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Analysis of Agricultural Rice Production in Jambi: Study of Acreage Response Under Price Policy Program

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***Abstracts*— Research aims was to evaluate effect of agricultural development on rice yield. Good prospect rice yield along years of evaluation (1986-2010) found much increasing in policy model, like support price program, also subsidy input program. Unstable acreage, also production, was affected by output price also input price like input fertilizer price. Successfulness support price policy also input subsidy policy depended on coefficient of support price also input price components. Price support program application research result was this policy was much credible also effective to improve acreage. Impact of support prices program on paddy was very crucial on evaluating acreage model, because government program on support prices on new condition played important role in policy application. Model calculating on those program for evaluating acreage model was conducted if effect price support also market problem was unstable on market phenomena. It predicted that effect of government policies changing since model on acreage program also support price were seemingly model next generation. Model analyzing support program, also acreage control was created also evaluated to learn changing government programs effect. Study found that if support price was much under appropriate market support, trigger action was not important also price support had a few effect on acreage conclusion. On other hand, as rate of support price, trigger movement was bigger, also final result on acreage conclusion was more negligable.**

***Keywords*— agriculture, rice yield, acreage response, government policy.**

I. Introduction

In economy improvement era, riel prices is found on markets movement also draw riel picture of government role in market grounded. Riel prices have been very much influenced by direct policy movement, it also cause to decide acreage model (Pearson et al. 1991). Market movement can be influenced by government policy also had effect on price information. Kolawole et al.(2011) expressed that input price policy can influence directly benefit of planting crops, also hence availability product in market. Ground mechanism applied to operate paddy price program was basic price, also market institution managed international market in paddy creates stabilized domestic sector on yield also demand getting on value on supply and demand. Finally, the availability on government policy, acreage model estimation has problematic because phenomena movements on policy program in timing of evaluation exists (Guyomard et al. 1996).

In order to see majority approach of policy role on price paddy program, study involves model of lagged of autoregressive expectations (Keeney and Hertel, 2008). On that models, basic supply equation will be evaluated using producers short-run acreage program in ex-ante rational risk also combination of each-hectare income.

Research aims is to evaluate impact rice acreage response on government stabilization programs. In order get objective, model is created that can be able to explain acreage problem, also effect that program. Following, short explained theoretical model also empirical equation including sub-model paddy market also price program. Moreover, program is evaluated applying integration on basic quantitative model also qualitative complicated model.

II. Research Method

In order to solve acreage response on price policy program, it needs doing riel study. Study was carried out in Jambi Province, since Jambi is central producers of paddy in Indonesia. Research was done in 2011. Study applied survey methods also data implemented got from secondary data. Study used year of 1986-2010 Jambi data. Year of 1986-2010 data are implemented explaining policy problem time which was unstable on policy problem level was big, average also other.

A. The Acreage Response Functional Form

Price policy program study interests mostly at level price problem because of big diversity on production. Because yield problem may be expressed on total yield, or acreage problem (Fraser, 1986 and Smith et al. 2009). If acreage also hybrid variety has probability develop, production response may be better to choose.

On contrary, since actual production levels expressed effect risk variables like season, insect problem also construction, ground acreage model on yield steps was questionary (Villano et al. 2005).

Problem acreage model in research can be expressed as

$$A_t = \alpha_0 + \alpha_1 \Phi_t + \alpha_2\lambda_t + \alpha_3 C_t + \alpha_4 \theta_t + \varepsilon_t \quad (1)$$

note : A_t means land acre

Φ_t means expected gross income

λ_t means expected risk

C_t means input prices

θ_t means government farm program

α_0 means intercept

α_1 - α_4 means parameters

ε_t means error term

Components in model (1) was expressed partially :

a) Total Income Component (Φ_t)

$$\Phi_t = \Sigma P_t.Y_t.A_t \quad (2)$$

note : Φ_t means total income wanted

P_t means price output

Y_t means production each acre

A_t means land each acre

Producers Wanted Total Income [$E(\Phi_t)$]

$$E(\Phi_t) = \alpha_1 \Phi_{(t-1)} + \ldots + \alpha_p \Phi_{(t-p)} + \beta_1 \varepsilon_{(t-1)} + \ldots + \beta_q \varepsilon_{(t-q} \quad (3)$$

note : $\Phi_{(t-1)}$ means total income each acre that expresses Auto-Regressive (AR) factor,

$\varepsilon_{(t-q)}$ means bias factor in lag q year that expresses Moving Average (MA) factor.

(b) Risk Variable (λ_t)

$$\lambda_t = [\Phi_t - E(\Phi_t)]^2 \quad (4)$$

(c) Farmers' Expected Risk Variable [$E(\lambda_t)$]

$$E(\lambda_t) = \alpha_1 \lambda_{(t-1)} + \ldots + \alpha_r\lambda_{(t-r)} + \beta_1 U_{(t-1)} + \ldots + \beta_s \varepsilon_{(t-s)} \quad (5)$$

note : $\lambda_{(t-r)}$ means uncertainty variable which means AR component

$\varepsilon_{(t-s)}$ means bias of uncertainty linkage with lag production which means MA component

Since research used secondary data, it is crucial to evaluate data stationary. Non-stationary secondary data has a very much effect on final result . Clark and Spriggs (1989) stated that if secondary data causes not stationary, quantitative problem, problematic policy case, will have effect on permanent problem, also data will not be back to before problem level unless an equal treatment did in other side. On the contrary, stationary secondary data fills just temporary shock.

In order to test hypothesis on acreage model, null hypothesis was used through unit root procedure was evaluated verse other hypothesis in which land model was moveless along strict graph. To explained hypothesis phenomena Model was expressed as:

$$\delta(A_t) = \beta_0 + \beta_1 T + \beta_2 A_{t-1} + \beta_3\delta(A_{t-1}) + \varepsilon_t \quad (6)$$

note : $\delta(A_t)$ means lagged land acre

T means linear year component,

A_{t-1} means acreage,

ε_t means bias component

β_0 means constant, and

$\beta_1 - \beta_3$ means coefficient estimations

Basic hypothesis can be expressed to evaluate model coefficient as :

$$H_0 : \beta_1 = \beta_2 = \beta_3 = 0$$

When H_0 was accepted, so paddy acreage model is a unit root model. Then, acreage model contains of lagged acreage and yield model on paddy. This model is expressed linearity and evaluated using seemingly unrelated regression method. Partial adjustment model was predicted also lag acreage was involved on acreage function. Land acreage model can be expressed as:

$$A_t = f(P^*_{t-1} , A_{t-1} ,\theta_t ,T ,\Phi_t) \quad (7)$$

note : A_t means land acre variable

P^*_{t-1} means farm price deflated index yield cost variable

θ_t means impact of input subsidy and price support program variable,

T. means linear year component, and

Φ_t means risk variable

Analyze land acre model in uncertainty condition are evaluated using OLS method. Durbin-Watson factor was applied to evaluate model problem. Finding is operated to analyze how much risk factor has effect on land acreage also on structural elasticity land acreage in respect on uncertainty (Lu et al. 2006) .

III. Findings And Discussions

Research aims was to investigate acreage model of producers conclusion role on uncertainty also price model. Expected Utility Profit model was applied to predict hypothetical coefficient. This function was restricted to factors by considering on uncertainty also policy model to explore optimal uncertainty strategy. Key words applied in risk evaluated was the lagged production model, also effectiveness policy model.

A. Estimation of Lagged Production Function

Research explored land acre model to influencing uncertainty component on lag yield model. Coefficient values of paddy acreage in risk condition were evaluated using ordinary least squares method. In evaluating significance of each variable, basic hypothesis can be explained as $H_0 : \beta_1 = \beta_2 = \ldots = \beta_n = 0$. Then, it found that coefficient parameters of acreage policy risk condition can be seen in table below. Durbin Watson result stated that basic hypothesis of $\beta1= \beta2 = \ldots = \beta n = .0$ can't be accepted. This means that at least one of coefficient variables was not equal to zero.

Acreage policy tended linearly, also evaluated two level. First level, producers expected total income each acre also risk component were specified. Then, coefficient estimation were applied to find expected total income each acre and risk component. Expected total income component were focused on autoregressive-moving average method of Φt. Final finding of ARMA (3,3) was stated as:

$$E (\Phi_t) = \Phi_t * = 23{,}4 + 0{,}7\ \Phi_{t-1} + 0.02\Phi_{t-2} + 0.4\Phi_{t-3} - 0.3\epsilon_{t-1} - 0.01\epsilon_{t-2} - 0.2\epsilon_{t-3} \quad (8)$$

Expected risk component (λ) were expressed as an autoregressive-moving average method $(\Phi t - \Phi t^*)^2$. Finding of ARMA (3,3) can be stated as:

$$\lambda = 20{,}4 - 0{,}6\,\lambda_{t-1} + 0.5\lambda_{t-2} + 0.6\lambda_{t-3} - 0.04U_{t-1} + 0.8U_{t-2} - 3.1U_{t-3} \quad (9)$$

Furthermore, this was recommended on riel solution that policy data series was not constant also it is not explanation that linked bias should be constant. In estimating constanta level (stationary) on land problem operating, Dickey-Fuller method applied to evaluate model which $H_0 : \beta_1 = \beta_2 = \ldots = \beta_n$ equals to zero. Finding was explained on following table.

TABLE I
DICKEY-FULLER TEST FOR ACREAGE RESPONSE

	Results
F-value	29.894
Critical Coefficient	3.97
Evaluation	accept H_a
Decision	no unit root

It showed paddy variable does not have a unit root It meant that paddy data on these model was the same while acreage model was evaluated. Then, acreage model was estimated as it can be seen in table 2 above. On this table, good coefficient on wanted total income, Φt^*, was significant. This meant that as farmers' expected income for paddy grows, paddy acreage component will also grow.

TABLE II
ESTIMATIONS OF ACREAGE RESPONSE UNDER LAGS

	Coefficient	Std. Error
Constanta	-8.634	
Φ_t *	0.0040***	0.0010
λ	-0.0051**	0.0021
C_1	0.0019	0.0059
C_2	0.0013	0.0023
θ_1	0.0927*	0.0489
θ_2	0.0511**	0.0239
T	0.0019	0.0909
R^2	0.8914	
D.W	2.7824	

Φt^* = total income expectation
Λ = uncertainty expectation
C_1 = input fertilizer price
C_2 = input pesticide price
θ_1 = price policy
θ_2 = subsidy input policy
T = linear year component
R^2 = adjusted R^2
D.W. = Durbin-Watson value

Research found that coefficient variable on risk component, λ, was more than zero even-though this wasn't significantly level. It meant that producers tended to risk averse behave, also risk component linkage to total income moves up, acreage graph moved down.

Coefficient variable of price policy, ή1, is more than zero even-though, this was significantly 10% level. It meant that support price policy have impact on left in land problem by left paddy land problem graph to up side.

The Impact of Fertilizer and Pesticide Programs on Paddy Production

On evaluating economic influence on input fertilizer also input pesticide policy program, it is important to learn effect of input fertilizer also input pesticide apply in crop production because model presented good impact on product developing and create to apply, best product condition that want more input fertilizer also input pesticide used each acre in year before and time condition, also predicted to be better in model as:

$$Y_t = \beta_0 + \beta_1 \text{ƭ}_{t-1} + \beta_2 \Phi_{t-1} + \beta_3 T + \epsilon_t \quad (10)$$

note : Y_t means paddy production
ƭ_{t-1} means input fertilizer each acre
Φ_{t-1} means input pesticide each acre
T means linear year component
β_0 means constant
$\beta_1 - \beta_3$ means coefficient variables
ϵ_t means bias

OLS approach was applied in evaluating paddy production variables. It can be expressed model as:

$$Y_t = 4851.4 + 0.109\,T + 0.371\,\text{ƭ}_{t-1} + 1.079\,\Phi_{t-1} \quad (11)$$
$$(19.8) \quad (0.041) \quad (0.139) \quad (0.2098)$$
$$D.W. = 0.5834 \qquad R^2 = 0.9016$$

Model can explain that program of subsidy fertilizer subsidy pesticide used each acre affects positively in production because its parameter was better also meaningful. It has meaning that improving fertilizer and pesticide used will create better rice production. Time parameter component was significantly different from zero. It has meaning that improving technical variable has positive effect on rice production.

From finding above, it can be said that input subsidy has positive effect in increasing production by applying more fertilizer also pesticide. Furthermore, increasing of total yield was caused by more acreage cultivated. Moreover, effect of input subsidy program can create good access for farmer to improve their yield, also move supply graph to the left. Therefore, subsidy input program can create business activity by moving supply graph to up side.

IV. CONCLUSIONS AND FUTHER RECOMMENDATIONS

A. Conclusions

Model evaluated supply response phenomena using theoretical and empirical model. Research showed the way to decide supply response based on risk. In explaining the problem, simulating approach used in acreage model on basis of rice price support rate. Simulation model is applied to investigate successfulness of government policy. Therefore, it can be explained risk effect on supply problem.

First of all, it was used lagged production function that can estimate risk component empirically. It got that parameter estimation of risk component became crucial factor to make decision. Finding explained that rice farmers were risk averse. So that, government programs had become considerations of risk and dynamic sectors.

Therefore, successfulness of farming government program can be evaluated, risk component played important role in evaluation. Such as kick off risk factor can improve acreage sector that it has meaning supply graph moved to right side.

B. *Further Recommendations*

Further recommendation can be found from conclusion above that model meta response can be used to explain effect of applying government program. Price variable that influenced rice crop is important factor for making decision such as whether to plant hybrid crop or to provide profit. Since price is crucial component, it can be influenced from relationship market and government programs. Therefore, it can be recommended that rice farmers can evaluate problem their face, also government become crucial factor to affect farmers condition, especially when program of input subsidy and supporting can play importantly to make good profit.

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