Impacts of Government Spending on Thailandûs Agricultural Sector

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ABSTRACT

The research examined the question of how much the expanded government consumption spending has been beneficial to agricultural sector. The study began with the estimation of parameters in the structural model. It revealed the government spending had impact on interest rate, exchange rate, price index and real GDP. These variables linked government spending to the agricultural sector. The estimated parameters were utilized for policy simulation. As simulation results, when the government increased in the budget spending by 5, 10 and 15%, its impacts on agriculture were concluded in terms of percentage change from baseline value. Food consumption rose to 1.04, 2.08 and 3.13%. Food export rose to 0.05, 0.10 and 0.15%. Meanwhile, food import rose to 1.05, 2.11 and 3.16%. Consequently, surplus of trade balance for food worsened to 0.21, 0.43 and 0.64%. In addition, employment in agricultural sector rose to 0.02, 0.05 and 0.07%. Capital stock in agricultural sector also rose to 0.07, 0.14 and 0.21%. Gross domestic production in agricultural sector subsequently rose to 0.23, 0.47 and 0.70%. Thus, Thai Agriculture was affected not only by the spending specifically designed for it, but also by the government consumption spending.

Key words: government consumption spending, agricultural sector

INTRODUCTION

Agricultural economists had to give greater attention to monetary and fiscal policy if they wanted to understand developments in the agricultural sector and to make useful forecasts of trade and other variables in the economy (Schuh, 1976). This was because the agricultural sector was affected not only by policies specifically designed for it but also, and often more deeply, by policies affecting the overall macroeconomic environment, e.g. public sector deficits, inflation, interest rate and exchange rate (Stamoulis 1995). Nonetheless, Thai Agriculture's empirical evidences have been known little up to now. Accordingly, how macroeconomic policies linked to Thai Agriculture was examined in this article. Within the macroeconomic policies, the fiscal policy was played as a crucial role in stimulating the economic growth through demand perspective. Moreover, the tool of expenditure was more effective and efficient than tax revenue (Loha-Unchit, 1985). According to the balance sheet of national income reported by Office of the National Economics and Social Development Board, the average of government consumption spending from 1996 until 2004 was approximately 278,626 million Baht at 1998 price.

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Its growth rate was accounted for 3.13% per year. It consigned this article to the research question of how much the expanded government consumption spending has been beneficial to agricultural sector.

LITERATURE REVIEW

Schuh (1974, 1976, 1979) rekindled issues in line with the theme of "linkage between macroeconomic policy and agriculture". It was broadly divided into two headings. Firstly, one way to deal with this research was that the macroeconomics variables, e.g. exchange rate, inflation and interest rate were treated as exogenous variable affecting agriculture. Secondly, the effects of macroeconomic policy on agriculture were analyzed. The tool of analysis was basically separated into two approaches, e.g. structural and computable general equilibrium model. The former was for macroeconomic theory to be employed as a guide as to the appropriate variables to run in the regression equations. The latter, derived from the microeconomic theory was well suited to analyze questions in particularly the tax policy and international trade (Mckibbin and Wang, 1998).

Effects of macroeconomic variable on agriculture

(1) Exchange rate and agricultural export: Schuh (1974) initially pointed out consequence of over-valuation of the dollar was the factor causing the U.S. farm problem. Thereafter, Chambers and Just (1981) revealed the devaluation of the early 1970s had extremely important effects on the U.S. agricultural exports and prices. Additionally, Batten and Belongia (1986) revealed the elasticity of real agricultural exports with respect to real exchange rate was about -0.72. Attentions turned out to be the dynamic model. Saunder *et al.* (1999) employed the error correction model in order to show that the existence of unidirectional causal flow from the real exchange rate to the U.S. agricultural exports.

(2) Inflation and agricultural price: Starleaf (1982) indicated that if activist macroeconomic policy actions have had at least a short-run impact on real output of the macroeconomy (nonfarm business), it appeared that they have also had a short-run effect on the agricultural sector, particularly the agricultural output prices level. Moreover, Starleaf *et al.* (1985) did not conclude that agricultural output prices relative to nonagricultural prices were increased by higher rates of inflation, but rather that they were benefited by unanticipated increases in the rate of inflation.

(3) Interest rate and agricultural input: Interest rate closely linked the U.S. agriculture to national financial markets in a number of ways. Interest rates would influence variable production costs and cost of long-term capital investments (Orden and Niles, 2003). On one hand, the interest rate had indirect effects on agriculture through exchange rate and price level. The farmland prices also varied inversely with interest rates (Snell *et al.* 1991). Nonetheless, interest rate linkage has been argued as important in the U.S. to high land prices in the 1970s period of loose monetary policy, and falling land prices in the 1980s period of tight monetary policy (Ardeni and Freebairn, 2002).

Effects of macroeconomic policy on agriculture

(1) Structural model: This approach was firstly necessary to consider the issue within the framework of macroeconomic schools of thought (Andrews and Rausser, 1986). The implications each of school for linkages between general economy and agriculture were quite different (Choe, 1989). Attention turned out to be the structural modeling. The model builders adopt two strategies to capture the interaction between macroeconomy and agriculture. Firstly, a satellite model was separated from the macroeconomics model in the sense of providing no estimates of endogenous variables but relied on forecasts of variables created by the macroeconomics model. Secondly, it considered agriculture as an industrial sector (Roop and Zeitner, 1977).

Regarding to a satellite model, Paarlberg *et al.* (1984) and Kitchen *et al.* (1987) created the

structural model for analyzing the effects of monetary and fiscal policies on agricultural sector. Their main simulation results were reviewed as follows: Paarlberg (1984) demonstrated alternative scenario, the acceleration in U.S. money growth between mid 1982 and early 1984, and the increase in the federal deficit. As the simulation results, the increase in U.S. income and the rising value of the dollar have raised U.S. import demand and, as a result, foreign exports and income. This increase in income has had a positive impact on demand for agricultural goods that has at least partly offset the dampening effect of the highly valued dollar. On one hand, Kitchen (1987) formulated Food and Agricultural Policy Simulator that was annual model. Under the alternative scenario of higher money growth and lower budget deficits, the main simulation results were concluded. Agricultural demand increased. Consumer food expenditures increased. Agricultural production increased. Net farm income increased. Farmland values increased.

(2) Computable general equilibrium (CGE) model: CGE had to firstly employ the database, which is a so-called social accounting matrix (SAM). SAM was a matrix representation of the circular flow of national income. SAM also worked as a tool for analysis of the impact of public policy on the economy. It looked very much like the simple Keynesian model. As an illustrative instance, Susungkarn and Tinnakorn (1999) and Saebea (2002) generated the SAM multiplier in order to study the effect of government expenditure on Thailand's sectoral economy. Attention turned out to be CGE model, i.e. Güzel& Kulshreshtha (1995) and, Fagernäs (2004). Güzel & Kulshreshtha created the static CGE model for Canada. It revealed that in the case of devaluation, the losses in other sectors would be higher than the gain in agricultural sectors. On one hand, Fagernäs formulated Zimbabwe's CGE model. As a simulation result, a fall in government consumption (combined with devaluation) seemed favors agriculture more than a rise in income tax rate.

CONCEPTUAL FRAMEWORK

Tracking down several previous literatures, the conceptual framework was outlined in Figure 1. It was schematically represented the linkages underlying the effect of government consumption spending on agricultural sector. Let agricultural sector be a satellite of mimic economy. Accordingly, the framework was divided into two blocks. The first block depicted forward linkage between government consumption spending and macroeconomic variables. It was based on the traditional Keynesian view. The government was treated as an exogenous variable. Keeping all other things constant, Keynesian view briefly stated the government expenditure affected GDP, price level and interest rate. They further affected the value of domestic currency. These macroeconomic variables, which is a so-called "transmission variable" transferred from the first block to the second block. It presented the relationship between transmission variables and agricultural variables. These variables consisted of food consumption, food export & import, employment & capital stock in agricultural sector and gross domestic production in agricultural sector. The detail of relationship was proposed.

(1) GDP would have positive impact on the food consumption and import.

(2) Price level would affect the food consumption and import via CPI for food and nonfood.

(3) Exchange rate would affect the food export.

(4) Interest rate would relate to the capital stock and employment in agricultural sector via a capital rental rate.

(5) Price level would relate to the capital stock and employment in the agricultural sector via a farm price index.

(6) Interest rate and price level would relate to gross domestic production in the agricultural sector via labor and capital stock.

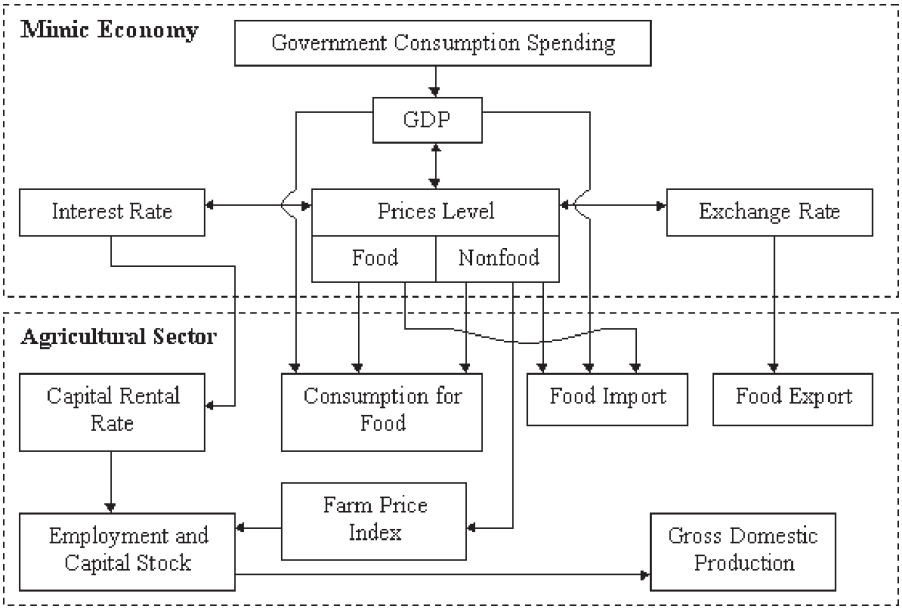

Figure 1 Conceptual framework.

METHOD AND PROCEDURE

Developed framework in the structural model was divided into two parts (Table 1). Developed first block in the structural models of estimating impacts of government consumption spending on macroeconomics variables. Developed second block in the structural models of estimating impacts of transmission variable on agricultural variable. The scope of this analysis was based on time series data during 1st quarter of 1997 through 3rd quarter of 2004. The main sources of data sets were drawn from Bank of Thailand (www.bot.or.th) and Office of the National Economics and Social Development Board (www.nesdb.go.th). The methods and procedures were summarized.

Step 1: Estimation of the equation. The simultaneous equations were estimated by the two-stage least square (2SLS) method. Other behavioral equations were estimated by the ordinary least square (LS) method.

Step 2: Formulation of the complete model. The complete model consisted of 16 behavioral and 6 identity equations. It also contained 22 endogenous and 12 exogenous variables. The baseline was solved by Gauss-Seidel algorithm for the entire period. And then the complete model had to be evaluated by the simulation errors.

Step 3: Policy simulation. Keeping all other things constant, the government consumption spending was played as a shock variable in alternative scenarios. The transmission variables linked the shock variable to agricultural sector (Figure 2). Alternative scenarios were solved by Gauss-Seidel algorithm for the entire period. Fortunately, the procedures were incorporated in EViews software.

ESTIMATION RESULT AND DISCUSSION

To discuss estimation results, more attention was placed on the effect of transmission variable on aggregate variable in agricultural sector instead of interpreting all behavioral equations. With respect to the results, the marginal effect of transmission variable on agricultural variable was utilized for the

Table 1 Structural model.

Models of estimating impacts of government consumption spending on macroeconomic variable.	**Equation**	**Models of estimating impacts of transmission variable on agricultural variable.**	**Equation**
$Y_t = C_t + I_t + G_t + Ex_t - Z_t + Sd_t$	(1)	$Ca_t = f(Pa_t, Y_t, Pfa_t, Pna_t, Pfna_t,)$	(14)
$C_t = f(Yd_t)$	(2)	$Cfa_t = f(Pfa_t, Y_t, Pfna_t, Pa_t, Pna_t,)$	(15)
$Yd_t = Y_t - T_t$	(3)	$Exa_t = f(Yf_t, E_t)$	(16)
$T_t = f(Y_t)$	(4)	$Ta_t = Exa_t - Cfa_t$	(17)
$I_t = f(R_t, Y_t)$	(5)	$Pfarm_t = f(Pna_t)$	(18)
$Ex_t = f(E_t, Yf_t)$	(6)	$Ptil_t = Pka_t \{R_t + \delta_t - (Pka_t - Pka_{t-4})/Pka_{t-4}) \}$	(19)
$Z_t = f(Y_t, Pimp_t, Ex_t)$	(7)	$Na_t = f(Wa_t, Pfarm_t, Ptil_t)$	(20)
$P_t = 0.6394Pna_t + 0.3606Pa_t$	(8)	$Ka_t = f(Ptil_t, Pfarm_t, Wa_t)$	(21)
$Pna_t = f(R_t, Pimp_t, Y_t)$	(9)	$Ya_t = f(Na_t, Ka_t)$	(22)
$Pa_t = f(Pna_t)$	(10)		
$Rn_t = f(Rninb_t, Ms_t, Y_t)$	(11)		
$R_t = Rn_t - (P_t - P_{t-4})/P_{t-4}$	(12)		
$E_t = f((R_t-Rf_t), (Ex_t-Z_t))$	(13)		
Method of estimation		**Method of estimation**	
2SLS method: Eq.(1) to Eq.(7)		LS method: Eq.(9) to Eq.(11), Eq.(13)	
Endogenous variable: Y, C, Yd, T, I, Ex, Z		LS method: Eq.(14) to Eq.(16), Eq.(18)	
Exogenous variable: G, Sd, E, R, Yf, Pimp		LS method: Eq.(20) to Eq.(22),	
Complete model: 6 Identity equations (Eq.(1), (3), (8), (12), (17), (19)), 16 Behavioral equations			
Endogenous variable: Y, C, Yd, T, I, Ex, Z, P, Pna, Pa, Rn, R, E, Ca, Cfa, Exa, Ta, Pfarm, Ptil, Na, Ka, Ya			
Exogenous variable: G, Sd, Yf, Pimp, Rninb, Rf, Ms, Pfa, Pfna, Pka, δ, Wa			

Note: - Variable names; see Table 2

- The share of food and nonfood in the equation (8) was drawn from Bank of Thailand.
- Derivation of optimization behavior in the model (Equation (14), (15), (19), (20), (21) and (22)) was based on In and Mount (1994).

estimation of elasticity at mean value.

(1) The estimated elasticity of food consumption and food import with respect to real GDP was respectively equal to 0.78 and 0.70 at mean value. Ardeni and Freebairn (2002) succinctly stated: "...the real income growth increased demand for food and fiber, but the income elasticity was low, perhaps as high as 0.7 to 0.9 for developing countries, but down to 0.4 or lower for developed countries...". Therefore, Thai Figure of this article was consistent with developing countries.

(2) The price level affected food consumption and import through consumer price index for food and nonfood. The estimation result showed that the own-price elasticity of food consumption expenditure was estimated to have been approximately -0.13 at mean value. This result supported the microeconomic theory that in the case of necessary commodities the absolute value of own-price elasticity of demand was less than one. Nonetheless, the interpretation of estimated cross-price elasticity of demand would be ignored here. This was due to the food commodities in home country not perfectly substituting for food produced in foreign countries. Similarly, food and nonfood commodities also were not clearly substitute products.

Table 2 Variable name.

	Variable name		Variable name		Variable name
Y	Gross domestic product	R	Real interest rate	Pfna	Import price index for nonfood
C	Private consumption	E	Real effective	Pfarm	Farm price index
Yd	Disposable income		exchange rate (REER)	δ	Depreciation rate
T	Tax revenue	Yf	Foreign GDP	Pka	Capital price index
G	Government consumption	Pimp	Import price index	Ptil	Capital rental rate
	spending[1]	Rninb	Interbank lending rate	Wa	Wage rate in agricultural sector
I	National investment	Rf	Real federal fund rate	Na	Employment in agricultural
Ex	Export of goods & services	Ms	Narrow money supply		sector
Z	Import of goods & services	Ca	Food consumption	Ka	Capital stock in agricultural
Sd	Statistic discrepancy	Cfa	Food import		sector
P	Consumer price index (CPI)	Exa	Food export	Ya	Gross domestic production in
Pna	CPI for nonfood	Ta	Trade account for food		agricultural sector
Pa	CPI for food	Pfa	Import price index for		
			food		

Note: [1]General government consumption expenditure = Compensation of employees (Wages & salaries and pay & allowance of members of the armed forces) + Purchases from enterprises and abroad (Military and civilian purposes) - Purchases by households and enterprises

(3) The marginal effect of real effective exchange rate on food export was significant and was of the expected sign. As a consequence, the food export elasticity with respect to exchange rate was estimated to have been approximately -0.45 at mean value. It was interpreted that holding other things constant, 10% depreciation in the Thai Baht, led on the average to about a 4.5% increase in the food export. This result was consistent with Batten and Belongia (1986) and Saunder *et al.* (1999) in the way that exchange rate was represented as a momentous factor to determine the competition of agricultural goods in the international markets.

(4) Real interest rate had an effect on input factors in the agricultural sector through the capital rental rate. The estimated elasticity of capital stock with respect to capital rental rates was equal to -0.006. On the other hand, the estimated elasticity of labor with respect to capital rental rate was equal to 0.003. It indicated that employment in agricultural sector was less sensitive to real interest rates.

(5) Price index had a positive impact on input factors in the agricultural sector through the farm price index. The elasticity of labor and capital stock with respect to farm price index was respectively estimated to have been 0.04 and 0.05 at mean value. Therefore, the inflation seemed to view as beneficial to employment and capital stock in agricultural sector.

(6) The real interest rate and price level affected gross domestic production in agriculture via the channel of two inputs. The estimated labor elasticity of gross domestic production was equal to 0.62 at mean value. It should be noted that the production elasticity of labor was low. It was of interest to compare the Cobb Douglas production function in logarithm transformation that was also estimated by Shintani (2003) using gross value added as dependent variable. The result was revealed that the estimated labor elasticity of agricultural production was about 0.6. It was stated that Shintani's result confirmed the reliability of estimated elasticity in this article. On the other hand, the

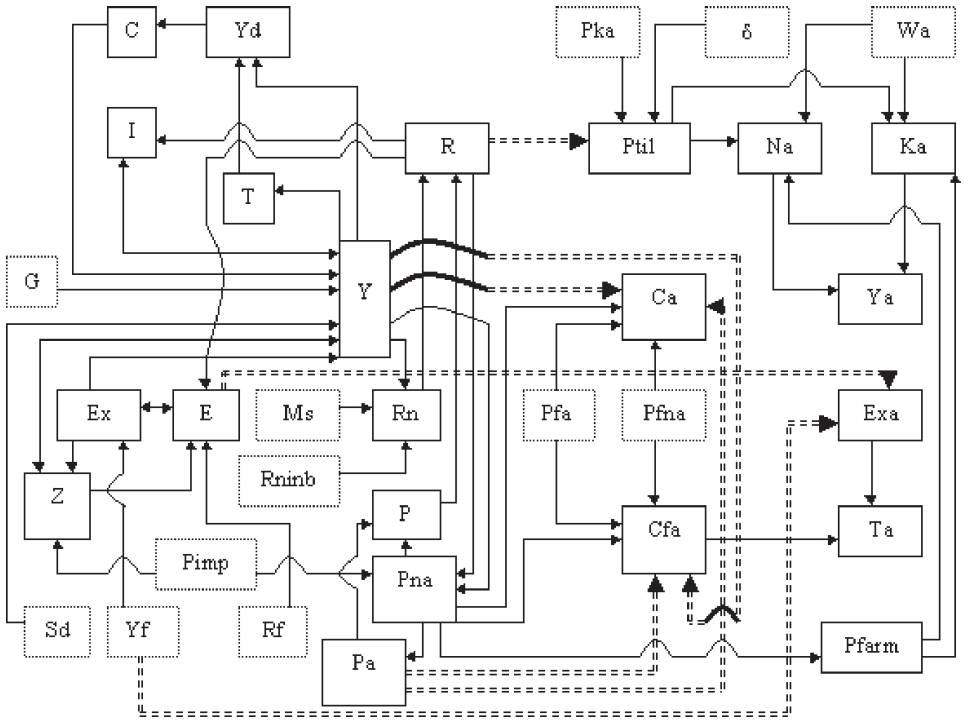

Figure 2 Transmission channels for impact of shock variable (G) on agriculture.
Note: □ = Endogenous variable, □ = Exogenous variable, Variable names: see Table 2

estimated capital elasticity of gross domestic production was equal to 3.09 at mean value. Comparing with Asian norms, the capital input elasticity of gross domestic production was rather high in Thai Agriculture. This was because Fan *et al.* (1995) revealed that in Asian Agricultural sector the capital input appeared to have played a small factor as its elasticities range from 0.04 through 0.10. Therefore, in this article the estimated input elasticity of gross domestic production showed that the assumption of constant return to scale technology was not supported by data set for Thai Agriculture during the study period.

In short, the macroeconomic factors had the significant impacts on agricultural sector. Fortunately, the estimated income elasticity of food consumption was not too low. Thus, the public policy utilized for stimulating economic growth useful to demand for food. Besides, the estimated exchange rate elasticity of export demand stated that not only the regulations of international trade but also the strengthening Thai Baht against the U.S. dollar should be a concern of the policy makers.

SIMULATION RESULT AND DISCUSSION

The estimated behavioral equations were employed in order to formulate the complete model. Due to assessing by the simulation errors, the model was appropriate for policy simulation (Table 3). Alternative scenario I, II and III was respectively set up by 5, 10 and 15% increase in government consumption spending for every quarter from 1998 to 2004. Under each of scenario, the expanded government consumption spending firstly affected the transmission variables. It revealed that real GDP, price level and real interest rate increased while real effective exchange rate declined. Thereafter, these transmission variables affected the endogenous

Table 3 Simulation errors of the estimated model.

Major endogenous variables in agricultural sector	Dynamic-deterministic simulation (1998:QI to 2004:QIII)		
	Mean error (%)	Root mean square error (%)	Theil inequality coefficient
Private consumption for food	1.64	3.04	0.02
Food export	4.20	7.68	0.04
Food import	6.84	10.46	0.06
Employment in agricultural sector	-0.26	1.31	0.01
Capital Stock in agricultural sector	-0.46	1.16	0.01
Gross domestic production in agricultural sector	2.86	4.41	0.02
CPI for Food (1988=100)	-0.27	2.58	0.01

Source: Author's computation

Table 4 Impacts of increasing in government consumption spending on agricultural sector.

Agricultural sector	Scenario I: (5%)	Scenario II: (10%)	Scenario III: (15%)
	(% change from baseline value)		
Private consumption for food	1.04	2.08	3.13
Food export	0.05	0.10	0.15
Food import	1.05	2.11	3.16
Surplus of trade account for food	-0.21	-0.43	-0.64
Employment in agricultural sector	0.02	0.05	0.07
Capital Stock in agricultural sector	0.07	0.14	0.21
Gross domestic production in agricultural sector	0.23	0.47	0.70
CPI for Food (1988=100)	0.09	0.17	0.26

Note: The figure was represented as the average value from 1st of 1998 through 3rd of 2004.
Source: Author's computation

variables in agricultural sector. The simulation results were described in term of percent change from baseline value (Table 4).

(1) Impacts of increase in government consumption spending on food consumption

On the average, the expanded government consumption spending led to increase not merely real GDP but also CPI for food. Nonetheless, the food consumption increased over the simulation years. This was because the absolute value of own-price elasticity of food consumption was obviously less than the real income elasticity as previously seen in the section of estimation results. Hence, the damage of food consumption derived from inflation was not too severe.

(2) Impacts of increase in government consumption spending on food import and export

On the average, the expanded government consumption spending led to increase food import over the simulation years through real GDP as an important transmission variable. At the same time, the expanded government consumption spending led to increase food export over the simulation years through the transmission variable of real effective exchange rate. Unfortunately, the increased food import had heavy impetus rather than the increased food export. Thus, it negatively affected the trade account for food. Since Thailand has been known as agricultural exporter, it has just resulted in the surplus of trade account.

(3) Impacts of increase in government consumption spending on gross domestic production in agricultural sector

On the average, the expanded government consumption spending led to increase farm price index as well as capital rental rate in agricultural sector. Nonetheless, the employment and capital stock in agriculture increased over the simulation years. This was because in term of absolute value the farm price elasticity of input was greater than the capital rental rate elasticity of input as seen in the earlier section. As a consequence, the gross domestic production in agricultural sector increased through the channel of two inputs. It was further stated that the inflation was advantage for gross domestic production in agricultural sector.

Comparing with the related literatures, the above simulation results were consistent with Paarlberg *et al.* (1984), Kitchen *et al.* (1987) and Just (1990) in the way that the macroeconomic policies had the significantly unintended impacts on agricultural sector. Beside, the simulation result of this article broadly conformed to the finding of Chaiyanakul (2002) and Saebae (2002) in the way that the expanded government expenditure was useful to Thailand's agricultural sector, although they employed different method, e.g. SAM multiplier and CGE model.

CONCLUSION AND RECOMMENDATION

The estimation result of behavioral equation consigned the complete model to wholly satisfactory the result of policy simulation. As simulation results, the impacts of expanded government consumption spending on Thai Agriculture were concluded. Food consumption increased. Food import and export increased. Unfortunately, the surplus of trade account worsened. Employment and capital stock in agricultural sector increased. As a consequence, gross domestic production in agricultural sector increased. In conclusion, the macroeconomic policy aspect of government expenditure had an unintended effect on agricultural sector. Quantitatively, it will provide valuable information for the policy makers before changing the government budget in the future.

What the recommendation would be stated as follows: Based on simulation results, no matter what the composition of public budget by purpose was, its expansion benefited to the agriculture. Nevertheless, based on the data sets that were reported by Bureau of Budget, over the past 40 years the government budget on defense & internal security and education was more or less accounted for 22 and 19% of total budget, respectively. On the other hand, the government budget on agriculture was just approximately accounted for 9% of total budget. Of these budgets, 2% was for agricultural research. Accordingly, in order to be more beneficial to agriculture in the long run, the government should give first priority to increase budget on agricultural research and extension together with encouraging the private investments in agricultural research, i.e. plant breeding. These activities led the farmers to more chance of improving technological progress. And then the farmers would be able to enhance their productivity. It would eventually increase the growth rate of agricultural GDP.

SUGGESTION FOR FUTURE STUDY

(1) If the complete data set were satisfactory in term of quarterly series, the agricultural sector would be disaggregated into crop products, livestock and fishery.

(2) To extend transmission channel of shock, not only forward linkage--from macroeconomy to agricultural sector--but also backward linkages--from agricultural sector to the rest of economy--would be analyzed.

(3) Regarding to dynamic context, the future study might employ the error correction model (ECM) in order to study disequilibrium in the short run.

(4) Since the structural model has to face

with the considerable choice of macroeconomic school, the future study might develop either New-Classical or New-Keynesian school in the model.

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