha).

DK_t is dummy crisis economy, value 1 is economic crisis is and value 0 is no economic crisis.

JPF_{t-1} is the number of fertilizer use last year (kg/ha).

$PPIN_t$ is paddy productivity in Indonesia (1000 ton).

$PBIN_t$ is rice productivity in Indonesia (1000 ton).

K_t is score conversion 0.63.

$BSPL_t$ is the amount of rice for seed, other uses/losses (1000 ton)

PRO_t is the proportion of rice for seed, other uses/losses (%).
$STBI_t$ is the number of national rice stocks at the end of the year in Logistic Agency (1000 ton).
$HBER_t$ is retail price of rice (Rp/kg), deflated with index of wholesaler's price in Indonesia (1995is100).
$PGST_t$ is total procurement of paddy/rice (1000 ton).
$PLST_t$ is total release/distribution of grain/rice (1000 ton).
$SKBR_t$ is real lending rate in Logistic Agency (%), that is the nominal interest rate minus the rate of general inflation.
$IBIN_t$ is the number of Indonesian rice import (1000 ton).
$STBI_{t-1}$ is the number of national rice stocks last year (1000 ton).
$IBIN_t$ is the number of Indonesian rice import (1000 ton).
$HIIN_t$ is Indonesia rice import price (US$/Kg), deflated with index of wholesaler's price in Indonesia.
$TARIF_t$ is Indonesian rice import tariff (Rp/kg).
$ERINA_t$ is the rupiah exchange rate against U.S. dollar (Rp/US$), deflated with index of Indonesia consumer's price.
$PDKIN_t$ is the number of Indonesian people (Million people).
$GDPIN_t$ is per capita income of Indonesia's population (Rp million).
TW_t is the tendency of the time or the time trend.
HBW_t is world rice price (US$/ton) namely 25 percent rice price quality broken in Bangkok *Free on Board*, deflated by wholesaler's price index of the United States with a base year (1995is100).
$IBIN_{t-1}$ is the number of Indonesia's rice import last year.
$HIIN_{t-1}$ is import price of rice last year.
$QSBI_t$ is the total supply of Indonesian rice (1000 ton).
$EKSPOR_t$ is total export of Indonesian rice (1000 ton).
$DBIN_t$ is total consumption of rice for food (1000 ton).
HDG_t is floor Price of grain (Rp/kg), deflated by wholesaler's price index in Indonesia.
$TAPB_t$ is the total procurement budget of grain/rice (Rp million).
INF_t is the rate of general inflation (%).
$PGST_{t-1}$ is the rocurement of paddy/rice last year.
$PLST_{t-1}$ is disposal/distribution of rice stocks last year.
$HBER_{t-1}$ is retail prices of rice last year.
$HGTT_{t-1}$ is the price of grain at farmer level last yeark
$PUPP_t$ is Indonesian Farmer's Income (Rp 1000)k
$JPPS_t$ is total of pesticide use (liter/ha)k.
HPS_t is rice toxic pesticides (Rp/liter)k.
$BPLN_t$ is other production costs (Rp/ha).

Model Identification

Model iidentification is determined on the basis of "order condition" as a condition of necessity and the "rank condition" as a condition of adequacy. According to Koutsoyiannis (1977), the formulation of structural equation model identification based on order condition is determined by:

$$(K - M) > (G - 1). \quad (19)$$

where K is total variables in the model, namely endogenous variables and predetermined variables, M is the number of endogenous and exogenous variables which are included in a particular equation in the model, and G is otal equations in the model, namely the number of endogenous variables in the model.

If in an equation in the model indicates the following conditions:
$(K–M) > (G–1)$ is the equation is stated over identified.
$(K–M)$ is $(G–1)$ is the equation is stated exactly identified.

$(K–M) < (G–1)$ is the equation is stated unidentified.

The result of identification for each structural equation must *exactly be identified* or *over identified* to be able to suspect its parameters. In this paper, a model that has been formulated comprising of 11 structural equations and 7 structural identities (18 endogenous variables (*G*), and 42 predetermined variables consisting of 31 exogenous variables and 11 lag endogenous variables Therefore, the total variables in the model (*K*) is 60 variables, the number of variables in the equation (*M*) is 7 variables. Therefore, based on the criteria of order condition, any structural similarities that exist in the model is over-Identified.

Model Estimation Method

Model estimation method uses two stages least squares (2SLS) and data processing is done by using software SAS / ETS v. 9.

To determine whether the model is valid enough to create a simulation of alternative policy or non policy and forecasting, it is necessary to do a validation model, with the aim to analyze how far the model can represent the real world. In this study, the statistic criterion for the validation of the estimating value of econometric model used is: Root Means Square Error (*RMSE*), (Root Means Percent Square Error (*RMSPE*) and Theil's Inequality Coefficient (*U*) (Pindyck and Rubinfield, 1991). The criteria are formulated as follows:

$$RMSE = \sqrt{\frac{1}{n}\sum_{t=1}^{n}\left(Y_t^s - Y_t^a\right)^2} \quad (20)$$

$$RMSPE = \sqrt{\frac{1}{n}\sum_{t=1}^{n}\left(\frac{Y_t^s - Y_t^a}{Y_t^a}\right)^2} \quad (21)$$

$$U = \frac{\sqrt{\frac{1}{n}\sum_{t=1}^{n}\left(Y_t^s - Y_t^a\right)^2}}{\sqrt{\frac{1}{n}\sum_{t=1}^{n}\left(Y_t^s\right)^2} + \sqrt{\frac{1}{n}\sum_{t=1}^{n}\left(Y_t^a\right)^2}} \quad (22)$$

where:

Y_t^s is value of the basic simulation results of the observation variable,

Y_t^a is the actual value of the observation variable,

n is total observation period.

Model Simulation

Policy analysis is carried out to see the impact of economic policies on all endogenous variables. Thus we can find out how the endogenous variables react to the changes in exogenous variables. Some simulations of alternative scenarios of economic policy are as follows: 1) Raise the floor price of grain 20 percent; 2) Elimination of urea fertilizer subsidies so that its price increases 20 percents; 3) Raise the 30 percent tariff on rice imports; 4) Simulation combination 1 and 2.

Welfare Changes

In this study alternative policy simulation is also used to calculate and analyze the changes in the welfare of society. The indicators which are used as a change from the public welfare are producer's surplus, consumer's surplus and government's revenue. The Indicator of welfare changes will be used as a basic evaluation and a determining policy direction that will be taken. Analysis of changes in welfare can be formulated as follows:

Changes in Producer Surplus Rice

$$PPIN_B\ (HGTT_S - HGTT_B) + ½\ (PPIN_S - PPIN_B)\ (HGTT_S - HGTT_B). \quad (23)$$

Changes in Producer's Surplus Rice

$$PBIN_B\ (HBER_S - HBER_B) + ½\ (PBIN_S - PBIN_B)\ (HBER_S - HBER_B). \quad (24)$$

Changes in Consumer's Surplus Rice

$$DBIN_B\ (HBER_B - HBER_S) + ½\ (DBIN_S - DBIN_B)\ (HBER_S - HEBR_B). \quad (25)$$

Government Revenue

$(IBIN_S * HIIN_S) - (IBIN_B * HIIN_B)$ (26)

Net Surplus is (1 + 2 + 3 +4).

Types and Sources of Data

Data used in this paper are secondary data with the time series from 1979 up to 2008. Sources of data are BPS, Logistic Agency, Sitepu (2002) and related institutions.

RESULTS DISCUSSION

Uncertainty of Estimation Results and Elasticity

As described before, the model formulated is linear simultaneous equations model, with two-stage estimation methods least squares method (2SLS). The result of behavioral prediction equation (structural behavior) which is based on the sign and magnitude, the coefficient of determination (R^2), t and F statistics can be seen in Table 1 untill Table 11. The result of the economic prediction of rice in this study is quite well as seen from the value of determination coefficient (R^2) of each equation behavior ranging from 0:55 to 0.99. This shows that in general the explanatory variables (exogenous variables) that exist in the equation can explain well the behavior of endogenous variables.

Table 1: Harvest Area Estimation Results

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	50.089452	96.490238	0.519	0.6089	Intercept		
HGTTR	0.024581	0.136168	0.181	0.8584	Grain price	0.009	0.131
HJTPR	-0.048319	0.106887	-0.452	0.6557	Corn price	-0.018	-0.260
HFUR	-0.141955	0.102728	-1.382	0.1809	Real fertilizer price	-0.048	-0.692
CH	0.036432	0.017091	2.132	0.0444	Rainfall	0.086	1.234
KUTR	0.000615	0.001937	0.318	0.7537	Credit UT	0.001	0.012
LRLAP	0.930480	0.076822	12.112	0.0001	RLAP *t*-1		

R^2 is 0.9407
Prob>*F* is 0.0001

Source: Data estimation.

Table 2: Paddy Productivity Estimation Results

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	0.355489	0.332086	1.07	0.296	Intercept		
INA3	0.058361	0.063912	0.913	0.3711	*HGTTR*/*HFUR*	0.02	0.05
JPFU	0.001217	0.001149	1.059	0.3011	Tot. use of urea fertilizer	0.05	0.13
AI	0.000078	0.000036	2.158	0.0421	Intensification area	0.18	0.46
GASI	0.000052	0.00012	0.44	0.6643	irrigation area	0.06	0.16
DE	-0.133658	0.050796	-2.631	0.0153	dummy el-nino	0.00	-0.01
LYPP	0.615094	0.118109	5.208	0.0001	Productivity *t*-1		

R^2 is 0.9927
Prob>*F* is 0.0001

Source: Data estimation.

Table 3: Estimation Result of the Number of Urea Fertilizer Use

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	-33.88015	35.2699	-0.961	0.3467	Intercept		
HFUR	-0.073123	0.03500	-2.089	0.048	Real Fertilizer Price	-0.16	0.42
HGTTR	0.040323	0.03991	1.01	0.3228	Grain price	0.10	0.25
RLAP	0.106768	0.06039	1.768	0.0904	Harvest Area Response	0.69	1.81
DK	-8.873013	9.89527	-0.897	0.3792	dummy crisis	-0.01	-0.02
LJPFU	0.620596	0.17177	3.613	0.0015	Fertilizer use *t*-1	n.a.	n.a.
R^2 is 0.9157							
Prob>*F* is 0.0001							

Source: Data estimation.

Table 4: Estimation Result of Indonesian Rice Stock

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	1778.768	732.76030	2.427	0.0238	Intercept		
HBERR	-2.213264	0.736311	-3.006	0.0065	Rice grain	-1.26	1.88
PGST	0.63348	0.164051	3.861	0.0008	stock procure. DL	0.60	0.89
PLST	-0.110925	0.134652	-0.824	0.4189	total release of stock	-0.18	0.27
SKBR	-33.47144	10.84742	-3.086	0.0054	interest rate	0.08	0.12
IBIN	0.23648	0.124239	1.903	0.0702	Rice Import	0.18	0.27
LSTBI	0.328215	0.188844	1.738	0.0962	Rice stock a *t*-1		
R^2 is 0.6953							
Prob>*F* is 0.0001							

Source: Data estimation.

Table 5: The Estimation Result of Indonesian Rice Import

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	939514.0	637960	1.473	0.1557	Intercept		
INA6	-0.000074	0.000042	-1.729	0.0985	(HIINR*ERINAR)	-0.27	-0.35
PBIN	-2.599275	1.842848	-1.41	0.173	Ina. Rice Production	-5.66	-7.26
LSTBI	-0.743686	0.295149	-2.52	0.0199	Rice Stock at *t*-1	-0.95	-1.22
PDKIN	211.78005	111.85948	1.893	0.0722	Population size	32.43	41.59
GDPIN	0.001942	0.001513	1.284	0.2133	Income population	0.62	0.80
TW	-486.9963	329.6805	-1.477	0.1545	Time trend		
LIBIN	0.220137	0.210041	1.048	0.3065	Ina. rice Import *t*-1		
R^2 is 0.5587							
Prob>*F* is 0.0001							

Source: Data estimation.

Table 6: The Estimation Result of Indonesian Rice Import Price

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	-361.86913	156.359097	-2.314	0.0292	Intercept		
HBW	1.532546	0.426108	3.597	0.0014	World Rice Price	0.494	1.694
TARIFR	0.076876	0.541087	0.142	0.8882	Import Tariff	0.002	0.007
LHIINR	0.708579	0.053748	13.183	0.0001	Ina Import Price *t*-1		
R^2 is 0.9322							
Prob>*F* is 0.0001							

Source: Data estimation.

The value of F test statistics is generally high, that is ranging from 3.79 to 496.21, which means that the variation of the explanatory variables in each equation behavior is jointly able to explain well the endogenous variation at the level α is 0.0001 and 0.0081. Besides, every structural equation has parameter magnitude and its sign is in line with the expectations and quite logical from the standpoint of economic theory.

Table 7: Estimation Result of Rice Demand

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	-8594.4655	4753.0847	-1.808	0.0837	Intercept		
HBERR	-4.170644	1.792611	-2.327	0.0292	Rice price	-0.15	-0.17
HJTPR	1.163571	1.902793	0.612	0.5469	Corn price	0.02	0.02
PDKIN	190.070939	61.410502	3.095	0.0051	Population size	1.41	1.64
GDPIN	-0.002184	0.001307	-1.671	0.1082	Population income	-0.03	-0.04
LDBIN	0.141459	0.247755	0.571	0.5736	Rice Demand *t*-1		
R^2 is 0.9868							
Prob>*F* is 0.0001.							

Source: Data estimation.

Table 8: Estimation Result of National Rice Stock

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	546557	160120	3.413	0.0025	Intercept		
INA2	-655.3044	475.9429	-1.377	0.1824	HGTTR/HDGRR	-0.45	-0.47
TAPB	0.523702	0.172884	3.029	0.0062	Total budget of Logistic Agency	0.46	0.47
PBIN	3.157749	0.86783	3.639	0.0014	Ina rice production	5.61	5.82
INF	-41.176711	9.203728	-4.474	0.0002	Gen. inflation rate	-0.43	-0.45
TW	-278.04333	81.61393	-3.407	0.0025	Time trend		
LPGST	0.036084	0.143305	0.252	0.8035	Stock procure. *t*-1		
R^2 is 0.7431							
Prob>*F* is 0.0001.							

Source: Data estimation.

Table 9: Estimation Result of National Rice Stock Release

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	-132353	39768	-3.328	0.0032	Intercept		
INA4	701.20767	290.7829	2.411	0.0251	DBIN/PBIN	2.90	3.32
LSTBI	0.453809	0.148081	3.065	0.0059	Rice stock at *t*-1	0.27	0.31
PGST	0.475395	0.244386	1.945	0.0653	Stock procure. DL	0.27	0.31
IBIN	0.393767	0.115451	3.411	0.0026	Total Ina rice import	0.18	0.21
INF	36.506429	7.58637	4.812	0.0001	Gen. inflation rate	0.22	0.25
TW	63.151344	19.069856	3.312	0.0033	Time trend		
LPLST	0.126569	0.161397	0.784	0.4417	Stock release *t*-1		
R^2 is 0.8654							
Prob>*F* is 0.0001							

Source: Data estimation.

Table 10: Estimation Result of Retail Rice Price

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	-40978	21600	-1.897	0.0704	Intercept		
INA6	0.0000023	0.000005	0.501	0.6213	(HIINR*ERINAR)	0.01	0.02
HGTTR	0.710195	0.247242	2.872	0.0086	Grain price	0.32	0.43
PBIN	-0.287901	0.145236	-1.982	0.0595	Ina rice production	-0.85	-1.14
TW	21.143433	11.086874	1.907	0.0691	Time trend		
LHBERR	0.254717	0.164482	1.549	0.1351	Rice price t-1		
R^2 is 0.7466							
Prob>*F* is 0.0001.							

Source: Data estimation.

Table 11: Farmer Grain Price

Variable	Parameter Estimate	Standard Error	*t* statistic	Prob > |*t*|	Variable Label	Elasticity	
						SR	LR
INTERCEP	7318.155	13291	-0.551	0.5875	Intercept		
INA6	0.000008	0.000002	3.795	0.0010	(HIINR*ERINAR)	0.09	0.10
HDGRR	0.573998	0.165934	3.459	0.0022	Grain Floor Price	0.63	0.73
MPBI	-0.332379	0.095926	-3.465	0.0022	Rice Market Margin	-0.20	-0.24
PPIN	-0.016387	0.057243	-0.286	0.7774	Ina Rice Production	-0.17	-0.20
TW	3.780092	6.825185	0.554	0.5853	Time Trend		
LHGTTR	0.141744	0.119135	1.19	0.2468	Grain price *t*-1		
R^2 is 0.7752							
Prob>*F* is 0.0001							

Source: Data estimation.

The $t_{statistic}$ value is used to test whether each of the explanatory variables gives significant effects to the endogenous variables which are not significant or giving no significant effect to the endogenous variables for the level α is 0.05.

From the results of model prediction models, we then calculate the short-term elasticity (SR) and long term (LR) of endogenous variables to each its endogenous variable. Of the eleven endogenous variables which are analyzed, it is obtained several endogenous variables that respond elastically to the exogenous variables as shown above.

Model Variation

Simulation policy is aimed at analyzing the impact of various alternative policies by changing the value of its policy variables. However, before doing the policy of alternative simulation, it needs to accomplish the model validation to see whether the allegation is in accordance with the actual value of each endogenous variable (Pindyck and Rubinfield, 1991). In this study, a basic simulation for the observation of sample period 1979-2008 has been tested. The validation of statistical indicator used is the Percent Root Mean Square Error (RMSPE) to measure how close the value of each endogenous variable estimation results following the actual data value during the period of observation or in other words how much the deviation in percent is.

Besides, the statistic of bias proportion (UM), the regressive proportion (UR), the distributive proportion (UD) and also Theil's statistical inequality coefficient (U) are used to evaluate the ability of the model for the analysis of historical and ex-ante simulation. Basically, if the values of RMSE, RMSPE and U-Theil's are smaller and the value of R^2 is greater, the prediction model will be better. Theil's coefficient value (U) ranges between 1 and 0. If U is 0, the model prediction is perfect, and if U is 1, the model prediction is naive.

Table 12: Testing Result and Model Validation

No	Variable	RMS % Error	Bias (UM)	Reg (UR)	Dist (UD)	Var (US)	Covar (UC)	U-Theil
1	PPIN	4.4939	0.2160	0.0320	0.7520	0.0130	0.7710	0.0240
2	PBIN	4.4939	0.2160	0.0320	0.7520	0.0130	0.7710	0.0240
3	BSPL	4.4939	0.2160	0.0320	0.7520	0.0130	0.7710	0.0240
4	QSBI	3.5098	0.0490	0.0000	0.9510	0.0070	0.9440	0.0171
5	PUPP	10.9340	0.0910	0.0050	0.9040	0.0500	0.8590	0.1044
6	MPBI	66.6072	0.0710	0.1400	0.7900	0.0340	0.8950	0.2001
7	EKSPOR	4.6042	0.1270	0.0010	0.8710	0.0020	0.8700	0.0228
8	RLAP	4.2002	0.1150	0.0080	0.8780	0.0060	0.8800	0.0212
9	YPP	2.4957	0.0990	0.0260	0.8750	0.0100	0.8900	0.0121
10	JPFU	12.7496	0.1550	0.0610	0.7840	0.0050	0.8400	0.0518
11	STBI	66.5252	0.0410	0.0240	0.9350	0.0810	0.8770	0.1666
12	IBIN	58.7913	0.0750	0.0400	0.8850	0.0130	0.9120	0.2003
13	HIINR	33.7960	0.0000	0.0140	0.9860	0.0640	0.9360	0.0996
14	DBIN	2.9880	0.0130	0.0010	0.9860	0.0020	0.9850	0.0149
15	PGST	61.3733	0.0880	0.1000	0.8120	0.0000	0.9110	0.1736
16	PLST	27.7640	0.0710	0.0830	0.8460	0.0010	0.9280	0.1059
17	HBERR	9.3033	0.0340	0.0040	0.9630	0.0510	0.9150	0.0487
18	HGTTR	26.1549	0.0290	0.0130	0.9580	0.1850	0.7860	0.0666

Source: Data estimation.

From Table 12, it can be known that four equations in the model have greater RMSPE values than 50 percents; the rests have RMSPE value of fewer than 50 percents. Based on of U-Theil's statistic value, it is found that all the equations have less U-Theil’s values than 0:20, and it shows that valid is carried out to perform policy simulations whether at the historical or forecast periods.

The Impact of Economic Policies on Rice Supply and Demand

There are four policies analyzed in this paper, they are the increasing of floor price by 20 percent, the elimination of fertilizer subsidy so that the price of urea fertilizer is increased by 20 percent, and the policy of increasing import tariffs by 30 percent, and the combination of policies of the increasing of grain floor price and the elimination of fertilizer subsidy respectively increases by 20 percent. The result of policy analysis can be seen in Table 13.

As seen in Table 13, if the policy simulation to raise the floor price of grain by 20 percent is done, it will have positive impact on the increasing of paddy production by 3.97 percents and the income of farmers by 38.79 percents. The increasing of the floor price of the grain will cause the prices of grain and rice to increase by 22.82 percents and 5:55 percents respectively. This will impact on the demand for rice, which is reflected by the decline in demand for rice by 0.94 percents.

The case will be different if the reduction policy of fertilizer subsidies or increasing the price of urea fertilizer by 20 percents is made, it will affect on the decrease of the rice production and farmer’s income by 13.20 percents and 35.40 percents. The decrease of this production will also reduce the supply of rice by 13.21 percents, therefore in order to meet domestic demand, it is required the additional rice import by 209.73 percents. The elimination of fertilizer subsidy will also cause the price of rice increased by 9.52 percents so that the demand for rice will decrease by 1.60 percents.

Table 13: Alternative Evaluation of Economic Policy on Rice Supply and Demand

Variable	Unit	Value Basic	Changing Percentage			
			1	2	3	4
Paddy production	000 ton	3856.00	3.97	-13.20	0.000	-9.75
Rice production	000 ton	2430.00	3.95	-13.21	-0.041	-9.79
Seed proportion/decreasing	000 ton	242.95	3.96	-13.20	-0.001	-9.76
Total of rice offer	000 ton	24154.00	-0.63	-4.35	0.000	-4.95
Farmer's income	Rp. billion	1.03	38.79	-35.40	0.039	-3.41
Rice market margin	Rp/Kg	195.26	-47.19	78.71	-0.014	34.64
Indonesian rice export	000 Ton	-19668.00	0.37	-9.02	0.000	-8.92
Harvest area response	000 Ha	1006.00	1.79	-8.85	0.000	-7.14
Productivity	Ton/Ha	3.75	2.07	-4.37	-0.003	-2.52
Total of fertilizer use	Kg/Ha	160.78	8.09	-24.75	-0.001	-16.83
Rice stock at year-end	000 ton	1533.00	3.91	-44.93	0.000	-39.54
Total of rice import	000 ton	792.63	-46.47	209.73	-0.035	111.57
Rice import price	US/ton	1145.00	0.00	0.00	0.087	0.00
Rice demand	000 ton	22621.00	-0.94	-1.60	0.000	-2.60
Stock procurement DL	000 ton	1503.00	19.89	-63.95	0.000	-47.58
Total of stock release	000 ton	2205.00	-14.69	38.00	0.000	22.63
Rice price	Rp/Kg	791.44	5.55	9.52	0.009	15.45
Grain price	Rp/Kg	375.59	22.82	13.14	0.016	9.17

Source: Data estimation.

The above table should be understood with the following notes. Simulation 1 is the increasing of floor price of grain by 20 percents. Simulation 2 is the elimination of fertilizer subsidies (urea fertilizer increasing) by 20 percents. Simulation 3 is the increasing of import tariffs by 30 percents. Simulation 4 is the policy combination to raise the floor price of grain and the elimination of fertilizer subsidy by 20 percents.

In terms of trade, the policy of increasing the import tariff 30 percents from the average import tariff that has already been set will not affect on Indonesian rice production so that the total supply will also remain unchanged. This shows that the policy of the import tariff is not effective to increase the rice production. The policy to increase the import tariff on the rice import will cause prices to increase by 0.09 percents that is followed by a decrease in the amount of rice import by 0.04 percents. The increase in import prices causes the prices of grain and rice to increase respectively 12.02 percents and 0.01 percents. The small percentage of increasing the rice price does not affect the demand for rice in Indonesia.

To protect producers and consumers, government often performs a combination of alternative policies such as raising the floor price of rice and urea fertilizer subsidy reduction. The alternative combinations of the policy give negative effects to the rice production by 9.79 percents. The decrease of this production will also reduce the supply of rice by 4.95 percents, so that to meet the domestic demand the additional rice import by 111.57 percents is required. Meanwhile, the combination of the policies causes the prices of paddy and rice to increase respectively by 9.17 and 15:45 percents. This causes the demand for rice to drop by 2.60 percents.

The Evaluation of Economic Policy on Public Welfare

Table 14: The Impact of Alternative Policies on Indicator Changes of Society Economic Welfare

Welfare Indicator	Item	Alternative Policy			
		1	2	3	4
Surplus of Paddy Producer	Rp Billion	337.13	-177.70	0.23	126.31
Surplus of Rice Producer	Rp Billion	108.88	171.06	0.17	282.62
Surplus of Rice Consumer	Rp Billion	-998.58	-1718.73	-1.57	-2802.38
Government Revenue	Rp Billion	-421.71	1903.41	0.47	1012.60
Net Surplus	Rp Billion	-974.28	178.05	-0.70	-1380.86

Source: Data estimation.

The calculation results of the impact of the alternative policies on economic welfare by using indicators of producer surplus, consumer surplus, and government revenues are presented in Table 14.

From Table 14 it can be seen that the increase in the floor price of rice by 20 percents gives a positive impact to the acquirement of the surplus of rice and paddy producers respectively by Rp 337.13 billion and Rp 108.88 billion. Instead, the policy gives a negative impact to the consumers by Rp 998.58 billion. Thus it can be said that the policy to raise the floor price of grain to the producers of paddy will create economic disparities. In applying the policy to raise the floor price of rice the government should issue a big enough budget, and this is indicated by negative government revenue by Rp 421.71 billion. An alternative policy is causing net surplus to be negative (- USD 974.28 billion). This indicates that the policy to raise the floor price of grain inefficient.

On the contrary, the elimination of by raising the price of fertilizer by 20 percents gives a negative impact to the acquisition of the surplus of rice producer and rice consumer respectively by Rp 177.70 billion and USD 1718.73 billion. On the other hand, a positive impact on producers of rice by Rp 171.06 billion is closely related to rice marketing margins. The producer of rice in general is a trader who receives the marketing margin greater than the marketing margin of the paddy and rice producers. Urea fertilizer is one of the major inputs in producing rice so that the decrease in the number of farmers who use urea fertilizer will directly impact the production decrease. Consequently, the rice farmer's revenue declines. Another implication is the price of rice will increase so that the acquisition of consumer surplus decreases. The application of the removal policy of the urea fertilizer will directly imply on the government revenue with the acquisition of revenue by USD 1903.41 billion. Overall, the net surplus is positive and it shows that the application of the policy is efficient.

In the international trade, the policy of import tariffs by 30 percents gives a positive impact to the acquisition of the paddy and rice producer's surplus and gives a negative impact to the acquisition of consumer's surplus. The policy to raise the import tariffs by 30 percents brings about surplus to the producer of paddy and rice respectively by Rp 12.23 billions and billions 0.17, while the acquisition of the consumer's surplus decreases by USD 1:57 billion. The application of the policy to raise the import tariffs by 30 percents gives a positive effect to the government revenue by Rp 12.47 billions. Furthermore, the net surplus of the application of policy to raise the import tariff is negative (USD 0.70 billion). It also happens to the application of policy to raise the floor price of grain. Therefore it can be inferred that the policy of increasing the import tariff is inefficient.

The alternative combination of the subsidy reduction policy and increasing the floor price of rice has the same implication with the application of the import tariff policy from the aspects of welfare indicators which are analyzed, but with a different scale. The combination of these policies brings a positive impact on the acquisition of the paddy and rice producer's surplus but it brings a negative impact for the acquisition of consumer's surplus. In addition, the combination of these policies has positive impact on the government revenue, but generates a negative net surplus. Thus it can be said that the combination of policies to raise the floor price of grain by 20 percents and remove the subsidy of urea fertilizer by raising its price by 20 percent will cause bias to the producers of paddy and rice. And the value of a negative net surplus shows that the application of this combination is economically inefficient.

CONCLUSION

From the research that has been carried out on the impact of economic policies and trade liberalization on the supply and demand of rice in Indonesia, it can be concluded as follows. First, harvest area is affected by the price of grain on the price of grain on the farmer level, the price of urea fertilizer, rainfall, the price of corn on the level of farmer and farm credit, but the response is inelastic. This shows that the area of paddy field has reached the maximum limit (closing cultivation frontier).

Second, paddy productivity is affected by the price of grain, the price of urea fertilizer, the total of fertilizer use, irrigated acreage, the area of intensification, and the symptoms of global warming (El Nino), but the response is inelastic. This shows that the productivity of paddy has encountered a problem stagnant production (leveling-off) as a result of the use of imbalanced fertilizer.

Third, the response of grain/rice production which is supposed from the increasing of acreage and productivity is not responsive to the price. This indicates that the price is not the main orientation for farmers to increase their production but it is mainly due to the consumption needs.

Fourth, the demand of rice for consumption is significantly influenced by the changes in the retail prices of rice, but the response is inelastic. It means that the changes in the price of rice brings only a small impact on the changes in demand for rice, and on the price of corn, the response on the rice demand is also inelastic. The other factor that affects the demand for the consumption of rice is the large number of Indonesian populations. The response to the changes in the amount of rice demand is inelastic in the short-term residents, and elastic in the long term.

Fifth, the factors that influence the number of Indonesia's rice imports are Indonesia's rice import price, exchange rate, early rice stocks, population, and income per capita of the population. The response of rice imports to the total demand for domestic rice production and population of Indonesia is elastic. Indonesia's rice import price itself is influenced by world price of rice and import tariffs.

Sixth, the increase of the floor price of grain by 20 percents brings a positive impact on the rice production and farmer's income. It also makes the price of rice rise, but it brings impact on the decline in demand for rice. This policy increases the welfare of the paddy and rice producers, while consumer's welfare decreases, and the government should issue a big enough budget to implement the policy. Overall, this policy is economically inefficient.

Seventh, the policy to increase the price of fertilizer by 20 percents affects on the decrease of the paddy production and farmer's income. This policy causes the price of rise to rise so that the demand for rice decreases. This policy causes the welfare of paddy producer and consumer to decrease, whereas the welfare of the rice

producer increases. The removal of urea fertilizer subsidy will reduce the government spending. Overall the implementation of this policy is economically efficient.

Eigth, the increasing of the import tariffs by 30 percents has no impact on the total supply of rice, but it only increases the price of paddy and rice in a low percentage. This policy increases the welfare of the paddy and rice producers, but the welfare of the rice consumer welfare decreases. Government obtains additional revenue by implementing this policy. Overall the policy is economically inefficient.

Ninth, the combination of the policies on the floor price of grain and the elimination of urea fertilizer subsidies has a negative impact on the production and demand of rice. The combination of these policies will improve the welfare of the paddy and rice producers, but the welfare of the consumer will decline. This alternative policy produces a negative net surplus; it means that it is economically inefficient.

Thenth, in the attempt to increase the production of grain/rice to achieve self-sufficiency in rice, it should be better to focus more on the increasing of the productivity through the development of irrigation area and intensification area (the use of superior seeds, integrated pest control and improve the quality of farm management). However, the increased production because of the intensification of development area and irrigated area can cause the welfare of the farmers to decrease, therefore the anticipation to prevent the decrease of grain price is needed. In this regard the procurement of grain from logistic agency needs to be effectively reinforced.

Eleventh, in the attempt to respond to the increasing production of grain/rice, the policy of the floor price of grain is still necessarily needed. If the subsidy of the input price (fertilize price) is removed, it should be followed with the increasing of the output price (the grain price), at least the minimum percentage of its increasing is the same.

REFERENCES

Caves, R.E., J.A. Frankel and R.W. Jones (1993), *World Trade and Payment: An Introduction*, Sixth Edition, Harper Collins College Publishers, New York.

Daryanto, A. (1989), *Dasar-Dasar Ekonomi Sumberdaya*, Jurusan Sosial Ekonomi Pertanian, Faperta IPB, Bogor.

Intriligator, M.D. (1978), *Econometric Model, Techniques, and Applications*, Prentice Hall Inc., New Jersey.

Just, E.R., L.H. Darrel and S. Andrew (1982), *Applied Walfare Economics and Public Policy*, Prenctice-Hall, Inc., Englewood Cliffs, New Jersey.

Koutsoyiannis, A. (1977), *Theory of Econometrics: An Introductory Exposition of Econometic Methods,* 2nd Edition, The MacMillan Press Ltd., London.

Koutsoyiannis, A. (1979), *Modern Microeconomics,* 2nd Edition, The MacMillan Press Ltd, London.

Pindyck, R.S. and D.L. Rubinfeld (1991), *Econometric Models and Economic Forcasts*, Third Edition, McGraw-Hill Inc., New York.

Simatupang, P. (2000), "Pandangan Skeptis Terhadap Kebijakan Harga Dasar Gabah," Paper Presented at Round Table Discussion, *Kebijakan Harga Gabah di Era Perdagangan Bebas*, Badan Urusan Ketahanan Pangan, Departeman Pertanaian, Jakarta.

Sitepu, K.R. (2002), *Dampak Kebijakan Ekonomi dan Liberalisasi Perdagangan terhadap Penaawran dan Permintaan Beras di Indonesia*, Master's Thesis, Magister Sain, Institut Pertanian Bogor.

Sudaryanto, T.B., R. Rachman and S. Bachri (2000), *Arah Kebijakan Distribusi/Perdagangan Beras dalam Mendukung Ketahanan Pangan: Aspek Perdagangan Luar Negeri dalam Pertanian dan Pangan*, Pustaka Sinar Harapan, Jakarta.