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Trends in Future Livestock Consumption and Production in Japan and Other Asian Countries

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1. Introduction

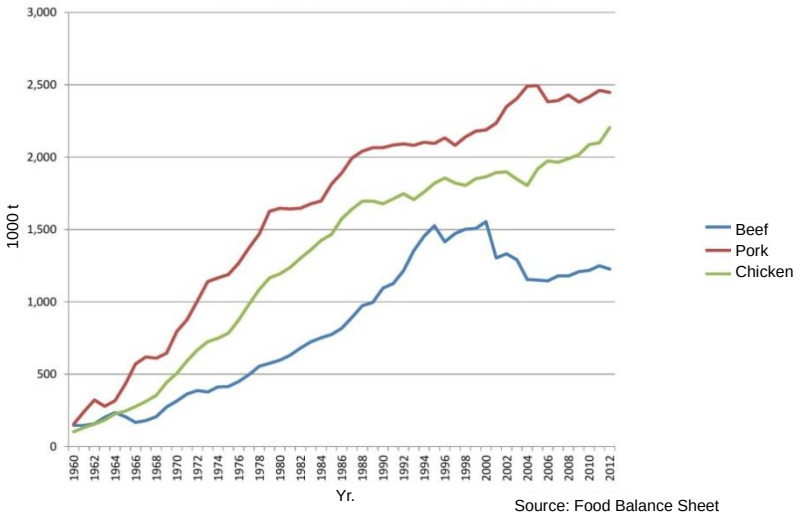
This paper aims to clarify trends in future livestock consumption and production in Japan and other Asian countries as well as to lay out a direction for future production of livestock products in Japan. Asian countries, such as China and India, have achieved rapid economic growth in recent years. This means the shift in eating habits from grains, particularly rice, to livestock products will progress rapidly. On the other hand, in Japan, which is now a mature society, there is growing concern that the nation's declining future population will shrink the food consumption markets, including the livestock product market.

In this paper, I first survey trends in livestock product consumption and changes in the breakdown of consumption in Japan. Next, I categorize trends in future livestock consumption and production in Japan and other Asian countries based on the results of the World Food Supply and Demand Estimates compiled by the Food and Agricultural Policy Research Institute (FAPRI) of the University of Missouri. Then, I clarify trends in future livestock product consumption in Japan based on trends in Japan's food consumption during the declining population phase compiled by Japan's Ministry of Agriculture, Forestry and Fisheries. Finally, based on these results, I propose a direction for future production and sales of livestock products in Japan.

2. Current Status of Japan's Livestock Product Consumption

First, let us review the current status of Japan's livestock product consumption. Figure 1 shows the changes in the supplies for consumption of beef, pork, and chicken. According to the figure, despite occasional wild fluctuations, livestock product consumption has been consistently increasing since 1960. Since demand for other farm products is nearly

Fig. 1 Changes in Supplies of Livestock Products for Consumption



Source: Food Balance Sheet

saturated, supplies of many farm products for consumption have been decreasing since 1980. Thus, livestock products are rare exceptions. Examining beef, after the trade liberalization accompanying tariffs during the 1990s, imports sharply expanded and supplies for consumption increased dramatically. Thereafter, however, consumption took a downward turn due to the BSE outbreak in the United States and Japan, but since then it has gradually begun increasing again. About 1.2 million tons of beef were consumed in 2012. Consumption of pork and chicken has been steadily increasing since 1960, to about 2.5 million tons and 2.2 million tons, respectively in 2012.

Beef

Table 1 Changes in Beef Consumption Percentages

Unit %

FY	Households	Processing	Other	Total
1975	70	13	17	100
1980	62	14	24	100
1985	56	14	30	100
1990	48	9	43	100
1995	43	8	49	100
2001	33	10	57	100
2002	34	8	58	100
2003	34	9	57	100
2004	35	10	55	100
2005	36	10	54	100
2006	35	10	55	100
2007	34	9	57	100
2008	34	6	60	100
2009	34	5	61	100
2010	34	5	61	100
2011	33	5	62	100
2012	32	6	62	100

Source: Meat and Egg Division, Japan's Ministry of Agriculture, Forestry and Fisheries

Now, let us examine the changes in consumption percentages of these livestock products. Table 1 lists consumption percentages for beef. The figures indicate that household consumption of beef has been decreasing year by year, and recently has fallen to about a 30% level. Instead, use in Other (restaurants, etc.) has increased to about 60%. Use in the processing segment is low. By contrast, household consumption of pork and chicken (Tables 2 and 3) has not decreased as much as that of beef. Pork (47%) and chicken (39%) hold important positions in household meat consumption. The reason may be the reasonable pricing and resulting affordability of pork and chicken compared to beef. Moreover, unlike beef, a percentage of pork is also consumed in the processing segment. As for chicken, about the same percentages are used for processing as beef, and its percentages of Other (restaurants, etc.) also has reached 54%. This point weighs heavily on changes in food consumption during the Japan's declining population phase (to be described later), and so it is important to review the current consumption percentages. In the declining population phase, increases in household consumption and spending on eating out and ready-made meals (processed meals, etc.) are expected to change significantly as well. This is because consumption patterns of various livestock products and current consumption percentages based on processing characteristics may affect household consumption into the future.

Pork

Table 2 Changes in Pork Consumption Percentages

Unit %

FY	Households	Processing	Other	Total
1975	59	19	22	100
1980	52	25	23	100
1985	46	27	27	100
1990	40	30	30	100
1995	40	31	29	100
2001	42	26	32	100
2002	42	30	28	100
2003	40	29	31	100
2004	40	29	31	100
2005	41	29	30	100
2006	43	27	30	100
2007	44	25	31	100
2008	45	25	30	100
2009	47	24	29	100
2010	46	25	29	100
2011	47	25	28	100

Source: Same as Table 1

Chicken

Table 3 Changes in Chicken Consumption Percentages

Unit %

FY	Households	Processing	Other	Total
1975	52	3	45	100
1980	46	4	50	100
1985	40	7	53	100
1990	32	8	60	100
1995	30	11	59	100
2001	31	9	60	100
2002	33	12	55	100
2003	32	10	58	100
2004	33	10	57	100
2005	34	8	58	100
2006	35	9	56	100
2007	36	9	55	100
2008	37	8	55	100
2009	38	7	55	100
2010	38	7	55	100
2011	38	6	56	100
2012	39	7	54	100

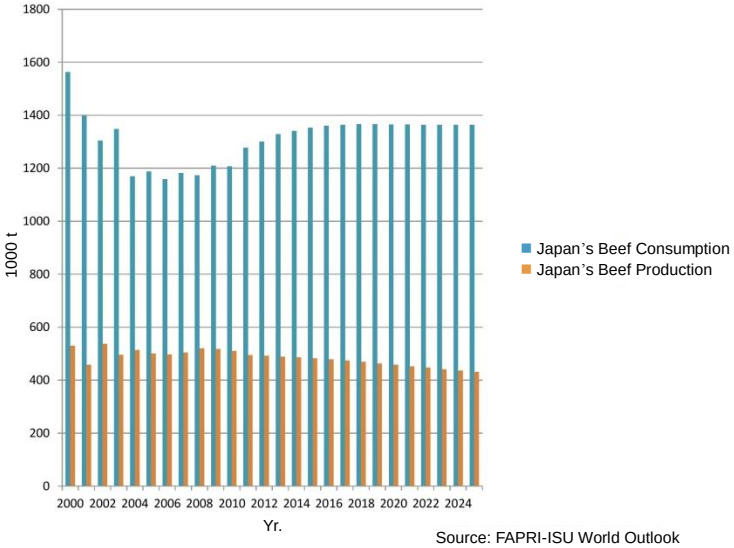
Source: Same as Table 1

3. Trends in Future Livestock Consumption and Production in Japan and Asia

Next, let us review trends in future livestock consumption and production in Japan and some other Asian countries (China, India, and Indonesia) based on the results of the World Food Supply and Demand Estimates compiled by the University of Missouri's FAPRI. These estimates are widely recognized as reliable future forecasts, alongside those prepared by organizations like the FAO and OECD, which provide estimates of food supply and demand globally. As of 2014, these estimates include results up to 2025. As for estimates of Asian countries, China, India, and Indonesia were selected because their massive populations (as of 2011, about 1.35 billion in China, 1.22 billion in India, and 240 million in Indonesia) will greatly affect consumption of livestock products and grains globally.

First, let us examine the trends in beef consumption and production. Figures 2 through 5 show changes in the consumption and production of beef in Japan, China, India, and Indonesia. Japan's beef consumption was about 1.3 million tons in 2012. This amount is expected to slightly increase and then remain steady at around 1.4 million tons

Fig. 2 Estimated Beef Consumption and Production in Japan



Source: FAPRI-ISU World Outlook

Fig. 3 Estimated Beef Consumption and Production in China

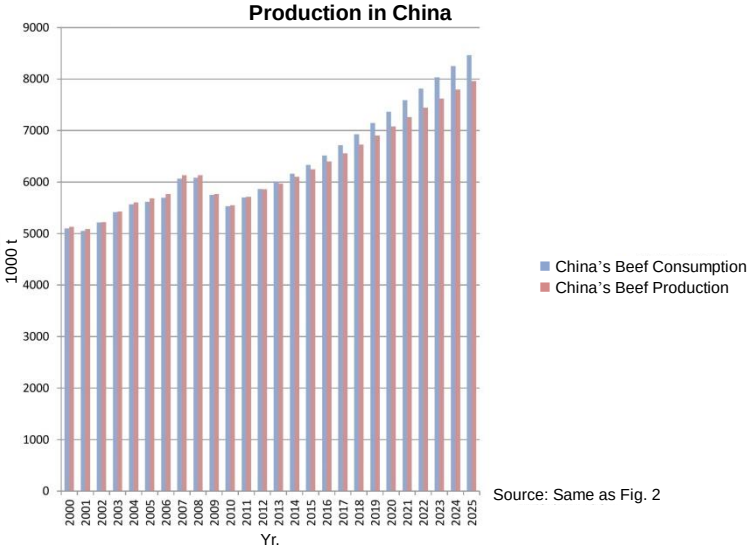


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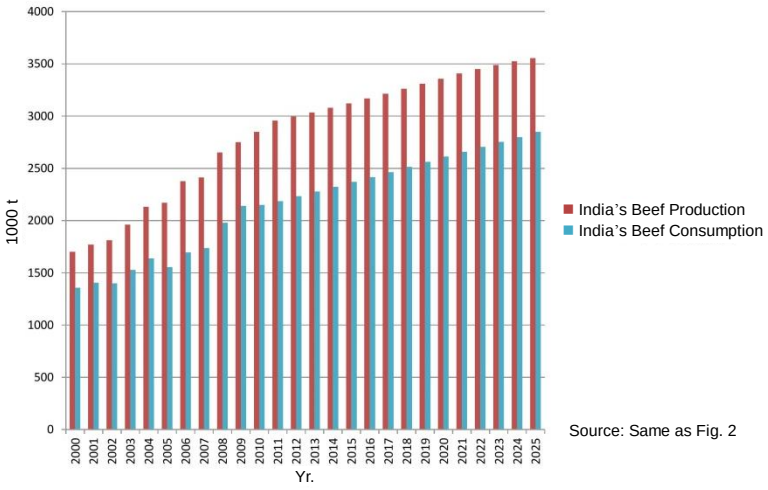
Fig. 4 Changes in Beef Consumption and Production in India



Source: Same as Fig. 2

thereafter until 2025. This can be explained by Japan's slowing economic growth and declining population. Beef production is estimated to decline slowly after 2010 but maintain an approximately 400,000 ton level. This can be speculated to be the result of the decreased number of dairy bull cattle (including F1 cattle) produced in the milk and milk product (dairy) sector, where demand is shrinking. Next, let us examine the consumption and production of beef in China, India, and Indonesia. In these countries, consumption and production are rapidly increasing because of the expansion in livestock product consumption due to steady economic growth, which is expected to continue in the future. Beef consumption is expected to reach about 8 million tons in China, 2.8 million tons in India, and 0.7 million tons in Indonesia in 2025. Compared to the 2012 level when these estimates began, the amount will increase about 1.5 times in China, 1.3 times in India, and 1.5 times in Indonesia. This indicates that Asian countries will become enormous consumers of beef in the future.

Next, let us examine the trends in pork consumption and production. Figures 6 through 8 show changes in consumption and production of pork in Japan,

Fig. 5 Changes in Beef Consumption and Production in Indonesia

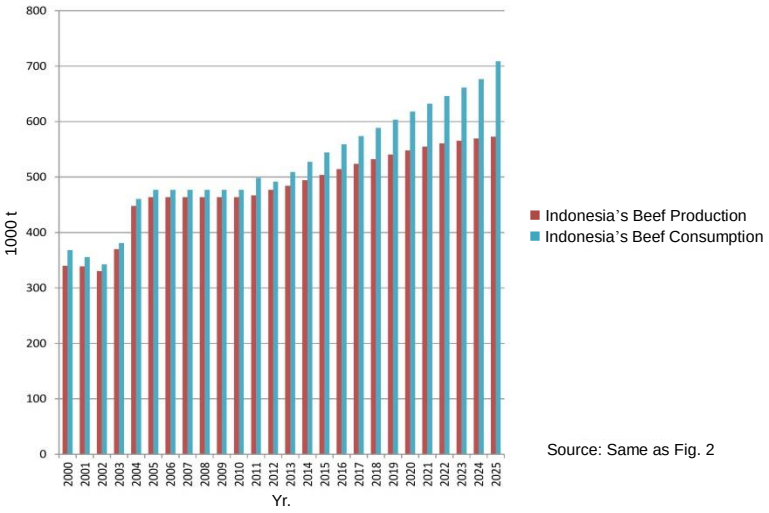


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Fig. 6 Estimated Pork Consumption and Production in Japan

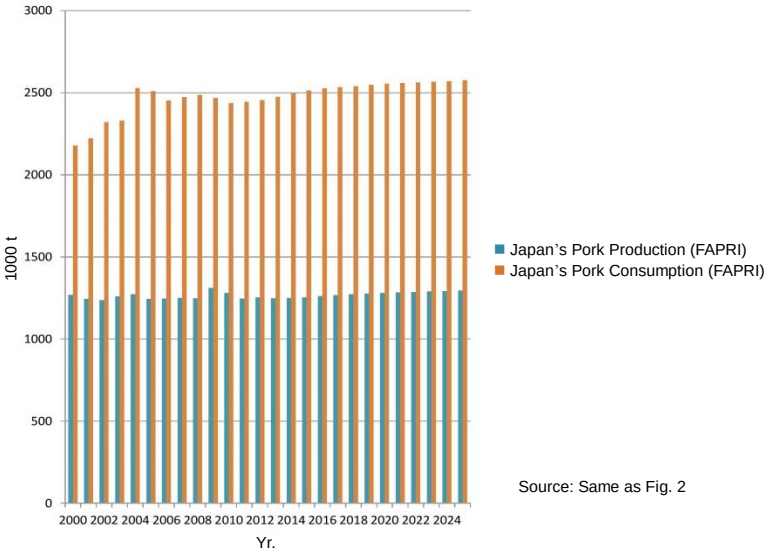

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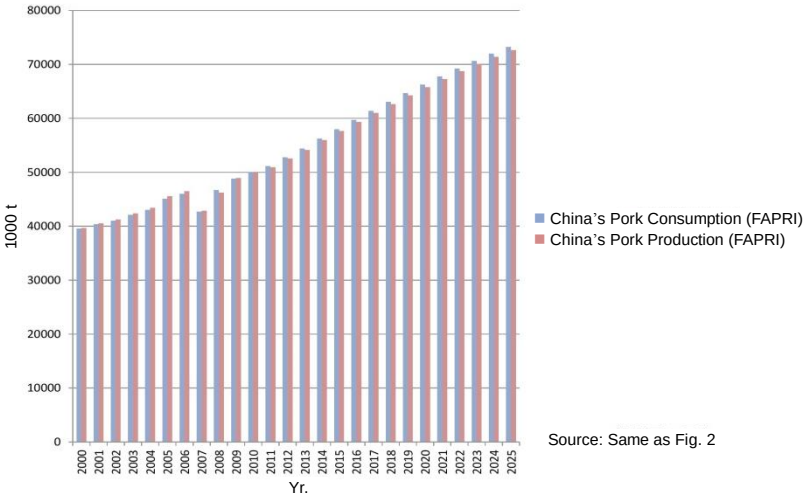
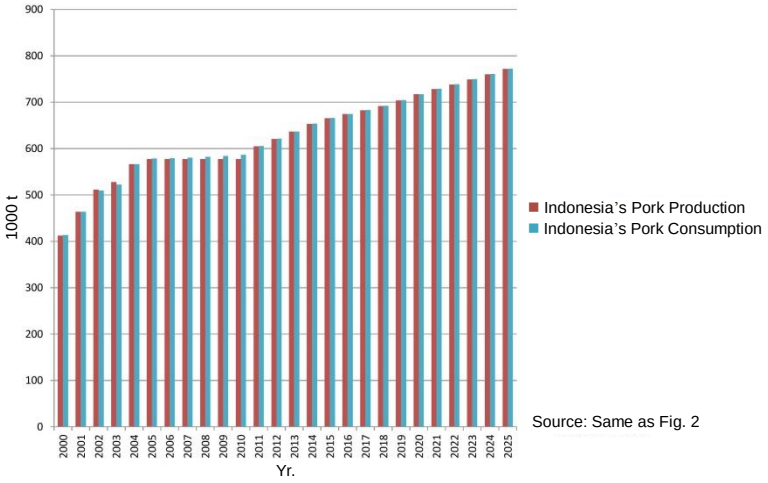
Fig. 7 Estimated Pork Consumption and Production in China



Source: Same as Fig. 2

China, and Indonesia. Like beef, Japan's pork consumption is also expected to remain steady at around 2.5 million tons after 2012 until 2025. Pork production will remain at its current level of about 1.3 million tons. Meanwhile, against the backdrop of steady economic growth, 70 million tons and 0.8 million tons of pork will be consumed in China and Indonesia, respectively. Pork consumption in China already accounts for about half of all pork consumption in the world, and this massive amount will continue to tower over other countries' totals in 2025. Meanwhile, in Indonesia, a Muslim nation, pork consumption by the non-Muslims who make up about 10% of the country's population amounts to almost 30% of Japan's total pork consumption. Note, however, that it remains to be seen whether pork production in China and Indonesia can maintain the projected high self-sufficiency ratio when pork production expands to these levels. Especially in China, the number of independent pig farmers is expected to decrease and the number of corporate pig farmers will increase. Therefore, use and import of grains are likely to rapidly increase. This will greatly affect global grain market prices by applying upward pressure. Building a

Fig. 8 Changes in Pork Consumption and Production in Indonesia



Source: Same as Fig. 2

Fig. 9 Estimated Chicken Consumption and Production in Japan

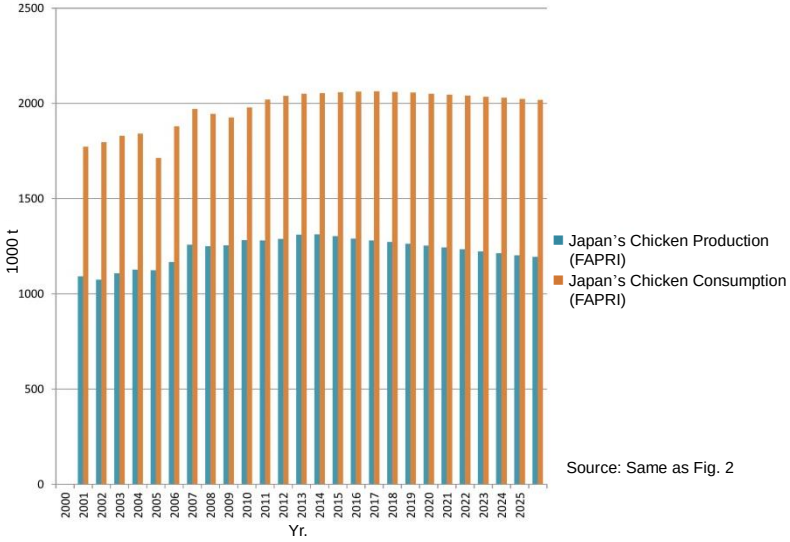


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Fig. 10 Estimated Chicken Consumption and Production in China

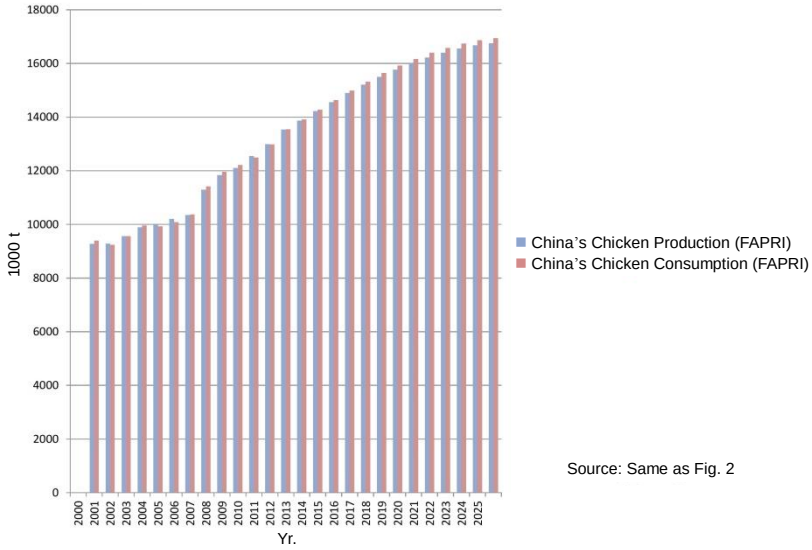

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Fig. 11 Changes in Chicken Consumption and Production in India

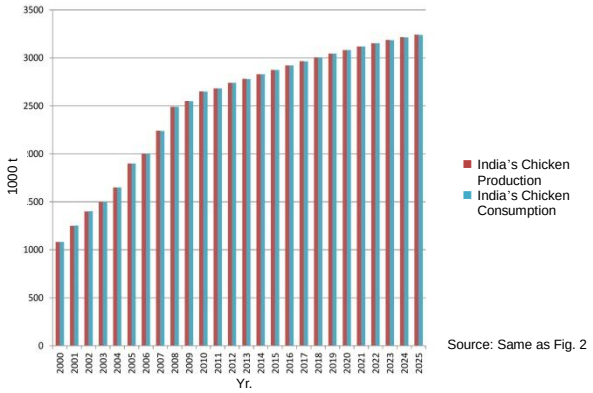

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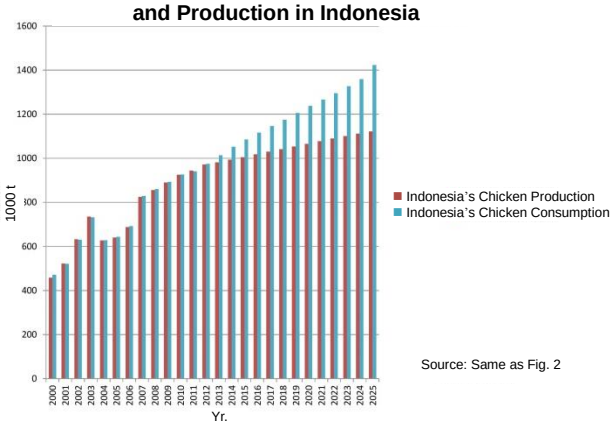
Fig. 12 Changes in Chicken Consumption and Production in Indonesia



Source: Same as Fig. 2

supply system to support pork consumption on such an enormous scale is not an issue for China alone but rather will have a substantial impact on pork markets and grain market prices worldwide.

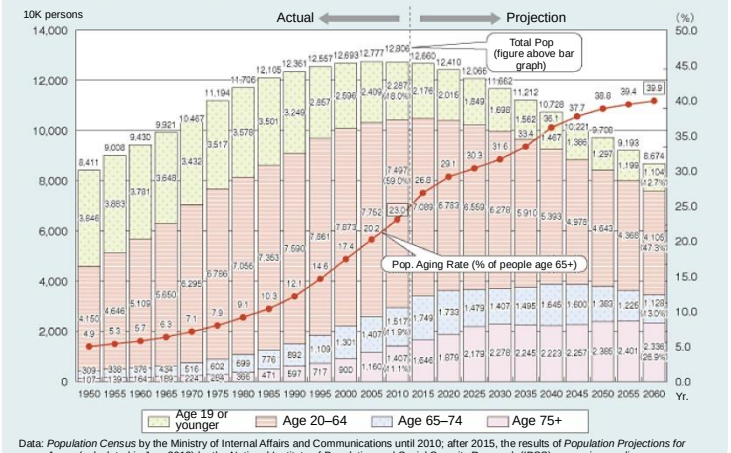
Next, let us consider chicken (Figs. 9 through 12). Like beef and pork, Japan's chicken consumption is also expected to remain steady at about the 2 million ton level. Meanwhile, as with other livestock products, chicken consumption is increasing rapidly in China (16 million tons), India (3.3 million tons), and Indonesia (1.4 million tons). In Asia, compared to Japan, not only China but also India and Indonesia are expected to become equal or larger chicken consumers. Although chicken has a lower feed conversion ratio compared to beef and pork, similar to pork, increasing chicken consumption will likely increase use and import of grains. Also like pork, building a stable supply system will become a major issue in the future.

4. Trends in Food and Livestock Product Consumption in the Declining Population Phase

Next, let us examine the trends in food consumption in Japan, the population of which will decline in the future. The examination is based on the data created by the Ministry of Agriculture, Forestry and Fisheries.

Figure 13 shows future changes in Japan's aging society and population projections. Japan's population started to decrease after peaking in 2010 at 128 million and is expected to decrease to 86.7 million in 2060, a fall of 67% of its peak in 2010. In this declining population phase, the percentage of people age 65 or older will increase rapidly from 23% (2010) to 39.9%, meaning almost 40% of the population will be at least age 65. Given these circumstances, the per capita energy intake per day (Fig. 14)

Fig. 13 Changes in Japan's Aging Society and Population Projections



Data: *Population Census* by the Ministry of Internal Affairs and Communications until 2010; after 2015, the results of *Population Projections for Japan* (calculated in Jan. 2012) by the National Institute of Population and Social Security Research (IPSS), assuming medium fertility/medium mortality
Note: The total numbers for 1950 to 2010 include people of unknown ages.

Source: Policy Research Institute of the Ministry of Agriculture, Forestry and Fisheries

will decrease from 2,430 kcal (2012) to 1,971 kcal (2050) in terms of nutrient supply in calories, and from 1,874 kcal to 1,542 kcal in terms of energy intake. Total food consumption (Fig. 15), one factor behind the population decline, is expected to decrease 38%, from 309.8 billion kcal (2012) to 191.3 million kcal (2050). This suggests the arrival of a state in which people consume only about 60% of the energy being consumed currently. However, this figure is an energy-based estimate. In terms of monetary amounts (Fig. 16), assuming future economic growth, if one sets per capita food consumption expenditures in 2010 as 100, such expenditures will be 117 in 2050. Total food consumption expenditures will be 83, down about 18% considering the declining population. This means, in terms of monetary amounts, that consumption will decrease about 20%.

Thus, due to the aging and declining of the population, by 2050 Japan's food consumption is expected to decrease to about 60% in terms of energy and 80% in terms of monetary amounts compared to its current level. Whether the current level of production will decrease in tandem depends on an understanding of the changes in the structure of food consumption during this period and enhancement of the reputation of domestic livestock products in different consumption scenarios.

Fig. 14

(1) Projection of Per Capita Energy Intake and Nutrient Supply in Calories Per Day

Assuming the downward trend in food consumption due to lifestyle changes continues (Assumption 1), cohort analysis projects that energy intake will fall to about 85% of the estimated energy requirement for Physical Activity Level 1 by 2050. Therefore, projections are made with two additional patterns assuming that the decrease in energy intake will stop at a certain lower limit in the future.

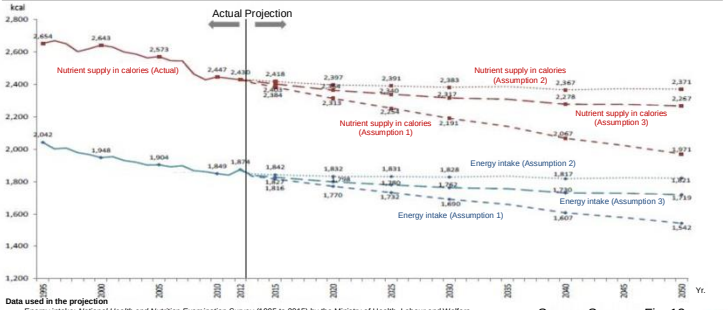
Projection method

- Based on the factor-analyzed effect of aging, period effect, and cohort effect, after making projections by gender and age group, the average energy intake per year was calculated from the *Population Projections for Japan* under different assumptions (three patterns) of future period effect.
- As for nutrient supply in calories, based on the *National Health and Nutrition Examination Survey*, the per capita nutrient supply in calories per day from 1995 to 2012 was broken down by gender and age group, and future values were projected using a technique similar to the above.

Assumption 1: The future period effect is based on an extension of the average rate of change of the period effect during 1995 to 2012 (i.e., the downward trend in food consumption due to lifestyle changes will continue).

Assumption 2: A lower limit is set for the future period effect (with regard to the downward trend in food consumption due to lifestyle changes, the lower limit is set in such a way that energy intake will not fall below 100%* of the energy requirement for Physical Activity Level 1 (mostly sitting/inactive during the day).) (* In terms of energy intake, 2,050 kcal for males and 1,610 kcal for females; in terms of nutrient supply in calories, 2,650 kcal for males and 2,110 kcal for females)

Assumption 3: A lower limit is set for the future period effect (with regard to the downward trend in food consumption due to lifestyle changes, the lower limit is set in such a way that energy intake will not fall below about 95%* of the energy requirement for Physical Activity Level 1 (mostly sitting and inactive during day).) (* In terms of energy intake, 1,900 kcal for males and 1,500 kcal for females; in terms of nutrient supply in calories, 2,500 kcal for males and 2,000 kcal for females)



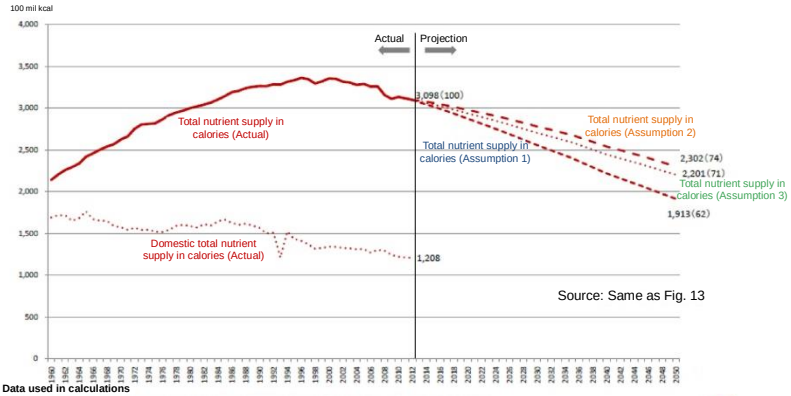
Data used in the projection
Energy intake: *National Health and Nutrition Examination Survey* (1995 to 2015) by the Ministry of Health, Labour and Welfare
Nutrient supply in calories: *Food Balance Sheet* by Japan's Ministry of Agriculture, Forestry and Fisheries
Population projections: *Population Projections for Japan* (calculated in Jan. 2012) by IPSS

Source: Same as Fig. 13

Fig. 15

(2) Projection of Total Food Consumption Factoring in Population Decline (Total Nutrient Supply in Calories)

- Total nutrient supply in calories from food per day (100 million kcal) up to 2050 was calculated by multiplying projected per capita food consumption (nutrient supply in calories) by Japan's population projections.
- When setting total nutrient supply in calories in 2010 to 100, the projected values for 2050 fall drastically to 62 in the case of Assumption 1, 74 in the case of Assumption 2, and 71 in the case of Assumption 3.



Source: Same as Fig. 13

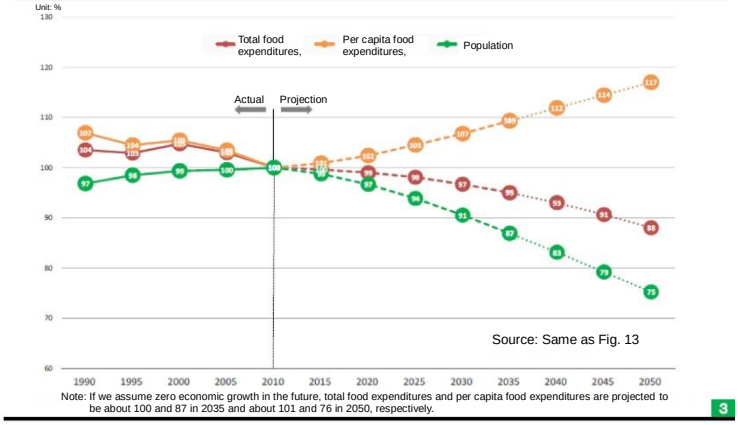
Data used in calculations
Population projections: *Population Projections for Japan* (calculated in Jan. 2012) by IPSS
Nutrient supply in calories: *Food Balance Sheet* by Japan's Ministry of Agriculture, Forestry and Fisheries

Fig. 16

(3) Projection of Total Food Expenditures and Per Capita Food Expenditures (2010 Expenditures = 100)

- Because of the future acceleration of the population decline, the food consumption market will gradually shrink (also in terms of total food expenditures).
- However, assuming future economic growth, the previous downward trend will reverse and per capita food expenditures are expected to increase. Therefore, the rate of decrease in total food expenditures in the future will be less than the rate of decrease in population.

(Reference) The real GDP growth rate up to 2022 is from *OECD-FAO Agricultural Outlook 2013–2022*. It will increase about 1.6% until 2022 and maintain that level thereafter.
(Total food expenditures) = (Per capita food expenditures) × (Population)



Source: Same as Fig. 13

Note: If we assume zero economic growth in the future, total food expenditures and per capita food expenditures are projected to be about 100 and 87 in 2035 and about 101 and 76 in 2050, respectively.

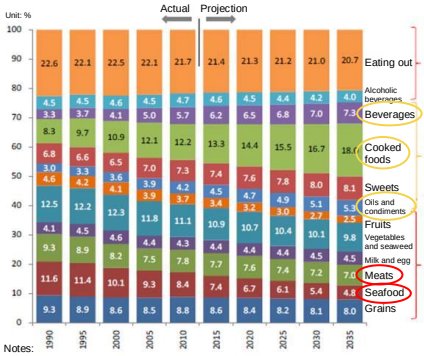
Figure 17 shows projections of food consumption by item. The table indicates that the percentages of household consumption will shrink further and further, and the restaurant segment will also decrease slightly in the future. The only segment expected to grow is the prepared food segment. Only consumption of deli and ready-made staple food items is expected to increase, from 12.2% in 2010 to 18% in 2035. Figure 18 illustrates the factors in detail. In Japan, with its increasingly aging and declining population, it is expected that the percentages of single-person households will also increase rapidly. Compared to households of two or more persons, single-person households tend to do less cooking at home and eat out less frequently. As a result, they purchase less perishable food. On the other hand, they use processed food more frequently, and as a result, the percentage of prepared food (processed, etc.) purchasing will increase across all types of food consumption.

Fig. 17

(4) Projection of Food Expenditures by Item (All Households)

- Examining food expenditures for 12 items, the percentages of seafood, meats, vegetables and seaweed, fruits, and grains will continue to fall.
- Meanwhile, the percentages of cooked foods, oils and condiments, beverages, and sweets are expected to rise.

→ Without bringing in demand from the processing and food service segments, where imported items traditionally occupy a high share, in line with changes in food consumption behaviors, there is a concern that the domestic livestock and seafood product markets will shrink.



Expenditure Category	Specific Items
Eating out	Restaurants, school lunches
Alcoholic beverages	
Beverages	Teas, coffee, cocoa, and other beverages
Cooked foods	Ready-made staple foods and other cooked foods
Sweets	
Oils and condiments	Oils and fats, and condiments
Fruits	Fresh fruits and processed fruit products
Vegetables and seaweed	Fresh vegetables, dried foods and seaweed, processed soybean products, and other processed vegetable/seaweed products
Milk and egg	Milk, milk products, and eggs
Meats	Fresh meats and processed meat products
Seafood	Fresh seafood, dried-salted seafood, fish meat products, and other processed seafood products
Grains	Rice, breads, noodles, and other grains

Notes:
1. Up to 2010, data consists of actual values calculated from surveys (e.g., household expenditure surveys and national surveys of family income and expenditures); values thereafter are projected values (2015 onward)
2. Percentages of real values based on 2010 prices

Source: Same as Fig. 13

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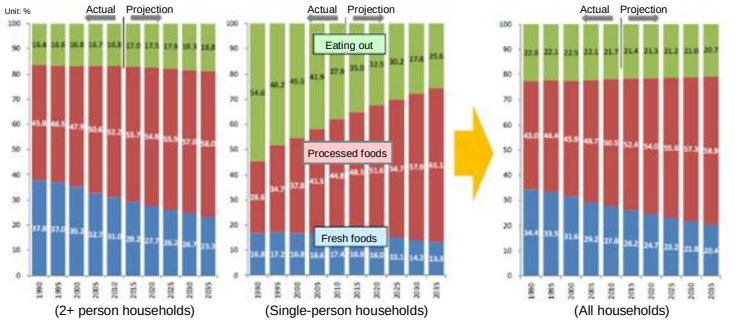
Fig. 18

(5) Externalization of Foods

- One factor behind the increase in per capita food expenditures is that progression of externalization of foods (from eating at home to use of ready-made meals) is expected to shift food expenditures from fresh foods to high-value-added processed foods.
- The percentages of fresh foods have declined and will continue to decline drastically: 34% (1990) → 28% (2010) → 20% (2035).
- In particular, among the increasing number of single-person households, the weight of processed food will increase significantly due to conversion from eating out and the shift away from fresh foods.



Notes:
1. Up to 2010, data consists of actual values calculated from surveys (e.g., household expenditure surveys and national surveys of family income and expenditures); values thereafter are projected values (2015 onward)
2. Fresh foods include rice, fresh seafood, fresh meats, milk, eggs, fresh vegetables, and fresh fruits.

Source: Same as Fig. 13

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To apply these results to livestock product consumption, we see that, as mentioned in Section 2, while beef and chicken are mostly consumed at home or restaurants at present, and much pork is consumed at home, about 25% of pork is used for processing, indicating its high processing suitability. Therefore, one can infer that dwindling food consumption and future changes in the structure of food consumption will more greatly affect beef and chicken than pork.

5. The Direction of Future Livestock Product Production and Sales

Based on the above analyses, this section examines the direction of future livestock production in Japan. Using the results described in the above sections, this section examines livestock product production and sales for the domestic market as well as livestock product production and sales (exports) for other Asian countries.

Given dwindling food spending at home and restaurants as well as an increase in spending on ready-made meals accompanied by the declining and aging population as well as an increasing number of single-person households, regarding production of livestock products for the domestic market, it will become important to enhance processing suitability through efforts such as

developing and improving cooking techniques well suited for ready-made meals (processing) in addition to continuing previous efforts for households and restaurants. At present, pork has the highest processing percentage. For meats and poultry such as beef and chicken, which are served as main dishes at homes and restaurants, it will be important to come up with creative ways to more easily use them as ready-made staple food and deli items. To compete against foreign livestock products, domestic livestock products will be required to be sufficiently competitive and function as convenient ingredients for ready-made meals (processing) in terms of cost (price). In addition to further cost-cutting in Japan, breed improvement is required to enhance the processing suitability of end products, promote primary producers' diversification into processing and distribution ("sixth sector industrialization"), and further promote agriculture-commerce-industry cooperation.

Moreover, as for the sales (export) business directed at other Asian countries, which is still in its infancy, it will become increasingly important to produce livestock products suitable for the needs of fast-growing Asian countries. Rapid expansion of consumption of livestock products in Asian countries should give rise to opportunities for consumption of diverse livestock products. At present, only beef is a major export. However, further promotion and popularization of Japan's food culture in other Asian countries will expand the opportunities available for Japanese pork and chicken exports. In such a case, sales of market-oriented livestock products that meet the needs of individual countries will greatly expand export opportunities. Therefore, it is critical to carefully observe Asian livestock product markets, which are expected to grow even further; to accurately understand the latent needs that exist in these markets; and to promote detailed production to develop domestic livestock products to meet such latent needs.

The Food Situation as Asia Rises

The Situation for Beef Globally and in Asia, and Japan's Domestic Beef Exports

Hiroshi Takahashi
Executive Director
Bridge International Inc.

Introduction

"The sleeping old tiger finally awoke. As a result, the world's meat supply is rapidly becoming increasingly tight." This sleeping old tiger is, of course, China. Seven years ago, I reported about the rapid expansion of China's food market before the Beijing Olympics, surging pork prices, bioethanol, and food safety in an article in a major meat trade magazine entitled "China rocked by food: Examining this mass producer and consumer of meat."

This trend in China's economic growth continues today even after the Olympics and Shanghai Expo; two years ago, the country finally surpassed Japan in terms of GDP to become the world's second largest economy (behind the U.S.) Nowadays, we often come across affluent Chinese businesspeople who have benefited from China's real-estate bubble and expansion into business areas such as IT, textiles, electrical appliances, and automobiles, as well as an increased number of civilian travelers due to eased tourist visa requirements, who enjoy marbled *Wagyu* beef and expensive sushi in Japan. Just a dozen years ago, such scenes were a rarity.

In the past, Japan's basic meat supply and demand could be predicted by understanding the situations of two major production areas: North America and Oceania for beef, and North America and Europe for pork. Today, however, we must also consider the production situations in South America (e.g., Brazil and Argentina) and the BRIC nations (e.g., China, Russia, and India), which include mass producers and consumers.

Last year, in a paper entitled "The Relationship between China's Economic Growth and Pork Production & Feed Grains," I examined the impact China's pork production and consumption, which have grown markedly in recent years, have on grain supply and demand in the global market. I predicted pork supply and demand as well as distribution trends in China, which accounts for half of all pigs on feed as well as total pork production and consumption volumes globally, based on data such as demographics, personal incomes, and changes in urban populations. I also explained that trends in China significantly affect the basic supply and demand for meat and feed grains not only in Asia but also worldwide.

In this article, I would like to focus on the beef segment, which is an important domestic user of corn for animal feed as well as Japan's best prospect for meat exports, and also examine the current state of beef supply and demand globally as well as predict future trends. I hopes this article will prove helpful in marketing Japan's domestic beef to Asia, where further economic growth and trade liberalization (EPA, FTA, etc.) continue to advance.

Table 1 Rankings of Beef-producing Countries

	2010	2011	2012	2013	2014 (estimate)	2015 (estimate)
U.S.	12046	11983	11848	11752	11126	10868
Brazil	9115	9030	9307	9675	9920	10215
EU	8101	8114	7708	7384	7475	7475
China	6531	6475	6623	6700	6525	6400
India	3125	3308	3491	3800	4100	4250
Argentina	2620	2530	2620	2850	2820	2850
Australia	2129	2129	2152	2359	2510	2340
Mexico	1745	1804	1821	1808	1760	1765
Pakistan	1485	1536	1587	1630	1675	1725
Russia	1435	1360	1380	1380	1390	1400
Canada	1276	1141	1060	1049	1050	1010
Others	8880	8743	8925	9048	9247	8441
(Japan)	512	505	514	506	500	500
Global Total	58488	58153	58522	59435	59598	58739

Source: USDA FAS October 2014; Japan: Agriculture & Livestock Industries Corporation (ALIC) data was converted into CWE. 2014–15 figures are the author's estimates.

Note: Weight is expressed in 1000-ton carcass weight equivalent (CWE)

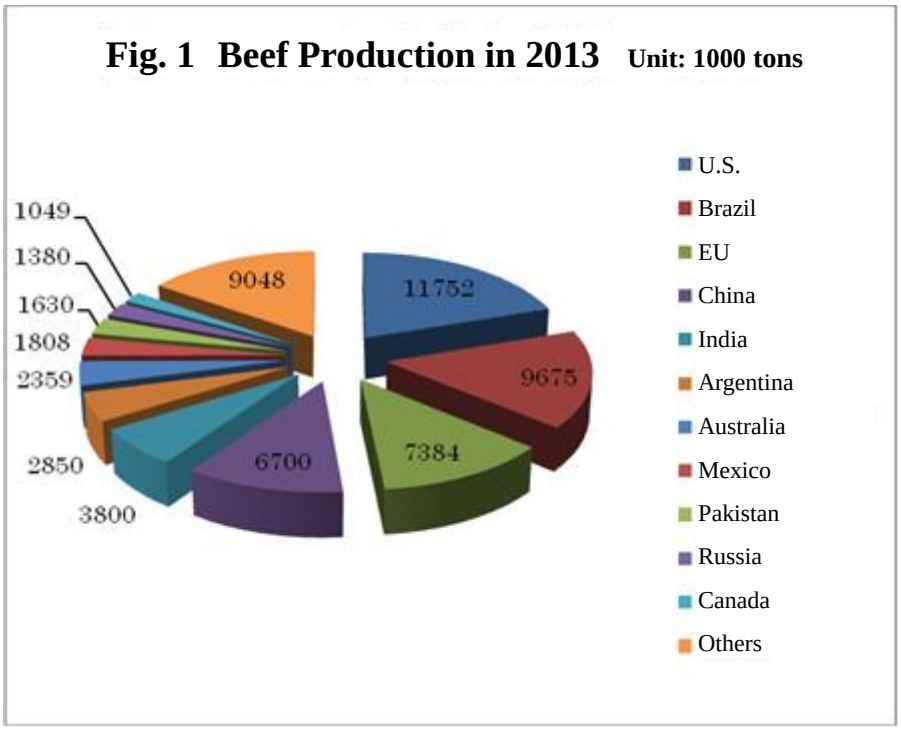


Fig. 1 Beef Production in 2013

Source: Prepared by the author based on Agriculture & Livestock Industries Corporation (ALIC) data.

Table 1 and Fig. 1 show beef production in the world's major beef-producing countries. Five countries and regions—the U.S., Brazil, EU, China, and India—account for almost two-thirds of the world's total beef production. Western countries are the traditional consumers of beef, while beef consumption in China and Russia has been increasing mainly because of recent economic growth. Depending on their political situations, these countries may suddenly stop importing or barge into the buying competition without notice, causing trouble for international beef prices.

South American countries, which have traditionally been beef exporters, used to be ridden with foot-and-mouth disease (FMD). Thus, they exported beef to wet markets (local markets that sell fresh meat and produce) of countries having relatively lax quarantine requirements for FMD, such as Hong Kong and Southeast Asia, in addition to distribution within their own regions. However, partly because these countries became FMD-free zones in recent years, they have stepped into the beef trading limelight by starting to export beef to East Asia, including Japan, as well as Europe and the U.S.

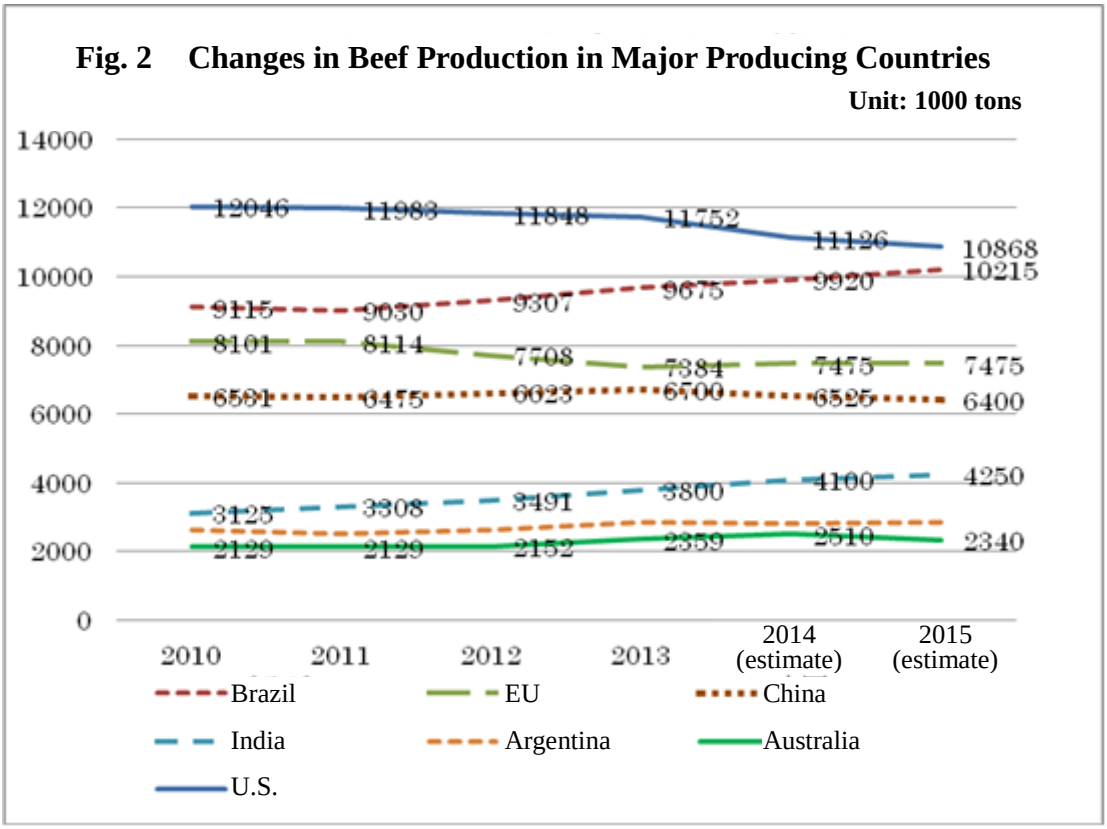
As for India, many readers may think Indians do not eat beef because Hindus believe cows are sacred. However, many non-Hindus, such as Muslims and Christians, live in India, and Indians have surprisingly been producing and consuming a large quantity of beef for a long time. I once heard that some Hindus considered water buffaloes not to be cows and ate their meat. Production of beef and water buffalo meat is increasing in India. In addition, it has been reported the amount of beef exports to Islamic states has been increasing.

In China, even though farmers are desperate to increase production since beef prices continue to surge, a shortage of forages due to reasons such as desertification of pasture land is expected to flatten out or decrease beef production in the future. Therefore, beef must be imported in order to meet the growth in consumption; consequently, Chinese purchases of beef from overseas will increase in the future.

Note that China concluded an FTA with New Zealand in April 2008, and tariffs on 96% of items exported to China will be eliminated by 2018 (tariffs on beef will be eliminated in 2016). Moreover, China also concluded an FTA with Australia on November 17, 2014, and this will go into effect in 2015. The present 12–25% tariff on beef will gradually be eliminated over nine years. As a result, the trend in increased beef imports from Oceania will no doubt accelerate.

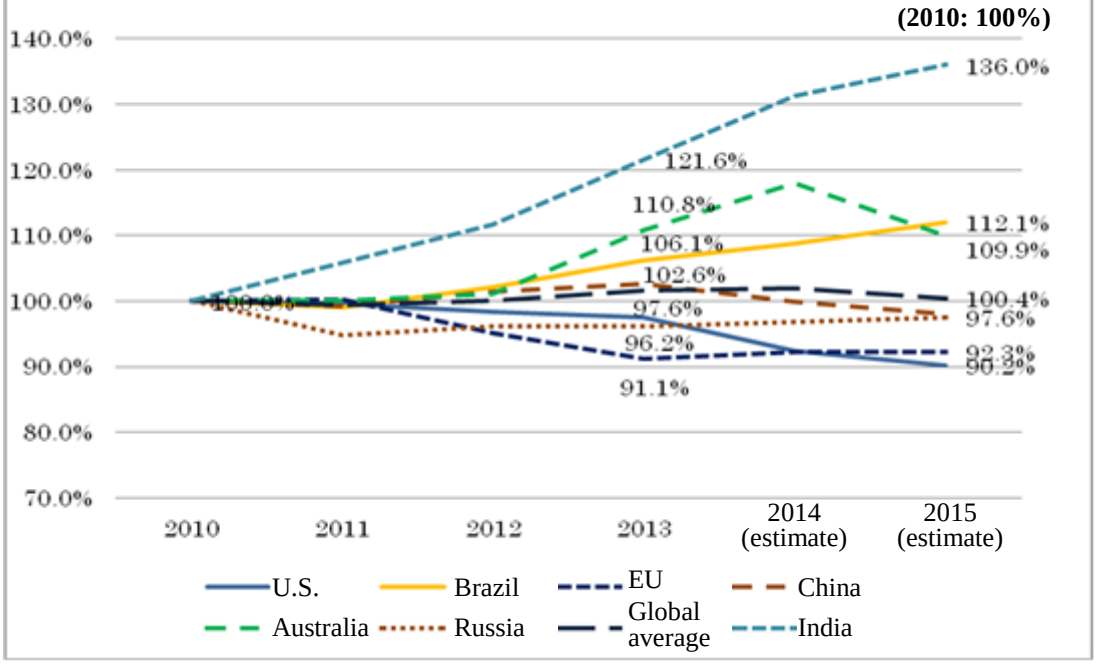
According to IMF's predictions, in 2019 China's population will grow 40 million from its 2013 total, surpassing 1.4 billion, and India's population will increase 100 million to reach 1.345 billion, thereby pushing up demand for meat. (Refer to Figs. 4 and 5.)

Fig. 2 Changes in Beef Production in Major Producing Countries



(Fig. 2) Source: Graph of the data in Table 1

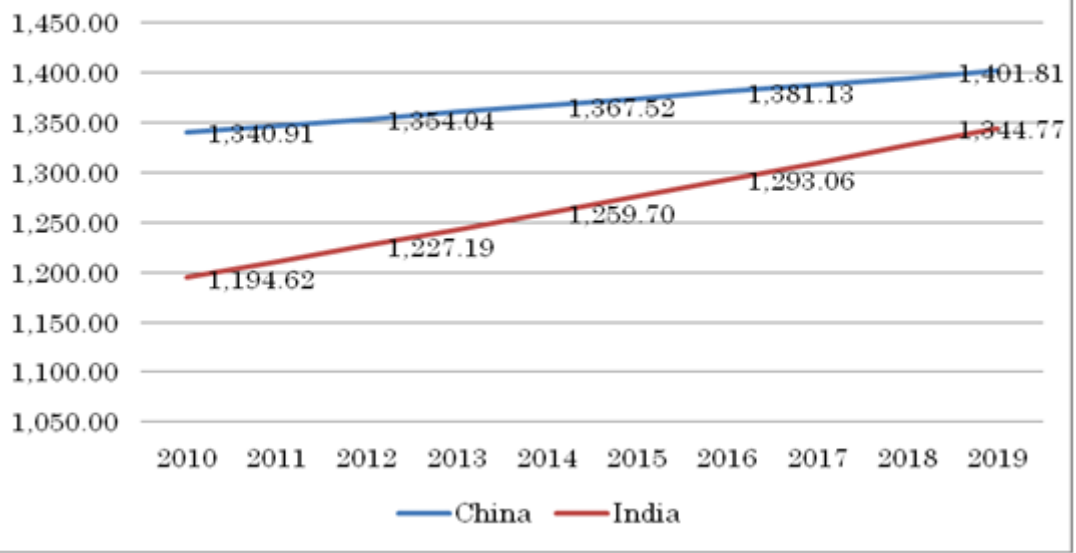
Fig. 3 Changes in Beef Production in Major Producing Countries



(Fig. 3) Prepared by the author based on Table 1.

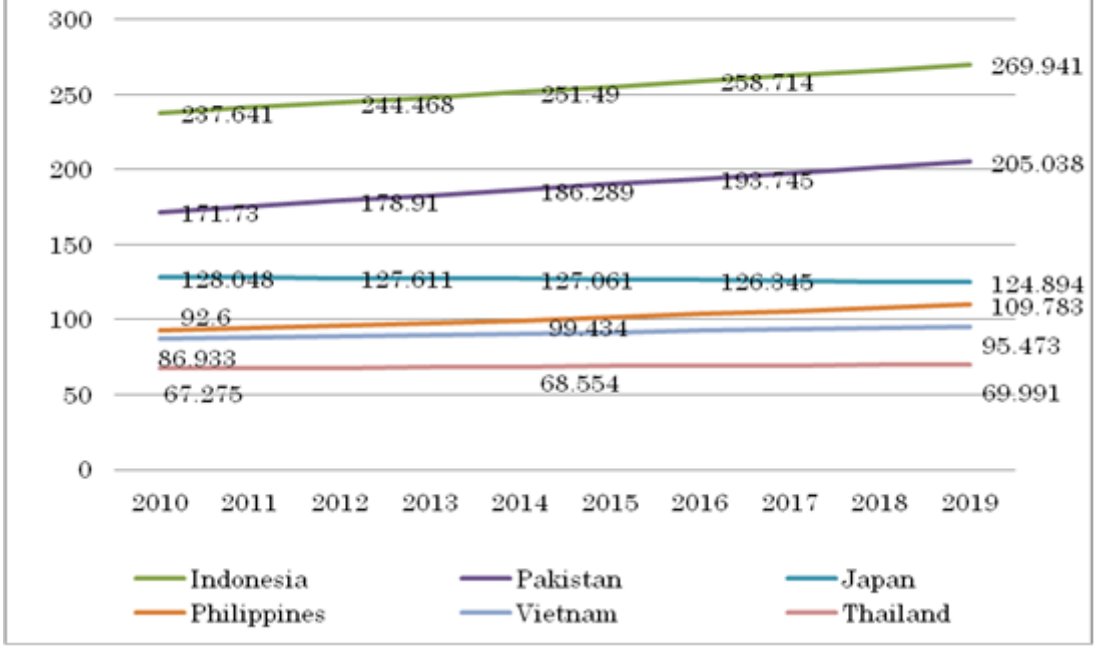
Fig. 4 Changes in Population in China and India

Unit: mil. people



Source: IMF World Economic Outlook Database, October 2014

Fig. 5 Changes in Population in Major Asian Countries **Unit: mil. people**



Source: IMF World Economic Outlook Database, October 2014

Beef Supply Situations in Australia and the U.S. in 2014

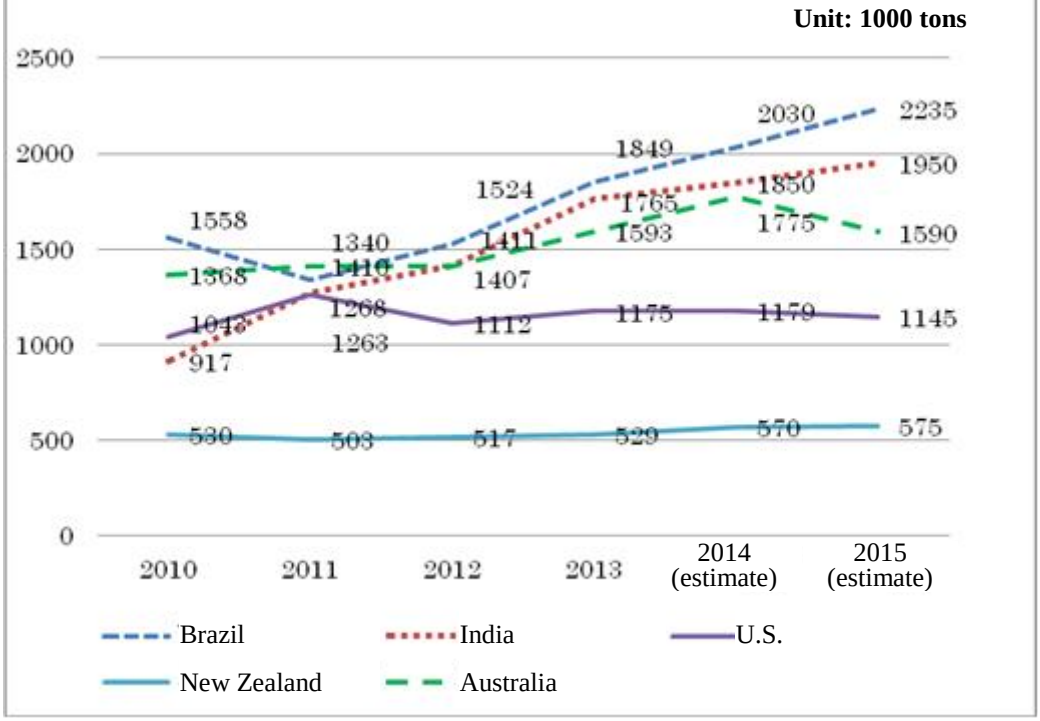
Next, let us examine the situations in Australia and the U.S., two countries which have a huge effect on supply and demand of imported beef in East Asia.
Since the production figures of countries in Fig. 2 vary too widely, in order to more clearly show increases and decreases in beef production, I prepared a graph of changes using 2010 as the base year (100%), which is shown in Fig. 3. Australia's production is 110.8% in 2013 and 117.9% in 2014 (estimate), indicating the country has the highest growth rate.

This is because shipments of adult cattle have increased due to the drought that started the year before, and in addition, Australia has maintained a high level of exports to the U.S., whose beef production fell, and to China, where beef consumption is brisk. Moreover, the weakening of the Australian dollar against the U.S. dollar helped exports in terms of costs. Therefore, the USDA predicts Australian beef production will reach a record-high 2.51 million tons in 2014. However, since Australia's cattle herds will be rebuilt in 2015 to cope with the previous drought, shipments of adult cattle are expected to decrease. Consequently, the USDA is predicting that expected increases in the price of live cattle will reduce beef production by about 7%.

Next, in the U.S., because of the Corn Belt drought of 2012, said to be the worst in 70 years, an increased number of breeding cows were slaughtered. As a result, one observes a drop in beef production in 2013 and thereafter. According to USDA predictions, production will be 11.126 million tons in 2014 and 10.868 million tons in 2015, showing a significant decline from the 2010 production of 12.046 tons (2014: 92.4%, 2015: 90.2%). Breeding cows give birth to their first calves when 24 months old; subsequently, they give birth to just one calf per year. Moreover, since fattening beef cattle are raised for 16–20 months in the U.S., even if production of breeding cows was increased from 2013, the USDA predicts that U.S. beef production may remain low for another three and a half years, until 2016–7.

Therefore, the price of U.S. beef as well as the volume of beef imported from Australia are expected to remain high. According to USDA predictions, U.S. imports in 2014 are expected to exceed a year-on-year increase of about 19%. The main reasons are reduced U.S. beef production, rising prices, and the strong U.S. dollar. Therefore, the price of ground beef (e.g., Australian cow meat) for hamburgers will remain high due to the surging price of U.S. beef.

Fig. 6 Changes in Beef Exports



(Fig. 6) Source: USDA FAS October 2014

Trends in Beef Consumption in Major Countries

Next, we shall examine the state of beef consumption in major countries.

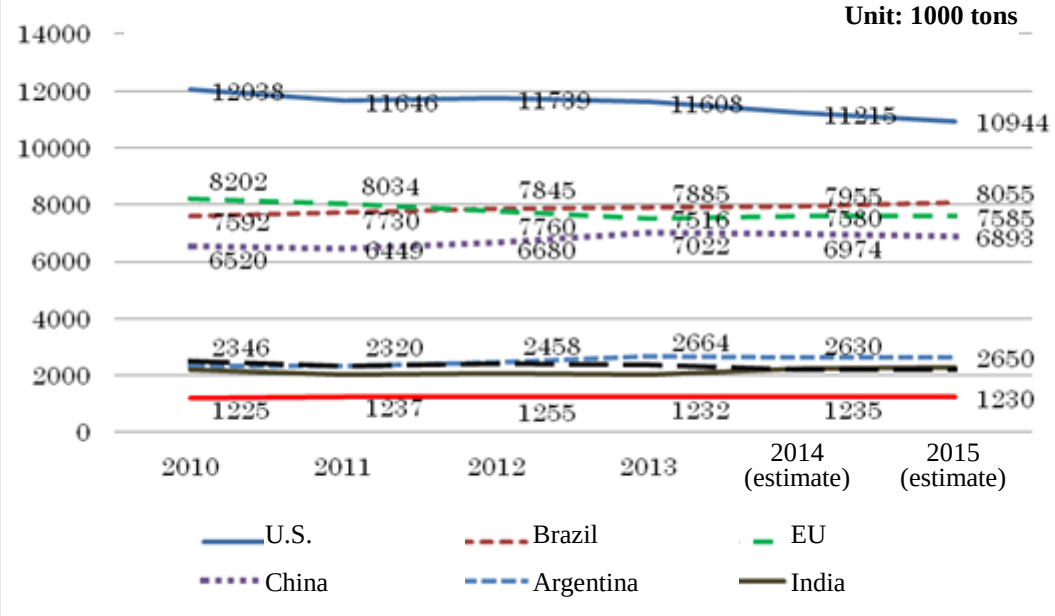
Table 2 Rankings of Beef-consuming Countries

	2010	2011	2012	2013	2014 (estimate)	2015 (estimate)
U.S.	12038	11646	11739	11608	11215	10944
Brazil	7592	7730	7845	7885	7955	8055
EU	8202	8034	7760	7516	7580	7585
China	6520	6449	6680	7022	6974	6893
Argentina	2346	2320	2458	2664	2630	2650
India	2208	2040	2080	2035	2250	2300
Russia	2488	2346	2406	2386	2205	2215
Mexico	1938	1921	1836	1874	1815	1810
Pakistan	1451	1503	1538	1576	1616	1661
Japan	1225	1237	1255	1232	1235	1230
Canada	1003	996	1019	1016	979	940
Others	10380	10256	10428	10882	11380	10601
World Total	57391	56478	57044	57696	57834	56884

Source: USDA FAS October 2014

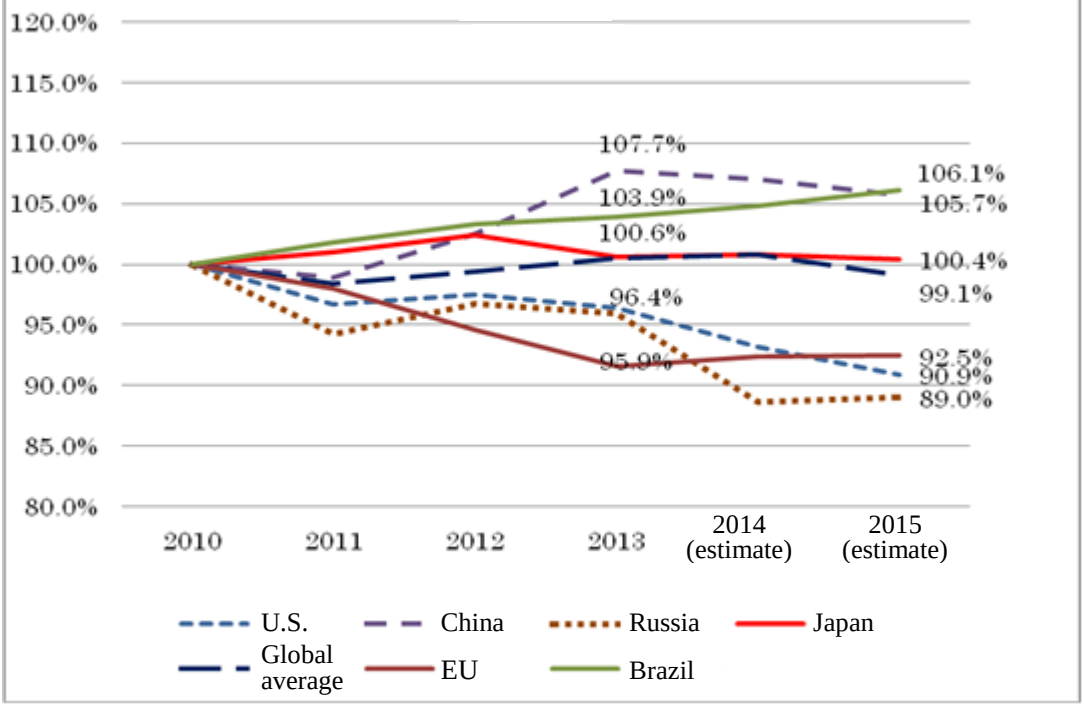
Note: Weight is expressed in 1000-ton carcass weight equivalent (CWE); Hong Kong is included in the China figures.

Fig. 7 Changes in Beef Consumption



(Fig. 7) Source: Graph of the data in Table 2

Fig. 8 Changes in Beef Consumption (2010: 100%)



(Fig. 8) Source: Prepared by the author based on Table 2.

As shown in Table 2, the major beef consumers in Asia are China, Japan, India, and Pakistan, but per capita beef consumption in Asia is less than that of Europe, the U.S., and South American countries. These Asian countries rank highly because of their large populations. In recent years, beef consumption in other Asian nations is also increasing in tandem with economic development. Although Japan is the tenth largest beef consumer in the world, it only consumes less than 10% the amount of the U.S., the world's top consumer. Except for certain "Japan items" such as ribs and tongue, Japanese consumers do not exert enough influence to affect international beef prices.

Now I will describe the current general situation from the perspective of consumption, i.e., demand. As with production volume, it is difficult to compare changes in consumption. Therefore, in Fig. 5 I prepared a graph of changes in the increase and decrease of beef consumption with 2010 as the base year (100%). In 2013, China was the country for which beef consumption increased the most among major consumers, followed by Brazil. Japan's consumption increased slightly.

Meanwhile, consumption dropped in the EU, Russia, and the U.S. The main reasons were the high price of beef, and in the case of Russia, the embargo on beef from Europe and the U.S. due to the Ukraine situation. Although the situation in the Ukraine is likely to improve slightly over time, according to USDA predictions, Russia's consumption will not increase. The U.S. appears to be anticipating a prolonged Russian embargo.

China's Beef Consumption, with the Highest Growth Rate among Asian Countries

Regarding the growth in China's beef consumption, one obvious reason is increased demand for relatively high-priced beef due to increased incomes that make such beef affordable. Other reasons include, as I pointed out previously, a boom in traditional Chinese dishes (hot pots and *shabu-shabu*), the popularization of Western-style food (e.g., hamburgers), and the influence of Japanese food, such as beef bowls.

Table 3 China's Top 30 Food Service Companies in 2013

Rank	Company Name	Business Category/Brand	Remarks
1	Yum! Brands Inc., China Division	KFC, Pizza Hut, Mongolian hot pot "Xiao Fei Yang"	Hot pots: beef, mutton
2	天津顶巧餐饮服务咨询有限公司	Chicken burger "DICOS," Taiwanese beef noodles「康師溥」	Beef noodles
3	四川海底捞餐饮股份有限公司	Mega-chain Sichuan hot pot restaurant "Hai Di Lao Hot Pot"	Hot pots: beef, mutton
4	Tao Heung Group	Seafood hot pot "Tao Heung," "Tao Square," "Ringer Hut," etc.	Hot pots: beef, mutton
5	河北千喜鹤饮食股份有限公司	Operates mess halls for the People's Liberation Army; leading industrial caterer	
6	Inner Mongolia Xiao Wei Yang Catering Franchise Co., Ltd.	Mongolian hot pot "Little lamb"	Hot pots: beef, mutton
7	浙江两岸食品连锁有限公司	Café restaurant "Liang An Ka Fei"	
8	重庆市毛哥食品开发有限公司	Duck soup restaurant 「毛哥老鴨湯」	
9	重庆刘一手餐饮管理有限公司	Chongqing hot pot「劉一手」	Hot pots: beef, mutton
10	福州佳客来餐饮连锁有限公司	Steak chain restaurant「佳客来牛排」	Beefsteak
11	Quanjude Group Holding Company	Peking duck "Quanjude," Sichuan cuisine "Sichuan Restaurants," etc.	
12	Guangzhou Real Kungfu Catering Management Co., Ltd.	Rice-based fast food "Real Kungfu"	Beef bowls
13	Chongqing Dezhuang Industry Group Co., Ltd.	Chongqing hot pot "DeZhuang"	Hot pots: beef, mutton
14	重庆陶然居饮食文化集团（股份）有限公司	Sichuan cuisine「陶然居」	
15	Ajisen (China) Holdings Ltd.	Ramen noodles "Ajisen Ramen"	
16	Xiao Nan Guo Restaurants Holdings Limited	Shanghai food "Xiao Nan Guo"	
17	Beijing Huatian Catering Group Corp	Peking food "Hua Tian"	
18	Inner Mongolia Grassland Pastoral Catering Development Co., Ltd	Mongolian hot pot "Grassland Pastoral"	Hot pots: beef, mutton
19	Beijing Dong Lai Shun Group Ltd	Long-established ram *shabu-shabu* restaurant "Dong Lai Shun"	Hot pots: ram
20	重庆五斗米饮食文化有限公司	Chongqing food, Chongqing beef pot「塔尔肥牛火锅」	Hot pots: beef, mutton
21	北京黄记煌餐饮管理有限责任公司	Steam hot pot food「三汁焖鍋」	
22	北京李先生餐饮管理股份有限公司	Chinese noodles fast food "California Beef Noodle King"	Beef noodles
23	重庆市朝天盟餐饮管理有限公司	Mongolian hot pot「重庆朝天门火锅」	Hot pots: beef, mutton
24	Xiabu Xiabu Catering Management Co., Ltd.	Taiwanese *shabu-shabu* "Xiabu Xiabu"	Hot pots: beef, mutton
25	The mother dumpling restaurant group co., LTD	Potsticker soup restaurant "Sui Cao Dai Nuong"	
26	重庆巴将军饮食文化发展有限公司	Chongqing hot pot「巴将軍」	Hot pots: beef, mutton
27	Zhejiang Triumphal Arch Macao Doulao Group CO.,LTD	Macao Doulao hot pot "Triumphal Arch"	Hot pots: seafood
28	Chongqing Qinma Catering Management Co., Ltd.	Chongqing hot pot "Qin Ma"	Hot pots: beef, mutton
29	Jiangsu Yacheng Pinshang Catering Management Co., Ltd.	Macao Doulao hot pot "Pin Shang"	Hot pots: seafood
30	Beijing Yoshinoya Fast Food Co., Ltd	Beef bowl Yoshinoya	Beef bowls

Released by the China Cuisine Association on April 19, 2014

Note:

1) Although McDonald's China ranks second in terms of size, it is not included in this ranking because it does not publish sales and other business statistics.
2) Beef items used:

Hot pots (chuck rolls, short plates, briskets, cube rolls, etc.)
Beef noodles (rib fingers, shin shanks. briskets, Achilles tendons, etc.)
Beef bowls (short plates, briskets, etc.)

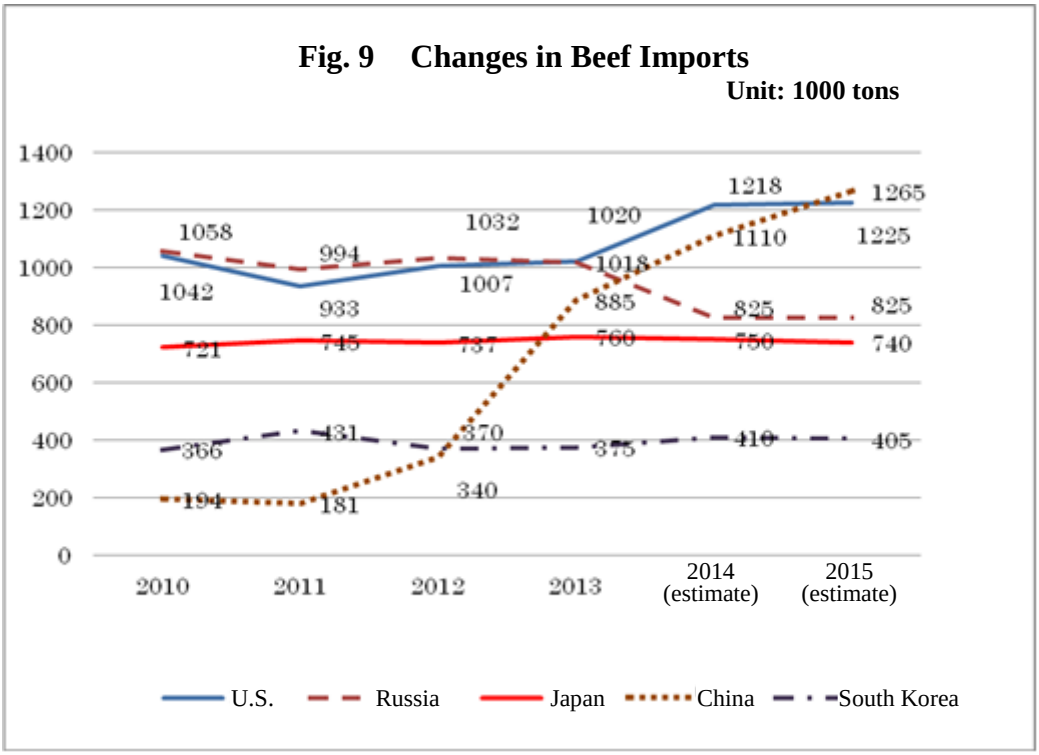
Table 3 lists the top 30 out of the top 100 food service companies in China based on statistics released from the China Cuisine Association on April 19, 2014. I have added brief descriptions of business categories and brands. The biggest company, Yum! Brands Inc., China Division, is a Chinese subsidiary of a U.S. food service company, Yum! Brands, Inc. As of the end of 2013, this massive enterprise operates 4,500 KFC restaurants, 1,200 Pizza Hut restaurants, and 400 Xiao Fei Yang (Little Sheep) restaurants which serve Mongolian hot pots throughout China. The third-ranked Hai Di Lao Hot Pot restaurant, whose specialty is Sichuan hot pots, has in recent years developed a restaurant chain across China at a rapid pace. This mega-chain food service company operates 97 hot pot restaurants (as of the end of 2013), each of which seats 250 to 1,200 people.

As is well known, many consumers in China have concerns about the safety of the food used in restaurants because of the number of food-related incidents that have occurred recently. Thus, hot pots, for which customers can see the ingredients themselves and add their favorite sauces and spices, have naturally captured the hearts of the Chinese during the last ten years. It is worth noting that many Chinese-style hot pot restaurants at which large amounts of beef and mutton are consumed—especially Mongolian, Sichuan, and Chongqing hot pot restaurants—appear on the list. The fact that 15 of the top 30 companies are hot pot chain restaurants is quite symbolic.

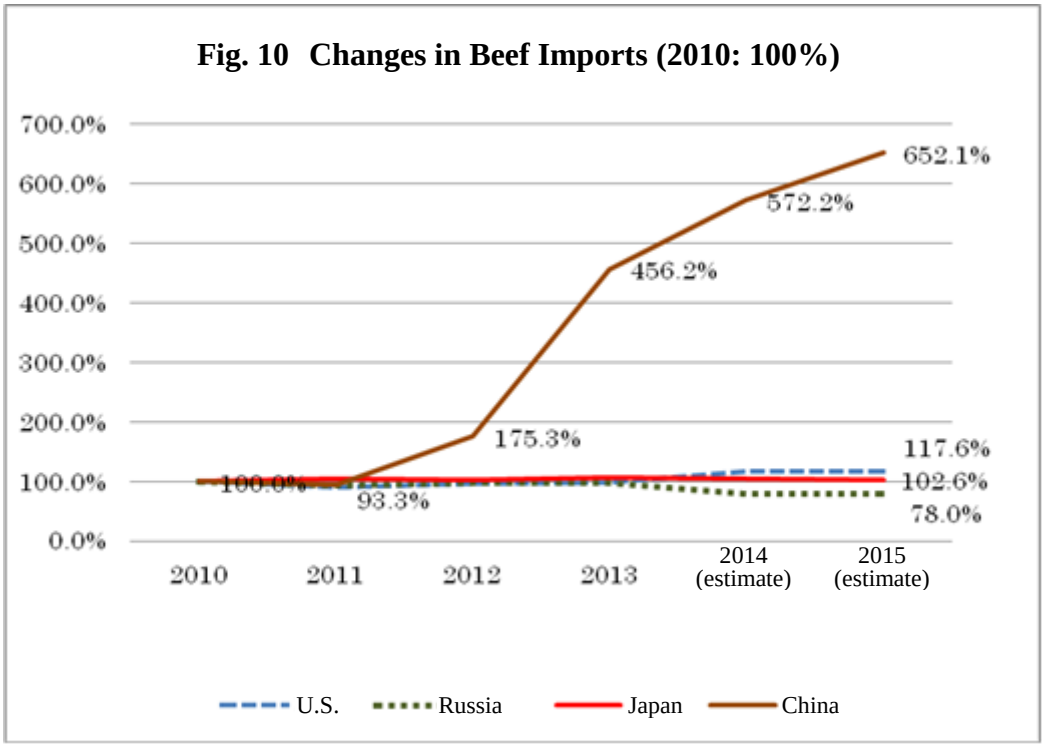
These hot pot restaurants use frozen beef and mutton, serving meat half-thawed and thin-sliced. In the case of beef, the restaurants previously used ribs and shoulders of Chinese domestic beef, which are the cheapest parts, for these thin slices. However, these days such parts are in short supply, so they have started to use more expensive imported short plates, navels, and briskets as well as chuck rolls, the parts that were previously mainly consumed in Japan.

In recent years, vast quantities of ribs, which are used for beef bowls and Korean barbecue, have also been imported in China, which is likely to intensify the buying competition. In addition to the popularization of Western-style food, a key factor behind the higher prices for "Japan items" (e.g., chucks and ribs) is the worldwide popularization of Japanese-style sliced meat dishes (e.g., beef bowls and *shabu-shabu*). Today, Japanese buyers often lose out in the buying competition for these items in international markets.

Please look at Figs. 9 and 10. Since 2012, China's beef imports have been increasing rapidly, increasing to 4.5 times in 2013 (actual result) and 6.5 times in 2015 (USDA estimate) from the 2010 import volume. Note that although USDA statistics treat Hong Kong and China separately, since Hong Kong's import volume is clearly excessive, it seems a significant percentage of Hong Kong imports are sent on to China.



(Fig. 9) Source: Prepared by the author based on USDA FAS data.



(Fig. 10) Source: Prepared by the author based on the Fig. 9 data.

I speculate the reason is that since China officially stopped importing U.S. beef following the discovery of BSE, it now imports U.S. beef via Hong Kong. Tables 4 and 5 show the export counterparts of Japanese beef. It can be inferred that luxury Japanese beef (frozen) used to be exported to mainland China via Viet Nam, but it is now exported via Hong Kong and Cambodia. Of course, as such roundabout import is not official, it may stop due to political or diplomatic changes, such as was the case with Viet Nam. Japanese beef is free of BSE, FMD, hormonal growth promotants (HGP), and Ractopamine (an additive to promote leanness). Toward the removal of non-tariff barriers, I hope government talks are able to open the gate to legitimate beef exports soon. Note that it is thought that most chilled Japanese beef is consumed in export destination countries due to the issue of expiration dates, and there is no roundabout export of such beef to China.

The Japanese Government has designated beef as a key agricultural product and set a target of expanding beef exports from 5.1 billion yen in 2012 to 25 billion yen in 2020. This year, bans on Japanese beef were lifted in Viet Nam as well as the EU and Mexico. Promotion of Japanese beef via public-private cooperation is underway. To promote exports, the universal *Wagyu* mark was established to visually distinguish Japanese *Wagyu* beef from *Wagyu* beef produced in other countries.

Table 4 Export Destinations for Chilled Japanese Beef

Category	Total		Country Name	Quantity (kg)	Share	Country Name	Quantity (kg)	Share	Country Name	Quantity	Share
FY	Quantity (kg)	YoY (%)			(%)			(%)			(%)
2009	225,321	116.5	Hong Kong	133,620	59.3	U.S.	77,750	34.5	Singapore	25,984	11.5
2010	234,496	104.1	Hong Kong	191,975	81.9	Singapore	18,825	8.0	Macau	17,883	7.6
2011	189,106	90.6	Hong Kong	141,278	74.7	Singapore	38,058	20.1	Macau	8,352	4.4
2012	318,452	168.4	Hong Kong	194,142	61.0	Singapore	55,127	17.3	U.S.	43,774	13.7
2013	444,099	139.5	Hong Kong	206,848	46.6	U.S.	116,888	26.3	Singapore	80,810	18.2
2014 (Apr.–Sept.)	291,390	151.6	Hong Kong	115,488	39.6	U.S.	70,771	24.3	Singapore	52,364	18.0

Source: Agriculture & Livestock Industries Corporation (ALIC), Livestock Product Exports from Japan

Table 5 Export Destinations for Frozen Japanese Beef

Category	Total		Country Name	Quantity (kg)	Share	Country Name	Quantity (kg)	Share	Country Name	Quantity	Share
FY	Quantity (kg)	YoY (%)			(%)			(%)			(%)
2009	449,970	125.9	Vietnam	430,884	95.8	Malaysia	7,431	1.7	Hong Kong	5,176	1.2
2010	263,637	58.6	Macau	97,834	37.1	Cambodia	70,272	26.7	Vietnam	59,997	22.8
2011	391,187	169.5	Cambodia	236,457	60.4	Macau	89,358	22.8	Hong Kong	34,281	8.8
2012	626,597	160.2	Cambodia	247,969	39.6	Laos	158,684	25.3	Hong Kong	100,583	16.1
2013	467,460	74.6	Cambodia	182,457	39.0	Hong Kong	91,501	19.6	Mongolia	80,036	17.1
2014 (Apr.–Sept.)	298,694	169.9	Cambodia	152,270	51.0	Hong Kong	48,306	16.2	Tadzhikistan	22,829	7.6

Source: Agriculture & Livestock Industries Corporation (ALIC), Livestock Product Exports from Japan

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Regarding Japanese beef, please look at Figs. 11 and 12, which graphically illustrate Table 6.

Table 6 Changes in the Domestic Carcass Market Price and the Rate of Price Increase Compared to 2009

	Wagyu steer A5	Crossbred steer B3	Rate of *Wagyu* steer A5 price increase	Rate of crossbred steer B3 price increase
FY 2009	¥2,186	¥1,133	100%	100%
FY 2010	¥2,087	¥1,198	95%	106%
FY 2011	¥1,852	¥1,003	85%	89%
FY 2012	¥1,970	¥1,107	90%	98%
FY 2013	¥2,138	¥1,249	98%	110%
Aug. 2014	¥2,165	¥1,264	99%	112%

Source: Agriculture & Livestock Industries Corporation (ALIC). The author calculated the price increase rates.

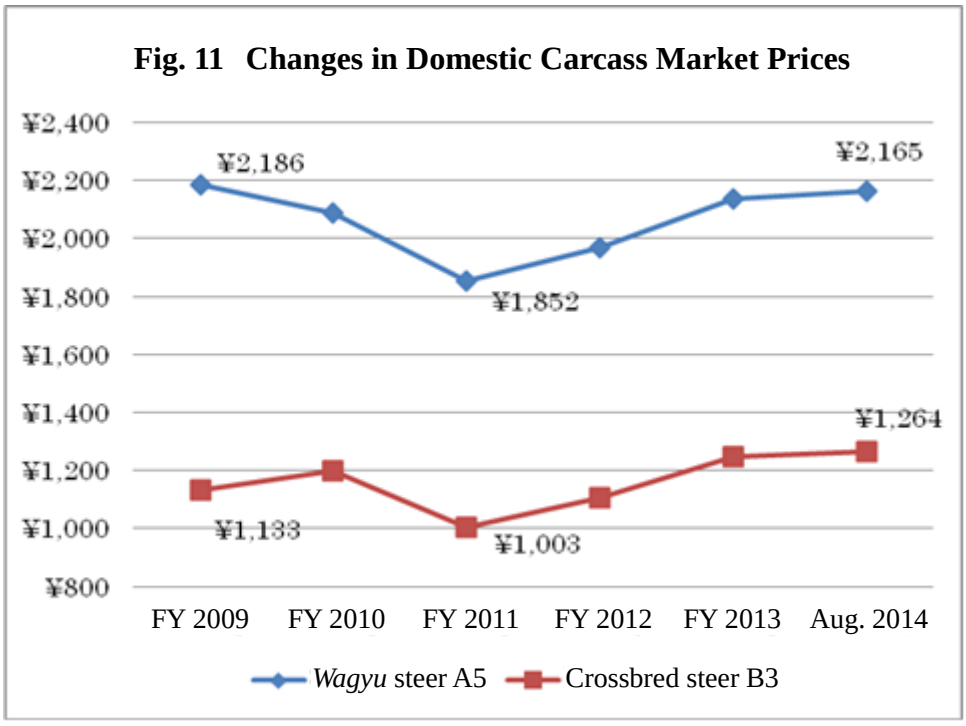
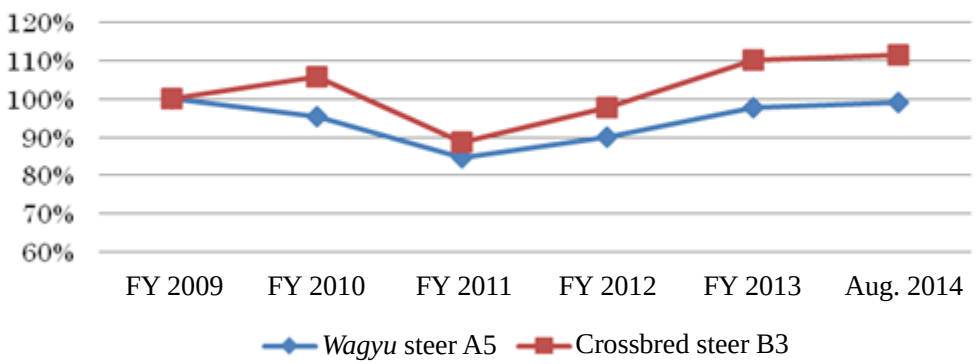


Fig. 11 Source: Graph of the data in Table 6

Fig. 12 Rate of Domestic Beef Price Increase (2009: 100%)



Source: Graph from Table 6 data

Examining these graphs, one sees the price of Japanese beef has remained almost flat, but the price of the highest class A5-grade marbled *Wagyu* beef is comparatively low due to consumers' recent preference for lean red meat. In Japan, the import tariff on beef is used as special-purpose tax revenue for subsidizing fattening and breeding domestic cattle. Moreover, when the prices of feed grains spike, a subsidy is provided from the Compound Feed Price Stabilization Fund (hereinafter, the "Stabilization Fund"). Therefore, the production cost of beef has been relatively stable.

However, the price of U.S. and Australian grain-fattened beef, which will be major competitors for Japanese beef in the export market, more than doubled from the 2009 price (Table 7, Figs. 13 and 14) on a yen basis because of soaring international beef prices and the weak yen noted above. Consequently, the price gap between Japanese beef and U.S. and Australian grain-fattened beef has been greatly reduced (Tables 8 and 9).

At present, *Wagyu* beef produced in Australia is sold in and filters into places like China and Taiwan, where Japanese beef is not imported. It seems most of this Australian *Wagyu* consists of crossbred (F1) with Angus and other varieties. Therefore, selling pure Japanese-breed *Wagyu*, produced using Japan's original excellent production and feeding system, to the Chinese and Taiwanese markets appears extremely promising. Even Japanese crossbreds such as grades B3 and B2 seem to be comparatively highly rated. Therefore, instead of calling them "crossbred," these grades should be given new names for export purposes and promoted. Aided by the weak yen, such efforts can further increase export volume.

Table 7 Changes in U.S. Carcass (COV) Market Price

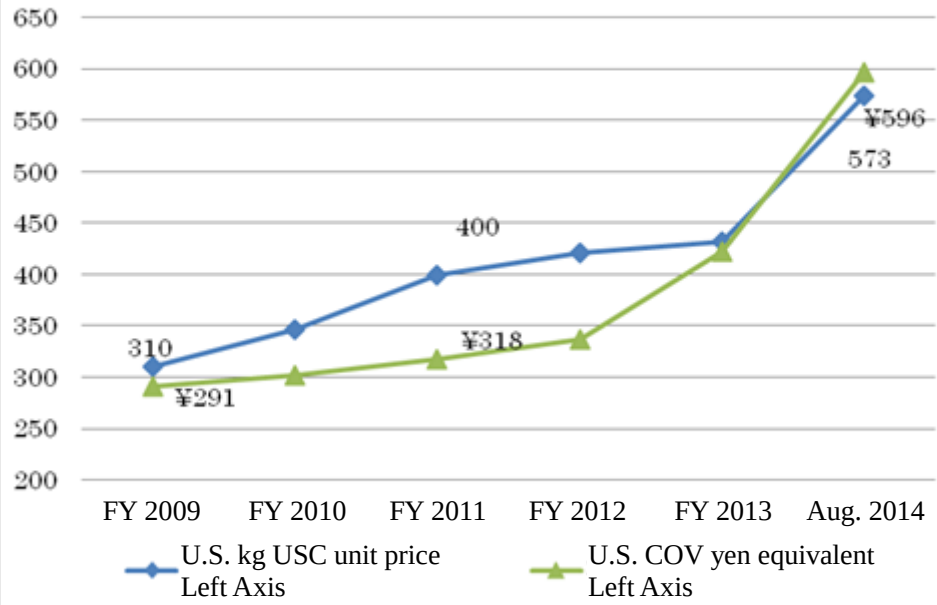
	U.S.				
	U.S. COV kg USC unit price	$-based rate of price increase (2009 = 100%)	$/¥ exchange rate	U.S. COV yen equivalent	¥-based rate of price increase (2009 = 100%)
2009	310	100%	94	¥291	100%
2010	346	111%	87	¥301	104%
2011	400	129%	79	¥318	109%
2012	420	135%	80	¥337	116%
2013	431	139%	98	¥422	145%
Aug. 2014	573	185%	104	¥596	205%

Source: Agriculture & Livestock Industries Corporation (ALIC)

Choice grade, 600–900 pound cutout value (COV)

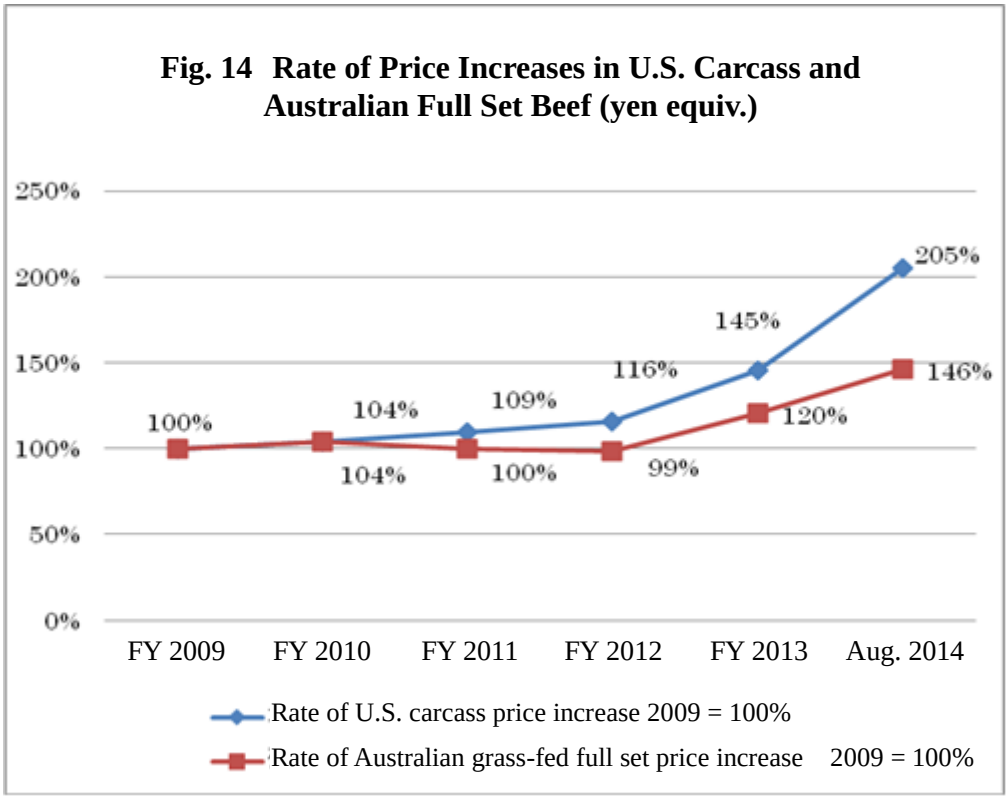
Note: The cutout value (COV) represents the estimated wholesale value of a beef carcass based on the wholesale prices of beef cuts. It is not the actual wholesale price of the carcass.

Fig. 13 Changes in U.S. Carcass COV Market Prices



Source: Graph of the data in "Table 7 Changes in U.S. Carcass (COV) Market Price"

Fig. 14 Rate of Price Increases in U.S. Carcass and Australian Full Set Beef (yen equiv.)



Source: Graph of the data in "Table 7 Changes in U.S. Carcass (COV) Market Price"

Table 8 Beef Carcass Market Price by Country (August 2014)

		/kg	kg/yen	Comparison to U.S.
U.S.	Choice 600-900LB	$5.73	596	100%
Australia	Grass-fed fattening JPOX	A$3.19	309	52$
EU	Steer R3 and R4	€ 4.02	549	92%
Japan	Wagyu A5		2,189	367%
Japan	Crossbred steer B3		1,275	214%
Japan	Holstein steer B2		811	136%
Japan	Delivered cow C1		609	102%

Source: Calculated by the author based on data from Agriculture & Livestock Industries Corporation (ALIC)

Data: USDA, "Livestock, Dairy and Poultry Outlook"; MLA, "Meat & Livestock Weekly"; ABARES, "Agricultural Commodity Statistics"; and the European Commission

Exchange rates: US$ = ¥104.05, Euro = ¥136.64, and A$ = ¥97.12 (August 2014 closing price)

Table 9 Beef Carcass Market Price by Country (August 2009)

		kg/yen	Comparison to U.S.
U.S.	Choice Y.G.1–3	268	100%
Canada	Young steer A1, A2	272	101%
Australia	Grain short fed	366	137%
Australia	Grass-fed fattening JPOX	236	88%
New Zealand	Young steer PS	234	87%
France	Young steer R3	419	156%
Japan	*Wagyu* steer A5	2,167	809%
Japan	Crossbred cattle B3	1,135	424%
Japan	Dairy steer B2	736	275%

Source: Weekly Overseas Meat Information (overseas market prices), ALIC (domestic market prices)

Exchange rates: US$ = ¥95, Euro = ¥132.2, Can$ = ¥84.2, A$ = ¥79.2

Conclusion

This report has examined global trends in beef supply and demand. Since demand for beef is expected to increase in Asian countries, the supply of beef from the U.S. and Australia is highly likely to tighten.

Moreover, there is no doubt that the rapid increase in demand in China in recent years has caused the price of beef to surge worldwide. What covered the drop in supply from the U.S. and the increase in China's demand was the Russian beef embargo and increase in supply from Australia and Brazil. A summary of this report is given below.

1) The recovery of the U.S. cattle cycle will likely take time, and the U.S. supply of beef will continue to decline.

2) In Australia, as a reaction to the record-breaking increase in beef supply this year, beef production is expected to fall starting in 2015 due to cattle herd rebuilding.

3) Production in the EU remains low, and Russia's consumption and imports are expected to be stagnant.

4) South American countries (e.g., Brazil) may increase beef production, but it is highly likely that such increases will not cover the reduced production in Europe and the U.S.

5) Basically, China's demand will rise; however, since production cannot keep up with the increase in demand, it is quite possible that China's beef imports will grow considerably. Because of the anticipated beef shortage within the country, it makes sense that China smoothly concluded FTAs with New Zealand and Australia. Japan should accelerate government talks on the removal of non-tariff barriers as a first step toward exporting meat to mainland China.

6) The relative price of beef produced in Japan has started to appear reasonable, helped by the weak yen. Trade liberalization, such as EPAs and FTAs, are no doubt a great opportunity for Japan, where the market is shriking because of the declining birth rate and aging population, to export Japanese beef overseas.

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The Grain Purchasing Environment

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Introduction

When we examine the export market for grains and oilseeds—especially corn, soybeans, and wheat—it is clear the United States remains highly competitive. One reason is the blessings its natural conditions offer (e.g., soil, climate, and agricultural water), but another important point is extremely efficient logistics, from production sites to export ports. This paper considers grain and oilseed shipping methods in the United States as well as touches on how these differ from those of Brazil, one of its main competitors.

1. Structure of Grain Supply and Demand in Japan

Supply and Demand Breakdown for Grains and Legumes in Japan (FY2013, 1,000 *t*)

	Supply		TOTAL	Demand (Domestic Consumption)		
	Net imports	Domestic production		(For feed)	(For processing)	(For eating)
Rice	733	8,718	9,185	599	383	7,995
Wheat	5,737	812	6,992	1,156	312	5,339
Barley	1,880	168	2,063	1,074	925	58
Hull-less barley	4	15	17	0	7	10
Corn	14,637	0	14,469	10,964	3,405	95
Sorghum	1,601	0	1,511	1,511	0	0
Other	191	34	238	75	0	150
Grains total	24,783	9,747	34,475	15,379	5,032	13,647
Soybeans	2,762	200	3,012	104	2,067	780
Other	276	100	372	11	53	297
Legumes total	3,038	300	3,384	115	2,120	1,077
Total	27,821	10,047	37,859	15,494	7,152	14,724

- Net imports (imports – exports) + domestic production + inventory increase/decrease = domestic consumption (Inventory changes have been omitted.)
- Processing in domestic production includes both food and industrial uses.

Using this supply and demand table from MAFF (the Ministry of Agriculture, Forestry, and Fisheries), we shall extract grains and legumes (soybeans, etc.) in Japan and examine their supply and demand structure. Total supply and demand (demand = supply) is 38,000,000 tons, with the main products being corn (14,500,000 *t*), rice (9,200,000 *t*), wheat (7,000,000 *t*), and soy (3,000,000 *t*).

On the supply side, this can be broken down into 10,000,000 tons of domestic production and 27,800,000 tons of imports, giving Japan a self-sufficiency rate of slightly less than 30%. Domestic production is dominated by rice; if one omits rice from the calculations, the rate plummets to 5%. Of this amount, the self-sufficiency rate for livestock feed is virtually zero. In terms of net imports, corn, wheat, and soy are the principal products, but barley (1,900,000 *t*) and sorghum (1,600,000 *t*) also have a certain level of volume.

On the demand side, of the total 38,000,000 tons, human and livestock consumption together account for around 15,000,000 tons, or about a 40% share each.

The majority of demand for human consumption is accounted for by the staples of rice and wheat.

As for livestock feed, corn accounts for two-thirds of the total. Looking at the global market, corn is the most produced grain in the world; though most of it is destined for feed, it is also used for food and industrial purposes (e.g., starch). The remaining one-third is comprised of wheat, barley, and sorghum (kaoliang), which are all vital products for feed. Wheat bran (the outer covering) and wheat unfit for human consumption (low quality wheat) are used as feed. Barley is an ingredient in beer, but low-grade barley is also used as livestock feed. Sorghum is used as an alternative to corn.

Livestock feed is not limited to these grains, however. Soy meal (soy lees), produced after extracting the oil, is considered a protein-rich feed. Other statistics reveal domestic production in Japan is 3,400,000 tons. If we add this amount, then demand for feed increases to a total of 19,000,000 tons. Incidentally, feed in the broad sense includes residue from a range of agricultural products and fish, and if we also include this amount in our calculations, we reach a final total of 24,000,000 tons.

The total supply for meat and dairy products produced from this feed is 21,000,000 tons, of which 13,200,000 tons is domestically produced. Of such domestic production, 3,300,000 tons is meat such as farmed beef, pork, and chicken; 7,400,000 tons is milk for drinking or milk products; and 2,500,000 tons is chicken eggs.

Taking another look at the above points, we see that the required amount of grain and legume feed to produce 13,200,000 tons of domestic meat and dairy products is 19,000,000 tons in total, or 24,000,000 tons if we apply the broader meaning of feed.

2. Position of the United States as a Supplier

(1) Overwhelming share

The question of how Japan will stably, efficiently procure the 19,000,000 tons of feed it requires is an important issue. Examining where Japan gets grains from, barley (1,900,000 *t*) and sorghum (1,600,000 *t*) are both largely supplied by Australia, which has a 60% share, and the U.S. is a minor player. However, for other grains, the U.S.'s competitive advantage becomes abundantly clear.

Of imports, the U.S. has a 70% share of all feed corn (11,000,000 *t*); Brazil trails at a considerable distance. Supply of corn for starch and other uses (4,000,000 *t*) is also dominated by the U.S., which has a 90% share. The U.S. has a 60% share for soy (2,700,000 *t*), while Brazil and Canada fall within the range of 10–20%. For wheat (5,700,000 *t*) as well, the U.S. also has a 60% share, with Australia and Canada at around 20% each. What lies behind the dominance of the U.S. in these shares?

(2) The United States as a production area

Looking at the topology of the United States, one finds vast plains bracketed in the east by the Appalachian Mountains and in the west by the Rocky Mountains. These plains form the grain belt of the Midwest, and through them the Mississippi River flows north to south. The river serves as a water transport route, transporting huge amounts of grain to export ports in the south. In addition, there are also export ports on the West Coast that ship to Asia and other locations; grain is transported to these via rail and river.

Let us examine the areas producing corn, soy, and wheat. First, the major area for corn is the four states of Iowa, Illinois, Nebraska, and Minnesota, to which we can further add Indiana, South Dakota, Ohio, and North Dakota. In other words, this is the area south and west of the Great Lakes. The major area for soy is the states of Iowa, Illinois, and Minnesota, to which we can further add Indiana, Nebraska, Ohio, and North Dakota. For wheat (including winter wheat, which accounts for 80% of the crop), the major production areas are the states of Washington and Montana along the Canadian border as well as Kansas, Oklahoma, Texas, and Colorado to the south. For spring wheat, production areas are limited to the states near the Canadian border, such as North Dakota, Montana, Minnesota, and South Dakota.

Among these states, we observe overlaps between corn and soy. Generally, a single farm will produce corn and soy simultaneously, but in order to prevent declines in yield per unit area through continuous cropping, farmers rotate crops between corn and soy. In addition, farmers will normally forecast the market for the following year after discussions with consultants, then increase the share of the crop expected to bring in the greater profit. For wheat, which is relatively resistant to climate and thus positioned as a limit crop, there is little overlap with corn and soy. Areas where winter wheat is grown require natural conditions suited to “planting in autumn and harvesting in the middle of the following year,” and for that reason areas are chosen where snow remains on the ground in winter in order to protect the wheat from the cold.

(3) Export trade routes

The United States produces 350,000,000 tons of corn, of which 43,000,000 tons is exported. U.S. soy production is 100,000,000 tons, of which 44,000,000 tons is exported. U.S. wheat production amounts to 53,000,000 tons, of which 26,000,000 tons is exported. The export ratios of soy and wheat are high, both around 50%, while corn is surprisingly low, at slightly more than 10%, which makes corn and soy roughly equal in terms of export volume. Corn exports were no more than around 20% even in 2000 due to the fact that most of it is supplied to domestic livestock farmers. Around the mid-2000s, due to the increase in domestic ethanol production, there was a further drop in export capacity.

Export trades use the following route. First, grains harvested by a farmer are collected (bought) by global grain companies (so-called the grain majors) and Japanese trading companies, then shipped to massive grain elevators.

Harvest ⇒ Storage on farms ⇒ Storage in grain elevators

Next, grains are taken from the grain elevators to ports via trucks, rail, or barges (inland shipping). Then, after being temporarily stored in ports’ export terminals before being loaded onto ships, the

grains are transported over the ocean to their destination ports.

Inland shipping ⇒ Export terminals ⇒ Loading ⇒ Sea shipping ⇒ Ports of importing nations

As a rule, grains are harvested once a year, so at harvest time farms find their stock suddenly increasing. As farm storage facilities (silos) were small in the past, there was a tendency to let go of all grain at once after harvesting, which meant market prices immediately after harvest dropped steeply, a phenomenon known as "harvest pressure." These days, as farm incomes increase, silos are getting larger. Portions that cannot be stored are sold to assemblers, but grains that can be stored in silos can be sold off according to market changes at the best sales timing.

Produce that has left the farm is stored in grain elevators owned by the grain majors or Japanese trading companies. From their positions as traders, they must respond accurately to clients' various trading conditions, including volume, price, quality, and handover location. For this reason, in addition to storage facility capacities, facility locations and decentralization of the stocks of grain suppliers (holding different qualities of grains in different locations) have become important decision factors.

There are two main routes from the grain elevators. One is to move the grain to a river elevator adjacent to the Mississippi River, then ship it by barge downstream to New Orleans, Louisiana or another location. This is known as the "Gulf Route." The other, mainly used for grain exports to Asia, is to ship the grain via river or rail to the port of Portland, Oregon on the West Coast. This is the "West Coast Route." Corn and soy produced along the Mississippi are generally shipped via the Gulf Route, whereas wheat, which is grown in areas near the West Coast, often uses the West Coast Route.

Examining the regions where quality inspections are carried out for export-bound grains, we observe that both routes are used. With corn, the Gulf Route accounts for slightly more than 60%, while the West Coast Route comprises slightly more than 10% (the remaining nearly 20% is inspected in river elevators, etc. within the U.S.). In the same manner, 60% of soy is shipped via the Gulf Route, while 20% uses the West Coast Route.

(4) Inland shipping

Three methods are used to ship grain within the country: barges (river shipping), rail, and trucks. Barges can carry around 1,500 tons per vessel, and by linking barges heading downstream at their midpoints, flotillas of up to 40 barges can be formed. Using such flotillas, as much as 60,000 tons of grain can be shipped at once. On the other hand, if one rail car can carry 110 tons, then a train 100 cars long can carry 11,000 tons. Trucks can carry around 20–25 tons per truck. This means that for short distances of up to 80 km, trucks are more competitive than rail, but for longer distances, barges and rail win out.

Looking at the usage ratios for corn and soy shipping, we observe significant differences between domestic and export trade.

Corn (avg. for 2007–2011)

Domestic trade usage ratios: 78% trucks, 21% rail, 1% barges

Export trade usage ratios: 9% trucks, 37% rail, 54% barges

Soy (avg. for 2007–2011)

Domestic trade usage ratios: 84% trucks, 13% rail, 3% barges

Export trade usage ratios: 13% trucks, 37% rail, 50% barges

(Source: U.S. Department of Agriculture)

Examining domestic trade, there are feed plants near the corn-producing areas, and the livestock industry is well developed. In addition, starting in the mid-2000s, a large number of ethanol plants were built within 80 km of production sites, and the truck shipping ratio is a high 80%. For soy as well, oil extraction plants are nearby, and soy meal is provided to local livestock farmers, making truck transport convenient.

However, for exports, target areas are the ports in the west and south. For example, from Iowa to the port of New Orleans is around 1,300 km in a straight line. From Nebraska or South Dakota to the port of Portland is around 1,800 km as the crow flies. This means that barges and rail are competitive methods for shipping large volumes of corn or soy long distances.

As already noted, barge transport to the South Coast uses the route from the upstream river elevators to export terminals in places like the port of New Orleans. Grain loaded at New Orleans crosses the Atlantic if shipped to Europe, Africa, or the Middle East, but if shipped to Asia, it will pass through the Gulf of Mexico and the Panama Canal before crossing the Pacific.

In addition, when shipping to the West Coast via rail, most grain elevators are directly linked to railway branch lines, and the rail companies partially subsidize elevator construction because doing so allows the railways to benefit from contracts to transport stable, fixed amounts of grain. In other words, it is a win-win situation for both parties. The grain majors and Japanese trading companies own export terminals along the West Coast and have storage warehouse connected to feeder rail lines, making it easy to ship grain along these routes. In addition, loaders and other machinery are installed to load the grain onto ships, increasing work efficiency. Grain loaded on the West Coast crosses the Pacific to Japan and other Asian nations on the same ship.

(5) Sea shipping

Sea shipping costs depend on the price of crude oil used for fuel, berthing fees when berthed for longer than the scheduled periods, the state of the shipping market, and so on. The “time charter” method used by Japanese trading companies and others enables competitive pricing. This system makes use of Panamax ships (60,000 deadweight tonnage class) that can pass through the Panama Canal; under the method, bulk ships are leased for a set period, loaded with grain, and then sent off, thereby reducing transport costs.

However, it is important to remember that the time charter method is subject to certain risks. In this method, the key to keeping shipping costs down is being able to load the entire ship with grain,

without any dead space. “Shipping air” makes it impossible to reduce costs.

Using the time charter method to keep sea shipping costs down and provide clients with competitive pricing allows even more offers to be obtained. This in turn begets more opportunities to fill the transport ships, allowing even more competitive prices to be presented to clients. In this manner, it is possible to create a system that forms a virtuous cycle through economies of scale.

In addition, in some cases, by loading non-grain cargo on shipping vessels bound for North America that have already unloaded their grain, it is possible to realize “two-way profits.” This is possible for trading companies that do business across a range of industries.

Construction work to widen the Panama Canal may affect sea shipping costs. At the moment, to pass through the canal from the Atlantic side, ships are raised up in a three-stage process by raising the water level at one flight of locks on the Atlantic side. After passing through Gatun Lake, ships are then lowered in three stages through two sets of locks on the Pacific side to enter the ocean. There have been complaints that the canal’s transport capacity is inadequate, and expansion work is underway and scheduled for completion in 2016.

The schedule involves (1) addition of one extra lock each on both the Atlantic and Pacific sides, (2) widening and deepening of the existing canal, and (3) dredging and widening of the passages from both the Atlantic and Pacific sides. This means that the upper limit for vessels that can navigate the Panama Canal (post-Panamax ships) will be increased from 60,000 tons to 80,000 tons, making it possible to load more grain. Some grain majors are aiming to increase shipping efficiency by ordering new, larger ships for 2016.

However, this expansion is also expected to lead to an increase in navigation fees and other costs, so the profits from this increase in capacity may not be able to be fully realized. In addition, in consideration of their draft, deeper ports will be needed for such ships to tie up at when they arrive at Japan. If such ports are not secured, then grain will need to be transported inland after being offloaded at another port, which will also increase costs.

(6) Shipping costs

Keeping down overall shipping costs for both inland and sea shipping will increase grain’s competitiveness. One reason for this is that that the price of grain itself is extremely low. The price of corn traded on the Chicago market was recently $3.5 per bushel. Converted into Japanese currency, this is just ¥15 per kilogram. Even soy, which is three times the price of corn, is about 40–50 yen per kilogram. In other words, shipping costs are important for grain, which is bulky yet traded cheaply.

The U.S. Department of Agriculture publishes standard shipping costs. These vary greatly from year to year and also differ by product, so the following figures are for reference only. These figures show the cost of shipping Minnesota corn to Japan via the Gulf Route and Minnesota soy via the West Coast Route to Japan. The breakdown of total costs for 2013 is as follows.

Shipping Minnesota corn via the Gulf Route to Japan
$90/*t* = truck $10/*t* + barge $30/*t* + sea transport $50/*t*
Shipping Minnesota soy via the West Coast Route to Japan
$90/*t* = truck $10/*t* + rail $60/*t* + sea transport $20/*t*

(Source: U.S. Department of Agriculture)

The total cost for both is about $90 per ton. In other words, the cost decision can go either way, and there are no significant differences. The breakdown shows that via the Gulf Route, sea shipping is expensive, while via the West Coast Route, rail is expensive. In addition, the difference between the costs depends on sea shipping, which is subject to major fluctuations. In other words, if sea shipping goes up in price, the West Coast Route is the better bargain, while if it drops, the Gulf Route is better.

The average trading price for (Chicago) corn in 2013 was $230/*t*. The landed price in Japan was $320/*t* ($230 + $90), but a simple calculation shows that around 30% of the landed price is shipping costs. Thus, the extent to which such costs can be reduced is key.

3. Comparison of Shipping Costs between the United States and Brazil

(1) Brazilian grain production

Globally, recognition of Brazil as a nation that produces and exports grains is increasing. In particular, it has soy production of 90,000,000 tons, and its soy exports (45,000,000 tons) are nearly on par with those of the United States.

In addition, corn can be grown in both winter and summer in Brazil, which means that in the south, where summer corn is popular, it can be planted in August for harvests starting in the new year. In the mid-western area, winter corn is becoming increasingly widespread, and planting starts in January after the soy harvest is complete; harvesting of the corn starts in May. The 70,000,000 tons produced is one-fifth that of the U.S., and the 20,000,000 tons of exports are about half that of the U.S., but in the future the country will become a competitor to be reckoned with for the United States.

Originally, Brazil's soy production was based in the south, near Uruguay and Argentina, and in states such as Parana and Rio Grande do Sul, it has been carried out by traditional, small- and medium-scale farmers. However, in recent years, Brazilian production has spread to the central western areas neighboring Paraguay and Bolivia, and the states of Mato Grosso, Goias, and Mato Grosso do Sul have become important production sites. Home to the expansive plateaus known as the Cerrado, agricultural development started in the 1970s with financial assistance from Japan. Compared to the south, this area features new, large-scale soy growers, and it is becoming Brazil's largest agricultural region. More than 80% of soy fields are planted is in the southern and mid-western areas.

Corn is produced in more areas than soy, but there are clear differences in degree among areas. Planted areas are increasing in the mid-west and northeast. The mid-west is dominated by winter

corn, and in recent years there has been a particularly notable increase in its planted area. The northeast is seeing increases in both winter and summer corn; however, the south and southeast are seeing major reductions of summer corn.

(2) Inland shipping costs: comparison between the United States and Brazil

I will now compare the shipping costs for the United States and Brazil. Generally speaking, the U.S. is blessed with good water and rail shipping, and has well-developed infrastructure with numerous grain elevators in the Midwest as well as export terminals. As explained earlier, this helps to keep costs down. This means that in the export trade, truck shipping accounts for no more than 10% of the total, enhancing the competitiveness of corn and soy.

However, while Brazil has a vast area, its infrastructure is not as well-developed as the U.S. First, its major ports are concentrated in the south, where agriculture has traditionally been concentrated; in the north, there are only Porto do Itaqui and the few ports midstream along the Amazon. In particular, the main concern here is by what means grain can be shipped cheaply and in bulk to ports from Brazil's mid-west area, where grains are widely produced.

Brazil (2013): shipped to Shanghai

Parana (South) soy shipping costs (via Paranagua Port)

$76/*t* = domestic shipping $32/*t* + sea shipping $44/*t*

Mato Grosso (Mid-west) soy shipping costs (via Santos Port)

$157/*t* = domestic shipping $116/*t* + sea shipping $41/*t*

United States (2013): shipped to Shanghai

Iowa soy shipping costs (via the Gulf)

$87/*t* = domestic shipping $40/*t* + sea shipping $47/*t*

Minnesota soy shipping costs (via the Gulf)

$93/*t* = domestic shipping $46/*t* + sea shipping $47/*t*

(Source: U.S. Department of Agriculture)

For Brazil's southern farms, inland shipping costs are relatively low. These farms are close to the ports, and even shipping by truck is effective. However, the farms in the mid-western areas, where production has been increasing recently, also rely on trucks to ship their harvests over the long distances to the ports. For example, the straight-line distance from the mid-west state of Mato Grosso to the port of Santos is about 1,400 km, and traversing the entire distance by truck will lead to unavoidable cost increases.

Based on data from the U.S. Department of Agriculture, I shall compare the costs for shipping Brazilian and American soy to Shanghai (in 2013). In the U.S., Iowa and Minnesota soy is exported via the Gulf, and the total shipping costs, both inland and overseas, are about $90 per ton.

In Brazil's case, we shall examine soy from Parana in the south and Mato Grosso in the mid-west. Costs for the south can be kept at relatively low levels, but costs from the mid-west are $80/ton more expensive. Most of this difference is due to inland shipping, in particular truck shipping. In other words, expensive fuel, traffic congestion, and underdeveloped infrastructure all combine to lower efficiency.

(3) Sea shipping costs: comparison between the United States and Brazil

Maritime distances to Tokyo

Brazil (ports)		
• Santarem (Amazon River)	via the Panama Canal	19,000 km
• Itaqui (NE)	via the Panama Canal	19,000 km
• Santos (South)	via the Cape of Good Hope	21,700 km
• Paranagua (South)	via the Cape of Good Hope	21,800 km
United States		
• Gulf Route	via the Panama Canal	16,900 km
• West Coast Route	via the Pacific Ocean	8,100 km

There are a number of sea shipping routes. Most routes from the ports of Santarem along the Amazon or Itaqui in the northeast cross the Panama Canal. When coming from the ports of Santos and Paranagua in the south, going around the Cape of Good Hope is efficient.

However, maritime distances from the U.S. to Japan are relatively short compared to Brazil. In particular, using the West Coast means a distance only about 40% that of Santos via the Cape of Good Hope.

(4) Infrastructure development

The Brazilian government is working to privatize railways and port facilities, to develop road networks, to modernize railway lines, and to carry out other infrastructure improvements in an attempt to increase transport efficiency. In particular, to reduce the costs of shipping grain from the mid-western areas to ports in the south, barges are used to carry grain along Amazon tributaries and then the Amazon itself for loading onto transport ships. The government aims to develop a route which follows the Amazon out into the Atlantic. In addition, there are also plans to develop a road to the ports in the northeast. It will take time to improve Brazil's infrastructure, but if this work continues, it may narrow the gap in competitiveness with the United States.

4. The Meaning of Supply Chains

Purchasing, storage, and transport of grain is just one part of the total supply chain. To allow for efficient livestock feed supplies, those on the demand side must also prepare systems. This is what it means to build a supply chain. For example, after corn arrives in Japan, it is unloaded from transport ships at import terminals and stored, passed through Customs, and then shipped. Normally, feed plants are located next to large silos, and grain is moved from there to plants via conveyer belts. The plants produce formula feed, which is then provided to livestock farmers. The meat thus raised is processed and sold via wholesalers to retailers. In other cases, corn is provided to starch makers as a raw material for starch, and then the starch is shipped to food product manufacturers. The last stage in this process is purchase by the consumer of the final product. This series of commercial processes is called the supply chain.

Trading companies which have interests in a wide range of industries can dispatch personnel or invest capital in each stage of the chain, creating a single supply chain within their group, including subsidiaries. Through this system, corn purchased upstream in the process will reach the retailer downstream as the final product after going through a large number of stages. By incorporating all these stages within the group, the corn will move along the chain smoothly.

This is not limited to corn, of course. With soy, the soybean oil is separated and soy meal is provided to livestock farmers, allowing them to produce processed meat products. With wheat, after sale to flour manufacturers, it is turned into pasta, bread, *udon*, cakes, and so on, and these end products are then put on shelves in stores.

Systems like this are being constructed not just in Japan but in many newly emerging nations, especially in Asia, increasing the volumes of grain able to be handled. In newly emerging nations, even if the various stages of "purchase, process, and distribute" exist, they remain isolated. There is no organic flow, and the commercial process itself is not necessarily efficient. Thus, trading companies are working to develop systems to convert these individual stages into a flow to make grain distribution smoother and more competitive.

In addition, there are many points in each stage of the supply chain in newly emerging nations that need improvement; addressing these points should improve supply chain efficiency. For example, in feed plants, there is a need to manage the growth of livestock by understanding how to supply formula feed suited to animals' various development stages. Other issues include managing meat traceability as well as eliminating and preventing harmful livestock-related diseases. There is also a need to manage hygiene for meat, processed meat, and dairy products. In distribution, there is a need to select hub sites for warehousing and retail sites after performing market surveys. In logistics, it is expected that refrigerated and frozen transport systems, for which demand in Asia is increasing rapidly, will be constructed.

By providing this sort of expertise, more business opportunities will be created in newly emerging nations where the middle classes are growing, and the supply chain flow will be further strengthened. This sort of creative ingenuity is very likely to act as a trigger to promote grain exports from the United States.

In Closing

What are the sources of the competitiveness of U.S. grain? First is the production costs of grain. Looking at yield per unit area, Brazilian soy is catching up to U.S. soy, but the U.S. retains a crushing lead in corn. Second, the logistics costs for exporting are important. In other words, how can large volumes of grain be incorporated into efficient distribution networks? In this sense, too, the U.S. has constructed a competitive system through skillfully combining barges, rail, and trucks. However, other competing nations are making efforts to develop infrastructure, and there is a chance that the gap in competitiveness with the U.S. will shrink in the future.

Third are relationships to supply chains in grain-importing countries. Systems must be created that are connected with the overall commercial process of "purchasing, manufacturing/processing, and sale," and this flow is linked to export of U.S. grain. This refers to linking the various points at each stage of this process into a linear flow, namely the supply chain. In other words, in addition to

tangible transport methods, intangible supply chain construction must be incorporated.

Japanese trading companies occupy a strong position in terms of companies connected to this sort of commercial process flow. Trading companies have global sales bases and are experienced in diverse business activities related to numerous industries and in realizing business models that allow for trade and investment to function equally. Therefore, in constructing a single, unified supply chain, trading companies can play an important role. If this spreads from Japan to developing nations, centering in Asia, then, while linking with these trading companies, the U.S. grain industry should be able to enjoy even more business opportunities with newly emerging nations as well as Japan.

Japan in 2040: Four Scenarios Concerning Grain Imports

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1. Introduction

This article is set against the backdrop of the *Report on Japan's Contribution to Growing Food Markets in Asia* (from the study group of the same name chaired by University of Tokyo Professor Masayoshi Honma), which was compiled in May 2013 with the assistance of the U.S. Grains Council.[1] This article expands upon the debates from May 2014[2] that built on top of this report in order to create a number of scenarios illustrating how grain imports from the United States might develop in the future based on Japan's situation.

While it is extremely difficult to forecast the uncertain future, this article builds upon the numerous future forecasts already published, starting with the *Shell Global Scenarios to 2025*,[3] and examines them by employing scenario analysis methods used in general business planning.[4]

Note that, in light of the goals of this study group, the following have been assumed with respect to the three elements (timeframe, geographic frame, and future themes) initially assumed for this scenario analysis.

- Timeframe (chronological axis): Generally, 2040 is assumed because that date was already published by the U.S. Grains Council in its "Food 2040"[5] future forecast, because a large number of future forecasts from research institutes and private corporations have already been presented that fall within this timeframe,[6] and because 2040 is 25 years from 2015, all of which make it easy for most involved parties to imagine realistically.

- Geographic frame (spatial axis): I carried out an evaluation of Japan as a market as seen from the perspective of the United States last year. Therefore, an analysis and study, as well as scenario creation, has been performed from the perspective of Japan, which imports livestock feed grain from the U.S.

- Future themes for analysis: This is where the study committee's name, "Promoting the Use of American Grain Feed in the Asian Food Market," is most appropriate, but as individual future demand predictions for Asian countries are not the target of this article, here I will merely study the

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[1] U.S. Grains Council, Report on Japan's Contribution to Growing Food Markets in Asia May 2013
[2] The study group met four times (May, June, September, and December 2014).
[3] Shell International Limited, *Shell Global Scenarios to 2025*, 2005.
[4] The scenarios created in this article are based on the methods in Y. Nishimura, *Scenario Ranking* (Diamond, 2013) and Hayden, *Scenario Planning* (Y. Nishimura, tr., Japanese ed. pub. by Diamond, 1998), which have been simplified as needed for this article's purposes.
[5] The *Food 2040* report may be viewed on the following website.
http://grainsjp.org/report_category/food2040-report/ (Accessed: September 14, 2014.)
[6] Some of the easier forecasts to obtain and read are, for example, *Megachange: THE WORLD IN 2050* FROM THE ECONOMIST (2012), *Global Trends 2030: Alternative Worlds* from the National Intelligence Council (2013), and J. Randers, *2052: A Global Forecast for the Next Forty Years* (2013). In addition, MEXT's *2040 Nen no Kagaku Gijutsu: Monbukagakusho Dai 9 Derufai Chōsa* (2010) is an example of a more specialized paper.

matter with a somewhat narrower focus, "the perspective of related Japanese industries."

2. Background to the basic scenarios

Based on the normal process of scenario analysis, basic background will be presented in the form of a simple story. This background is simply my subjective viewpoint.

Japan has been importing grains, particularly from the United States, for many years. While serving as part of a comprehensive measure for tackling rising demand for meat in Japan, the exporting nation (the U.S.) has viewed Japan as an extremely attractive market, so both sides have benefited from this arrangement.[7]

However, in recent years, this situation has started to change. Within Japan, the total population, which was the largest factor in generating domestic demand, has already peaked, and it is now clear Japan is entering a period of decline.[8] *In many cases, declining demand (e.g., declining food demand) is directly linked to population decline. This is a major issue for Japanese agriculture and food product-related industries.*

By contrast, the situation overseas differs greatly from that of Japan. The global population is increasing, and populations in Asia and Africa in particular are expected to increase for quite some time into the future.[9] *A number of Japanese private corporations have taken note of this and are already actively attempting to move overseas to capture part of this Asian demand for foods.*[10]

Japan currently imports approximately 30,000,000 tons of grain annually. The major grains imported are wheat (6,000,000 t), rice (700,000 t), coarse grains (18,000,000 t), and oilseeds (5,500,000 t).[11] *Among coarse grains, approximately 16,000,000 tons is corn, and among oilseeds, approximately 2,700,000 tons is soy. To state without fear of misinterpretation, this sort of situation is generally understand at a level of "that looks like a lot of imports," "a 39% self-sufficiency ratio on a calorie base is rather low," or "future food issues appear serious." Even when specific figures are known, it is likely that those who so strongly think the current situation should be changed that*

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[7] For details on this point, see "Emerging Asian Food Markets and Japan's Strategy" by this author in *Report on Japan's Contribution to Growing Food Markets in Asia* (May 2013).

[8] Japan's peak population was 128,057,000 (2010), and since then it has been decreasing. (National Institute of Population and Social Security Research, "Sōjinkō oyobi Jinkō Zōka: 1872–2012" in *Jinkō mo Tōkei Shiryōshū* (2014). URL: http://www.ipss.go.jp/syoushika/tohkei/Popular/P_Detail2014.asp?fname=T01-01.htm&title1=%87T%81D%90l%8C%FB%82%A8%82%E6%82%D1%90l%8C%FB%91%9D%89%C1%97%A6&title2=%95%5C%82P%81%7C%82P+%91%8D%90l%8C%FB%82%A8%82%E6%82%D1%90l%8C%FB%91%9D%89%C1%81F1872%81%602012%94N (Accessed on September 17, 2014.)

[9] For example, as of 2010 the global population was 6.9 billion, of which Asia accounted for 4.2 billion and Africa for 1.0 billion. By 2040, these figures are expected to increase to a total global population of 9.0 billion, 5.1 billion for Asia, and 2.0 billion for Africa. In other words, of the additional population growth of 2 billion over the next 25 years, Asia and Africa will account for 1 billion each. (UN, *World Population Prospects: The 2012 Revision*)

[10] Japanese food companies had a total of 694 overseas subsidiaries in FY2012, a large increase over the previous year's 533 (MAFF, *FY2013 Food, Agriculture, and Rural Areas White Paper*). In addition, the future size of the global food market, which was estimated in 2009 to be 340 trillion yen, is calculated to expand to 680 trillion yen by 2020 (MAFF, *Nōgyō Nōson no Shotoku Baizō ni Muketa Taiō Hōkō ni Tsuite*, 2014, p. 17).

[11] Individual figures are based on USDA, *Grain: World Markets and Trade*, November 2014, and *Oilseeds: World Markets and Trade*, November 2014. Totals were calculated by the author.

they are willing to dramatically alter their current lifestyles are still in the minority.

The same applies even in the formula feed and food product industries, which have benefited the most from these grain imports. Though the future may be harsh, the present is of primary importance for companies and industries, and "how does this year compare to last year" is even more important. Most management-level personnel think a few years ahead, but they definitely do not have the room to consider what will happen once they retire. This may just be the reality.

However, there are also many who feel it is necessary to comprehensively strategically study future trends in Japanese food, agriculture, and rural areas in addition to economic trends as well as the aging, low-birth rate population, globalization, and changes in the environment. To this end, grain imports, particularly U.S. grain imports and ways of utilizing such imported grain, must be considered in addition to the balance between domestic agricultural production and imports.

In other words, preparing a number of strategic scenarios to determine whether Japan should continue to import grain mainly from the U.S., or should diversify its sources, as well as in either case whether Japan should decrease its amount of imports and increase domestic production, or make use of both in combination, all the while retaining a base of domestic agricultural production, is not merely a measure for the current moment, but a necessary preparation from the perspective of ensuring food safety in the face of an uncertain future.[12]

3. Macro/Micro and External/Internal Study Perspectives

To examine Japan's grain imports in the future, this article makes use of PEST and Porter's Five Forces, which are general frameworks.

PEST (Politics, Economy, Society, and Technology) is a basic framework for macro environment analysis. In recent years, Ecology has been added to these four to form the SEPTEmber Framework (PEST+1).

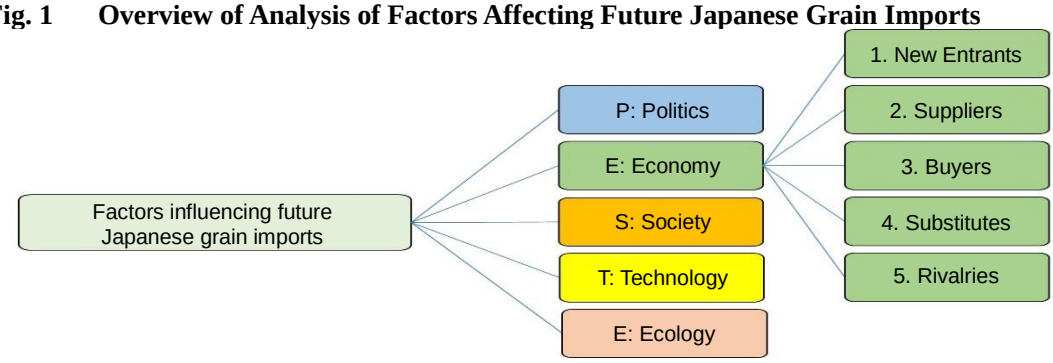
By contrast, Porter's Five Forces are a framework for analyzing industrial structures and can be thought of as a method for performing micro analysis of the Economy aspect of PEST.

The "five forces" are Potential Entrants: the Threat of Mobility, Supplier Power, Buyer Power, Threat of Substitutes, and Industry Rivalry. Though this is the most basic framework used in structural analysis in competitive strategy theory, in this article it will be used as a basic analysis tool for creating scenarios.

Figure 1 shows an overview combining both PEST+1 and the Five Forces. PEST+1 is the macro analysis framework, while the Five Forces is the micro analysis framework.

[12] Article 2, Paragraph 2, Item 2 of the Basic Law on Food, Agriculture and Rural Areas states: "In consideration of the fact that there are certain unstable factors in the world food trade and supply/demand, this stable food supply to the people shall be secured with increase of domestic agricultural production as a basis, together with an appropriate combination with imports and stockpiles."

Fig. 1 Overview of Analysis of Factors Affecting Future Japanese Grain Imports



The next diagram lists trends in more detailed changes for each item. At this stage, there is a mix of items for which change trends are clear with those for which trends are either somewhat unclear or completely unforeseeable. However, such items have been left untouched and keywords have been extracted for each item using the macro (PEST+1) and micro (Five Forces) frameworks. In addition, "Value" has been added to elucidate the importance to society and culture as an attribute. Normally, such elements should be extracted based on free discussions among members of the study group, but time limitations forced me to extract individual elements on my own for this article, which I did based on various study group discussions. Table 1 shows the results.

Table 1 Study Factors for Changes Affecting Future Japanese Grain Imports

MACRO (PEST+1)
P: Politics (incl. regulations, policies, international negotiations)
- Global trends - Japanese economy trends - Systems assuming population increases (pensions, etc.) - Regional devolution, *Dōshū* system - TPP and other international frameworks
E: Economy
- Expansion of globalization - Domestic and overseas economic trends - Agricultural and food-related industry trends - Overseas corporation activity trends - Interest and exchange rate trends
S: Society (incl. culture and values)
- Aging population, low birth rate - Increase in No. of single-person households - Increase in No. marrying late/never - Women's participation in society - Increase in the No. of non-fulltime workers - Increase in the No. of foreign workers - Worsening public safety? - Home ownership/renting - Seniority system/changing jobs - Later retirements - Wealth gap - Concerns about academic history - Food safety and security - Health trends - Real-time information transmission - Concerns about agriculture - Concerns about the food self-sufficiency rate
T: Technology
- Spread of portable devices - New energy sources (e.g., biomass and solar) - 3D printers - Big Data - Tailor-made foods and medicines - GMOs - Precision agriculture

MACRO (5 FORCES)
New Entrants
- Overseas companies (Western, Asian) - Companies from different fields
Suppliers
- Traditional exporting nations - Emerging exporting nations - Global corporations - Outsourced producers - Demo of safety, quality, and lineage
Buyers
- Expansion of Asian markets, esp. China - Food, beverage, and feed manufacturers - Pharmaceutical companies - Consumer groups/organizations - Return to Japanese food - Low volume/high quality - Traceability - Trust - Health trends - Food for the elderly - Accessibility/delivery - Processed/prepared foods - Mass-produced/added-value foods - HACCP/GAP/ISO - Ecological production/foods
Substitutes
- Domestic grains - Other foods/prepared foods - High-tech production - Functional foods with special features - Non-GMO produce/foods
Rivalries
- Newly emerging nations (Asia) - Pharmaceutical companies

E: Ecology
- Renewable resources - Local production, local consumption - Emissions reductions - Animal protection - 3Rs (Reduce, Reuse, Recycle) - Food loss and disposal

- Shipping-related companies
Values
- Male-centric/Sexual equality/Female-centric - Global/Local - Family/Single-person households - Price/Quality - Growth/Maturity - Competition/Coexistence

4. Creating the Scenarios

I initially thoroughly shuffled these attributes, which were extracted in accordance with the PEST+1 and Five Forces classifications, and then narrowed them down based on their degrees of uncertainty. As a result, one of the most uncertain was "Changes in overall social systems," and another was "Changes in diet and lifestyle."[13]

Then, I created a matrix with the former on the horizontal axis and the latter on the vertical axis, after which I gave each quadrant a convenient name reflecting the relevant features of the horizontal and vertical axes. These four quadrants—A, B, C, and D—I named "Expected/advance scenario," "Uncertain/trial and error scenario," "Uncertain/delayed scenario," and "Skeptical/compliant scenario."

Closely examining the details, it should be clear that "Changes in social systems" refers to the major changes in PEST+1 (politics, economy, society, technology, and ecology), and "Changes in diet and lifestyle" refers to the micro changes in the Five Forces. In other words, put simply, Figure 2 can be understood as a simple expression of the combinations of how individuals and corporations act in response to changes in their surrounding environments.

Next, after a more detailed study of the elements in each scenario, I listed the individual factors (driving forces) considered important with respect to future changes in accordance with PEST+1 and the Five Forces; these are shown in Table 2.

[13] In this process, influence is plotted on the vertical axis and uncertainty on the horizontal axis, with individual elements grouped in order after extracting those that are both most uncertain and most influential (though this step was omitted here).

Fig. 2 The Four Envisaged Scenarios

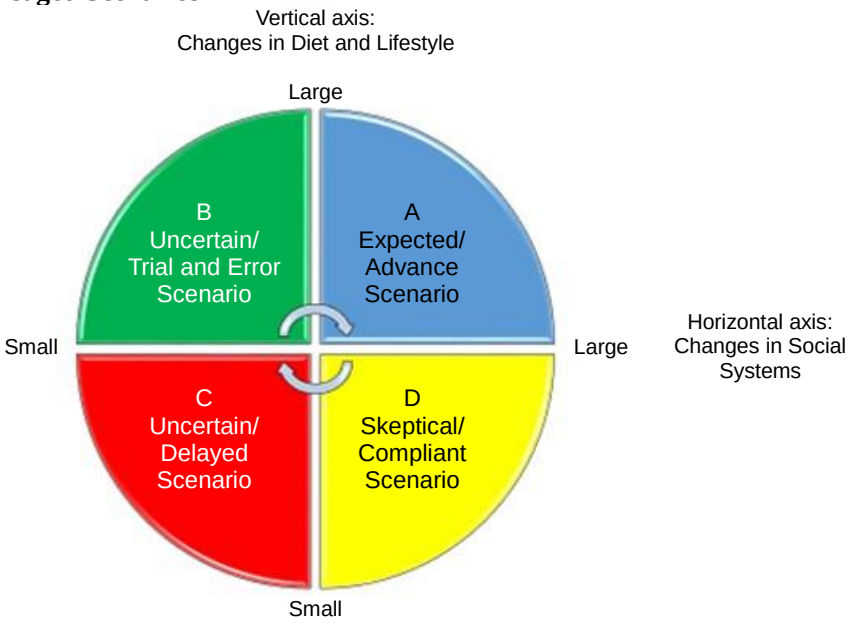


Table 2 Features of Individual Factors for Each of the Four Scenarios

	Scenario A	Scenario B	Scenario C	Scenario D
Uncertainty	Social systems↗ Diet and lifestyles↗ Expected/advance scenario	Social systems↘ Diet and lifestyles↗ Uncertain/trial and error scenario	Social systems↘ Diet and lifestyles↘ Uncertain/delayed scenario	Social systems↗ Diet and lifestyles↘ Skeptical/compliant scenario
Politics	Transfer of power to regional governments Revitalization of economic links	Transfer of power to regional governments Revitalization of local food usage	Transfer of power to regional governments Less revitalization of local foods usage	Transfer of power to regional governments Revitalization of economic links
Economics	Globalization	Some globalization Coexistence with local markets	Partial globalization Based on local markets	Some globalization Coexistence with local markets
Society	Globalization Aging society, low birth rate, single-person households Prepared/processed foods Quality traditional foods Population decline Sexual equality/ women-centric	Increased power for regional governments Aging society, low birth rate, single-person households Return to traditional foods Population decline Male-centric/sexual equality	Increased power for regional governments Aging society, low birth rate, single-person households Return to traditional foods Low-cost/low-quality processed foods Population decline Male-centric	Globalization Aging society, low birth rate, single-person households High-quality traditional foods Prepared/processed foods Population decline Sexual equality/ female-centric
Technology	Traceability Biotechnology progress Ensuring of trust	Return to traditional technologies Ongoing quality issues	Return to traditional technologies Ongoing quality issues	Traceability Biotechnology progress Uncertain trust
Ecology	Aspiring to sustainable growth Ongoing problems	Ecology-oriented	Ecology-oriented But very luxurious in reality	Aspiring to sustainable growth Ongoing problems
New Entrants	Global corporations Companies from different fields	New business for domestic companies	Restructured, downsized	Global corporations specialized by product/business
Suppliers	Based on traditional exporting nations Chances for newly emerging exporting nations as well	Based on traditional exporting nations	Based on traditional exporting nations	Based on traditional exporting nations Chances for newly emerging exporting nations as well
Buyers	Asian markets Food, beverages, feed Fuel, pharmaceuticals	Asian markets Food, beverages, feed Fuel, pharmaceuticals	Asian markets Food, beverages, feed	Asian markets Food, beverages, feed Fuel, pharmaceuticals
Substitutes	Domestic grains Imported grains with added value	Domestic grains Imported grains with added value	Domestic grains	Domestic grains Imported grains with added value
Rivalries	New advanced companies Brand companies	Industry colleagues in the country Low-cost overseas companies	Industry colleagues in the country Low-cost overseas companies	New advanced companies Industry colleagues in the country
Japanese Agriculture	Certain level of domestic production Ongoing grain imports Exports of livestock products and grain products with added value	Certain level of domestic production Reduced grain imports Trial and error for agricultural exports	Reduced domestic production Reduced grain imports	Reduced domestic production Reduced grain imports Trial and error for agricultural exports

These characteristics are merely conceptual. Therefore, some are duplicated in multiple scenarios, while others appear only in one.

The main goal of this article is to study and create scenarios based on what will happen to future grain imports and how such events will be handled. Therefore, at this stage, “Japanese agriculture” has been added to the list as a qualitative item. At my discretion, I added the content of each item in Table 2, which is not limited to the individual item “Japanese agriculture.” Therefore, note that these items have not been extracted as the result of statistical analysis based on quantitative data, but are merely my own qualitative ideas.

With that in mind, the scenario stories for the individual cases are as follows.

- **Scenario A: Expected/Advance Scenario**

Scenario A envisages a world in which not only the various elements that make up social systems—politics, the economy, society, and technology—but diet and lifestyles also change. In this scenario, while the content proposed in various fields may not always be synchronized, they are not just general changes in the direction deemed "good," but rather require that people be forward-looking with respect to the envisaged changes. For that reason, I labeled this the "Expected/advance scenario." The scenario's story is as follows.

Expected/Advance Scenario

Active trading in the global grain trade continues in 2040 (25 years from now). The global population has increased at a slightly higher rate than predicted by the UN, reaching nine billion a few years earlier, but food production, thanks to the development and spread of ICT equipment, has allowed production and farming statuses to be shared around the world in real time. In addition, as many countries now understand the nature of the international public goods trade in food, no export restriction measures for poor harvests such as those put into place in various ways from the 1970s to the 2010s have been enacted for several years.[14]

The background to this production has been heavily influenced in various ways with respect to safety and trust both by leaps in biotechnology and the understanding of general consumers. The ratio of GMO corn and soy planted in major exporting nations has been around 95% for the past decade. The remaining 5% are premium products sold to special consumers who desire foods having no genetic modifications; these occupy a position as high added-value products.

As there are a great number of grains and foods having added functions, production of around half the raw ingredient grains is subcontracted out through individual production contracts. Chicago and other trading markets remain active, but are merely trading venues for grains as normal items. Most grains, which have functions protected by patents and are produced under contract, have their prices determined through negotiated transactions, and trading is carried out in completely isolated ways from production to distribution.

Traceability is ensured, and betrayals of trust are rare. Generally, prepared foods and processed foods are eaten, but, depending on the time and place, people can choose to eat high-quality traditional foods.

Note that in the international grain trade there will be three extremely large changes in distribution by 2040.

First, as a result of the widening of the Panama Canal several times over the past quarter-century, the maximum size of ocean-going vessels carrying grain has increased to

[14] For details on past grain export restrictions by the U.S., see S. Mitsuishi, "U.S. Export Restrictions of Grains: Issues and Challenges from Administrative Documents," *Journal of Food System Research* Vol. 20, No. 4, 2014, pp. 372–385.
https://www.jstage.jst.go.jp/article/jfsr/20/4/20_372/_pdf

the 100,000-t level. The maximum level was once around 50,000–60,000 tons, but at present there are dozens of ships twice this size around the world, and major grain-importing nations, starting with China, have multiple ports that can accommodate 100,000-t class grain transports. Incidentally, by 2040, "Panamax" will refer to ships in the 100,000-t class, with 80,000-t ships referred to as "Regulars" and the old 50,000-t class ships as "Classics."

The second change is that, as a result of the melting of the north polar icecaps due to global warming, the Arctic Ocean passage will be fully open, greatly altering world maritime logistics. In the 2010s, passage was only possible for around two months in the summer, and even then only for a few ships, but in 2040 the passage is usable nearly year-round. While there is little direct connection with grain shipping, the fact that 100,000-t class ships are still restricted and there is prioritization of the Arctic Ocean when shipping resources from northern Russia to Asia and Europe means that effects on the global chartered vessel market cannot be ignored.

Third, the lot level for individual production and distribution management for grains that include specific functions has become much smaller. For example, corn which has health functionality for major lifestyle diseases (e.g., obesity and diabetes) can be shipped using large ships, since the target lot numbers are in the thousands of tons, but there has also been a major increase in individual distribution of functional agricultural products for specific diseases that affect small numbers of people thanks to small-lot container shipping. In such cases, an extremely complex yet accurate control system is used for the overall supply chain.

As a result of these changes, functional foods that employ the results of biotechnology are used in ways that clearly contribute to consumer health.

However, while Japan's grain imports in the 2010s were around 30,000,000 tons in total for wheat, rice, coarse grains, and oilseeds, by 2040, the country still imports around 27,000,000 tons. The total population of Japan in 2040 is now about 100,000,000 (107,270,000)[15], a 16% decline from the peak, but the grain import level has only dropped by 10%.

Examined even more closely, not only has the working-age population (ages 15 to 64) of Japan dropped by 18,950,000, from 76,820,000 to 57,870,000 over these 25 years, but the population age 75 and older has increased by 5,770,000, from 16,460,000 to 22,230,000.

This means that there have been some major changes in who is responsible for industry at each level of Japanese society. Specifically, about a third of the 25% drop in the working-age population is offset by extended employment for mature, older workers; another third is offset by making use of technologies Japanese people are skilled in; and the remaining third is offset by obtaining new markets (e.g., importing bulk agricultural produce from the United States, processing it in Japan, and exporting it as value-added goods to other Asian countries experiencing rapid growth). In this process, the perspectives and sensibilities of the many women working on the front lines in society greatly contribute to each aspect of planning and development, production, and sales for

[15] National Institute of Population and Social Security Research, *Japan's Future Estimated Population (Est. as of Jan. 2012)*

overseas markets.

As a result, while the population has declined, the reduction in grain imports has not kept pace with this decline, and in fact, with established processed foods and regional brands as well as new exporting of Japan-grown livestock products and other items having special added value, Japan's once small-scale food production continues to enhance its unique track record.

This is the result of "All Japan" export campaigns for Japan-grown agricultural products carried out when Japan-produced food brands were strong, which led to a strategy for unique processing of grains imported in bulk from the United States and other countries and their export as high added-value products to still other countries.

In addition, there have been major changes in renewable energy sources. There has been steady progress in the commercialization of cellulose-based biomass, and in parallel, some of the various plants adjacent to ports around Japan have been converted to handle bioethanol production.

In the Expected/advance scenario, ethanol and other renewable energies are considered one of the most important issues for Japan's future. For that reason, following debates over many years that importing ethanol as a product would be cheaper economically, it is treated under a comprehensive policy for resources and energy based on higher-level national, political decisions informed by the perspectives of environmental issues as well as food and energy security.

In other words, in this scenario, ethanol around the world is positioned as a pillar of mid- to long-term basic planning that incorporates imported products, domestic production of imported raw materials (grains), and full-scale production using cellulose-based raw materials grown in Japan.

This means that Japan's old grain importing pipeline itself had to undergo a major qualitative transformation.

Japan's population will continue to shrink, but already most of the country's production, processing, and distribution systems have completed their transformation to more compact sizes, and the responses in this area are complete. Japan's GDP in 2040 is fourth[16] in the world. It may drop to around eighth by 2050 or 2060, but it will definitely remain within the top ten globally.

- **Scenario B: Uncertain/Trial-and-Error Scenario**

I named Scenario B the "Uncertain/trial and error scenario." This is a world in which changes in diet and lifestyles occur basically as predicted, but social systems do not change as intended. People have different feelings, and while some enjoy new lifestyles and foods based on new values, for society overall, the political, economic, social, technological, and cultural aspects continue to proceed on a trial-and-error basis. This world is in a sense extremely stressful; as long as people live, there is a chance of a "I might know, or might want, things to happen one way, but they don't go as

[16] The timing differs slightly, but previous predictions of Japan's GDP ranking in 2050 are listed here for reference. HSBC: 4th (2012); The 21st Century Public Policy Institute: 4th (2012); Citigroup: 8th (2011); PricewaterhouseCoopers: 5th (2011), Goldman Sachs: 8th (2007)

planned" situation. The story of the world of Scenario B is as follows.

Uncertain/Trial-and-Error Scenario

In the Japan of 2040, many office workers live in rented housing and change jobs every five to ten years. The old style of lifetime employment has nearly disappeared, and it is now standard for students to look for jobs that allow them to maintain good work-life balance right from graduation. Companies are places to learn certain skills, and while people work hard until they reach the point of mastery, afterwards they change jobs to find something else they want to do. This style is now the mainstream.

In addition to the aging, low birth rate population, there has been a rapid rise in the number of single-person households (to more than 30% of all households). This means that also in terms of daily work, wide gaps have developed in terms of life values and remuneration between general office workers and physicians, nurses, teachers, and traders/dealers handling grain or currency conversions, for whom per-function industries can all relatively easily be created.

The concept of the family as the next-smallest unit of society after the individual has also changed considerably. While households comprised of a husband, wife, and child(ren) were more than 40% of the total in the 1980s, they are now no more than 20%. By contrast, the number of single-person households is nearly 40%.[17]

For this reason, most family restaurants that opened around the nation at the start of the 2000s have now become "singles restaurants," places for young people and elderly living on their own to have their daily meals. Naturally, the menus have also changed a great deal. Other than a few restaurants which provide private rooms, which are now very rare, families with children find it harder and harder to locate places to eat peacefully without having everyone looking at them.

Politically, the transfer of power to regional governments has progressed considerably, and more and more women play active roles in society. The restoration of regional and traditional cooking is frequently publicized, but the effects are not as hoped. This is because despite the major changes in awareness of workers, the overall systems of society underpinning everything have changed little.

People in the Uncertain/trial and error scenario feel both attraction to fashion and trends in other advanced nations as well as a sense of nostalgia towards their own country's traditional foods and techniques. In other words, they distinguish between the Outside (*soto*) and Inside (*uchi*) in their everyday lives.

As the fundamental systems of society have not changed, grain imports retain their basic structure. However, the aging population and population decline have affected domestic demand. For example, even traders in Japan's most prominent general trading companies find it hard as individuals to act in ways that incur risk (e.g., attempting to develop new

[17] According to the National Institute of Population and Social Security Research, *Future Estimate of Japan's Household Numbers (National Estimate)*, 2013, based on the fact that nuclear families in 1980 accounted for 60.3% (of which, households with a husband, wife, and child(ren) were 42.1%) and single-person households were 19.8%, the estimates for 2035 are 55.9% for nuclear families (of which, households with a husband, wife, and child(ren) will be 23.3%) and 37.2% for single-person households.

import suppliers), and grain imports from countries that are not traditional suppliers are limited to emergency or spot use. As a result, in contrast to prevailing global trends, 21st century "nationalistic cultural" activities are found all over Japan.

Recently, China and other Asian nations have been successfully raising living standards, though their economic growth is still behind that of Japan. However, biotechnology and IT, as well as other new technologies, have been actively brought in as drivers of economic growth. As a result, Japan, where coordinating opinions even at the government level is difficult, is feeling impatient. Trial and error attempts have been made in numerous ways, including exports of agricultural products, but it is hard to obtain results as good as those of the past.

As track record assessments gradually shift to a merit-based system worldwide, people whose performance is not improving find it hard to remain within their organizations, and fluidity increases. This means the "invisible expertise" or "implicit/collective knowledge"—the source of Japanese corporations' deep competitiveness—that they once had is being lost.

There has also been a reduction in demand (−25%) for Japan's grain import volume nearly parallel to the population decline, and as of 2040, corn imports, which peaked at 16,000,000 tons, are down to 12,000,000 tons. The total imported volume of grains has also dropped from a peak of 30,000,000 tons to 23,000,000 tons.

Examined from the perspective of food self-sufficiency, it may appear to be a blessing that the absolute amount of imported grains has been reduced, but the self-sufficiency rate itself has either barely budged from what it was 25 years before or has in fact dropped. While some industries have become globalized, the base of the economy are the domestic markets in each region.

While there has been a gradual decrease in domestic agricultural production, there has also been a decrease in food demand, so those living in Japan are not concerned about food stability, and it is not generally considered to be a major social issue. Various attempts are made to export agricultural products, but there are still many producers and organizations who remain convinced of the need to export primary products made in Japan. Therefore, while efforts are made in the global marketplace for a time, it is hard to provide much stimulus to the overall Japanese economy.

In addition, the way in which each individual production area claims various rights makes the problem more complicated and renders it more difficult to create and carry out unified export strategies in response. Exporters of Japanese agricultural produce are constantly exposed to threats from fakes by later-developing neighboring nations, which look for such gaps to exploit.

In terms of renewable energy, while everyone is aware of its necessity, it is always thought to be something separate from existing energy systems, so it remains difficult to link to major changes in industrial structure. In anticipation of future reductions in demand for domestic feed grain, some companies are starting to study converting some of their plants in coastal areas into ethanol plants, but the commercial base is still taking a wait-and-see approach.

However, some corporate groups have started to import ethanol products while keeping

an eye on market trends. While the product imports themselves are gradually increasing in volume, the fact that existing energy can fully meet domestic demand, and the fact that there are insufficient systems (e.g., subsidies) to encourage import of ethanol products, means that ad hoc trial-and-error efforts continue to be made, regardless of such products' market value superiority.

For this reason, Japanese society overall suffers from a strange sense of rampant stagnation as it watches other countries develop, even though its GDP remains in the upper echelons globally.

- **Scenario C: Uncertain/Delayed Scenario**

The Uncertain/delayed scenario is, in a sense, the worst scenario, as it envisages a world in which there are few changes to Japanese lifestyles and feelings towards food, and no changes in social systems themselves. Put simply, it assumes that current attitudes and awareness as well as current lifestyles continue unchanged for the next 25 years. This scenario's world is as described below.

Uncertain/Delayed Scenario

The world of the Uncertain/delayed scenario in 2040 is very similar to that of the Uncertain/trial and error scenario with respect to the larger political and economic frameworks. The aging, low birth rate society and increase in the number of single-person households is also the same. However, the scenarios differ in that in the Uncertain/trial and error scenario, there are various attempts throughout society to attempt to change these trends, but in the Uncertain/trial and error scenario, most such attempts are forestalled, and the majority of the time, the intended effects cannot be obtained.

What must be noted is that in this scenario, the world retains the awareness, behavior, and social systems of 2014, when the scenario was created, almost unchanged in terms of diet and lifestyles. In other words, it attempts to answer the question of what would happen if behavior considered normal for Japanese in 2014 is continued unchanged for the next 25 years. Infrastructure directly connected to lifelines (e.g., electricity, gas, water, transport, and food) is already starting to shudder.

Many elderly Japanese regret the mistakes of the past, such as that they did not use resources more wisely, and wasted too much food, but there is nothing to be done now.

Back in the 1980s, the period came to be referred to as the "Bubble," but looking back at that time from the Japan of 2040, the entire period from the 1960s to about 2020 appears to be a bubble era. In 2040, you must be 75 to receive your pension. As the average lifespan has changed little from 25 years before, on average men receive it for a mere five years, and the amount is a pittance.

While employment is fluid, schools teach that Japan once used to have a lifetime employment system, and most office workers—not just young people—generally have five- to ten-year contracts. Uncertainty about the future is common among all generations, and their constant companion.

Aside from the very wealthiest, most Japanese have shifted to eating cheap, simple meals, such as prepared and processed foods, and many young people and elderly subsist

by eating all three daily meals in block or tube form (substitutes). The average person considers cooking to be a hobby of unattainable luxury, unless it is something they genuinely enjoy.

However, even in this world, traditional dishes, while pricey, can be had. However, each year fewer and fewer people are able to consistently eat like this.

Domestic industries connected with agriculture and food products have shrunk significantly due to the effects of reduced demand resulting from the reduced population. Much of the increased food demand overseas is handled by domestic production in the respective country or import of high added-value processed foods, but Japanese companies do not significantly engage in either. Asian countries, which absorbed almost all of Japan's cutting-edge technologies from the 2010s to the 2020s, have already built systems and technologies to create products well-suited to address their own demand themselves.

As other Asian countries have been able to develop their own economic and technological capacities to replace financial and technical support, which they once heavily relied upon, there are fewer and fewer countries relying on Japan for aid, and theoretically even if such support is now offered, the receiving country will no longer be nearly as grateful.

Grain imports have been progressing at a somewhat faster pace than the reductions in population or demand due to that reduction. Behind this is the fact that Japanese ideas about rapidly changing overseas countries in Asia and Africa as well as the social systems supporting these ideas have not changed enough, so in many cases Japanese companies are unable to suitably adapt to newly created overseas demand. Asian countries which wanted high-quality Japanese agricultural products are now largely self-sufficient for their needs, or they importing such products from countries other than Japan.

In the end, in the shrinking domestic market, there is not only an ongoing competition within industries to survive, but, as companies tire from this war of attrition, they leave themselves open to the injection of low-cost products from overseas manufacturers in selected categories, and a state of gradual decline continues. Domestically, there is more interest in ecology, and some favor renewable energy, but this is limited to just a few specific areas within Japan and has not reached the level where it could greatly affect the international grain import system.

In the world of the Uncertain/delayed scenario, Japan's annual corn imports have declined to 10,000,000 tons, almost one-third of their peak. Though Japan has made maximum use of economies of scale for grain imports, it is now starting to reach its limits.

- **Scenario D: "Skeptical/Compliant Scenario"**

The "Skeptical/compliant scenario" envisages a world in which a certain level of change in social systems has been acknowledged but ideas about individuals' food and lifestyles remain largely unchanged. In the world of the Skeptical/compliant scenario, scientific truths continue to be discovered and new knowledge presented, but most of people's basic behavior patterns remain unchanged; people only incorporate those aspects which are forced on them in the form of government policies or work-related orders.

The story of the world of the Skeptical/compliant scenario is as follows.

Skeptical/Compliant Scenario

Even by 2040, there has been little fundamental change in the way most people around the world think and behave. There has been some progress in the transfer of power to regional governments and economic links with other countries, but economically, only a few fields have globalized, and there are a number based exclusively on local markets.

As Japanese society is increasingly affected by the number of single-person households and the elderly as well as the low birth rate, peoples' diets are split, according to time and place, between high-quality traditional foods and prepared/processed foods. Biotechnology and other scientific technologies have shown some progress, and a number of new discoveries have been made, but these are not yet sufficiently trusted by general consumers. In this world, most peoples' daily lives coexist with global changes in a strangely independent manner.

Various problems related to the global environment, starting with climate change, remain the subjects of debate, but this is merely a general debate and specific solutions are not put into practice. Some multinational companies have been able to move into new markets by making use of changed social systems, but these are limited to a few specific products for a few specific users.

Regarding grain imports, there have been some changes in the positions of exporting nations, depending on the product, but Japan remains dependent on its traditional exporting nations, especially those in the Americas. However, there are time-limited chances for newly emerging exporting nations, such as those in Central Asia, due to the weather, crops, and demand in a given year.

Asian markets continue to grow, and demand is expanding across a range of areas, including fuel and pharmaceuticals, rather than merely the old areas of food, drink, and feed, so the content of grain exports is also shifting in response to individual needs.

Some time has passed since Japan's total population started to decrease, but the country still has one of the world's highest standards of living and its GDP remains in the top ten globally.

The amount of grain imported has been decreasing in response to the reduced population; however, there is now a certain level of demand for grains with advanced functionality added not just within Japan but among the wealthy classes throughout Asia. In other words, the competitiveness gap is widening between companies that quickly shifted their profit sources from bulk trading to high added-value products and those that did not. This means that selected producers and corporations that adapted to market changes and needs, who won out over advanced companies in newly emerging nations, enjoy higher awareness of their companies and their products overseas than back home, while companies in many conventional agricultural categories continue to be dissatisfied with the current situation yet present no clear direction.

Note that while domestic agriculture in Japan has been shrinking due to the effects of generational changes, grain imports, which totaled 30,000,000 tons at peak, are now down to 23,000,000 tons. This means that overall, imports have compacted while maintaining

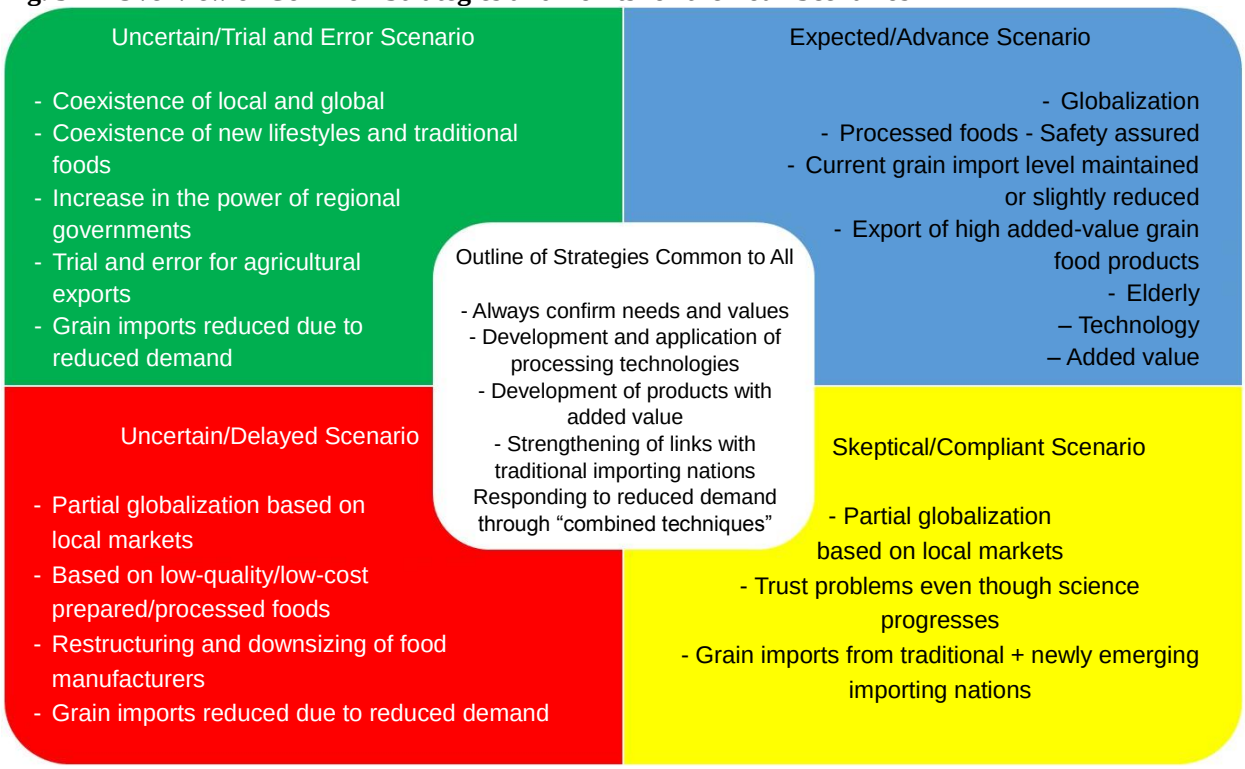
balance as they contracted. However, in the Skeptical/compliant scenario, while Japan has exhibited a range of developments in globalization and advanced science and technology, the country remains skeptical and is often passive or late in taking action.

The introduction of new systems based around renewable energy is progressing in model regions, mainly focused on administration, and some effects have been achieved, but such technology is still a long way from being put into general use. Some plants located along the coast of Japan are also importing grain to produce ethanol in addition to traditional grain importing companies, attempting to expand into new businesses. However, these moves are limited to those corporate groups which have the capital to allow them to invest in new equipment.

In this scenario, Japan shows no leadership of the global economy, and is merely a member of the high-level group that follows the way the world moves.

The strategy factors common to all four scenarios are (1) an accurate grasp of domestic and overseas needs as well as consumers' values, (2) the development of techniques and systems to respond to these, and (3) being able to properly procure the required raw materials. If we apply these factors to grain imports, then (1) is to always grasp the needs and values of Japan and other Asian countries, (2) is to make use of the latest processing techniques and added-value commercialization of grains and foods, and (3) is to strengthen links with traditional exporting nations as well as respond to reduced demand through "combined techniques" using multiple measures. These are summarized in Fig. 3 below.

Fig. 3 Overview of Common Strategies and Points for the Four Scenarios



5. In Conclusion: To set and enact strategies

At the time of writing this article, the year 2040 lies about 25 years ahead. If we think about how a newborn today will be 25 years old then, it may seem like a long time, but in terms of human history, and in particular the history of food, it is but the blink of an eye.

However, Japan, which for many years had the world's second-highest GDP, has now dropped to third. When a person or organization who has occupied one position for a long time faces a change in that position, it may be experienced as something truly major. In fact, the population of Japan has passed its peak, and will continue to decline for several dozen years. Moreover, if we consider that Japan will be the first in the world to experience an old-age society, the future tends to look rather bleak.

Examining things more calmly, we realize we are vacillating in confusion because we are greatly exaggerating this change, since it is actually just the smallest start amidst a large flow. For example, the fact that the population, which peaked at 128 million, will still be more than 100 million 25 years from now suggests an extremely important point with respect to the future.

At the close of this article, I would like to share a few of my own opinions.

First, though this has already been mentioned, a quarter century may be a long part of a human lifetime, but in terms of the flow of history for society overall, it is not merely not long, it is virtually a single instant. Even if the worst scenario studied in this paper comes to pass, it is extremely likely that Japan's grain imports will be nearly 20,000,000 tons in 2040. If just the amount of corn imported is nearly 10,000,000 tons, Japan will definitely remain one of the major importing nations.[18] And, if we think calmly about the fact that even with an aging population, low birth rate, and reduced population, Japan will still be a market of 100 million people, this is an extremely obvious conclusion.

Second, when considering the above point, there is no immediate need to expand the dispersal of risk by wildly diversifying production areas in the period leading up to about 2040. It will take quite a lot of time and money for Central Asian and South American grain-exporting nations to develop their distribution facilities and port facilities as well as other infrastructure to the same extent as the United States. Moreover, there is even more uncertainty regarding their political and economic stability. Considering these facts, even in 2040 it is likely that Japan, a major grain-importing nation, will maintain close relationships with its current major suppliers; ensuring suppliers are in position to provide the required amount, no matter what happens, will be its top priority. This is something that will be studied as part of national policy from the perspective of ensuring food security, rather than merely as a business base.

As noted in the previous year's report, Japan was the fourth most popular destination for U.S. grain exports in 2011, and the ratio in terms of monetary amount was 10% of the top 15. In terms of Lanchester's market occupancy ratio, it would be at the bottom limit of "existence affects market trends, and is the focus of attention." If the amount of grain imported in 2040 is two-thirds of its current level (i.e., Japan's weight as a destination as seen from the United States falls to 6–7%), it will be barely at a level where its existence is recognized by competing companies. There will be

[18] According to the long-term projections released in February 2014 by the U.S. Department of Agriculture (*USDA Agricultural Projections to 2013*), the amount of corn imported by China will exceed that of Japan six years from now, around FY2020/21. China is expected to import 22,000,000 tons of corn in FY2023/24.

genuine questions about whether to keep this at the current "influential level" at the very least.

Third, how should we view the entries of newly emerging exporting nations into the international market? For Japan, it is sufficient to see them as "available just in case," or perhaps as checks and balances against major exporting nations. There are strong feelings that 25 years will not be nearly enough time for these countries to be able to ensure year-round, stable exports in the millions of tons. Even if hypothetically they achieve this faster, that would be preferable, as it will allow dispersal of risk in the true sense.

Fourth, the best way to make use of scenario analysis is to virtually experience the future and make it become the past. In many cases, people make decisions based on what they have experienced. Therefore, it is extremely hard to make decisions about a future one has not yet experienced. However, even in the worst-case scenario, if we do not steer wrongly and understand that the next 25 years offer the chance to create the future, then it will be possible to make decisions relatively easily even if we actually face such a situation.

The points considered here are to allow for a more accurate grasping of the multiple phenomena that have appeared to build upon the cause and effect relationship and chronological axis of the envisaged scenarios. Though this article has not probed such depths, one phenomenon must always occur to allow another given phenomenon to occur. Whether we can grasp this as a hint to remain cautious and make decisions in response will determine how bright or dark our future becomes.

Finally, I would like to present a passage found both in an old book I reread as I was reminded of it in preparing this paper as well as a book I recently perused.

"For us, wars happen to obtain land, cities, villages, and their wealth. Japan's wars are almost always to obtain wheat, rice, and barley."[19]

This is how the 16th century Portuguese missionary Luis Frois saw Japan in his time. Therefore, "for us" here refers to Frois. When we reflect on the Warring States period, there is a tendency to focus only on the warriors and how they fought, but this is an observation that in fact wars in Japan were also wars over food. As a Japanese person living in a major grain-importing country, it is my sincere wish that great care is paid to grain imports so that we need never repeat this era again.

[19] K. Matsuda, E. Jorissen, *Furoisu no Nihon Oboegaki: Nihon to Yōroppa no fūshū no chigai* (1983), p. 109. This book is packed full of memories for the author, who studied Portuguese and the history of Christianity in Japan in the 1980s. In addition, this section is quoted on p. 3 of H. Fujiki, *Shinban Zōhyōtachi no Senjo* (2010). Fujiki's works are a valuable and very accessible source regarding the wars in medieval Japan over food.

Food Security and Trade Expansion

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1. Introduction

Although international agricultural markets have been expanding and the trade volume of agricultural products has been increasing, the trade volume of wheat is approximately 25% of production volume and that of rice is approximately 15%, which is lower than that of industrial products. Food is essential to survival and some citizens maintain self-sufficiency as a basic ideal; the international market is built out of what is not consumed in domestic markets, so one can consider it to be the movement of the leftovers of domestic consumption into international markets.

In countries and regions having lower food self-sufficiency ratios, such as Japan, it is often said that domestic production should be increased to improve the self-sufficiency ratio in order to ensure food security. Streamlining domestic production is desirable in order to increase competitiveness in the international market, thereby increasing the self-sufficiency ratio. However, when the goal is improvement of food self-sufficiency itself, products having less comparative advantage are prioritized and, as a result, expansion of the agricultural products market is interrupted by trade distortions.

Food security is important; we must review how to address various risks. In this article, we organize our thoughts on food security to argue that the self-sufficiency ratio itself cannot serve as an index, but rather attempting to expand and stabilize trade of agricultural products will more likely achieve food security.

Also with the aim of searching for new opportunities for Japanese agriculture, exporting of agricultural products is important and one strategy is to bring low-priced agricultural products through the processing trade by making the most of high quality. Exporting livestock products is truly a processing trade, and I discuss the importance of assured collaboration between the United States as a raw material provider and Japan as an exporter of Japanese-branded agricultural products.

2. How to Understand the Food Self-Sufficiency Ratio

The Japanese food self-sufficiency ratio is 39% on a calorie value basis (for fiscal year 2012, the same hereinafter). This low food self-sufficiency ratio has been seen as a problem, and Japan's Ministry of Agriculture, Forestry and Fisheries (MAFF) estimates the Japanese self-sufficiency ratio will drop to 14% if Japan joins the Trans-Pacific Partnership (TPP) and removes its border measures.

The self-sufficiency ratio on a calorie value basis is calculated by dividing the total number of domestic food supply calories for all domestic agricultural products, which is calculated by multiplying the production volume of each agricultural product by the amount of calories contained per unit weight, by the total supply of calories (the total number of food calories of domestic and imported products as well as those lost or discarded). Production generated by imported feed is deducted from the calculation to calculate the self-sufficiency ratio for livestock products.

The self-sufficiency ratio of rice is 96%, while that of wheat is 12% and soy is 8%. Regarding

livestock products, although the self-sufficiency ratio is a high 69%, 52% of that is production from imported feed, which brings the self-sufficiency ratio down to 17%. The self-sufficiency ratio of vegetables is a high 78%; however, this contributes little to the total food supply calorie count due to the low number of calories per unit weight for vegetables. The total supply of calories per person per day is 2,431 kcal, of which 948 kcal is supplied domestically, giving a self-sufficiency ratio of 39%.

There are several points to remember when examining calorie self-sufficiency ratios.[1] First, the total number of calories supplied, which is the denominator, is not the number of actual food calories consumed by Japanese. This includes residues as well as discarded and unused food. Actual consumption is estimated to be approximately three-fourths of total supply volume, and if consumption volume is used as the denominator, the self-sufficiency ratio becomes 54%. Of course, it is unrealistic to assume that people consume only domestic food completely without any waste.

On the other hand, we must pay attention to the numerator as well. Domestic supply in this context is limited to products sold by farmers[2] and does not include farmers who produce for self-consumption.[3] Even among farmers who sell produce, this figure does not include amounts sold to family and friends. Therefore, the estimated self-sufficiency ratio is less than the actual value.

The Japanese food self-sufficiency ratio was a high 79% in 1960. It was maintained at 60% during the 1970s; however, the current self-sufficiency ratio is half that of 1960 and two-thirds that of 1970 with no signs the declining tendency will improve. How should we think about this declining food self-sufficiency ratio? Eating habits do not necessarily improve when the food self-sufficiency ratio is increased. Imagine the eating habits of countries at war or that are isolated which have 100% food self-sufficiency ratios.

The food self-sufficiency ratio is a result of economic behavior: production and imports as well as consumption.[4] Said differently, behind this behavior is primarily economic judgments and decision-making. Given the same quality, consumers choose the cheaper option. Domestic products survive if they are cheaper than imported products or have better quality. Products will be imported if it is judged consumers will purchase them even after customs duties are paid for; the lower customs duties become, the greater the amount of imports.

Japan formulated the “Outline of the Plan for Trade and Foreign Exchange Liberalization” in 1960, opening up the markets for many agricultural products and becoming one of the top importers of agricultural products globally. Today, Japanese dinner tables are filled with food from all over the world. The decline in the food self-sufficiency ratio until the 1980s is mainly due to these changes in trade policies, such as liberalization of imports and reduced customs duties. Pursuit of profits in trade based on comparative advantage brought about a decline in the food self-sufficiency ratio as people became more affluent.

On the other hand, high customs duties are still imposed on agricultural products that are important for domestic agriculture (e.g., rice, starch, and dairy products) in order to limit imports. In other words, if such high customs duties are abolished to increase imports of agricultural products,

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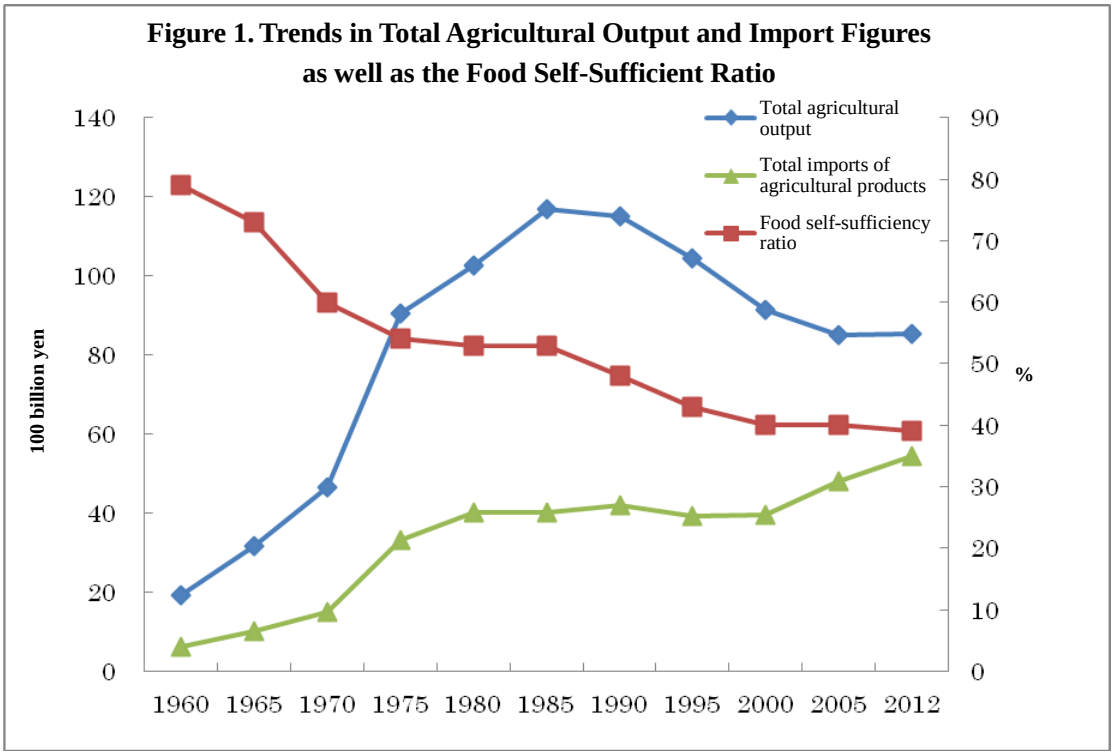
[1] See Asakawa (2010) for an explanation of the various problems with food self-sufficiency ratios.
[2] Households with cultivated acreage of 30 are or more, or 500,000 yen or more of sales of agricultural products.
[3] Households other than sales farmers with cultivated acreage of 10 are or more, or 150,000 yen or more of sales of agricultural products.
[4] See Honma (2006) for an explanation of how food self-sufficiency ratios are considered in economics.

the food self-sufficiency ratio will decrease but people's lives will improve. These agricultural products are those which were deemed not to be internationally competitive and for which market liberalization was delayed. Many agriculture-related parties oppose Japan's joining of the TPP because it will potentially deal a fatal blow to domestic production of these products.

Japanese agricultural production, however, has been declining for the last 20 years even without Japan's joining of the TPP. As shown in Fig. 1, agricultural output peaked at 12 trillion yen in the mid-1980s before declining to 8.5 trillion yen in recent years, while imports have reached 6 trillion yen. It is important to recognize the causes of the steady decline in the food self-sufficiency ratio differ before and after the 1980s.

Although imports have increased due to market liberalization and the food self-sufficiency ratio has declined, Japanese agriculture prior to the 1980s expanded agricultural output by importing agricultural products of less comparative advantage to Japan (e.g., feed grain) and shifting production to more profitable products for which demand was expected to increase (e.g., livestock, fruits, and vegetables). On the other hand, after the 1980s, Japanese agriculture showed a remarkable overall decline and output significantly decreased. During this time, it did not deteriorate due to the progressive market liberalization.

Figure 1. Trends in Total Agricultural Output and Import Figures as well as the Food Self-Sufficient Ratio



Source: *Annual Report Reference Statistical Tables*, Japan's Ministry of Agriculture, Forestry and Fisheries

3. The Food Self-Sufficiency Ratio and Food Security

Japan has set a target value for food self-sufficiency; let us again consider the meaning of this.[5] What is achieved by increasing the food self-sufficiency ratio? A food self-sufficiency ratio target was included in the Basic Plan for Food, Agriculture and Rural Areas ("Basic Plan") stipulated in the Food, Agriculture and Rural Areas Basic Act ("Basic Act," enacted in 1999), which states it "shall be established in view of improving the ratio and as a guideline for domestic agricultural production and food consumption, while identifying issues which farmers and other relevant parties should address" (Basic Act, Article 15, Section 3).[6]

Although the law advocates improvement of the food self-sufficiency ratio, the purpose of doing so is unclear. If the purpose is to ensure steady supply of food to the people, as specified in Article 2, Section 2, it could be achieved by "secur[ing] an increase of domestic agricultural production as a basis, together with appropriate combination of imports and stockpiles." Since target values for the food self-sufficiency ratio were established without clarifying the purpose, the purpose has become achieving the target values.

In reality, agricultural products with low self-sufficiency ratios (e.g., wheat and soy) have been recommended upon rice crop conversion under the rice acreage reduction policy. However, what do we achieve by increasing the self-sufficiency ratio of wheat and soy? Both differ significantly in price between domestic and imported, and the cost of domestic production is several times that of imported products. Although domestic wheat has improved, wheat production for bread is not suited to the climate and is thus limited in Japan. Even for wheat noodles, Australian wheat (ASW) is used for the Sanuki brand. Durum wheat for pasta cannot be produced in Japan.

Although the target of food self-sufficiency ratio is said to be established as a production/consumption index, it may encourage production that limits consumers' choices and forces consumption of products having low self-sufficiency in order to achieve the target. Furthermore, in addition to inefficient distribution of resources (social loss) due to government intervention in the market, policies usually require budget measures and thus cost taxpayers as well. What do the people gain by improving the food self-sufficiency ratio at these costs?

Food security is often mentioned as the purpose of improving food self-sufficiency. The term "food security" must be defined, but here let it mean simply taking measures to prevent threats to people's survival due to food supply shortages. Both domestic production and imports may lead to food supply shortages; if Japan has a greater dependency on imports due to a low self-sufficiency ratio, disruption of imports becomes a concern.

Imports may be disrupted in various situations, including completely unanticipated natural disasters, strikes at ports and harbors, supply shortages due to cyclical climate changes, Malthusian food crises, and crises due to political use of food. In any case, depending on their probability, these should be manageable by combining various measures, such as stockpiles, dispersion of countries of origin, the futures market, and use of long-term contracts.

However, the people's largest concern is generally food security during emergency situations such as war. Of course, eating habits during emergency situations are completely different from the current situation, and in such cases food security to sustain life will be prioritized. Food production

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[5] This discussion is based on Honma (2011).

[6] See Chapter 4 of Honma (2010) regarding the Food, Agriculture and Rural Areas Basic Act as well as the food self-sufficiency ratio.

will focus on calories, and a production system completely different from that of ordinary times is required. Therefore, it is clear that the self-sufficiency ratio for eating habits during ordinary times cannot be an index for the supply power of food calories during emergency situations.

Essentially, food security should be recognized as part of total security and addressed under the emergency system (e.g., that for military affairs and energy issues). Food security is infeasible without combining other measures and policies, including those for ensuring the supply of energy (e.g., oil) required for food production and securing of transportation routes and means. Food security during emergency situations need not model that of ordinary times if stockpiles, forced production, and distribution systems have been established and emergency collateral measures are taken. We need not be preoccupied with the self-sufficiency ratio of ordinary times, and if we freely pursue agriculture that makes the most of what we have, the self-sufficiency ratio will improve as a result.

Beyond food, the most important thing for security is to exert efforts to prevent situations leading to emergencies such as war. When food imports are stopped, so do those of other items including oil, and it does not make sense to think of the security of food alone. Domestic agricultural production itself utilizes many imported raw materials as well as oil. If one considers the total volume of imported raw materials, not just imported feed for livestock, it becomes clear how meaningless having a self-sufficiency policy only for food is.

4. Food Security Under Interdependence

As we examine the associations between the food self-sufficiency ratio and security, food security targeting only improvement of the food self-sufficiency ratio is meaningless, though establishing a food supply system for emergency situations is essential. On the other hand, even given today's globalism, we still have not established a cosmopolitanism that standardizes all policies worldwide and eliminates power struggles between nations. There is also no strong system to guarantee food security internationally through the collaboration of all the world's nations. When one thinks of the current situation in international politics and the maturity of international society, a total security strategy must be re-established and globalization should be promoted realistically, after recognizing the current situation of the interdependent international economy. By this, I mean nothing more than clearly spelling out the status and role of Japan as a country with few natural resources in international relations.[7]

Today, a significantly increased number of communication channels have become available. While international relations have conventionally been based on the relationships between countries with respect to governmental and foreign policies, today, various actors with worldwide networks form the base of international communications. Inter-dependent partners exist not only between nations and we must communicate with various agents around the world.

In particular, it is important to consider that Japan's food security is linked to world food problems. The more food Japan imports, the more Japan must contribute to solving malnutrition issues around the world, not only by decreasing food imports but also by supporting agricultural production in developing countries as well as increasing investment in agriculture. At the same time, it is wise to expand donations to global organizations and actively participate in efforts for the

[7] For a detailed discussion of the issues in this section, see Honma (2012), which outlines the history of food security and theories of security.

Second Green Revolution by CGIAR (formerly known as the Consultative Group on International Agricultural Research) and others.

In addition, besides food security, various types of economic and technical security must be discussed to determine their priority order and mutual relationships. Food is important, but so are energy and rare metals. In reality, under the banner of total security, priority orders have been fixed politically based on conflicts of interest among sectors. Today, we must grasp interrelationships and realize that security based on food alone is unlikely to be achieved; our position must be defined in other fields, such as energy and international relations.

Furthermore, today's interdependencies are not limited to trade expansion. International interdependencies have deepened as many industries expand raw materials procurement, production locations, sales, and marketing. In particular, international trade within corporations and trade in the manufacturing and assembly industries has been increasing and procurement of intermediate commodities is shifting from domestic to international networks as production processes have become multinational and fragmented, connecting intermediate commodities and parts produced in various countries and regions with final commodity production. Also for food, domestic food supply chains depend more on overseas bases to procure ingredients; this network may even bring a more stable supply of food to Japan.

5. Securing a Stable Food Supply

Today, food security means nothing if not securing a stable food supply. For this, transportation and logistics between producers and consumers must be streamlined in addition to searching for stable food production bases in various parts of the world. In Japan, this role is fulfilled by trading firms' overseas affiliated companies. The question is how effectively we can utilize the functions of international markets and how we can stabilize food imports by offsetting the flaws of international markets.

As seen in the 2006–2008 grain price hikes, the international food market is constantly at risk of change, but changes also provide business opportunities for food-related economic agents. In fact, Japanese trading firms used to supply food mainly for export to Japan; however, they have kept step with the growth of the markets in newly emerging economies, especially China, and have started focusing on supplying food directly to China from exporting countries.

Still, the Japanese market remains attractive. In particular, many trading firms have established supermarkets, convenience stores, and food supply chains in Japan in order to take advantage of solid sales volume in contrast to the instability of emerging markets. These distribution businesses not only handle distribution but also will integrate under a uniform, international system from production, distribution, and processing to domestic sales. This system itself is required infrastructure for supplying food steadily to domestic consumers in the face of internationalization.

On the other hand, other countries are carrying out numerous efforts in response to previous food price spikes. For example, although Korea has been making strong efforts to carry out agricultural development overseas, the country regards such development as a business opportunity and has been investing in overseas agriculture rather than linking agricultural production overseas to a stable food supply and security at home. When one considers importing countries are powerless if producing countries impose limitations on exports, this is an inevitable result. However, it is also necessary to recognize that investment in agriculture overseas is effective not for emergency situations but for

decentralization of sources of food imports during ordinary times.

Japan once experienced an export ban of soybeans from the U.S., and the country has since attempted to decentralize its import sources. As part of these efforts, Japan has transformed Cerrado, Brazil to a fertile grain-producing region by investing in development, thereby contributing to a stable supply of imported soybeans. What we can learn from Japanese agricultural development is not only that it is possible for the investing country to profit but that it is also desirable to invest in agriculture overseas in a way that returns investment profits to the local area and contributes to stimulating the local economy and economic development. Considered this way, Japan should not stop investment in agriculture overseas as part of securing a stable food supply but rather reconsider such investment with respect to its effectiveness in reducing poverty in developing countries.

This article previously mentioned a food supply chain system as a way of securing a stable food supply, but this does not end with Japanese affiliated companies. A network of multinational joint ventures can be created, presenting still more possibilities. In fact, not having its own route, Korea is faced with limitations on international distribution development; the country must depend on local companies to sell products, although it invests in agriculture overseas for production purposes. Similarly, Japanese food companies that expanded into China ran into obstacles in domestic distribution when entering the expanding Chinese market, although they were able to depend on Japanese companies for distribution within Japan.

It is essential to secure a stable food supply to extend such international networks in the future. To do so, necessary policies are not limited to establishment of information infrastructure but include provision of technical support for SMEs that wish to expand overseas, funding, and human resource development at different levels.

6. Expansion of Agricultural Product Exports

Although increasing the domestic supply is desirable from the standpoint of efficient domestic production for food security, this need not rely on increased production of items for which self-sufficiency is low. The important point is to fully use domestic agricultural resources in order to become able to shift to a production system capable of securing enough food calories in an emergency situation. Therefore, during ordinary times, trading can be carried out based on comparative advantage and Japanese agricultural products can be sold in international markets without fixation on the domestic market. During emergency situations, food will be secured by shifting production from exporting agricultural products to grain and potatoes, which contain high numbers of calories.

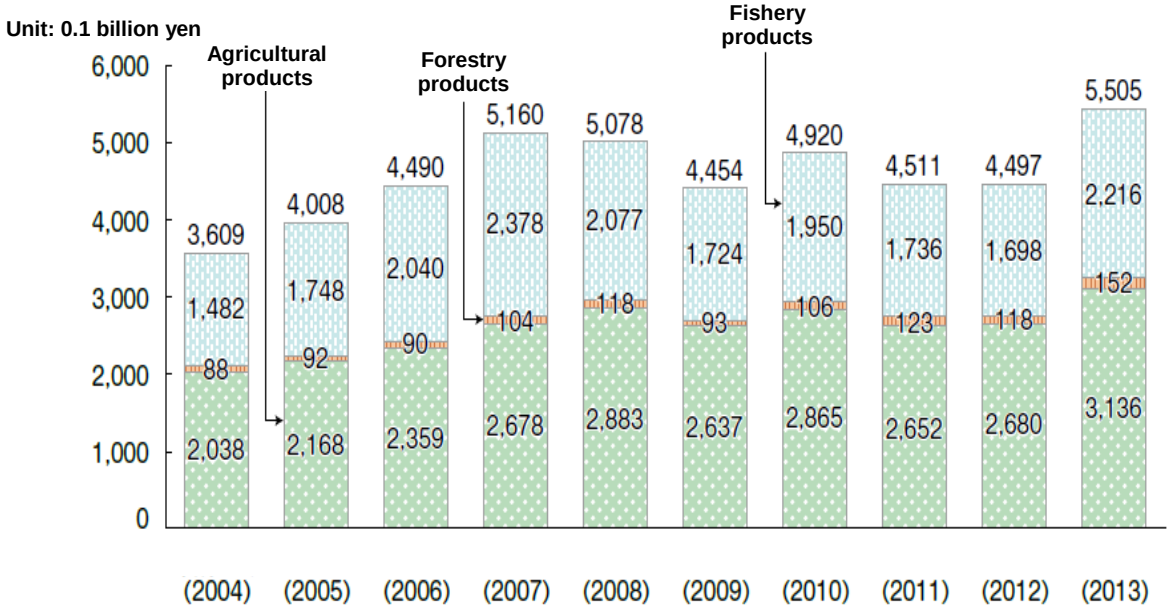
Expanding agricultural product exports will increase the food self-sufficiency ratio. Total domestic supply calories, which are the numerator in the food sufficiency ratio, are the calories supplied by domestic production and include the volume exported. Promotion of exports increases food self-sufficiency. As mentioned earlier, the food self-sufficiency ratio is not in itself an index of food security; it is important to make full use of the agricultural landscape and secure domestic production bases whenever products are consumed.

How are Japanese agricultural exports structured at present? The trends in export volumes of Japanese agricultural, forestry, and fishery products are shown in Fig. 2. MAFF aims to reach 1 trillion by fiscal year 2020 by exporting agricultural, forestry, and fishery products, which include processed products as well as agricultural, forestry, and fishery products as ingredients. The trends

shown reflect this definition.

Exports of agricultural, forestry, and fishery products totaled 550 billion yen in 2013; the content was 310 billion yen for agricultural products (including processed products), 15 billion yen for forestry products, and 220 billion yen for fishery products. Exports of agricultural, forestry, and fishery products have remained stable at around 500 billion yen for the last several years, showing a stagnant tendency.

Figure 2. Trends in Japan's Exports of Agricultural, Forestry, and Fishery Food Products



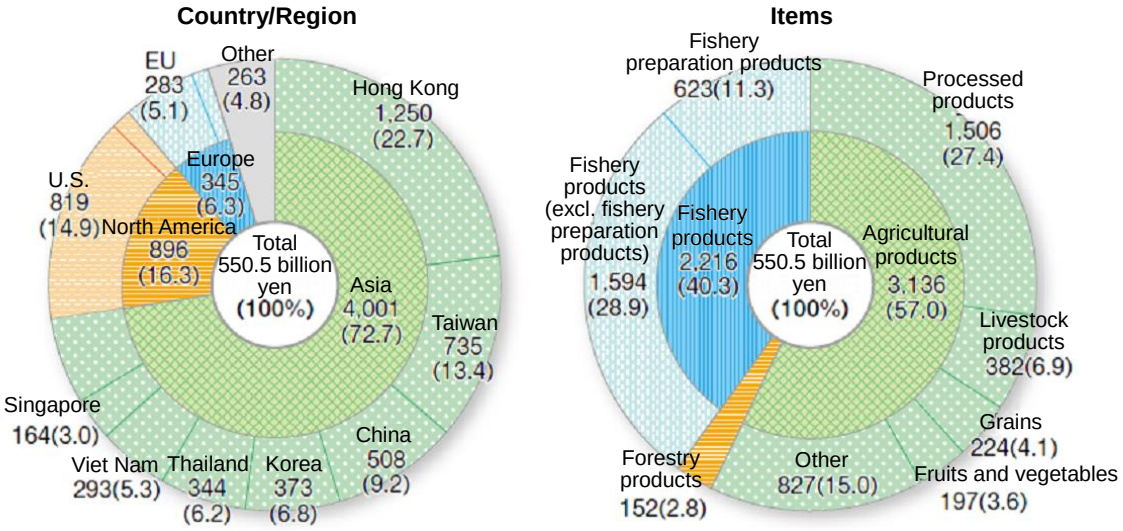
Source: Prepared by MAFF based on the Ministry of Finance's *Trade Statistics*

If one examines the content of exports of agricultural, forestry, and fishery products closely as shown in Figure 3, approximately half of agricultural products (150 billion yen) are processed products. Exports of agricultural products as ingredients are a mere 80 billion yen. Figure 3 also reveals Hong Kong, Taiwan, China, Korea, and Thailand are the main countries to which agricultural, forestry, and fishery products are exported; exports to Asia exceed 70%. The top products exported to these Asian countries are primarily fishery products.[8]

In overseas markets, there has been growing interest in Japanese cuisine in recent years, and demand for Japanese agricultural, forestry, and fishery products remains high. Especially in Asia, where the food market has expanded due to rapid economic growth, trends in demand toward luxury, variety, and popularization of food have accelerated. In addition to the supply of expensive Japanese food to the wealthy, Japanese food has rapidly spread to mainstream consumers who have increasing incomes. Japanese agricultural, forestry, and fishery products are becoming common commodities in Asian countries.

[8] See Honma (2013) for details of the structures of Japanese exports of agricultural, forestry, and fishery products.

Figure 3. Breakdown of Major Agricultural, Forestry, and Fishery Food Product Exports in 2013



Source: Prepared by MAFF based on the Ministry of Finance's *Trade Statistics*
Note: Numbers in parentheses indicate the percentage of the total.

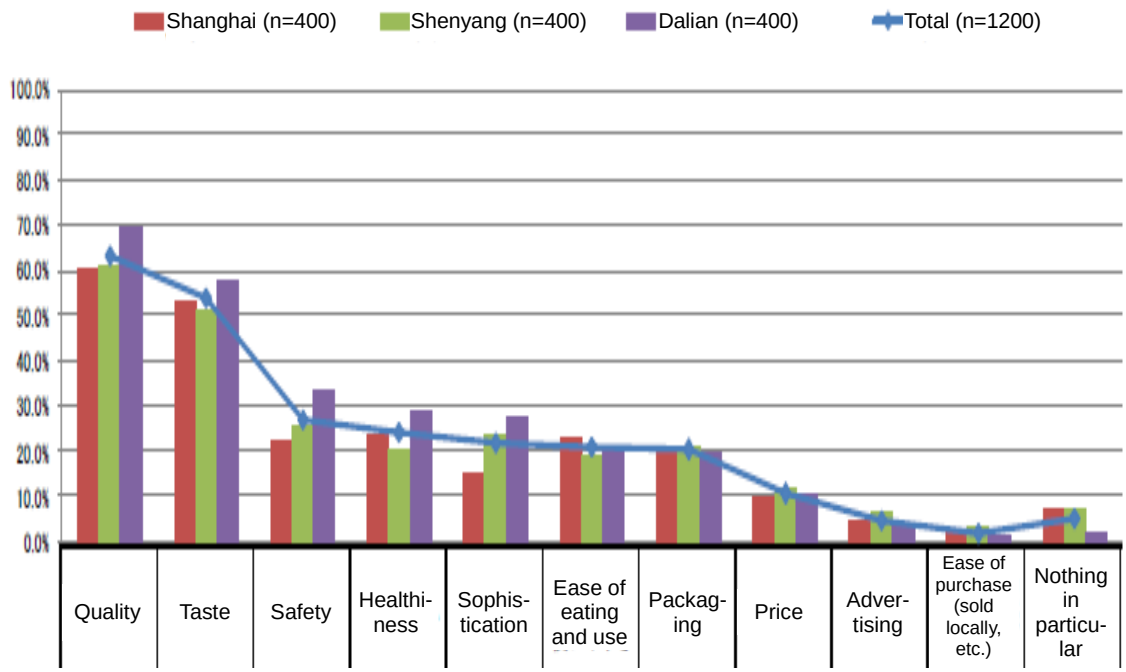
According to a consumer survey on food made in Japan carried out by the Japan External Trade Organization (JETRO) in Shenyang and Dalian in Liaoning Province, China, the most common answers to a question asking about what consumers rate highly about food made in Japan compared to food made in China and other countries were responses such as quality, taste, and safety (Figure 4). By contrast, issues noted included "high price" first, followed by "authenticity" and "few retailers or unsure where to purchase" (Figure 5).[9]

In short, the common evaluation of Japanese food is that it is of good quality but has a high price. Therefore, a prerequisite to expanding exports of Japanese food and agricultural products is to reduce the cost while maintaining the quality in order to meet the needs of consumers overseas.

There are issues to solve in order to develop food and agricultural strategies in Asia. Beyond Asia, global trade of agricultural products today has entered the era of intra-industry trade, and comparative advantages are not only determined by natural conditions and factor abundance. Not to mention differentiation and branding of products such as Japanese beef, significant gaps in quality have also occurred for fruits and vegetables depending on plant varieties and production regions; rice, which has a land-use model, is no exception. Therefore, this point will also be important when considering trade in the Asian region in the future.

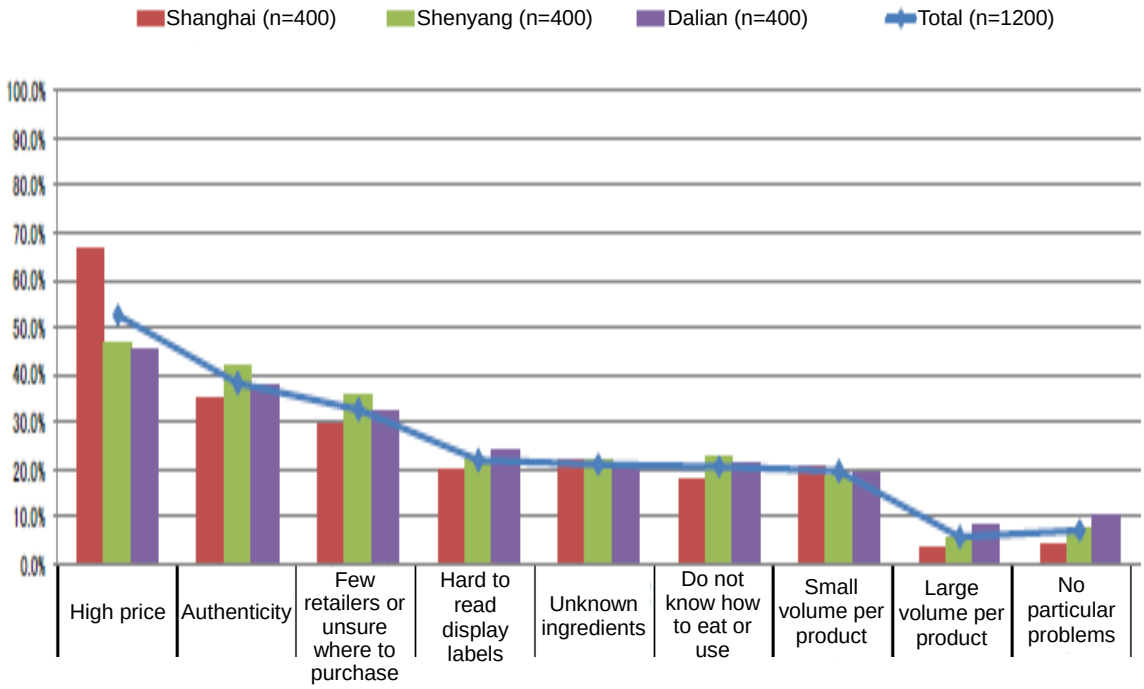
[9] According to JETRO (2012).

Figure 4. Evaluation of Japanese Food in China (3-choice survey)



Source: "Consumer Survey on Food Made in Japan in Shenyang and Dalian in Liaoning Province" (2012), JETRO

Figure 5. Problems with Japanese Food for Chinese People (3-choice survey)



Source: "Consumer Survey on Food Made in Japan in Shenyang and Dalian in Liaoning Province" (2012), JETRO

Certainly, agricultural products made in developing countries where labor costs are exceedingly low may dominate markets in Japan and Korea if such products are of the same quality. However, a new strategy of differentiation is starting to unfold for agricultural products. Although Japanese and Korean agricultural products cost more to produce and have higher prices, the two countries offer many exportable items in abundant varieties that have high levels of quality and safety. For example, even China cannot compete on grains with exporting countries like the U.S., so China has shifted production to fruits, vegetables, and livestock to pursue added value. Even in agricultural trade with Japan and Korea, China is finding ways to promote trade within product categories by importing some agricultural products and exporting others.

Therefore, when establishing an export strategy for Japanese agricultural products, the first step is to prepare a free competitive environment that eliminates Japanese border measures. After that, various possibilities will arise for developing intra-industry trade, when agriculture with comparative advantage to Japan is developed. In the field of fruits and vegetables, Japan is already internationally competitive; Japanese products have defeated imported products and secured sufficient profit, even expanding overseas in some cases. Livestock has also found a way into intra-industry trade. Beyond ultra-luxurious Japanese beef, less expensive Japanese beef may be able to cultivate a larger market by targeting the middle-class in Asia, including China.

As seen previously in the structure of exports of Japanese agricultural, forestry, and fishery products, processed products occupy a large portion for Japan. This is an agricultural version of the processing trade, at which Japanese manufacturing industry has exceled. Japan imports wheat and other grains, then processes them into instant noodles and cup noodles for export. Exports of livestock products could also be considered a processing trade. Japan imports feed grains from overseas (e.g., the U.S.); processes them into beef, pork, chicken, and other livestock; and then exports the finished products—this is a textbook example of the processing trade. I hope Japanese agricultural products develop into exports for the global market using the processing trade as a new export strategy, while reviewing the path of the Japanese manufacturing industry, achieving improved quality and lower costs as well as through strengthening marketing overseas.

7. Conclusion: In Search of New Opportunities for Japan and the Role of the U.S.

This report provides an expert review of Asian (and even global) food security as well as the role of the Japanese livestock industry with respect to Japan and the U.S. Chapter 1 (authored by Hotta) contained an analysis of future consumption of livestock in Japan and Asia as well as production trends. Due to the declining and aging population as well as the increasing number of single-person households in Japan, needs for ready-made meal replacement (with processed meals) are expected to increase, and beef and chicken, which have been the main ingredients for traditionally cooked meals in homes and restaurants, must be treated as ready- made meal replacements. As for exports to Asian countries, livestock production must meet the needs of export counterparts, and there is the possibility of expanding exports of Japanese agricultural products by spreading Japanese food culture.

Chapter 2 (authored by Takahashi) discussed trends in international and Asian markets with respect to beef, the primary Japanese livestock export. While demands for beef in China and other Asian countries are increasing, recovery of cattle cycles in the U.S. has been slow and production in Australia and the EU has been low. The international market for beef is tight, and the currency

exchange rate leans toward the weakened yen, indicating Japan has a chance to expand exports of Japanese beef for the time being.

Chapter 3 (authored by Mikamo) discussed the circumstances of grain procurement in the global market, where the U.S. has advantages in terms of the cost of grain production, especially corn, with which the nation is extremely competitive. In addition, the U.S. has established logistics infrastructure. The chapter also mentions that other countries have started focusing on the condition of their infrastructure, and supply chains through trading companies are important for importing countries.

The Japanese agricultural processing trade is supported by a supply of grain from the U.S. Chapter 4 (authored by Mitsuishi) discussed four scenarios for Japanese grain imports in 2040. Japan will be a market with a 100 million population in 2040, which requires approximately 20 million tons of grain imports, though the number of births will continue to decrease. In order to secure such imports, the chapter contended that rather than expanding risks by decentralizing blindly, it is important to solidify relationships with exporting countries with established infrastructure and political relationships, namely the U.S., so that Japan can definitely secure the necessary amount whatever emergency situation occurs—this is important also from the point of view of food security.

What these discussions reveal is the efforts to achieve the "Expected/advance scenario" discussed in Chapter 4. This scenario assumes changes in the social system, eating habits, and lifestyles as premises for a constructive response. In this, food is more recognized as the international public good, no countries place export bans, and the development of IT allows production to be increased in conjunction with the use of biotechnology, with a deeper understanding of consumers also in the background. At the same time, consumers can freely choose non-genetically-modified food or high quality food that has not undergone conventional processing.

Under the "Expected/advance scenario," what kind of response will be expected from Japanese agriculture and food? Although the domestic market will shrink due to the declining population, food made in Japan will be supplied globally. In particular, booming Asian countries are the best market for food made in Japan. The way to develop Japanese agriculture for the processing trade is by utilizing bulk produce (e.g., grain) from the U.S. to feed livestock and produce exports with added value. Not limited to livestock products, Japan can revitalize its agriculture as a new exporting country that exports with added value by improving the quality of its current processed food and establishing local brands.

As exports of bulk produce continue to expand, efficient transportation is a must. As a result of the Panama Canal's several phases of expansion construction, sizes of grain transport vessels will reach 150,000 tons. Japan must immediately prepare domestic ports to accommodate large-size grain transporters, such as Panamax with 150,000-ton capacities.

There are also high hopes for the advancement of renewable energy technologies under this scenario. If cellulosic biomass is put into practical use, Japan will become able to produce ethanol inexpensively, and use of imported grains from the U.S. might then fall under total energy security. If this happens, systems for producing bioethanol from imported corn could be built adjacent to the grain receiving facilities scattered throughout Japan. In addition to the supply pipeline, based on traceability, establishment of distribution networks will be necessary for high quality grains. This means the pipeline for the grains Japan imports will find new demand and a bigger pipeline will contribute to a stable trade relationship, particularly between the U.S. and Japan.

Advancement of biotechnology will enable product development that meets consumers' needs. In particular, promoting consumers' understanding of grains with functions for tackling lifestyle diseases, such as diabetes and obesity, as well as genetic modification (GM) techniques in the healthcare field is expected to dramatically broaden the range of usage.

On the other hand, distribution management will use much smaller lot levels for separate production for grains with specific functions. Separate distribution of small lots utilizing containerized transport has remarkably increased for functional plants for specific diseases, which have a limited number of target consumers. This requires an extremely complicated, precise control system throughout the entire supply chain.

To achieve the "Expected/advance scenario" in Japan, international efforts and collaboration with other countries are both essential. In particular, with respect to the U.S. with which we must deepen our economic collaboration to further our friendly relationship, Japan should request the following.

- Continuation of a stable supply of high quality bulk grain produce through continuous use of infrastructure within the U.S.
- Reduction of costs through more efficient transportation using larger-scale vessels for bulk transport
- Real-time information services to supply information on grain production and growth conditions
- Creation of grains and food having added functions using biotechnology
- Creation of a consignment production market for grains with added high value based on traceability and individual production contracts

There is no guarantee this "Expected/advance scenario" will be achieved. However, if both countries have common future goals they wish to collaborate on to realize, in the end this will be the most effective step to approach this scenario.

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REPORT ON THE ROLE OF THE JAPANESE LIVESTOCK INDUSTRY IN SECURING A FOOD SUPPLY FOR THE GROWING ASIAN MARKET

December 2014

U.S. Grains Council