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Impact of Depreciated Currency on Agriculture in Thailand

Minoru TADA*

Research Information Division, Japan International Research Center for Agricultural Sciences (JIRCAS) (Tsukuba, Ibaraki, 305-8686 Japan)

Abstract

In this paper, the impact of currency depreciation that took place on July 2, 1997 in Thailand, on agriculture especially on prices and production was analyzed by estimating and constructing demand-supply models for the main agricultural commodities. As a result, it was found that the most favored commodities were upland crops which compete in the world market and for which dollar prices are given, and the broiler meat export sector which has a significant market share in Japan, although the contraction in the domestic market exceeded the expansion in export. The next favored commodity was rice in the rainy season for which few imported input materials are used and the output price depends on export. Domestic commodities such as pork and eggs were worst off because of the contraction of the domestic market. If we consider the recent economic recession in Thailand, the impact of the factors indicated above is amplified, although the increase in the number of migrants from urban to rural areas may lead to the decrease in farmers' income per capita.

Discipline: Agricultural economics
Additional key words: demand, supply, price, economic growth

Introduction

The purpose of this report is to analyze the impact of the currency depreciation that took place on July 2, 1997 in Thailand on agriculture, especially on prices and production by estimating and constructing demand-supply models for the main agricultural commodities.

In the latter half of 1997, the "Baht", the currency of Thailand, depreciated nearly 100% against the US dollar and other major currencies. This is because the Baht had been strongly pegged to the dollar and overvalued in spite of continuous inflation and wage hikes in Thailand, and the current account balance recorded almost 338 billion Baht which accounted for 8% in the GDP (Fig. 1).

There are direct and indirect effects of currency depreciation on agriculture. The direct one is that some agricultural commodities gain competitiveness in the world market in spite of the rise in input prices such as fertilizer price. The indirect one is through changes in the domestic demand for agricultural products caused by the economic recession, especially in the commercial sectors such as real estate development, banking and retail companies which do not face international competition. The economic crisis of these sectors is caused by the loss of the purchasing power of urban people and increased debt payment of the sector accelerated by the currency depreciation.

Thailand experienced an economic boom after 1987 caused by direct and indirect foreign capital inflow with the appreciation of the Japanese "yen". During this period, the Baht was overvalued against the US dollar, and the impact was opposite to the recent case. Martin and Warr demonstrated the importance of the impact of capital accumulation in

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Present address:
* Fisheries Management and Economy Division, National Research Institute of Fisheries Science (Fukuura 2-12-4, Yokohama, Kanagawa, 236-8648 Japan)

the manufacturing sector that reduced the agricultural share in the GDP of Thailand[3].

In light of the macroeconomic linkages with agriculture, Schuh was the first to show the importance of exchange rates in determining agricultural competitiveness[5]. Subsequently, McCalla emphasized the role of monetary policy that affects agricultural trade through changes in the exchange rates[4]. Chambers and Just developed these concepts into an empirical model, and the importance of real exchange rates was verified[2]. In the case of Japan, Tada pointed out the key role of monetary policy in determining the agricultural income of upland crop commodities[6]. Thraen, Hwang and Larson could not find a clear relation between US monetary expansion and soybean exports, where the role of the exchange rate was still significant[7]. For the macroeconomic impact on agriculture in developing countries, Bautista pointed out that realistic and competitive real exchange rates in the 1980s promoted the growth of the agricultural sector[1].

Method

In the context of introductory economics that assumes a "small country" case, industries of tradable goods become better off through the depreciation of currency. In the case of Thailand, however, exported rice has a significant market share in the world and the assumption of "small country" can not be applied. Additionally Thai broiler meat competes with US, Chinese and Brazilian products in the Japanese market, and each share is substantial. This means that the balance between the positive influence of the improvement in price competitiveness and the negative effect of the rise in input prices is important to evaluate the impact of the depreciated Baht. Therefore, we constructed an econometric model of Thai agriculture comprising rice, wheat, maize, sugarcane, cassava, broiler, pork and egg commodities, where the sub-models of US rice and Japanese broiler meat were also included.

After constructing the model, we compared the results of simulations as of 1995/96 under the actual exchange rate which was 26 BT/$ in 1996 and the alternative 40 BT/$, which was stable as of April 1998 and corresponds to the Purchasing Power Parity exchange rate. The period of simulation ranged from 1989/90 to 95/96, because it takes several years for planted areas and prices to be adjusted to new economic conditions. Therefore, the differences in the simulated results under the alternative conditions of exchange rates demonstrate the long-term impact when the exchange rate changes from 26 to 40 BT/$ under conditions where other exogenous variables such as GDP and dollar prices of fertilizer and feed remain constant.

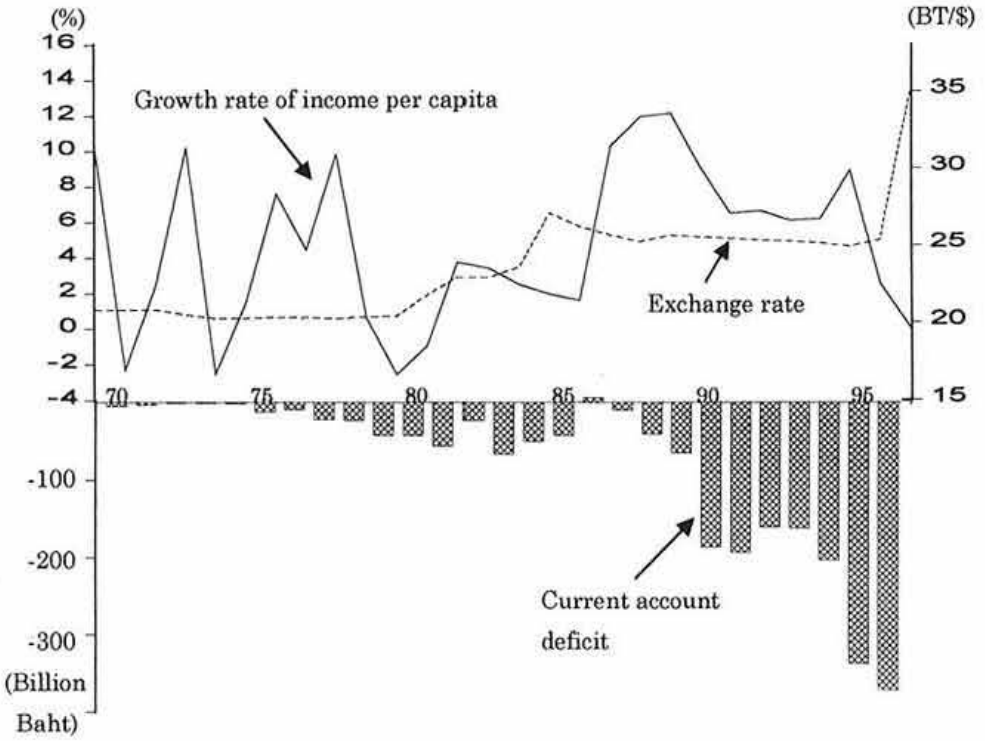

Fig. 1. Main economic indicators of Thailand

Framework of the model

The model is composed of 8 sub-models for rice, wheat, maize, cassava, sugarcane, broiler meat, pork meat and eggs, and these commodities account for nearly 60% of the value of the agricultural production. The model also includes the agricultural labor supply reflecting the subsistence characteristic of rice farming. Exchange rate, national income, population, CIF prices of fertilizer and feed given in dollar are the important exogenous variables influencing agriculture (Fig. 2).

The rice model shows the following characteristics: price, production, consumption and trade depend on each other, where Thailand and USA are main players. FOB price for Thai rice is determined by the export of Thailand, by the aggregated export of USA and Australia, by the aggregated export of Vietnam, India, Myanmar and Pakistan, by the import of Japan, by the aggregated import of China, Indonesia and Iran, by the inflation ratio, implying that the demand for assets shifts from monetary to real assets during the period of inflation. The FOB price is transmitted into the wholesale price, thereby into retail and farm gate prices. Since it takes several years for the FOB price to be transmitted, we adopted partial adjustment lags for equations of wholesale, retail and farm gate price determinations. Production is defined as the planted area multiplied by yield, and the export is defined as production—domestic consumption—change in ending stock, where ending stock is an exogenous variable.

Supply of small livestock such as broilers, pigs and hen layers can respond to price changes quickly, because Thailand imports parent stock from the USA and European countries. Therefore, we assume horizontal supply curves for them, implying that they are produced under a constant return to scale. The prices depend on the price of feed which is the main component of the cost of production. In the broiler meat sector, the demand is represented by the aggregation of domestic and foreign market, where the Japanese market is the most important. The import of Japan from Thailand depends on the Japanese demand and the relative price of Thai to US and Chinese products.

Demand for maize is derived from livestock production, and the difference between production and domestic consumption is exported or imported. The price is transmitted into the domestic market through the exchange rate from US Chicago market. Broken rice is also a major component of feed, and the price is determined based on wholesale prices of maize and rice.

For the cassava and sugarcane commodities, the raw outputs are processed into various kinds of final goods, and it is difficult to estimate the domestic consumption. Therefore, we built models for forecasting price and production. Yields are exogenous, because the yield functions estimated did not fit well. Domestic markets for these products are not linked to the world market perfectly, and the domestic prices are influenced by domestic production as well as world prices.

In estimating supply functions composed of planted area and yield functions and demand functions, we adopted single equation regressions such as OLS and ridge regressions rather than system estimations. In addition, the planted area and price in the previous year were selected in the explanatory variables of the planted area functions, where these 2 variables are components of the partial adjustment lag and adaptive price expectation. In all the equations, prices are deflated by the CPI of the country.

The reasons for this approach are as follows: (a) the presence of significant differences in profitability and labor productivity among industries and the fact that optimum conditions such as profit maximization and zero profit are not satisfied in the Thai economy, (b) the problem of data accuracy in using sophisticated estimating methods such as the seemingly unrelated regression (SUR), and (c) existing equations estimated by single equation regressions that can be readily replaced by new equations when data are updated.

Estimated impact of depreciation

The explanation below shows the difference in endogenous variables when the exchange rate changes from 26 to 40 BT/$. Table 1 presents a summary of the impact. Since the simulation was conducted during the 6-year period after 1989/90, the estimated impact of the devaluation is considered to be a long-term one. In the short-term, the rise in prices of imported materials such as fertilizer and feed may not be fully transmitted to the domestic prices, or farmers change their planted area gradually, and as a result the impact will be less appreciable than the impact in the long-term.

1) Rice

Planted area and yield decrease by 4.4 and 2.6%,

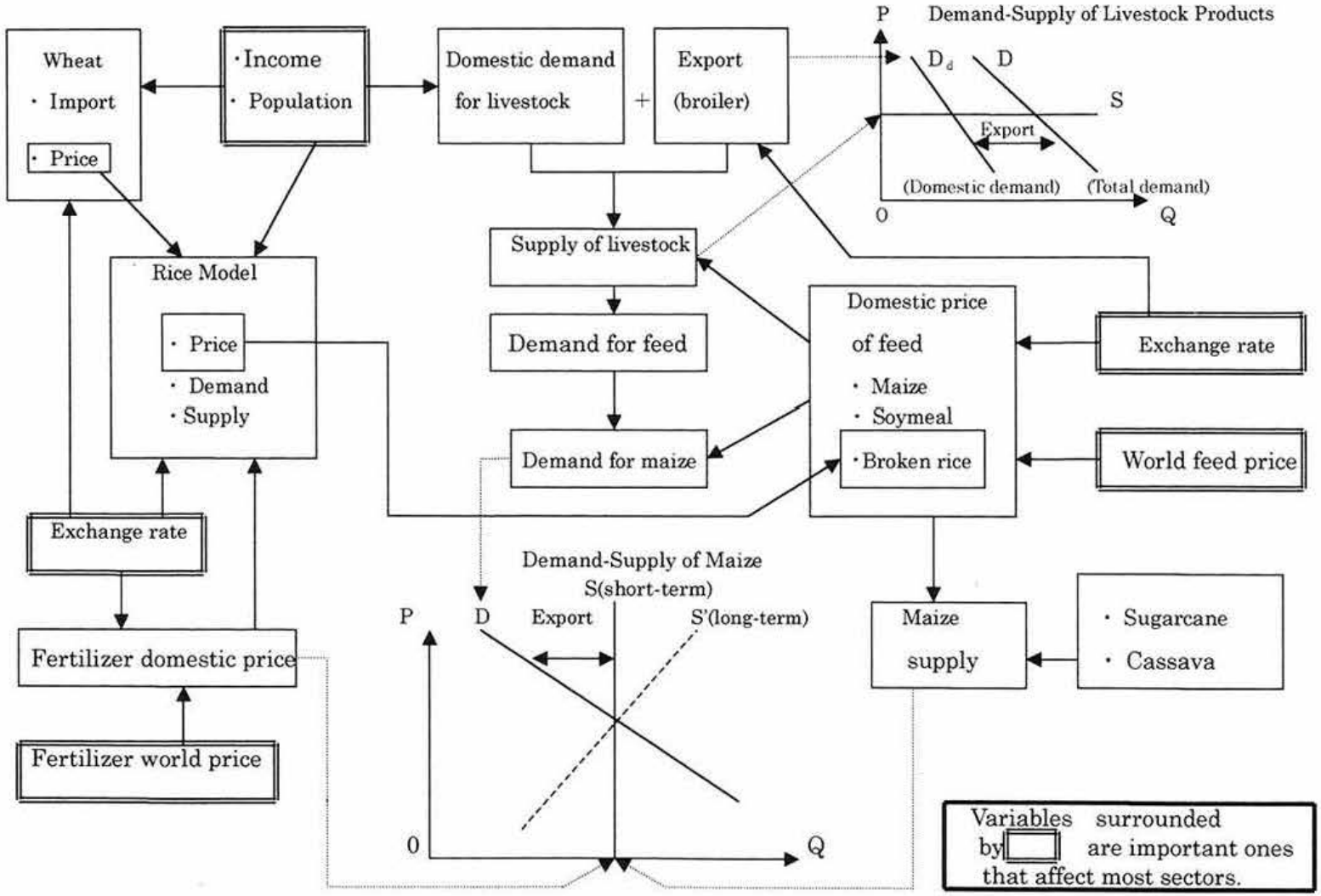

Fig. 2. Structure of the econometric model of Thai agriculture

Table 1. Estimated impact of the depreciation on agriculture

	1995/96	1995/96 (Simulation)		
	Actual value	Actual exchange rate (a)	40 BT/$ (b)	Impact of depreciation (b)/(a)(%)
Rice				
Planted area (million rai[a])	63.35	61.32	58.60	▼ 4.4
Yield (kg/rai)	347	336	327	▼ 2.6
Production (1,000 t)	22,015	20,622	19,183	▼ 7.0
Farm gate price (BT/t)	5,182	5,127	6,030	△17.6
FOB price (BT/t)	9,229	9,298	11,561	△24.3
Retail price (BT/t)	10,970	11,711	12,741	△ 8.8
Demand per capita (kg)	140	136	138	△ 1.8
Domestic consumption (1,000 t)	13,009	12,352	12,577	△ 1.8
Export (1,000 t)	5,619	5,131	4,033	▼21.4
Broken rice price (BT/t)	5,290	5,586	7,004	△25.4
USA export (1,000 t)	2,624	2,757	2,219	▼19.5
Wheat				
Import (1,000 t)	694	653	588	▼10.0
Maize				
Planted area (1,000 rai)	8,346	9,218	9,219	△ 0.0
Yield (kg/rai)	498	420	485	△15.5
Production (1,000 t)	4,155	3,874	4,476	△15.5
Farm gate price (BT/t)	4,350	4,021	5,630	△40.0
Wholesale price (BT/t)	4,950	4,776	7,114	△49.0
Net export (1,000 t)	-582	-963	510	(△1,473)
Domestic consumption (1,000 t)	4,512	4,836	3,965	▼18.0
Broiler[b]				
Production (million head)	705	772	703	▼ 8.9
Retail price (BT/kg)	42.8	39.1	45.4	△16.1
Export (1,000 t)	137	190	221	△16.1
Domestic consumption (1,000 t)	661	684	575	▼16.0
Feed price (BT/kg)	8.38	9.27	11.32	△22.1
Japanese import (1,000 t)	548	588	595	△ 1.2
Pork[b]				
Production (head)	9,993	9,647	9,387	▼ 2.7
Retail price (BT/kg)	78.0	79.3	86.2	△ 8.7
Farm gate price (BT/kg)	40.6	37.5	42.0	△12.0
Feed price (BT/kg)	7.18	7.16	8.73	△21.9
Eggs[b]				
Production (million eggs)	8,599	9,017	8,541	▼ 5.3
Retail price (BT/egg)	1.83	1.77	1.91	△ 8.0
Feed price (BT/kg)	6.22	6.57	7.43	△13.1
Cassava				
Planted area (1,000 ha)	1,200	1,366	1,365	▼ 0.0
Production (1,000 t)	16,000	18,205	18,197	▼ 0.0
Farm gate price (BT/t)	1,207[c]	813	1,138	△40.0
Sugarcane				
Planted area (1,000 rai)	6,279[c]	5,398	5,422	△ 0.4
Production (1,000 t)	57,974[c]	48,581	48,794	△ 0.4
Farm gate price (BT/t)	386[c]	356	526	△48.1

a): 1 rai = 0.16 ha.

b): Since the data of livestock production are derived from estimations from the import of parent stock rather than from the survey, there are serial correlations for errors between actual and forescasted values.

c): The data refer to those of 1994/95.

respectively, because the impact of the rise in fertilizer price exceeds that of the rise in rice price. In total, production decreases by 7.0%. Domestic consumption increases by 1.8% in spite of the 8.8% rise in retail price, because substitutive foods such as meats and wheat products become expensive relative to rice.

Farm gate price rises by 9.8%. One reason is the leftward shift of the supply curve (= cost push), and the other is the increase in the domestic and foreign demand for Thai rice due to the decrease in US production that responds to the fall in the dollar rice price.

Consequently, the gross revenue of farmers from rice production increases slightly, and farmers' income increases especially from the main crop (rainy season). This is because the cost of imported inputs in the total cost accounts for 10–12% for the main crop and 16–23% for the second crop, respectively. Therefore, production cost per unit increases by 5.0–7.0%, and is slightly lower than the price rise for the main crop.

2) Maize

Wholesale price and farm gate price rise by 49.0 and 40.0%, respectively due to the depreciation. For the supply side, planted area remains almost constant because of the substitution between maize, cassava and sugarcane. Yield and production increase by 15.5% due to the rise in output price, which means that more intensive production is promoted. Consequently, farmers' gross revenue increases by 65.5%. The cost of imported inputs accounts for about 10% (max. 25%) of the total cost, and the production cost per unit of maize is estimated to increase by 5.4% (max. 13.5%). Therefore, farmers' income from maize production increases significantly.

For the demand side, the use of maize is discouraged because of the contraction of livestock production. Thus, domestic consumption decreases by 18.0% and the export increases by 1,470,000 ton. Therefore, Thailand becomes a net exporter of maize again, and exports nearly 510,000 ton. For this estimation, it must be noted that the climatic conditions of the northeastern area of Thailand have become unsuitable for maize production, and that the expansion of production seems impossible. If this interpretation is correct, the production of other upland crops and perennial crops such as sugarcane, cassava, and kenaf is likely to increase.

3) Broiler

Feed price and retail price rise by 22.1 and 16.1%, respectively, and domestic consumption decreases by 16.0%. However, Thai broiler meat recovers its price competitiveness in the Japanese market, although it becomes expensive in the domestic market. Thus, the export to Japan increases by 20.0%. Under the assumption that exports to countries other than Japan remain constant, the total export increases by 16.1% and the total demand for broiler and the production decline by 8.9%.

4) Pork and eggs

Feed prices for producing pork and eggs rise by 21.9 and 13.1%, respectively. Consequently, farm gate price and retail price increase as well. As a result, domestic consumption and production of pork and eggs decrease by 2.7 and 5.3%, respectively.

5) Cassava and sugarcane

Farm gate prices for these commodities rise by 40.0 and 48.1%, respectively. However, planted areas remain constant because of the substitution between these commodities, maize and other upland crops. Since the yield functions could not be estimated for these commodities, the yields are assumed to be constant in the simulation, although they are considered to respond to the prices of products and fertilizer. Thus, gross revenue exceeds price increase.

Economic growth and prospects for agriculture

The drastic depreciation of the exchange rate which occurred in 1997 had 2 effects: (a) agricultural products recovered their price competitiveness, and (b) the cost of production increased, especially for the commodities for which imported materials are intensively used. These effects offset each other, and the effect of the former was dominant for the commodity which competes internationally.

According to the results of simulation, the most favored commodities are upland crops such as maize, cassava and sugarcane for which world dollar prices are given, and broiler meat for export. The next favored commodity is rice in the rainy season. On the other hand, pork and egg commodities which are domestically consumed, are worst off because of the contraction of the domestic market.

The current balance account of Thailand has improved remarkably and been in the black since the

end of 1997, implying that the international competitiveness of exporting industries has recovered substantially. Therefore, the predictions of our econometric model seem to be qualitatively satisfactory, although they should be revised by updating the data.

The analysis above is limited to the impact of the currency depreciation, and does not include the impact of economic growth. The recent economic recession in Thailand is very severe, and the economic growth rate is forecasted to be −3.0 to −8.0% for the year 1998. If this situation continues for some years, the impact may become very significant both on the demand and supply of agriculture, though it is not significant in only one year.

The persistent economic recession affects agriculture as follows. Demand for livestock products and maize decreases, while the demand for rice increases under the negative economic growth. The production of livestock shrinks and exports of upland crops expand due to the changes in the demand side. If the economic growth rate recovers to a 3.0% value or higher, our model shows that the situation after the depreciation will return to that before the depreciation in some years. However, under the assumption that the growth rate remains at less than 1% even after 1999, similar situation of agriculture is forecasted to continue.

These effects of the economic recession amplify the impact of devaluation. However, if the economic recession continues for many years, many laborers in the urban sector will migrate to rural areas. Under this scenario, labor migration may reduce the agricultural income per capita.

Finally, there are 2 alternative strategies for the recovery of the Thai economy: (1) to promote the introduction of advanced technology and enhance the industrial structure through the improvement of human capital, thereby discontinuing the export-oriented growth depending on assembly plants such as current automobile industries, and (2) to enhance the domestic industrial linkages, thereby expanding the labor-intensive industries that are less dependent on foreign capital and technology.

For the development of agriculture in Thailand, the latter alternative is preferable whereby the currency weakens and the export of agricultural and processed products is promoted. Consequently, the opportunities for employment in the rural areas are also expanded.

References

1) Bautista, R. M. (1993): Trade and agricultural development in the 1980s and the challenges for the 1990s; Asia. *Agric. Econ.*, **8**, 345–375.
2) Chambers, R. G. & Just, E. J. (1982): An investigation of the effect of monetary factors on agriculture. *J. Monetary Econ.*, **9**, 235–247.
3) Martin, J. W. & Warr, G. P. (1994): Determinants of agriculture's relative decline; Thailand. *Agric. Econ.*, **11**, 219–235.
4) McCalla, A. F. (1982): Impact of macroeconomic policies upon agricultural trade and international agricultural development. *Am. J. Agric. Econ.*, **64**, 861–868.
5) Schuh, G.E. (1974): The exchange rate and U.S. agriculture. *Am. J. Agric. Econ.*, **56**, 1–13.
6) Tada, M. (1991): Effect of foreign exchange rate on Japanese agricultural income. *Bull. Natl. Agric. Res. Cent.*, **20**, 73–91 [In Japanese].
7) Thraen, C. S., Hwang, T. C. & Larson, D. W. (1992): Linking of U.S. monetary policy and exchange rates to world soybean markets. *Agric. Econ.*, **6**, 365–384.

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