Can Trade Liberalization Promote Sustainability of Crop Production and Food Security?

Nobuhiro Suzuki
Department of Global Agricultural Sciences,
the University of Tokyo
E-mail: asuzukiz@mail.ecc.u-tokyo.ac.jp

Junko Kinoshita
Visiting Researcher, Department of Applied
Economics and Management, Cornell University

Lessons from Food Crisis

- The grain inventory rate is an indicator of market tightness with which we can predict grain price levels to some extent. However, in 2008, we observed extremely high grain prices which could not be explained by the normal price-inventory relationships.
- The main problems were: oligopolistic market structure, export restriction and speculation. Since continuous tariff reductions under the WTO (World Trade Organization) system have led to a steady oligopolization of the world grain markets, the recent grain prices are much more sensitive to changes in supply-demand balance. Moreover, the sense of insecurity becomes a cause of export restraints and raging grain speculation, thereby increasing grain price volatility.
- We cannot stop export restraints because any country has the right to ensure food supply for its own nation. So, we should reexamine the current WTO rules to check whether its simple and continuous tariff reduction scheme would promote sustainable agricultural development and food security in the world.

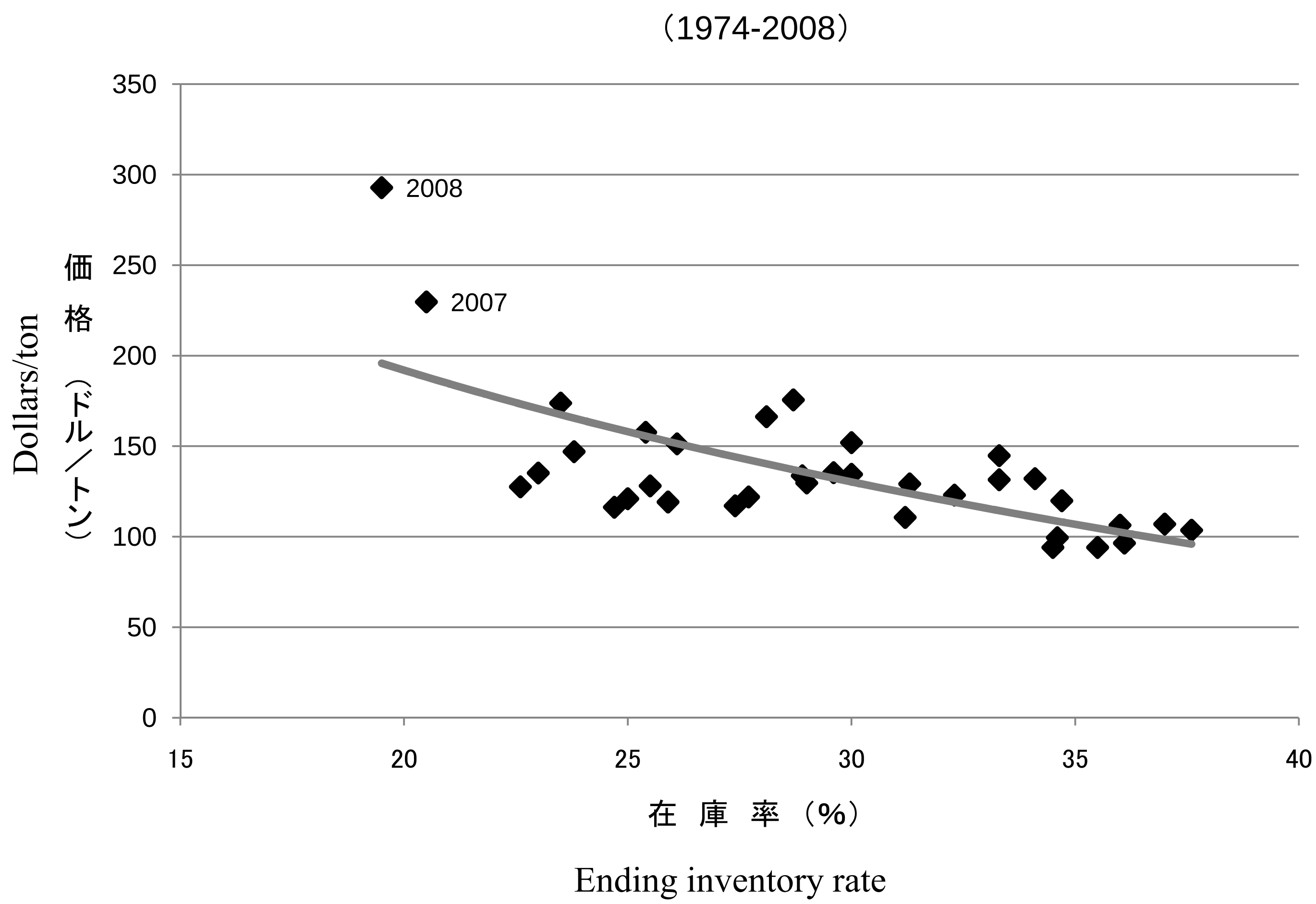


Figure 1-1. Price-inventory relationship: Wheat

Source: USDA as for price, Reuters ES as for ending inventory, both provided by Ministry of Agriculture, Forestry, and Fisheries, Japan.
Note: Prepared by Visiting Researcher Junko Kinoshita at Cornell University.

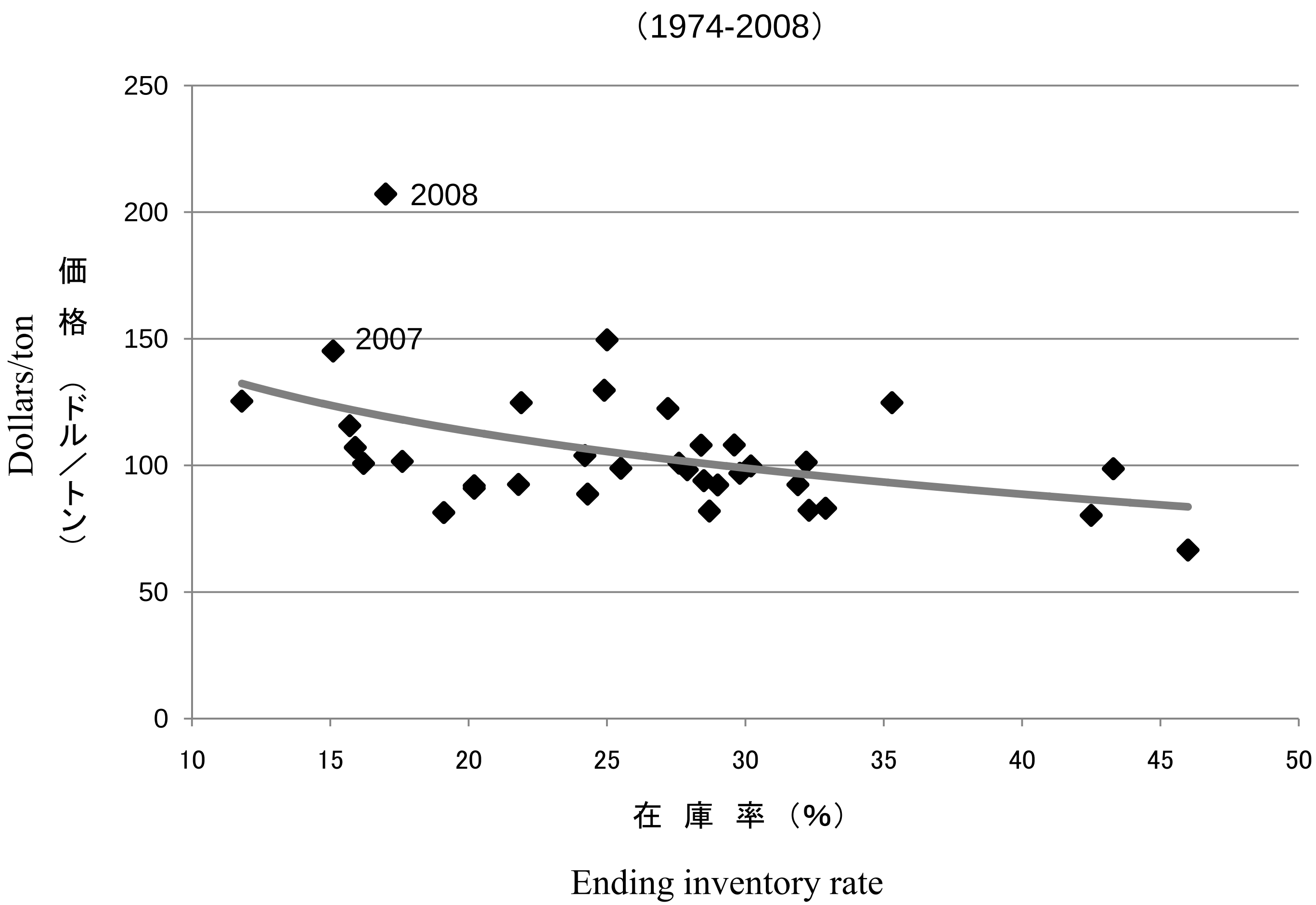


Figure 1-2. Price-inventory relationship: Corn

Source: USDA as for price, Reuters ES as for ending inventory, both provided by Ministry of Agriculture, Forestry, and Fisheries, Japan.
Note: Prepared by Visiting Researcher Junko Kinoshita at Cornell University.

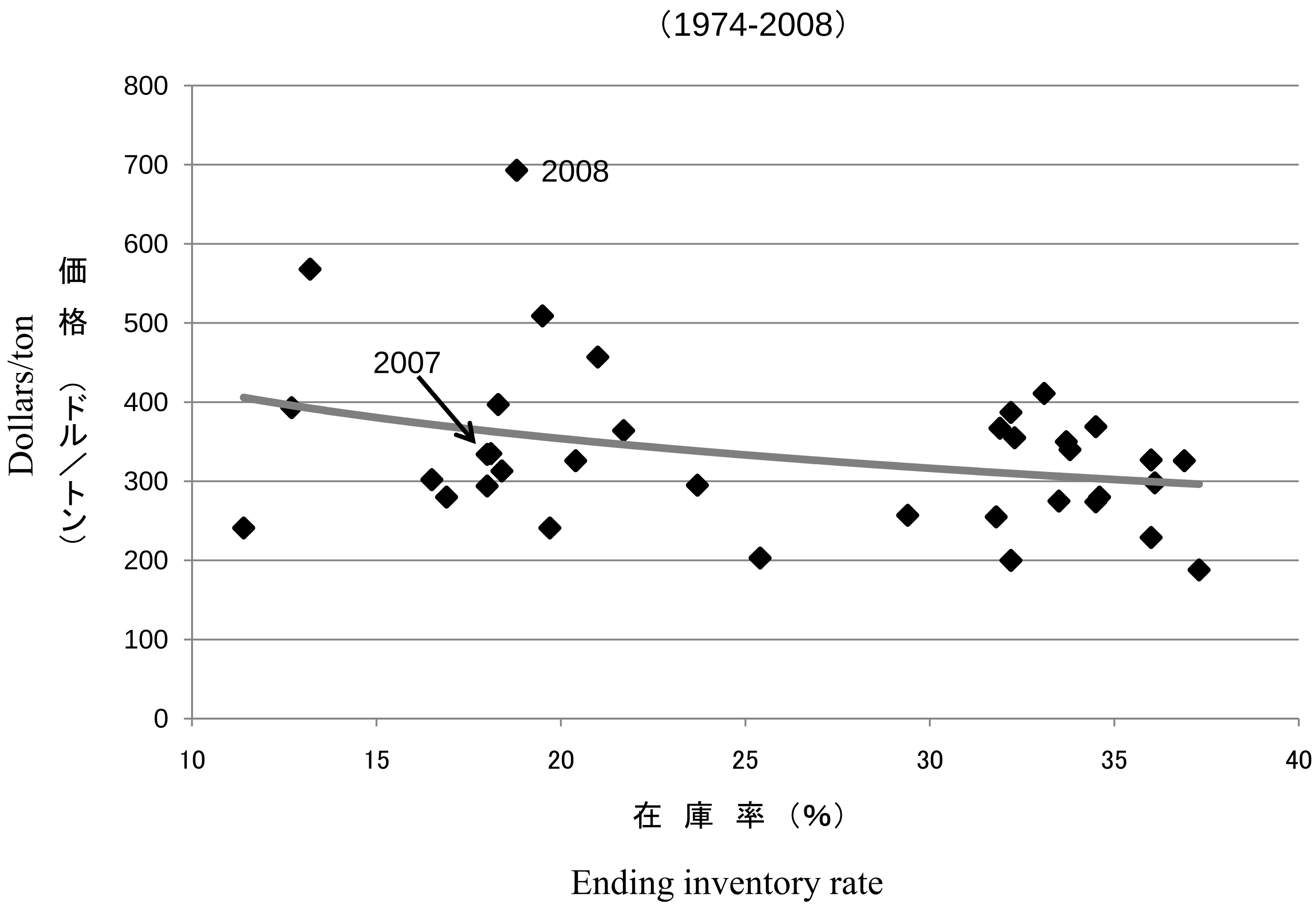


Figure 1-3. Price-inventory relationship: Rice

Source: USDAThailand as for price, Reuters ES as for ending inventory, both provided by Ministry of Agriculture, Forestry, and Fisheries, Japan.
Note: Prepared by Visiting Researcher Junko Kinoshita at Cornell University.

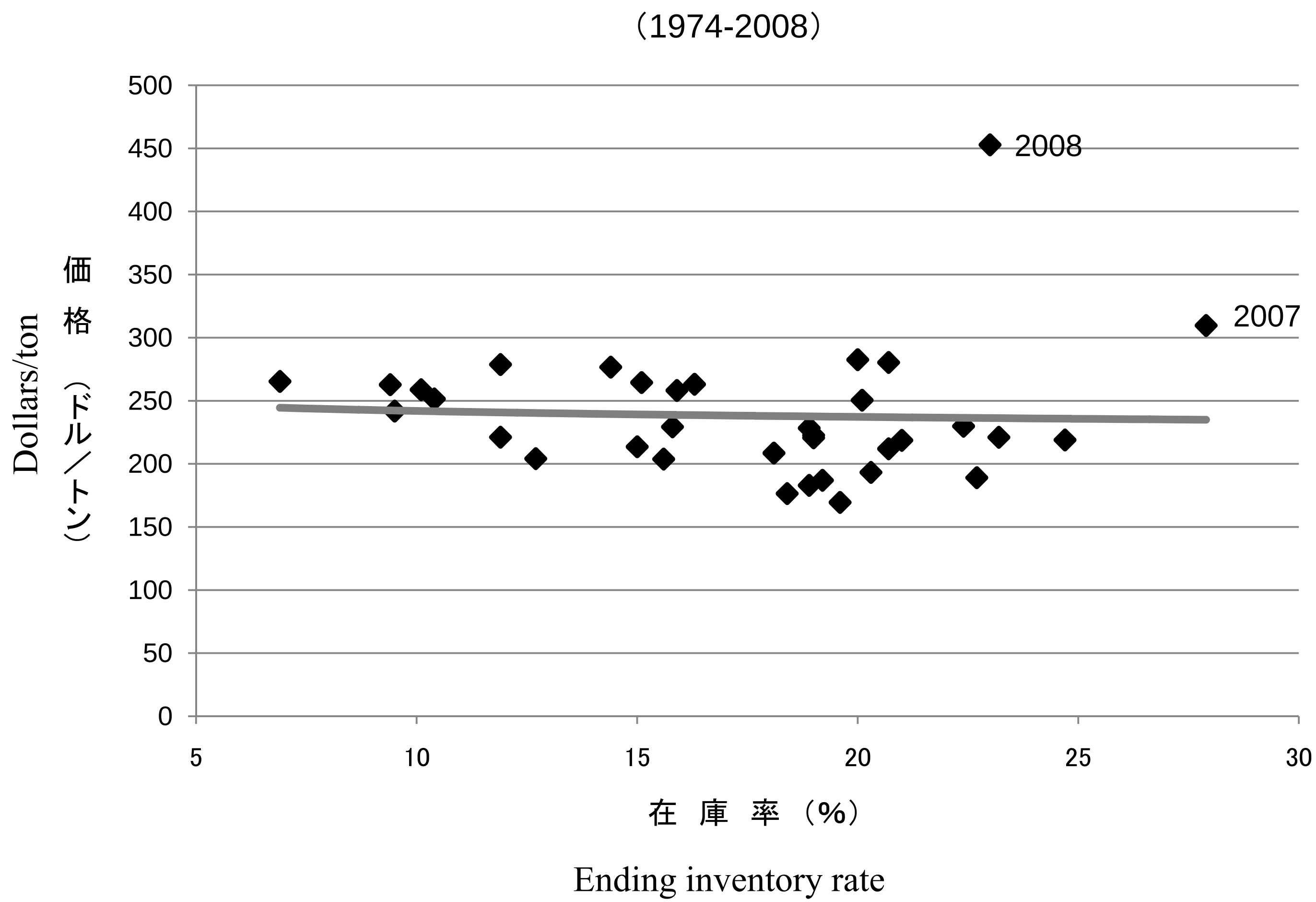


Figure 1-4. Price-inventory relationship: Soy bean

Source: USDA as for price, Reuters ES as for ending inventory, both provided by Ministry of Agriculture, Forestry, and Fisheries, Japan.
Note: Prepared by Visiting Researcher Junko Kinoshita at Cornell University.

Table 1 Price Transmission from Exporters to Rice Farmers in Vietnam

	1996	1997	1998	1999	2000	2001	2002
Perfect Competition dPf/dPw=1	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Current dPf/dPw=1/(1+θ/e)	**1.073**	**0.725**	**0.886**	**0.771**	**0.486**	**0.483**	**0.401**
Monopsony dPf/dPw=1/(1+1/e)	**0.439**	**0.439**	**0.439**	**0.439**	**0.439**	**0.439**	**0.439**

Notes: Pf = Farm gate price, Pw = Export price, e = Price elasticity of supply, and θ= Parameter for degree of imperfect competition. Estimated by N. Suzuki. Although it is often pointed out that high grain prices contribute to increases in farm income, the gains are not fully transferred to farm gate prices in many cases, especially in developing countries. In this case, when the export price rises by 1 riel, the farm gate price rises by about 1 riel in 1996, but only by 0.4 riel in 2002.

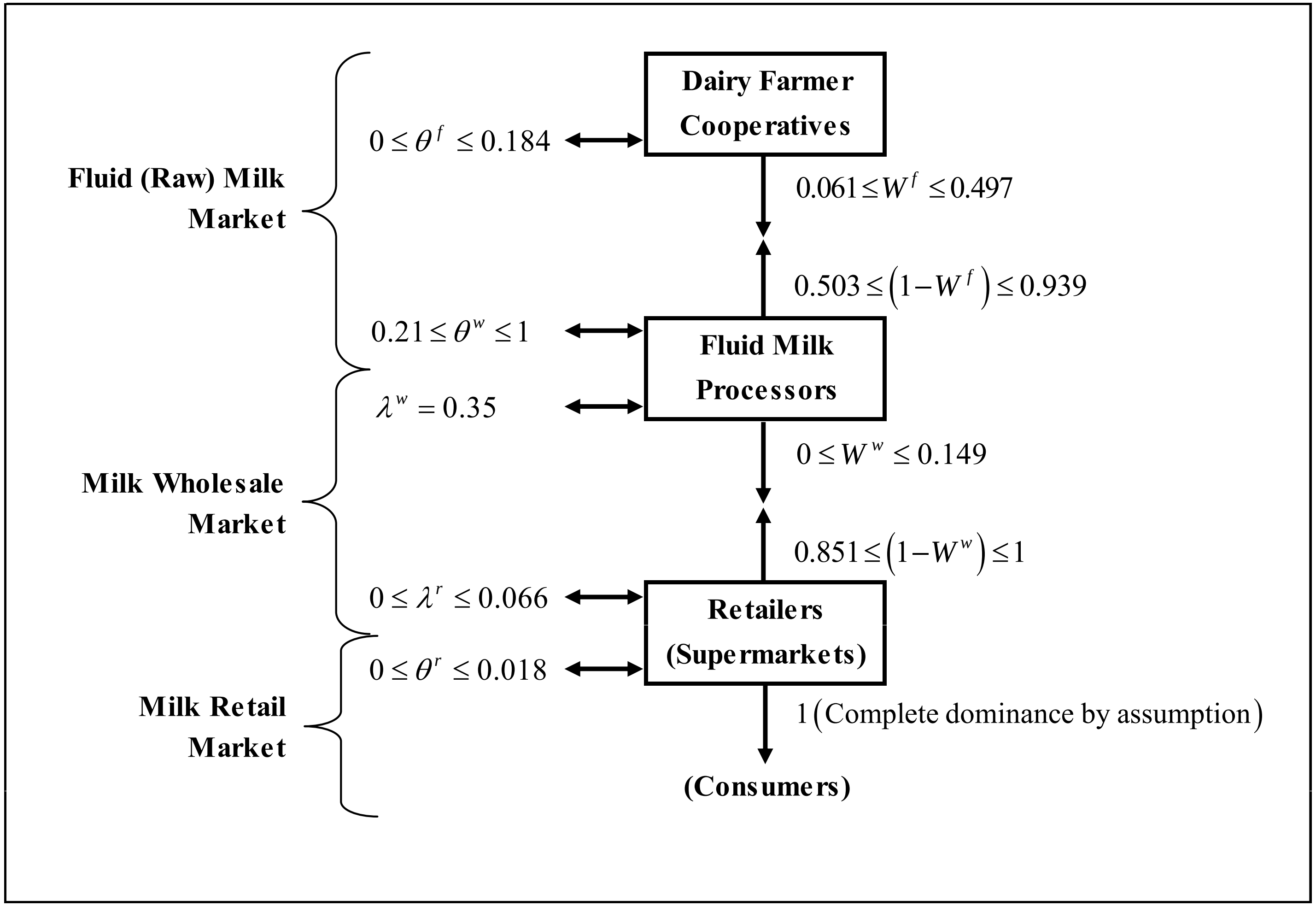


Figure 2. Balance of Market Power among Dairy cooperatives, Manufacturers, and Supermarkets in Japan

Source: Kinoshita et. al. (2006)

Notes: Parameters W^f and W^w indicate the degree of vertical power balance, that is, W^f : (1-W^f) ranges from 0.061:0.939 to 0.497:0.503, W^w : (1-W^w) ranges from 0:1 to 0.149:0.851. Parameters θ^f, θ^w, θ^r, λ^w and λ^r indicate the degree of horizontal competition.

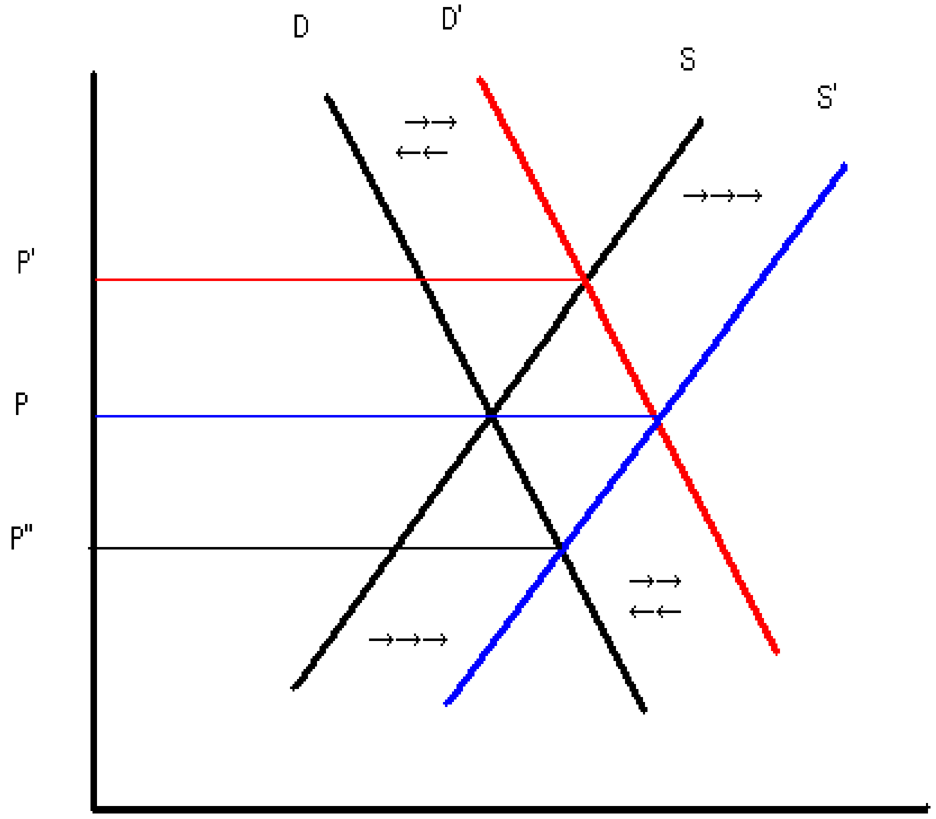


Figure 3. Effect of demand for biofuel production on grain supply-demand and price.

Note: If demand of grain shifts to D' due to growth of biofuel demand and supply of grain does not increase, the price rises to P'. If supply of grain shifts to S' due to a technology improvement, the price returns to P. Furthermore, the price may drop to P'' if the demand goes back to D after commercialization of second generation biofuels. Source: Prepared by author.

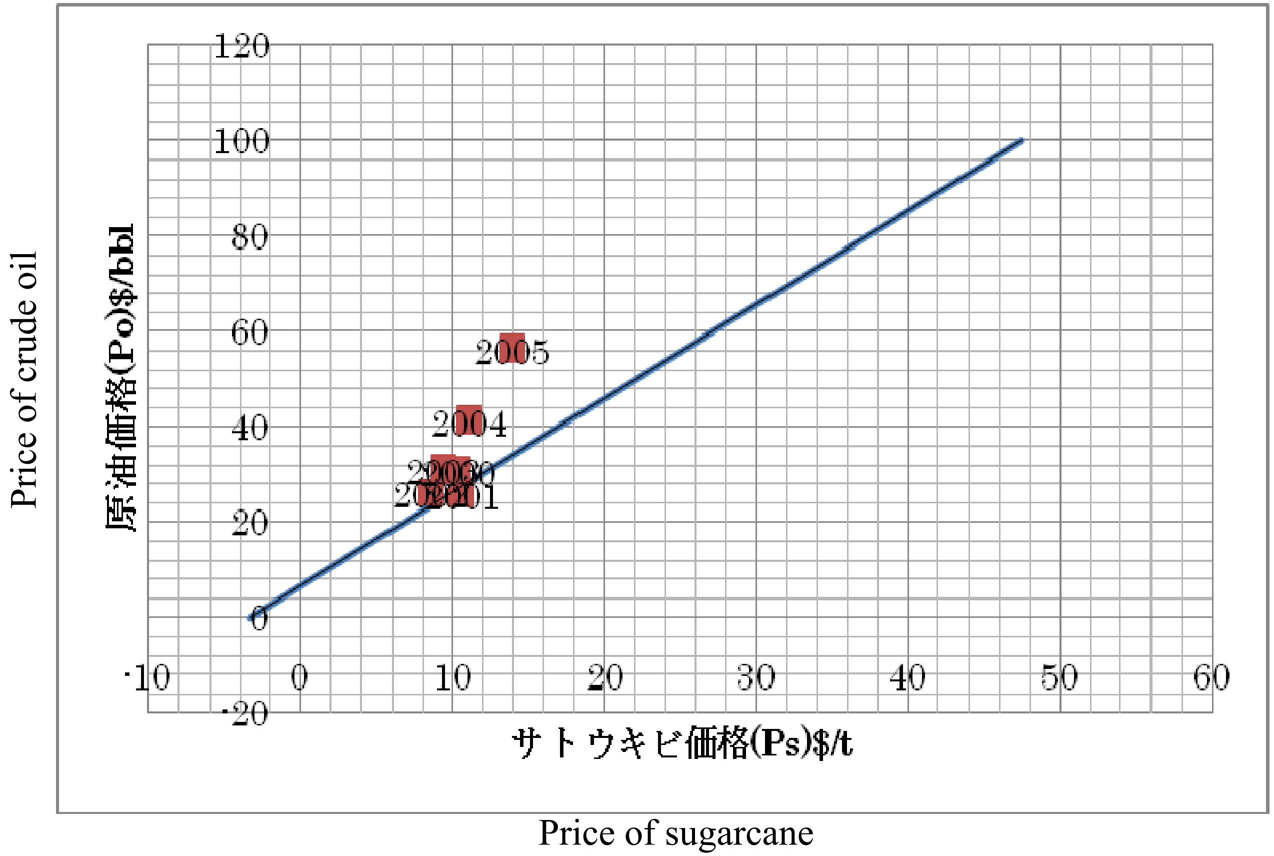


Figure 4. Profitability of sugarcane in Brazil compared to crude oil.

Note: If the price of sugarcane is located to the left of the break-even line, it indicates that ethanol can be produced from sugarcane at a lower cost than gasoline. It is satisfied in nearly every year. Provisional values currently estimated by Mr. Kosuke Shibako at the Faculty of Agriculture, University of Tokyo.

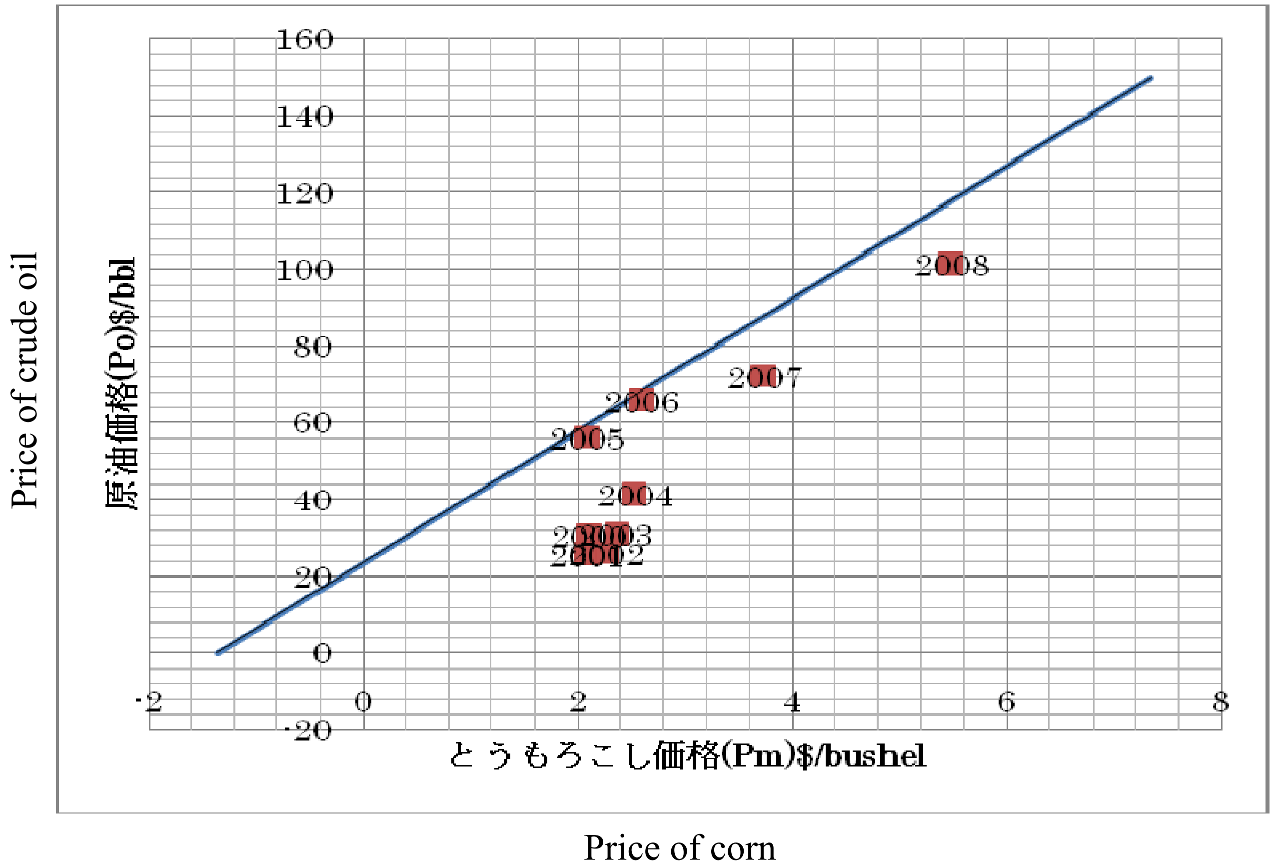


Figure 5. Profitability of corn in the U.S. compared to crude oil (without subsidies)

Note: If the price of corn is located to the left of the break-even line, it indicates that ethanol can be produced from corn at a lower cost than gasoline. It is almost never profitable without subsidies. Provisional values currently estimated by Mr. Kosuke Shibako at the Faculty of Agriculture, University of Tokyo.

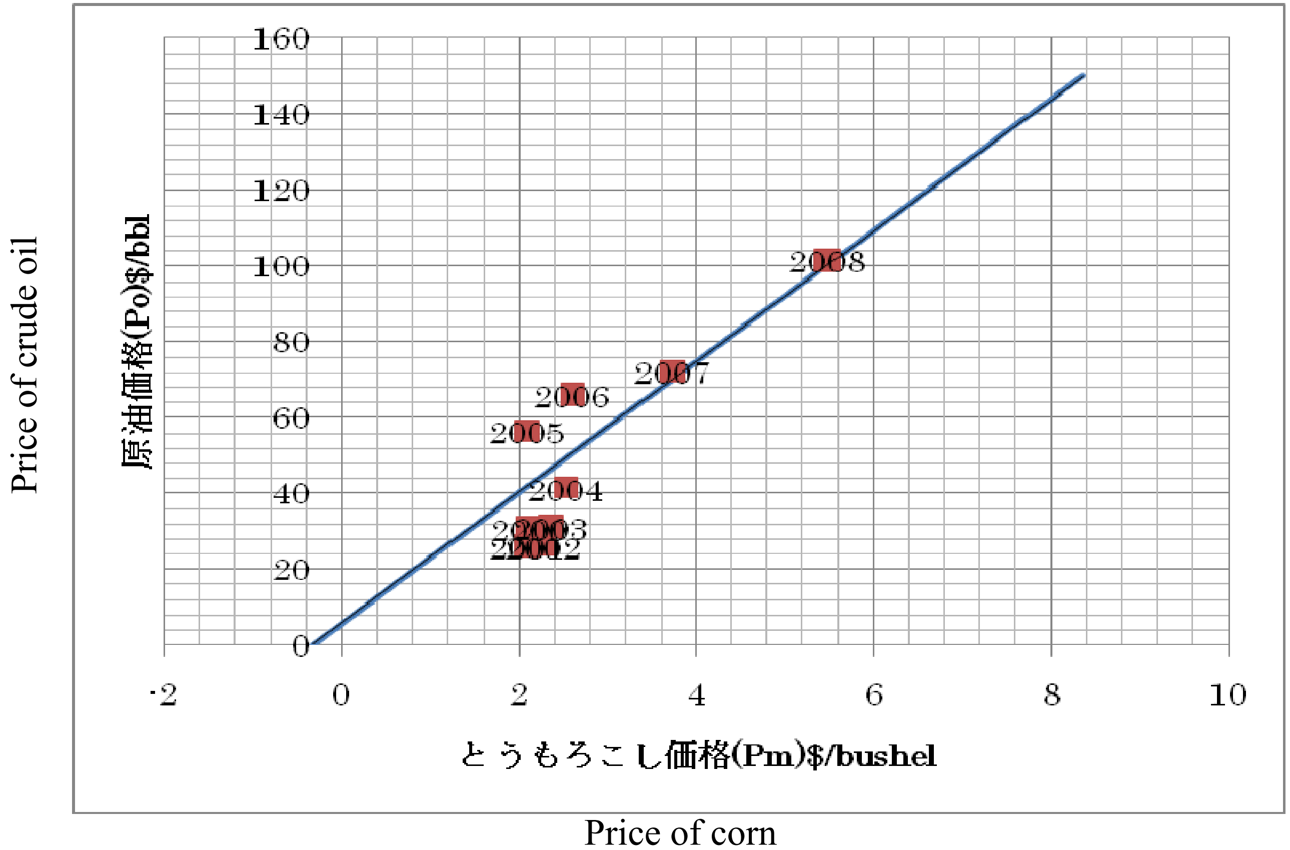
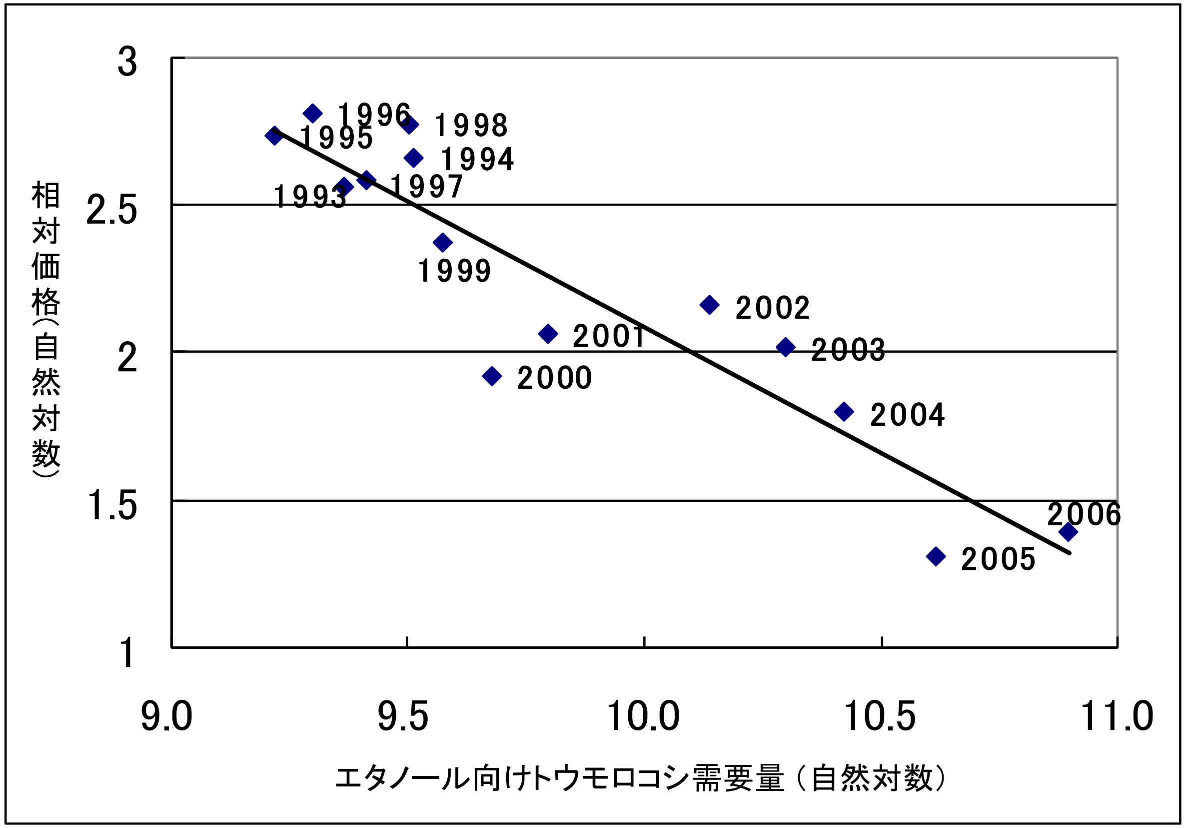


Figure 6. Profitability of corn in the U.S. compared to crude oil (with subsidies)

Note: With the current 51-cent-per-gallon tax deduction, this became profitable for the last several years. This means the U.S. corn ethanol will not be able to survive without increases in subsidies after oil price decline. Provisional values currently estimated by Mr. Kosuke Shibako at the Faculty of Agriculture, University of Tokyo.

Relative price (natural logarithm)



Ethanol Demand for corn (natural logarithm)

Figure 7. Relationships between corn/crude oil relative price and ethanol demand

Note: Since the measures to make the utilization of biofuel mandatory by mixing ethanol in gasoline were reinforced globally, some advocate that the demand for biofuel will not decline. However, if the relative profitability of biofuel deteriorates due to a decline in crude oil price, the mandatory target could not be maintained without increase in subsidies.

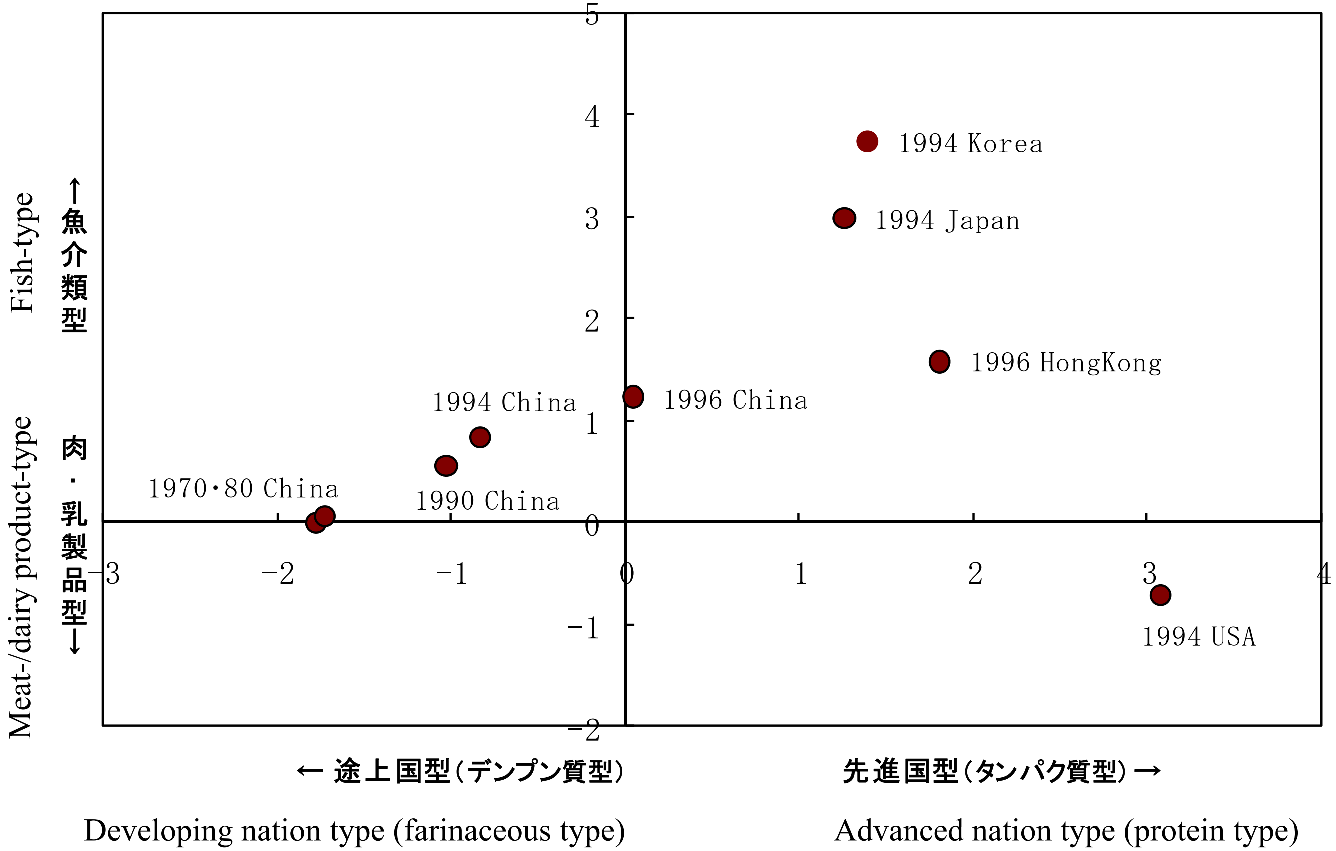


Figure 8. Characteristics of changes in dietary life in China over time.

Source: Results of principal component analysis by Suzuki, Shono and Peng (彭) (2003)
Note: While dietary life in China has shifted from the "developing nation type," centering on farinaceous food, to the "advanced nation type," centering on protein, its destination is the "advanced East Asian nation type" (which includes South Korea, Japan and Hong Kong) with a relatively large amount of fishery products, instead of the "western type," which includes a lot of meat and dairy products.

Table 2. Estimated income elasticity values for demand for animal protein sources in China

	1996 (urban)	2006 (urban)	2006 (rural)	OECD estimate[1]	Feed grain requirements (kg) per 1kg meat[2]
Beef	0.422	0.276	0.647	1.593	11
Pork	0.314	0.157	0.278	0.709	7
Chicken	0.534	0.370	0.905	0.983	4
Fish	0.336	0.478	1.399	—	2
Milk	0.855	0.559 (2005)	—	1.470	—
Powdered milk	0.722	0.380 (2005)	—	Skimmed 0.137 Whole 0.703	—

Source: Results of cross section analyses by income class by Kinoshita and Peng (2007), Ryohei Masuda (2008), and Hui Jiang (2009).
Note 1: Estimated values for all of China by AGLINK-COSIMO model.
Note 2: Corn equivalents.

Table 3. Predicted population increase rate by United Nations (%)

	2005	2035	2045
China	0.7	0.0	▲ 0.5
India	1.6	0.6	0.4

Source: UN, *World Population Prospects*, 2005.

Note: China is expected to go into a population decrease phase after it peaks at 1.4 billion people in the 2030s. In India, which has an enormous population of 1.1 billion people, 80% are Hindus who do not eat beef and pork, and another 14% are Muslims who do not eat pork.

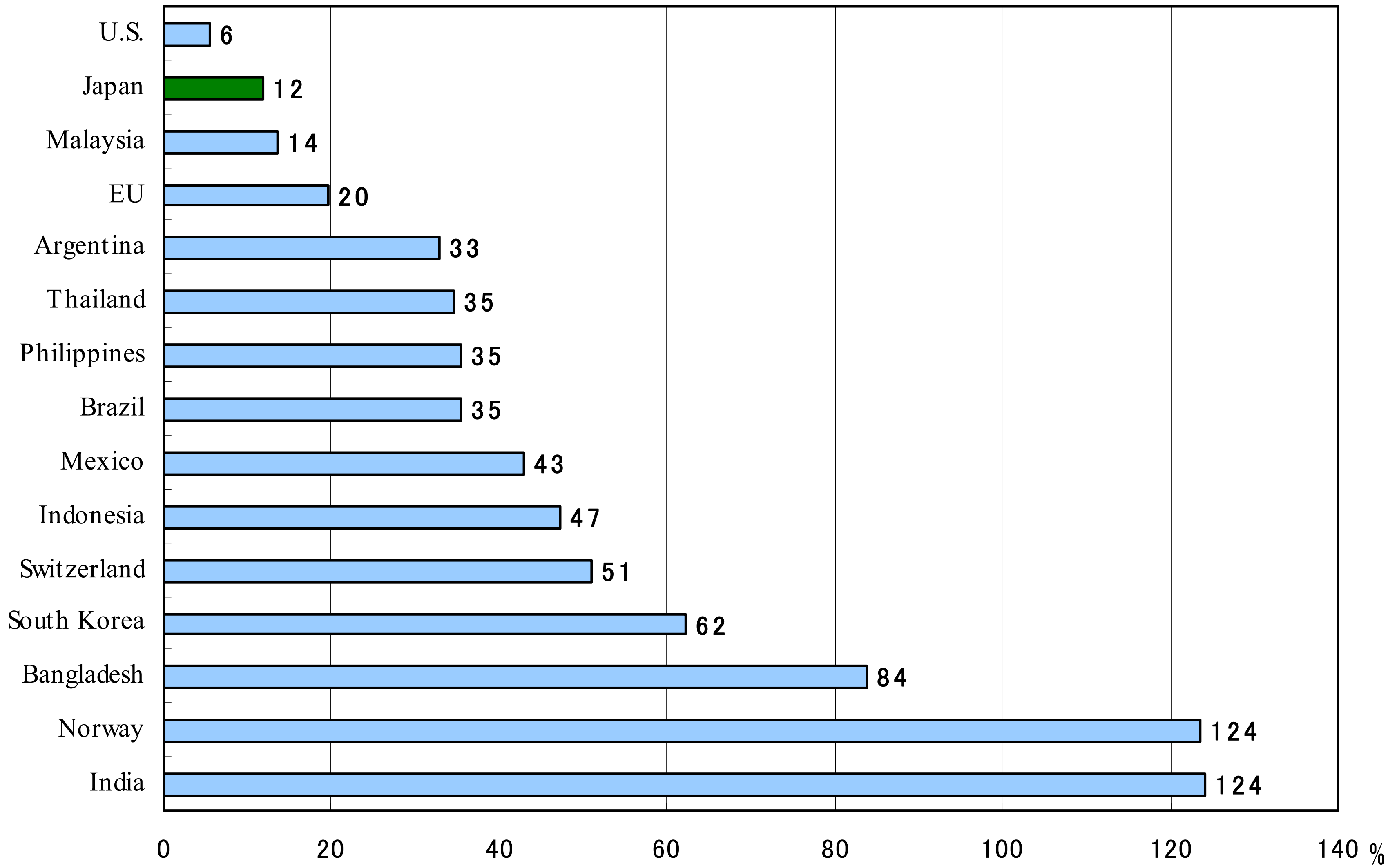


Figure 1. Average agricultural tariff rates agreed to attain in 2000.

Source: Data sets in the OECD (1999) "*Post-Uruguay Round Tariff Regimes*."

Note: Simple averages at tariffline levels after the Uruguay Round commitments in 2000.

Table 1. Aggregate Measurement of Support (AMS).

	Total AMS (billion yen)	Proportion in agricultural production (%)
Japan	641.8	7
U.S.	1751.6	7
EU	4042.8	12

Source: Website of Ministry of Agriculture, Japan.

Table 6. Components of Japan's Producer Support Estimate (PSE) in 2003 with rice and dairy products removed

	Amount in billion yen	Component percentage
Total PSE other than rice and dairy products	2,252	100.0
Market Price Support (MPS)	2,160	95.9
MPS attributable to tariffs	1,266	56.2
MPS attributable to domestic premiums	893	39.7
Government expenditure	93	4.1
Gross agricultural production (A)	6,082	—
Production of items included in PSE (B)	3,072	—
B/A	50.5%	—

Source: Adachi and Suzuki (2005).

Table 7. Components of EU's Producer Support Estimate (PSE) in 2003.

	Amount in million euro	Component percentage
Total PSE	108,251	100.0
Market Price Support (MPS)	61,552	56.9
MPS attributable to tariffs	60,194	55.6
MPS attributable to domestic premiums	1,358	1.3
Government expenditure	46,699	43.1
Gross agricultural production (A)	243,030	—
Production of items included in PSE (B)	171,409	—
B/A	70.5%	—

Source: Adachi and Suzuki (2005).

Unfair aspects of the WTO rules

- The current WTO criteria for reducing agricultural protection focus on economic efficiency or maximization of the total economic welfare. The meaning of "efficiency" is narrowly defined without considering the equitable distribution of wealth and external economies such as national security and environmental protection.
- The average farm size in Australia is almost 4,000 hectares, over thousand times superior to every Asian country's. Since Agricultural productivity is severely constrained by the land endowment, it is nearly impossible for most Asian farmers to compete with the U.S. and Australian farmers with no protection or supports.
- A total ban on export subsidies by the end of 2013 was agreed in the WTO, but the pledge is very unlikely to be fulfilled because many "hidden" export subsidies are left out of this agreement. Some of them are forming a high percentage of government payments to farm income.
- Consequently, further global tariff reduction will unfairly penalize small-scale farming in importing countries, while it is apparently favorable to exporting countries with large-scale farming.

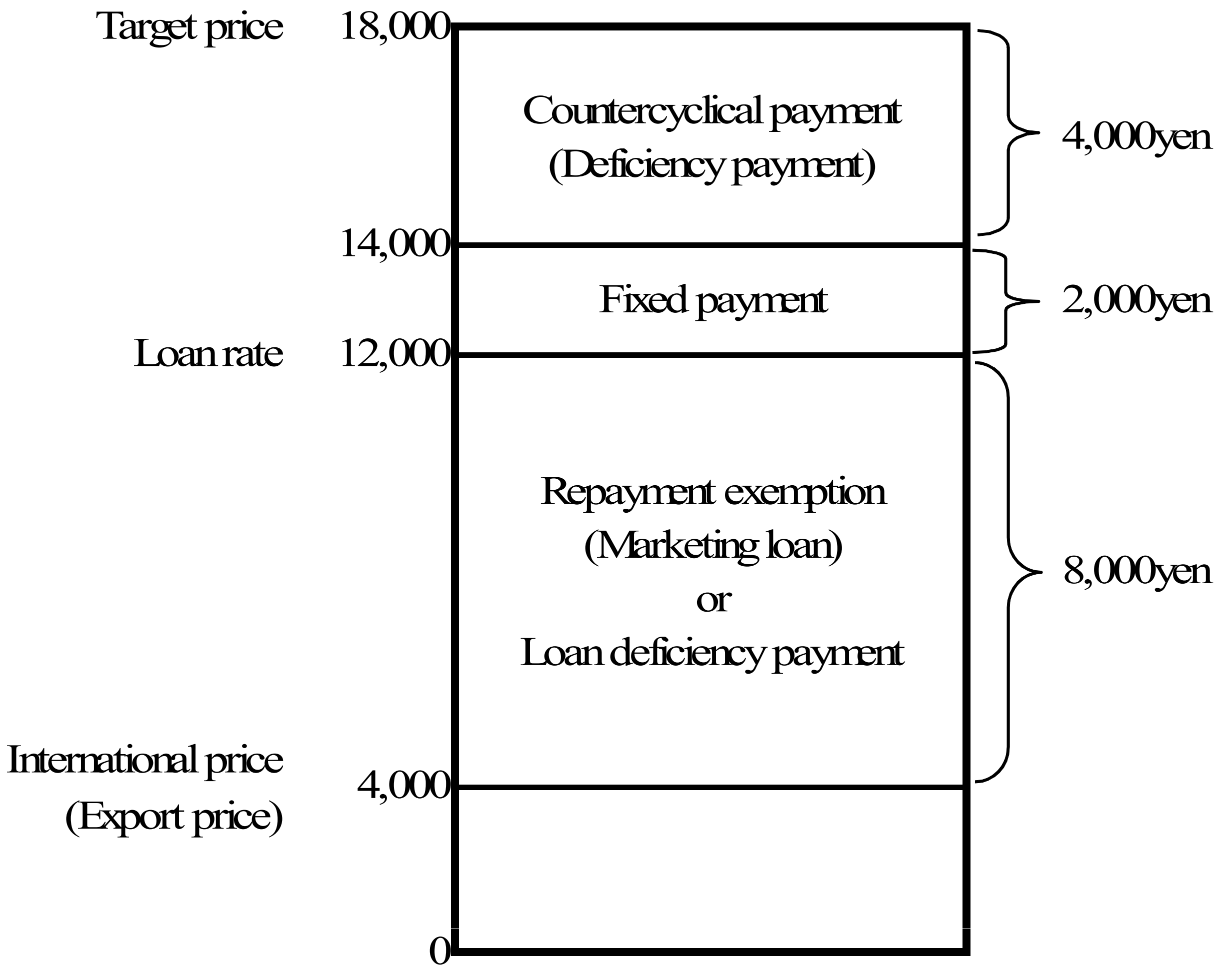


Figure 10. Illustration of the U.S. farmer support for rice.

Note: Japan's rice price levels (yen/60kg) are employed for descriptive purposes.

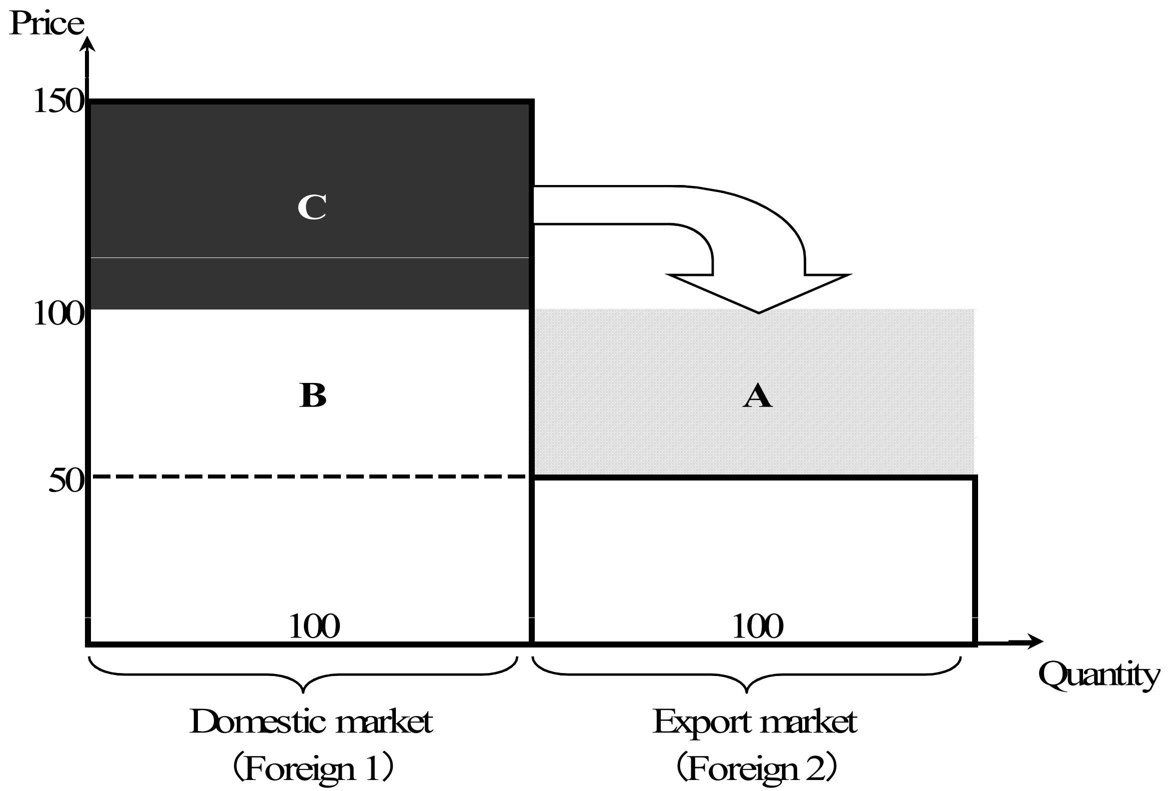


Figure 11. Varieties of "hidden" export subsidy

Notes: **A** corresponds to an ordinary export subsidy paid by the government.
A+B corresponds to the U.S. direct payment for grain etc. paid by the government.
C corresponds to the Canada, Australia and NZ's price discrimination measurs paid by consumers. **B+C** corresponds to the EU sugar direct payment in the domestic market.
Each makes an equal amount of Export subsidy equivalent, 5000, in this case.

Table 8. Proportion of Government Subsidy in Agricultural Income

	%
Japan	15.6
U.S.	26.4
Wheat	62.4
Corn	44.1
Soybean	47.9
Rice	58.2
France	90.2
UK	95.2
Switzerland	94.5

Source: The Ministry of Agriculture, Japan. Adapted from *Shukan-Economist*, The Mainichi Shinbun Co., July 22, 2008.

Table 9. Cultivated area per farm.

Country	hectare(100㎡)
Australia	3385
Canada	250
U.S.	197
UK	68
France	42
Germany	36
EU	19
Thailand	3.7
Japan	1.8
India	1.4
Taiwan	1.2
China	0.5
Vietnam	0.3

Source: Website of Ministry of Agriculture, Japan.

What we lose and what should be incorporated in the globalization rule

- In order to examine what we gain and lose with free trade, we conducted a simple simulation analysis. We assume that there exist only four countries (Japan, Korea, China, and the U.S.) and one commodity, rice, in the world.

- The results indicate that, in deed, total economic merits will increase by almost 1 trillion (2.1 trillion of consumers' gain , 1 trillion of producers' loss and 0.1 trillion of government's loss) yen, but, on the other hand, virtual water will increase by 22 times, nitrogen surplus will increase from 1.9 to 2.7 times, CO_2 emission will increase by 10 times, biodiversity will be severely damaged, and Japan's national security will be destroyed with only 1% of the rice self-sufficiency rate. The value of 1 trillion yen should be re-evaluated considering these environmental and security losses.

- Although direct payments instead of tariffs is an alternative way to protect domestic agriculture, this replacement is difficult for many countries because of budgetary constraints. Therefore, we should develop detailed indicators of agricultural multifunctionality to incorporate into the current WTO rules, and realize more comprehensive trade rules for sustainable growth of diversified agriculture in the world.

Table 10. Estimated impacts of free trade under FTAs and WTO on rice markets: Changes in economic welfare. (billion yen)

Variables		Japan-Korea FTA	East Asian FTA	WTO
Japan	Consumer surplus	152.4	2108.1	2115.4
	Producer surplus	-140.2	-1020.0	-1020.2
	Government revenue	-98.8	-98.8	-98.8
	Total surplus	-86.7	989.2	996.4
Korea	Consumer surplus	-390.2	1089.0	1095.1
	Producer surplus	419.6	-864.5	-868.3
	Government revenue	-11.6	-11.6	-11.6
	Total surplus	17.8	212.8	215.1
China	Consumer surplus	20.4	-1336.9	-1202.9
	Producer surplus	-20.4	1384.3	1241.3
	Government revenue	0	0	0
	Total surplus	0	47.4	38.4
U.S.	Consumer surplus	23.9	23.9	-68.3
	Producer surplus	-24.3	-24.3	73.7
	Government revenue	0	0	0
	Total surplus	-0.4	-0.4	5.5

Source: Estimates by Suzuki and Kinoshita.

Table 11. Estimated impacts of free trade under FTAs and WTO on rice markets: Changes in environmental indicators.

Variables		Unit	Actual	Japan-Korea FTA	East Asian FTA	WTO
Japan	Water-use inefficiency: Virtual water	km^3	1.5	3.8	33.2	33.3
	Nitrogen accumulation increase:					
	Total nitrogen capacity of farm land (A)	1,000t	1237.3	1207.5	827.2	825.8
	Domestic food-derived nitrogen supply (B)	1,000t	2379	2366	2199.4	2198.8
	B/A	%	192.3	195.9	265.9	266.3
	Deprivation of biodiversity:					
	Tadpole shrimp	million	4,456	4,138	81	66
	Tadpole	million	38,987	36,209	708	576
	Red dragonfly	million	371	345	7	5
World total	Transportation energy consumption: Food miles	points	457.1	207.6	3175.9	4790.6

Source: Estimates by Suzuki and Kinoshita.

Table 12. Estimated impacts of rice tariff elimination in Japan-Korea-China FTA under the East Asian common agricultural policy

Variables		Unit	Estimates
Japan	Supply	1,000t	7,808
	Demand	1,000t	9,063
	Self-sufficiency rate	%	86.2
	Compensation target price of rice	yen/kg	200.0
	Market price of rice	yen/kg	126.5
	Imports from China	1,000t	1,255
	Tariff rate	%	186.4
	Required compensation to Japan (a)+(b)-(c)	billion yen	470.8
	Supply control (a)	billion yen	0
	Direct payment etc.(b)	billion yen	574.1
	Tariff revenue (c)	billion yen	103.3
	Net financial burden on Japan	billion yen	400
	Total nitrogen capacity of farm land (d)	1,000t	1,219
	Domestic food-derived nitrogen supply (e)	1,000t	2,356
	(e)/(d)	%	193.2
Korea	Supply	1,000t	6,118
	Demand	1,000t	7,482
	Self-sufficiency rate	%	81.8
	Compensation target price of rice	yen/kg	150.0
	Market price of rice	yen/kg	116.5
	Imports from China	1,000t	1,364
	Tariff rate	%	186.4
	Required compensation to Korea (f)-(g)	billion yen	101.3
	Direct payment etc.(f)	billion yen	204.7
	Tariff revenue (g)	billion yen	103.5
	Net financial burden on Korea	billion yen	124.2
China	Supply	1,000t	177,869
	Demand	1,000t	175,250
	Market price of rice	yen/kg	37.8
	Total exports	1,000t	2,619
	Exports to Japan	1,000t	1,255
	Exports to Korea	1,000t	1,364
	Required compensation to China	billion yen	0
	Net financial burden on China	billion yen	47.9

Table 13. Grain price impacts of consecutive poor crop, export restraint and reserve tapping. **(10,000yen/ton)**

Year	Case 1 Status quo	Case 2 Poor crop	Case 3 Poor crop + export restraint	Case 4 Poor crop + reserve tapping	Case 5 Poor crop + export restraint + reserve tapping
2001	20.0	20.0	20.0	20.0	20.0
2002	20.0	21.4	21.4	20.3	20.3
2003	20.0	18.7	18.7	19.7	19.7
2004	20.0	23.9	25.6	20.8	20.8
2005	20.0	13.6	10.2	18.7	18.7
2006	20.0	34.0	62.0	22.8	23.2
Standard deviation	0.0	6.9	18.2	1.4	1.5

Source: Suzuki (2001)

Notes: Case 1 = the Status quo.

Case 2 = five-year's poor crop (2002- 06) with -500,000 ton/year in the export country.

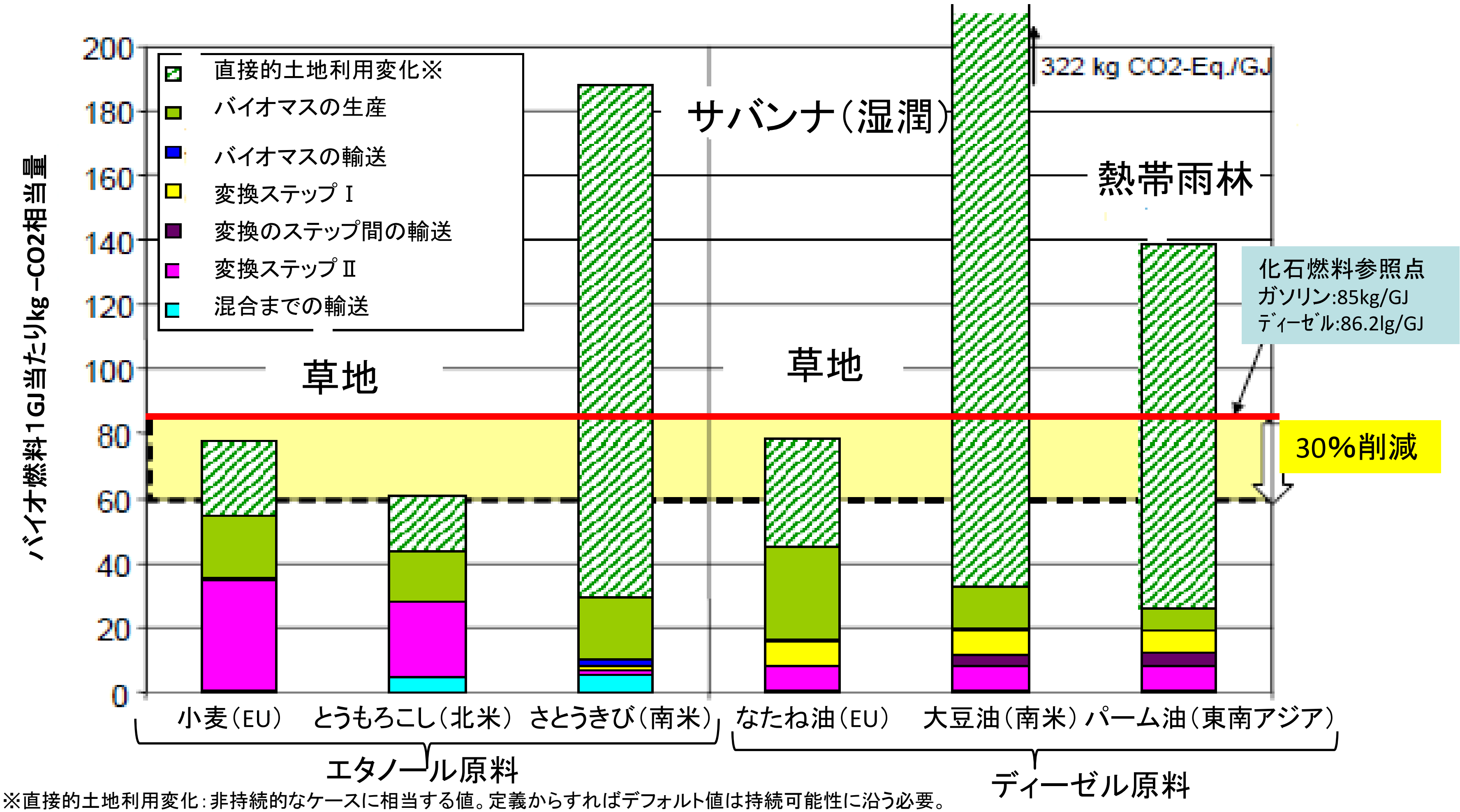
Case 3 = poor crop (same as Case2) and export restraint to keep 4 million ton of domestic grain supply in the export country.

Case 4 = poor crop (same as Case2) and 400,000 ton/year of reserve tapping in the import country.

Case 5 = poor crop, export restraint (same as Case2) and reserve tapping (same as Case3).

参考図

LCAの試算例
（GBEPホームページより抜粋）



※直接的土地利用変化：非持続的なケースに相当する値。定義からすればデフォルト値は持続可能性に沿う必要。

資料：ドイツifeu "Greenhouse Gas Balances for the German Biofuels Quota Legislation "
注：2007年10月GBEP温室効果ガスタスクフォースにおけるプレゼン資料。試算の一例。